



VALUE FOR MONEY AUDIT REPORT

of the

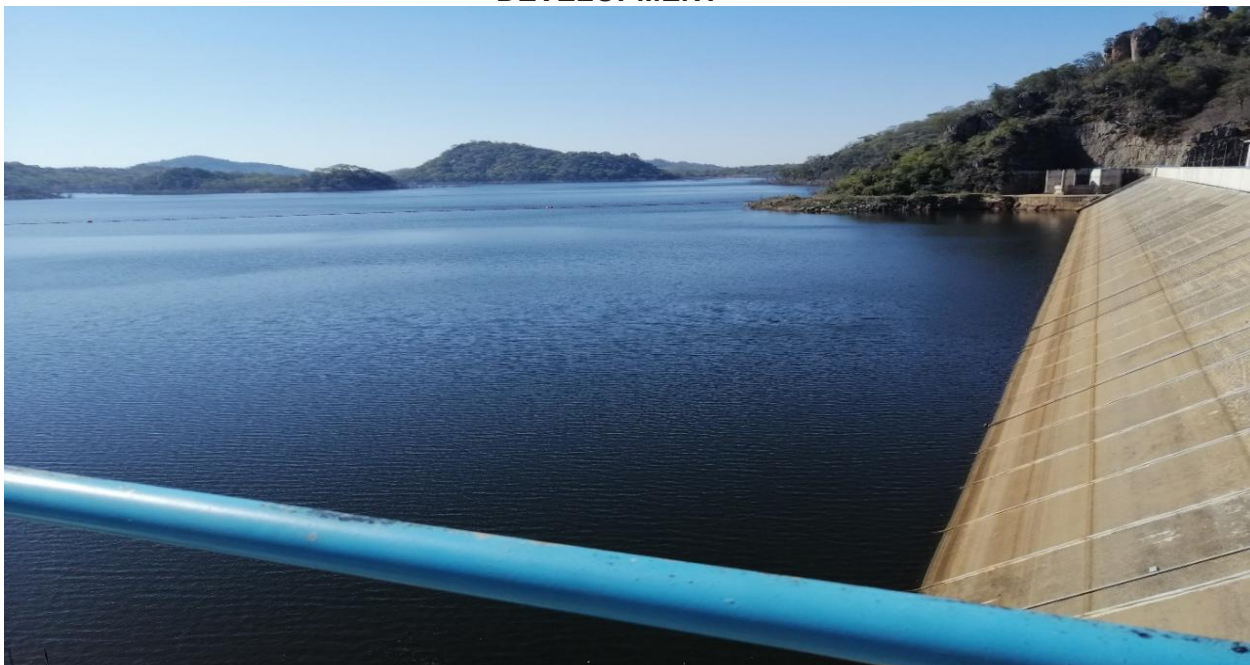
AUDITOR-GENERAL

on the

UTILISATION OF DAMS, A CASE OF TUGWI-MUKOSI DAM

by the

**MINISTRY OF LANDS, AGRICULTURE, FISHERIES, WATER AND RURAL
DEVELOPMENT**



VFM 2024:02



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The Hon. Dr. A. J. Masuka
Ministry of Lands, Agriculture, Fisheries, Water and Rural Development
Ngungunyana Building
1 Borrowdale Road
Harare, Zimbabwe

Dear Sir

I hereby submit my Value for Money Audit Report on Utilisation of Dams, A Case of Tugwi Mukosi Dam in terms of Section 11 of the Audit Office Act [Chapter 22:18].

Yours faithfully,

R. KUJINGA
ACTING AUDITOR-GENERAL.

Harare,
September 2, 2024.



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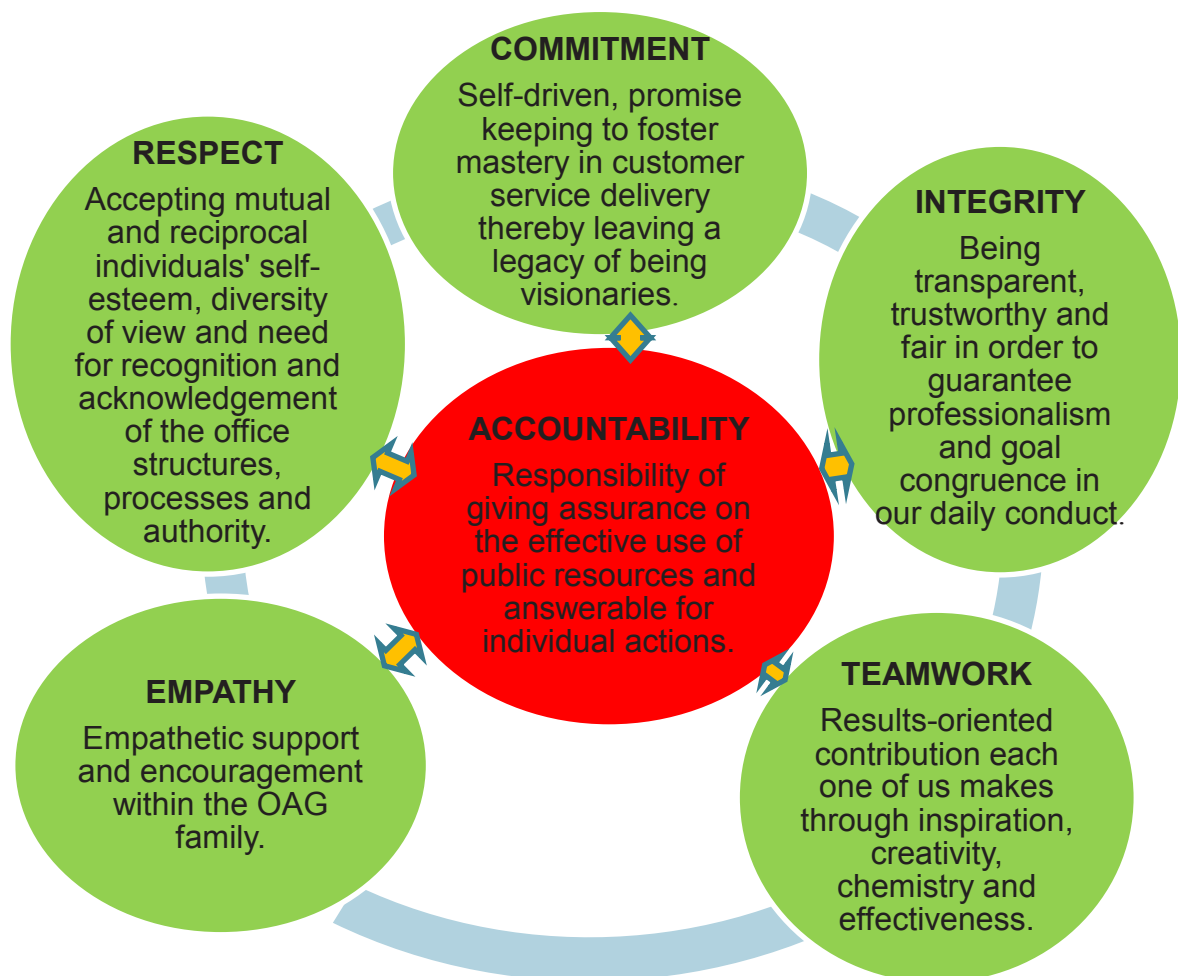


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GLOSSARY OF TERMS

Afforestation	This is when new trees are planted in an area where there were no trees before, creating a new forest.
Appurtenant works	Refers to any works which contribute directly or indirectly to the functioning, operation or safety of a large dam.
Combination Authority	Refers to the Tugwi Mukosi Dam and Environs Combination Master Plan Authority.
Conveyance Systems	These comprise of infrastructure which transport water from the main intake structure or main pumping station up to the irrigation fields.
Dam Inspection	Refers to checks done by engineers at periodic intervals to determine the safety of the dam.
Dam Maintenance	Refers to actions or upkeep performed on a dam or its appurtenances to reduce wear and tear of the dam. This includes mowing, repairing fences, exercising valves, and clearing downstream of the primary spillway works so it continues to drain normally.
Dam Project Cycle	Refers to the three stages involved in the construction of the dam namely, planning, development and management.
Dam Safety	Means the measures taken to ensure the safe operation and maintenance of the existing dam.
Dam Security	This refers to protection of information, infrastructure and accessibility to the dam.
Dam Silt Surveys	Involves surveying the hydro-soil and the sediment proportion in the water body.
Guaging Station	Refers to a flow monitoring tool used to measure the flow of water in and out of the dams.
National Dam	Means a dam which is capable of storing water which has a vertical height of fifteen metres or more measured from the non-overflow crest of the wall of the structure to the lowest point on the downstream face of the wall and or is capable of storing one million or more cubic metres of water at full supply level.
Pilot study	A small-scale test or study of the methods and procedures done to benchmark on how other dams were being utilised.

The Ministry	Refers to Ministry of Lands, Agriculture, Fisheries, Water and Rural Development.
Sustainability of the Dam	The assurance and guarantee for continued existence of the Dam serving the purpose for which it was constructed uninterrupted.
Saddle	Refers to a wall constructed on the banks of the dam to confine the reservoir either to permit a higher water elevation and storage or to limit the expansion of a reservoir.
Servitude	Refers to the boundary or area reserved from the water reservoir.

ACRONYMS

CCTV	Closed-Circuit Television
DTZ	Development Trust of Zimbabwe
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement Construction
GOZ	Government of Zimbabwe
ICOLD	International Commission on Large Dams
MW	Megawatt
NDS	National Development Strategy
OPC	Office of the President and Cabinet
PSIP	Public Sector Investment Programme
RDC	Rural District Council
TMMRI	Tugwi Mukosi Multi- Disciplinary Research Institute
TSP	Transitional Stabilisation Plan
WASHP	Water Sanitation and Hygiene Programme
ZICOPE	Zimbabwe Community Option for Protection and Empowerment Trust
ZIMPARKS	Zimbabwe Parks and Wildlife Management Authority
ZINWA	Zimbabwe National Water Authority
ZNA	Zimbabwe National Army
ZRP	Zimbabwe Republic Police

EXECUTIVE SUMMARY

Background of the Audit

The Ministry of Lands, Agriculture, Fisheries, Water and Rural Development is responsible for making sure that dams are fully utilised in accordance with Section 6 of the Water Act [*Chapter 20:24*]. The Ministry develops policies to guide the orderly and integrated planning of the optimum development, utilization and protection of the country's water resources in the national interest. In discharging its duties, the Ministry delegates its functions or duties to the Zimbabwe National Water Authority (ZINWA) in line with Section 8 of the Water Act [*Chapter 20:24*] and the ZINWA Act [*Chapter 20:25*]. The Ministry may also assign other duties to Catchment Councils in accordance with Sections 20 and 21 of the Water Act [*Chapter 20:24*] and Statutory Instrument 242 of 2000. There are 7 catchment areas namely Manyame, Sanyati, Save, Mazowe, Mzingwane, Runde and Gwayi in the country.

The Ministry promulgated Statutory Instrument 135 of 2021 which established the Tugwi Mukosi Dam and Environs Combination Master Plan Authority (Combination Authority). The Combination Authority's functions included development of the Master Plan for proposed activities and related policies for the Tugwi Mukosi Dam among others.

This Audit was centred on utilisation of Tugwi Mukosi Dam. The Tugwi Mukosi Dam was constructed for the purposes set out in the approved Tugwi Mukosi Integrated Development Framework (August 2017). The framework consists of 14 anchors or targeted development programmes and activities. These included irrigation development, wildlife and parks management programme, tourism, fisheries and crocodile farming activities and construction of a Mini Hydro Power Generation (15 MW) to mention a few. A pilot study was carried out at Kariba and Mazvikadei Dams to benchmark on how dams were being utilised.

Motivation

My audit was motivated by the Government investment and potential contribution from various developmental projects earmarked for utilising Tugwi Mukosi Dam. The Government has made extensive investments for the past years in the construction of national dams. The Tugwi Mukosi Dam construction was wholly funded by Government through Public Sector Investment Programme (PSIP) at a cost of US\$300 Million. The large dam was completed and commissioned in 2017. The dam has a capacity to irrigate at least 25 000 hectares of land. Tugwi Mukosi Dam has a potential to change the face of Masvingo province as there are a number of business opportunities, ranging from tourism, wildlife and farming activities.

The Herald of January 14, 2020 indicated that Government through the Ministry of Local Government, Public Works and National Housing was still to come up with a Master Plan on how the Tugwi Mukosi dam was supposed to be utilised, four (4) years later after the date of commissioning.

It is for the above reasons that I considered it important to conduct a performance audit on Utilisation of Dams, A Case of Tugwi Mukosi Dam by the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development and also to proffer recommendations for improvement where necessary.

Findings

The dam has a computerised dam safety system to monitor movement of the dam structure, has security guards to provide security of infrastructure 24/7, sixteen (16) Fishing Cooperatives and four (4) cage culture Companies. Despite all the resources and efforts that Government has invested in the construction of the dam, the Ministry was still to realise the targeted objectives as the Tugwi Mukosi Dam was not being fully utilised. There was inadequate implementation of the Tugwi Mukosi integrated development programmes and projects. Also there were inadequate measures in place to ensure sustainability of the Tugwi Mukosi Dam. This entailed the assurance and guarantee for continued existence of the Dam serving the purpose for which it was constructed. There were some inadequacies on dam safety inspections and maintenance mechanisms, availability of gauging stations for collection of hydrological data, silt surveys and security systems for Tugwi Mukosi Dam.

1. Functionality of the Tugwi Mukosi Dam and Environs Combination Master Plan Authority (Combination Authority).

The Combination Authority was not functioning as required by Statutory Instrument 135 of 2021. The Combination Authority's responsibility is to formulate the policies and general proposals for the planning area in respect of development and land use. The proposed development and land use plans were targeted at utilising Tugwi Mukosi Dam. At the time of audit in March, 2023, interviews held at Provincial Offices with the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, ZIMPARKS and ZINWA officials revealed that the Combination Authority was not operational. No formal meetings were held since promulgation of the statutory instrument. There were neither evidence of minutes nor terms of reference availed to audit to determine how the various members appointed to the Authority would execute their duties. Non-functionality of the Authority was attributed to the non-appointment of representatives and lack of coordination amongst the members in accordance with Statutory Instrument 135 of 2021.

Five (5) years after commissioning of the Tugwi Mukosi Dam, the Ministry did not have an approved Master Plan which guided the distribution of various developmental programmes and activities to be carried out. The Master Plan was supposed to be in place before construction of the dam. However, at the time of audit in March 2023, the Master Plan for Tugwi Mukosi was still at draft stage. Failure by the Ministry to have a Master Plan was due to inadequate planning and non-compliance with Section 14 (2) of the Regional, Town and Country Planning Act [Chapter 29:12] which requires the establishment of a Master Plan before construction. The delay in establishment of Master Plan affected implementation of developmental projects and Government may take long to realize the return on investment and benefits attributed to the structure and improvement of citizens' lives.

2. Utilisation of Tugwi Mukosi Dam water resources.

Analysis of water release reports for the years 2018, 2020, 2021 and 2022 as compared to the average yield for the four (4) years indicated that there was underutilization of Tugwi Mukosi water resources ranging from 21-71%. In 2019, water released exceeded the average yield by 2%. During the period 2018 to 2022, ZINWA was using the water resources in the Dam as back up to cushion supplies of other dams that were failing to meet the demands from their clients. These included Mutirikwi and Tokwane Dams that were struggling to supply water to sugarcane farmers in Triangle, Chiredzi and A2 farmers in other parts of the region. Underutilisation of the dam was attributed to non-existence of water agreements.

Since commissioning of the Dam in May 2017 up to the date of audit on March 13, 2023, there were no existing water agreements or permits for utilisation of Tugwi Mukosi Dam. ZINWA had not issued any agreements or permits to specific farmers for utilisation of Tugwi Mukosi water. Non-issuance of water agreements or permits was due to absence of conveyance systems to identified irrigable land and the Ministry was awaiting the approval of the Master Plan to start construction. It is the responsibility of the Ministry through ZINWA to construct conveyance systems to identified irrigable land. The Nyahombe Irrigation Scheme which started operating in 2022 was utilising water from the dam to irrigate 80 hectares of land but did not have a water permit to do so.

3. Implementation of Tugwi Mukosi Integrated Development Programmes and Projects.

Documentary review revealed that they were fourteen (14) anchor projects that were supposed to be implemented. Reports, minutes and inspections carried out as at March 2023 revealed that eight (8) anchor projects were not yet implemented as they solely depended on the finalisation of the Master Plan, whilst the remaining six (6) had been partially implemented. The partially implemented anchors had some short and medium term project activities that were supposed to be carried out in the absence of the masterplan. The delay in implementation of projects has stifled Government plans and objective of realising a return on investment and improvement of citizens' lives. The status for the implementation of the fourteen (14) anchors is as outlined below:

- There was inadequate expansion of the irrigation development programme. Documentary review of irrigation reports at the Ministry and ZINWA showed that only 80 hectares (0.32%) out of a potential of 25 000 hectares of land was under irrigation utilising water from Tugwi Mukosi Dam. Most land that was suitable for irrigation was private land owned mainly by DTZ (Development Trust of Zimbabwe) therefore, the Ministry would need to negotiate and acquire land from these private owners for the irrigation development programme to succeed. In most areas close to the dam, the soils and topography were not suitable for irrigation development. Feasibility designs and irrigation planning had been completed and this included Environmental and Social Impact Planning and Draft Irrigation Masterplan. The feasibility studies encompassed both state and private owned land. However, there were no conveyance systems and other irrigation infrastructure setup as at March 2023.
- The Wildlife and Parks Management Programme was not yet implemented as at March 2023. Despite existence of ZIMPARKS Officials at Tugwi Mukosi Dam, there were no game parks that had been established. ZIMPARKS was awaiting gazetting of the Recreational Area which was pending at the time of audit in March 2023. There were some settlements that were within the proposed game reserve servitude.
- There was no evidence to show whether the tourism plan was developed. The Tourism Investor Prospect had identified 22 Islands for the construction of Hotels, Holiday Homes, Cultural Village, Lodges and Restaurants. There were no Hotels, Holiday Homes, Cultural Village, Lodges and Restaurants constructed at the dam at the time of audit in March 2023.
- There were no Crocodile farming activities yet at the dam due to weather conditions claimed not suitable for crocodile farming which was likely hindering investment in the project.

ZIMPARKS had issued licenses to sixteen (16) Fishing Cooperatives. However, fish poaching activities were rampant due to lack of vehicles and speed boats to use for patrols by ZIMPARKS.

- Construction of a Mini Hydro Power Generation (15 MW) had not yet started at the time of audit in March 2023. The delays were attributed to absence of a water supply agreement between ZINWA and the Contractor. However, the Environmental Impact Assessment (EIA), feasibility report, power purchase agreement, and the Engineering, Procurement Construction (EPC) proposal have all been finalised.
- Construction of a Navigation Mast (Control Tower) and a Harbour for the management of boating operations had not yet commenced at the time of audit in March 2023. The Tugwi-Mukosi Consolidated Report of July 2021 revealed that tenders for the construction of the Control Tower and two (2) harbours were floated in the newspapers and there were no takers.
- There were no developments that had been done to establish the Museums at the dam site since commissioning in May 2017. This was due to lack of coordination between the Ministry of Home Affairs (Museums and National Monuments) and ZINWA on establishment of interim museum in the short term. There were no clearly defined lines of authority between the two on how they should operate.
- The Security Institutions were not yet at the dam site despite the fact that the dam had been gazetted as a national asset which warranted presence of the security sector to guard against any attacks or compromise of critical infrastructure.
- The construction of integrated service centre, residential and commercial development programme had not been implemented as the integration of the service centres were supposed to be informed by the masterplan.
- The area wide power supply programme had not commenced due to absence of the Master Plan and the power generating station.
- Identification and construction of airstrips near Tugwi Mukosi dam had not yet commenced as at the time of audit in March 2023 due to absence of an approved Master Plan. This was part of the short term targeted projects inclusive of upgrading. However, upgrading of airstrips at Buffalo Range, Chivi and Masvingo Districts were in progress.
- The Tugwi Mukosi Multi-Disciplinary Research Institute (TMMRI) on disciplines like Tourism, Agriculture, Processing, Engineering, Ecology, Local Governance, and Marketing was not yet established due to absence of an approved Master Plan. However, ZINWA was using the existing camp left by the contractor (Salini Impreglio) for its in house training for engineers and hosting university students. Apart from this, the Institute was not yet registered by the Ministry of Higher and Tertiary Education, Science and Technology Development at the time of audit in March 2023.
- Establishment of value addition intended activities around the dam which included fish canning, sugar milling, fruit juice manufacturing, cooking oil production, ethanol

production, cereal milling, beef and molasses production were not yet in place. The establishment of the activities were supposed to be informed by the masterplan.

- Forestry Commission had managed to partner with Zimbabwe Community Option for Protection and Empowerment Trust (ZICOPE) and Aquaculture Zimbabwe to plant a total of 18 644 trees of assorted varieties against a target of 10 000 in the Tugwi Mukosi catchment area. This translated to 41.7 hectares planted from a target of 25 hectares. Despite the efforts by the Forestry Commission, deforestation was exceeding afforestation efforts due to uncontrolled cutting down of trees by residents.

4. Sustainability of the Dam.

There were inadequate measures taken to ensure sustainability of the Tugwi Mukosi Dam. The measures would give the assurance and guarantee for the Dam to continue serving the purpose for which it was constructed. The inadequate measures include:

- There were no detailed engineering inspections that had been carried out by an approved civil engineer at Tugwi Mukosi Dam since commissioning in May 2017 in compliance with the regulations. However, ZINWA engineers carried out adhoc inspections including in 2021 when the dam first over spilled. Since then no comprehensive inspections were done. ZINWA indicated that they had no equipment.

The Tugwi Mukosi Dam has a dam safety computerised system. However, at the time of audit in March 2023, the server was not working since September 2022 due to expired software which was not locally available.

- Saddle Dam 3 at Tugwi Mukosi Dam had developed a deep crack at the time of audit in March 2023. Also, there were no devices placed on the crack to monitor the severity and whether it was further enlarging with time. There was a great risk that if the wall fails, many lives and property may be lost due to flooding downstream.
- Gauging stations for collection of hydrological data were not available at the Dam's main tributaries which included Tugwi, Shashe and Mukosi rivers to measure inflows. The absence of gauging stations increased the risk of flooding and cast doubt on preparedness to combat floods. There were no plans availed to audit for the establishment of gauging stations in the main tributaries in the near future.
- There were no silt surveys done at the expiry of five (5) years after commissioning of the Dam in May 2017. During my inspections of the servitude area in March 2023, I noted that the dam was prone to high rate of siltation due to excessive farming activities, overstocking and deforestation by the residents.
- There were inadequacies in the security system at Tugwi Mukosi Dam as at the time of audit in March 2023. My audit noted that for instance, there were no barricades to secure the dam wall, the bi-metric, alarm and CCTV systems were not working. Security reports also indicated inadequate security measures along the canals which convey water from Tugwi Mukosi Dam to farming activities. There were no vehicles that could be used to support the existing security personnel in executing their duties at the time of audit in March 2023.

Recommendations.

My recommendations below are intended to facilitate maximum utilisation of Tugwi Mukosi Dam in the quest to achieve the intended developmental objectives as set by Government:

1. The Ministry should:
 - Ensure that the Tugwi Mukosi Dam and Environs Combination Master Plan Authority is functional and making sure that terms of reference for the Authority should be established and made available for audit review. Clear responsibilities should be outlined for proper coordination of the Authority members. This is vital for the success of earmarked projects and activities.
 - Expedite the process of implementation of the Master Plan to ensure proper allocation and distribution and execution of developmental activities.
2. The Ministry should ensure maximum utilisation of the Tugwi Mukosi Dam by:
 - Accelerating the process of putting in place conveyance systems in all identified irrigable land to ensure access to the water. This would trigger interest in application for permits for the use of the water resources by investors and commercial farmers.
 - Coming up with stiffer penalties or other measures to deter illegal abstraction of water resources along the conveyance systems so that permit holders benefit from what they would have paid for.
3. The Ministry should ensure that the projects planned under the Tugwi Mukosi Integrated Development Framework (14 Project Anchors) are implemented without any further delays. This will enhance the maximum utilisation of the dam for the benefit of the country and enhance economic activities in the Tugwi Mukosi environs such as irrigation development, electricity production, tourism resort facilities and fishing activities.

The Ministry should ensure availability of financial and material resources for the conclusion of all short term and medium term projects that were partially implemented.

Maximum effort on coordination of activities earmarked for the Tugwi Mukosi Dam should be done to ensure successful implementation of the short and long term integrated development projects. Monitoring mechanisms should be put in place to facilitate efficiencies.

The Ministry should expedite the process for the registration of the Multi-Disciplinary Institute for Research and Advisory Services with the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development and construction of more facilities on site to facilitate research activities.
4. To enhance sustainability of the Tugwi Mukosi Dam, the Ministry should ensure that detailed engineering inspections are done after every five (5) years by an approved civil engineer in compliance with the requirements of the Water Act [*Chapter 20:24*] and International Commission on Large Dams (ICOLD) to reduce chances of dam failure. Regular inspections and midterm monitoring reviews should also be done.

To enhance safety of the dam, the Ministry should:

- Ensure that the available computerised system to monitor the behaviour of the dam structure is always working to detect any changes. Also institute a monitoring mechanism for cracks that develop on the dam walls in line with international dam safety requirements. There is a risk that if the wall fails, many lives and property may be lost as there may be flooding downstream
- Establish the Independent Regulator of Dam Safety in accordance with the National Water Policy (2013) to assist with independent inspections and maintenance of dams to assure on safety. Benchmarking can be done with other dams such as Kariba Dam which is regularly inspected by independent dam safety experts.
- Ensure availability of gauging stations in the main tributaries to Tugwi Mukosi Dam for collection of hydrological data that would assist in management and control of flooding in the dam catchment area and downstream. Benchmarking with Kariba Dam which has gauging stations in all tributaries that feed the dam.
- Comply with the requirements of the Water Act [*Chapter 20:24*] and International Commission on Large Dams (ICOLD) which stipulates that silt surveys should be carried out after every five years to determine the extent of segmentation in the Dam. The Ministry should capacitate the engineers with modern technologies available to aid the silt survey programmes. The modern survey equipment such as echosounders and a computer controlled positioning system are required for data computation and map generation. These modern technologies increase rate of accuracy and make use of limited labour. The initial cost for the necessary software may be high, but it is essential for the function of the siltation monitoring programme.
- Put in place adequate security systems through construction of barricades to secure the dam wall to reduce vandalism of property. The Ministry should consider increasing security along the canals to curb illegal abstractions. Vehicles should be availed to aid security personnel in patrolling along the canals. The Ministry should also benchmark with Kariba Dam which has a security zone guarded or protected by armed National Security Officers 24/7.

5. Pilot Study

From the results of the pilot study the Ministry should also consider the following recommendations for the improvement of management of Tugwi Mukosi Dam.

- Emulate the standards for maintenance and dam safety procedures and operations being implemented by Zambezi River Authority at Kariba Dam. Kariba Dam maintains high standards in accordance with the International Commission on Large Dams in areas such as dam safety, security, water utilisation, inspections, gauging stations and maintenance.
- Ensure that ZINWA is capacitated with the requisite infrastructure to continue abstracting water without interruptions for the benefit of its customers and that all the water supplied is billed.

- Adhere to regulations and best standard practices in the management of Mazvikadei Dam in areas like maintenance of the dam infrastructure, ensuring security services are available, inspections, silt survey, utilisation of water resources, sustainability and management of gauging stations.

CHAPTER 1

1. INTRODUCTION

This Chapter outlines background to the utilisation of dams, the motivation, organizational structure, funding and the audit design.

1.1 Background

The Government has made extensive investments for the past years in the construction of national¹ dams. The Ministry of Lands, Agriculture, Fisheries, Water and Rural Development is responsible for making sure that dams are fully utilised in accordance with Section 6 of the Water Act [Chapter 20:24]. The Ministry develops policies to guide the orderly and integrated planning of the optimum development, utilization and protection of the country's water resources in the national interest.

In discharging its duties, the Ministry delegates its functions or duties to the Zimbabwe National Water Authority in line with Section 8 of the Water Act [Chapter 20:24] and the ZINWA Act [Chapter 20:25]. The Ministry in consultation with the Authority may also assign other duties to Catchment Councils in accordance with Sections 20 and 21 of the Water Act [Chapter 20:24] and Statutory Instrument 242 of 2000.

ZINWA assists the Ministry in the administration of the Water Act Act [Chapter 20:24] and co-ordinates the development of the water resources of Zimbabwe to ensure optimum utilisation. To ensure a smooth and co-ordinated management of Zimbabwe's water resources, Catchment Councils and Sub Catchment Councils have been established. ZINWA has 7 catchment areas controlled by Catchment Councils namely Manyame, Sanyati, Save, Mazowe, Mzingwane, Runde and Gwayi.

1.1.1 Area of Study

The area of study is Tugwi Mukosi Dam which is located in Masvingo Province. The Dam is built on the point where two rivers namely, Tugwi and Mukosi converge, giving rise to the use of the name Tugwi Mukosi Dam. **Picture A** shows part of Tugwi-Mukosi Dam view from hilltop.

¹ Means a dam with which its abutments, appurtenant works and foundations, is capable of storing water which:

(a) Has a vertical height of fifteen metres (15) or more measured from the non-overflow crest of the wall of the structure to the lowest point on the downstream face of the wall; or

(b) Is capable of storing one million or more cubic metres of water at full supply level.

Picture A: Cross Section of Tugwi Mukosi Dam.



Source: Department of Water Resources, Irrigation Development and National Water Sanitation and Hygiene Programme Coordination archive.

Construction of the dam began in June 1998 and eventually completed in December 2016. The dam was commissioned in May 2017. The dam was constructed by a contractor named Salini Impregilo. Tugwi-Mukosi is the largest inland dam in Zimbabwe with a 90-metre height dam wall, a back throw of over 35 kilometres and capacity to hold more than 1.8 billion cubic meters of water. Tugwi-Mukosi has a potential to change the face of the province as there are a number of business opportunities, ranging from tourism, wildlife and farming activities.

1.1.2 Pilot study

The audit was focused on utilisation of water resources at Tugwi Mukosi Dam. However, a pilot study was carried out at Kariba and Mazvikadei Dams to benchmark on how the dams were being utilised. The results of the pilot study were mainly reflected in the findings and recommendations of the report.

1.2 Motivation

The audit was motivated by Section 711 of the National Development Strategy 1 (NDS1) which targets that provinces fully benefit from their resources under the devolution of power framework. The construction of the dam was wholly funded by Government through PSIP at a cost of US\$300 Million. The Ministry programmes and projects earmarked to be carried out at the dam will be funded by the Government of Zimbabwe and private partnerships. The dam was completed and commissioned in May 2017 but only supplies water to a few sugarcane estates in the lowveld. The dam has a capacity to irrigate at least 25 000 hectares of land.

The Herald of January 14, 2020 indicated that Government through the Ministry of Local Government, Public Works and National Housing was still to come up, four (4) years later after the date of commissioning, with a Master Plan on how the Tugwi-Mukosi dam and areas surrounding the dam were supposed to be utilised. It was also reported that the Government was yet to pay US\$200 000 to a consultant from South Africa hired to come up with a Master Plan. The Master Plan was set to be out in the first quarter of the year 2020. The Herald of June 30, 2021 further indicated that the Ministry had issued Statutory Instrument 135 of 2021

which set up the Tugwi Mukosi Dam and Environs Combination Master Plan Authority in a bid to fast track the process of coming up with a Master Plan.

1.3 Organisational Structure

The Ministry supervises and monitors utilisation of water activities through the Department of Water Resources, Irrigation Development and National Water and Sanitation, Hygiene Programme Coordination. The Department execute its mandate through the Zimbabwe National Water Authority (ZINWA) and Catchment Councils and Sub-Catchment Councils. The Sub-Catchment Council and ZINWA reports to the Ministry through the Department of Water Resources, Irrigation Development and National WASHP Coordination. Refer to **Annexure A** for details.

1.4 Audit Design

1.4.1 Audit Objectives

The objective was to evaluate whether the Ministry had achieved its targets as set in the approved Tugwi Mukosi Integrated Development Framework (August 2017).

1.4.2 Audit Scope

The audit focused on the extent of utilisation of Tugwi Mukosi Dam as set in the approved Tugwi Mukosi Integrated Development Framework (August 2017), under the supervision of Ministry of Lands, Agriculture, Fisheries, Water and Rural Development. The audit covered the period from commissioning in 2017 to March 2023.

1.4.3 Auditee

The auditee was the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development.

1.4.4 Audit Questions and Assessment Criteria.

1. To what extent is the Ministry utilising water resources at Tugwi Mukosi Dam to achieve the targeted commercial projects or programmes?

The Ministry should ensure that water resources are utilized at all times in an efficient manner having special regard to its value and the economic and other benefits that may be derived from it in accordance with Section 6(2)(e) of the Water Act [Chapter 20:24].

1.1 To what extent has the Ministry been able to issue permits to water users?

Section 34 (1) Water Act [Chapter 20:24] indicates that no individual or company shall abstract water for primary purposes except in terms of a permit. In terms of Statutory Instrument 242 of 2000, the Catchment Councils are responsible for receiving applications and granting permits for water use.

1.2 To what extent is the Tugwi Mukosi Dam and Environs Combination Master Plan Authority functional?

Section 6(1) (a-h) of Statutory Instrument 135 of 2021 indicates that the Combination Authority is responsible for formulating the policies of the authority and its general proposals for the planning area in respect of development and land use.

1.3 Has the Ministry been able to achieve commercial activities as determined by the Master Plan?

Section 5 of Statutory Instrument 135 of 2021 on Regional Town and Country Planning (Tugwi Mukosi Dam and Environs Combination Master Plan Authority) requires the establishment of a Master Plan for Tugwi Mukosi Dam.

2. To what extent had the Ministry implemented the Tugwi Mukosi Integrated Development Framework (August 2017) anchor points?

Section 7 of the Tugwi Mukosi Integrated Development Framework (August 2017) indicates a Summary Schedule of the fourteen (14) proposed main projects and programmes Anchored by Tokwe Mukosi Dam.

- a) Did the Ministry achieve the target of Irrigating 25 000 hectares or plans in place?
- b) Is there any Wildlife and Parks Management Programme running at the designated sites or are plans in place?
- c) Did construction of Hotels, holiday homes, cultural village, Lodges and Restaurants commence or are plans in place?
- d) Are there any Fisheries and Crocodile Farming activities and or plans in place?
- e) Is the Mini Hydro Power Generation (15 MW) operational and or plans in place?
- f) Did construction of a Navigation Mast (Control Tower) and a Harbour and management of Boating Operations commenced or are plans in place?
- g) Did construction of a Museum commence or are plans in place?
- h) Is the Development Programme for Administrative and Security Institutions in place?
- i) Is the Integrated Service centre, residential and commercial development programme in place?
- j) Did the Area Wide Power Supply Programme start?
- k) Did the upgrading of aerodrome commence?
- l) Did construction of Training Institute for all disciplines like Engineering, Agriculture, Tourism, Ecology, Local Governance, and Marketing start?
- m) Is there any Value addition to the intended activities around the dam e.g. Fish canning, Sugar milling, Fruit juice manufacturing, cooking oil production, Ethanol production, Cereal milling, Molasses and beef production?
- n) Are there any Afforestation activities being done or are plans in place?

3. What measures has the Ministry put in place to ensure sustainability of the dams?

Section 7.6.3 of The National Water Policy (2013) stipulates that an Independent Regulator of Dam Safety shall be established to oversee competent, transparent, regular and independent inspections of large dams as well as routine maintenance of all dams in line with the Water Act Chapter [20:24] and International Standards and Norms.

3.1 Have planned inspections and maintenance been carried out to ensure sustainability of the dam's water resources?

Section 105 (1) (d) (iii) of the Water Act Chapter [20:24] requires that for each successive period of five years reckoned from the date of completion of construction of the large dam, cause a detailed engineering inspection and maintenance of the large dam to be carried out by an approved civil engineer. This is also in compliance with the requirements of the International Commission on Large Dams (ICOLD).

3.2 Has the Ministry installed adequate Gauging Stations to help monitor volume of inflows and outflows of water resources into the dam?

Section 96 of the Water Act [Chapter 20:24] requires that appurtenant works be put in place and include gauging stations which are used for measuring flow, movement and pore water pressure, seepage, strain, velocity, temperature or uplift pressure, whether in the structure of the large dam or separate therefrom. Section 43 of the Water Act [Chapter 20:24] highlights that gauge plates or any other measuring devices must be put up at the dam.

3.3 To what extent have silt surveys been carried out to ensure sustainability of the dam's water resources?

The Zimbabwe National Water Authority is supposed to conduct silt surveys in line with International Commission on Large Dams (ICOLD) which requires every large dam to be surveyed after every 5 years.

3.4 To what extent is there security of infrastructure at the Dam?

Tugwi-Mukosi Dam was declared a national asset which therefore warrants maximum protection twenty-four hours daily in line with International Commission on Large Dams (ICOLD) requirements.

1.5 Sampling

A pilot study had been carried out in Mashonaland West Province (Kariba and Mazvikadei Dams) considering their capacity and level of activities. Masvingo Province, (Tugwi-Mukosi Dam) had been selected as the main area of study considering that:

- According to ZINWA, it is the largest inland dam in the country, with a capacity of 1.8 billion cubic meters of water.
- Government had invested substantial financial resources amounting to USD 300 Million on the project and expected a return targeting commercial activities to be carried out.
- The TSP and NDS 1 targeted to carry out commercial farming, tourism, wildlife and electricity generation to boost economic activities utilising the water resources.

1.6 Audit Methodology

The following methods were applied in data collection:

1.6.1 Documentary Review

Documents were reviewed to gather information with regards to policies, strategies, and progress related to utilisation of dams. **Refer to Annexure B** for documents reviewed.

1.6.2 Interviews

These were carried out with key and relevant personnel from Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, Zimbabwe National Water Authority (ZINWA) and other key stakeholders. The interviews were used to collect evidence on how the dam was being utilised to deliver value and benefits to the citizens as well as corroborating information obtained from documentary review for the purposes of evaluating the project. **Annexure C** shows the list of interviewees.

1.6.3 Inspections

Inspections were carried out in sampled areas to assess progress on irrigation, fishing, recreational facilities, electricity generating and wildlife activities and plans in place at the dams' sites.

Table 1: List of inspections done

Details		Area Inspected
Pilot Study		
ZINWA-Manyame Council	Catchment	Mazvikadei Dam Wall, Spillway, gauging station, Crop farming activities around the dam, Fish Farm and Crocodile Farm

Kariba Dam	Dam Wall, Spillways, gauging stations, dam wall safety and protection equipment, Plunge pool rehabilitation works, Activities around the dam, ZINWA plant
Main Study	
Forestry Commission	Afforestation activities in Tugwi Catchment at Gunikuni Secondary School, and illegal settlements (Masvingo District) and Chindiro (Chivi District)
ZINWA- Tugwi Mukosi Dam	Dam wall, gauging stations, dam wall computerized equipment for protection and safety of the dam, spillways, release valves, flood control and management systems
ZIMPARKS Recreational Zone- Tugwi Mukosi Dam	Caging fisheries. Speed boats, illegal settlements in the servitude areas
Irrigation Schemes	Nyahombe Irrigation Scheme
Irrigation Canal routes	Illegal water abstractions in Tokwane area canals

CHAPTER 2

2. SYSTEMS DESCRIPTION

This chapter describes the roles and responsibilities and processes carried out by the Ministry and other key players in the utilisation of dams.

2.1 Roles and Responsibilities of Key Players

2.1.1 Ministry of Lands, Agriculture, Fisheries, Water and Rural Development

The responsibility of utilisation of dams in the country lies with the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development in accordance with Section 6 of the Water Act [*Chapter 20:24*]. The Ministry is responsible for:

- Developing policies to guide the orderly and integrated planning of the optimum development, utilization and protection of the country's water resources in the national interest.
- Ensuring the equitable and efficient allocation of the available water resources in the national interest for the development of the rural, urban, industrial, mining and agricultural sectors.
- Providing overall policy guidelines on the development, exploitation and utilization of water resources.
- Making sure that water resources are managed, utilized and conserved in a manner consistent with national environmental approaches provided for in any enactment.
- Ensuring that water resources are utilized at all times in an efficient manner having special regard to its value and the economic and other benefits that may be derived from it.
- Ensuring that research is carried out and information is obtained and kept, on hydrological and hydrogeological matters such as the utilization of the country's water resources.
- Fixing criteria for water allocation and the issue of permits for the use of water by catchment councils.

In discharging its mandate, the Ministry may delegate some of its functions or duties to the Zimbabwe National Water Authority in line with Section 8 of the Water Act [*Chapter 20:24*]. The Authority's mandate is derived from the ZINWA Act [*Chapter 20:25*] and the Water Act [*Chapter 20:24*].

2.1.2 Zimbabwe National Water Authority (ZINWA)

ZINWA derives its mandate and functions from the Zimbabwe National Water Authority (ZINWA) Act [*Chapter 20:25*]. ZINWA assists the Government in the administration of the provisions of the Water Act [*Chapter 20:24*] and co-ordinates the development of the water resources of Zimbabwe to ensure optimum utilisation. According to Section 5 of the ZINWA Act [*Chapter 20:25*], the major functions of the Authority includes:

- To advise Government on the formulation of national policies and standards on water resources planning, management and development, dam safety and water pricing.
- To assist and participate in or advise on any matter pertaining to the planning of the development, exploitation, protection and conservation of water resources.
- To exploit, conserve and manage the water resources of Zimbabwe with the object of securing equitable accessibility and efficient allocation, distribution, use and development.

To ensure a smooth and co-ordinated management of Zimbabwe's water resources, Catchment Councils and Sub Catchment Councils have been established in terms of Sections 20 and 21 of the Water Act [*Chapter 20:24*] and Statutory Instrument 242 of 2000. There are 7 catchment areas namely Manyame, Sanyati, Save, Mazowe, Mzingwane, Runde and Gwayi in the country.

Catchment Councils

According to Section 21 of the Water Act [*Chapter 20:24*] and Statutory Instrument 242 of 2000, the Catchment Councils are responsible for:

- Determining applications for water usage and grant permits.
- Regulating and supervising the exercise of rights to and use of water in respect of the river system for which it is established.
- Supervising the performance of sub catchment councils.

Sub-catchment Councils

These are established through Section 24 of the Water Act [*Chapter 20:24*] and Section 11 of Statutory Instrument 47, 2000 and are responsible for:

- Regulating and supervising water usage within the area for which it is established.
- Monitoring water flows and water use in accordance with allocations made under permits.
- Promote catchment protection.
- Collect sub catchment rates, fees and levies.

2.1.3 Ministry of Local Government and Public Works

According to the Tugwi Mukosi Integrated Development Framework (August 2017), the responsibility of the Ministry includes the following;

- Regulates the development processes in the area. This involves coming up with the Master Plan of activities in the area and facilitating relocation of citizens in areas earmarked for development.
- Appointment of the Combination Authority members.

2.1.4 Ministry of Environment, Climate, Tourism and Hospitality Industry

According to the Tugwi Mukosi Integrated Development Framework (August 2017), the responsibility of the Ministry includes the following;

- Development and management of the Wildlife and Parks Management Programme under the Zimbabwe National Parks & Wildlife Authority.
- Construction of Hotels, holiday homes, cultural village, Lodges and Restaurants by the Zimbabwe Tourism Authority, Mosi Oa Tunya Development Company and Private Investors.
- Development and management of Fisheries and Crocodile Farming under the Zimbabwe National Parks & Wildlife, Private Companies and Community groups.
- The afforestation of dam servitude area by the Forestry Commission.

2.1.5 Ministry of Energy and Power Development

According to the Tugwi Mukosi Integrated Development Framework (August 2017), the responsibility of the Ministry includes the following:

- Development of a Mini Hydro Power Generation (15 MW) at Tugwi Mukosi Dam.
- Development of the Area Wide Power Supply Programme at Tugwi Mukosi Dam.
- Provision of the policies and operational framework for the hydro and power supply programme.
- Energy and infrastructure development strategies.
- Identification of private players or companies to carry out various projects and activities.

2.1.6 Tugwi Mukosi Dam and Environs Combination Master Plan Authority

Section 13 and 14 of the Regional, Town and Country Planning Act [*Chapter 29:12*] together with Statutory Instrument 135 of 2021 indicates that the Combination Authority is responsible for:

- Undertaking a study of the planning area and examining such matters as it considers are likely to affect the development or redevelopment of the area or the planning of its development or redevelopment.
- Formulating the policies of the authority and its general proposals for the planning area in respect of the co-ordinated and harmonious development or redevelopment and other uses of land, including measures.
- Regulation of the use of land and the construction and use of buildings.
- Conservation and improvement of the physical environment, including the preservation of buildings of special architectural merit or historic interest.
- Economic development of the planning area.
- Consulting with neighbouring local planning authorities and local authorities and any other statutory or other body whose activities or plans may affect the Master Plan, with the object of ensuring coordination of policies.
- Phasing of any development in terms of the Master Plan, the order of priorities in respect of the proposals and the reasons therefor; and the resources likely to be available.
- Indicating in the Master Plan any part of the planning area which has been selected for comprehensive development, redevelopment or improvement as a matter of priority.

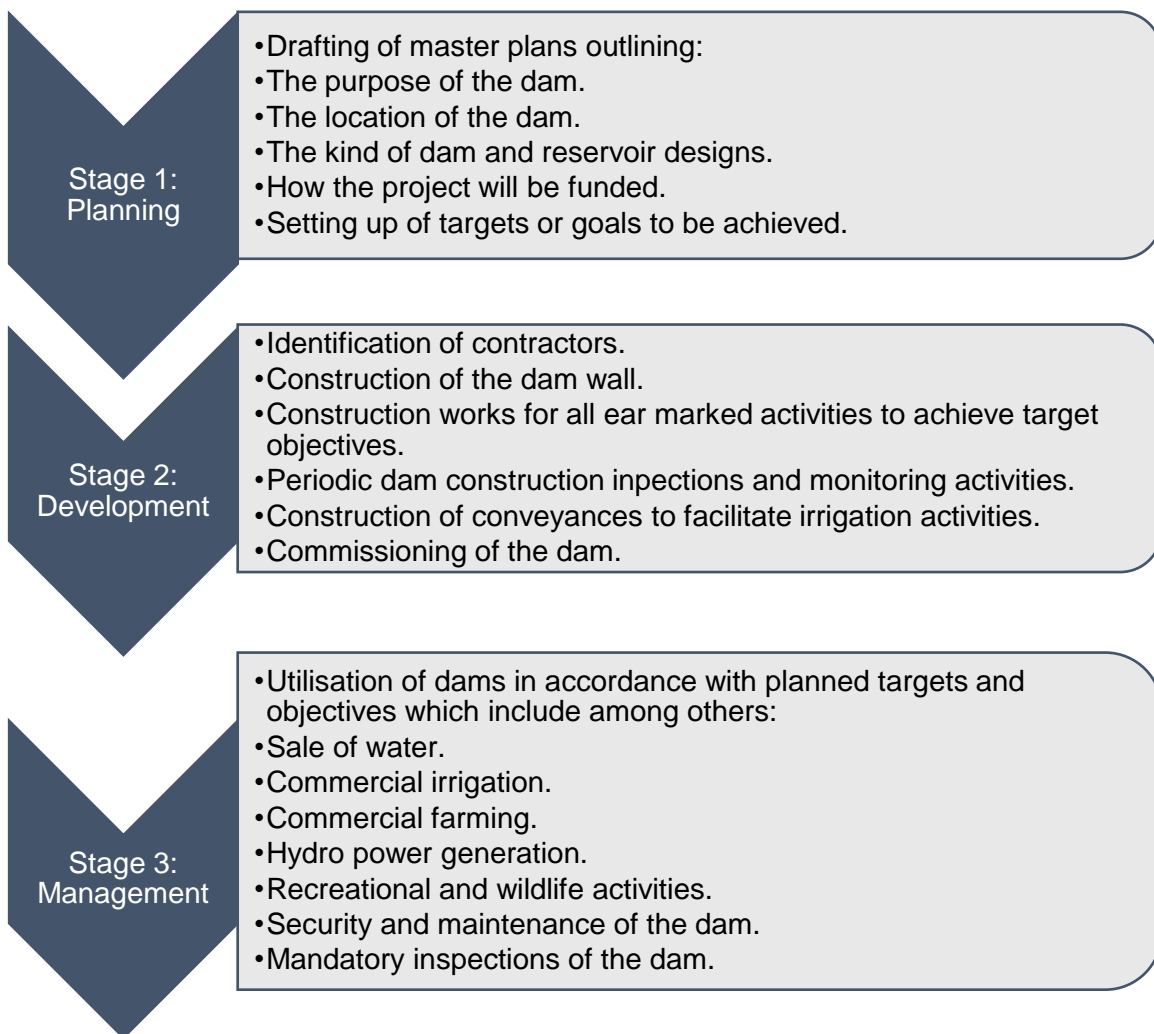
Section 6(1) (a-h) of Statutory Instrument 135 of 2021 indicates that the Combination Authority shall consist of the following members:

- Chivi Rural District Council.
- Masvingo Rural District Council.
- Zimbabwe Parks and Wildlife Management Authority.
- Ministry of Lands, Agriculture, Fisheries, Water and Rural Development.
- Zimbabwe Tourism Authority.
- Zimbabwe Council for Tourism.
- Environmental Management Agency.

2.2 Process Description

Section 6 of the Water Act [*Chapter 20:24*] identifies three stages in the dam project life cycle namely, planning, development and management. Utilisation of water resources in the dams is a management aspect which heavily depends on the plans or purpose for which the dam was constructed. The audit evaluated the planning and management aspects of the dam project cycle. **Flow Chart 1** shows the stages and process involved.

Flow Chart 1: Dam Project Cycle.



Source: Process Derived from Section 6 of the Water Act [Chapter 20:24].

2.2.1 Master Plan

The Master Plan is a development document designed by planning authorities for any project for the purpose of coming up with a land use plan in accordance with Section 14 (2) of the Regional, Town and Country Planning Act [Chapter 29:12]. The Master Plan is supposed to be designed in the initial planning phases² of a project. This includes coming up with regulations, siting or positioning buildings and also taking into consideration conservation and improvement of the physical environment.

The Cabinet in 2017, approved the Tugwi - Mukosi Dam Integrated Development Framework which formed the basis for the development of an Integrated Tugwi Mukosi Master Plan to take care of all the key projects in and around the Dam. In line with this requirement, Government gazetted Statutory Instrument 135 of 2021 which formed a combination authority called the Tugwi Mukosi Dam and Environs Combination Master Plan Authority. The combination authority was tasked to produce a Master Plan to determine the activities to be done at the Tugwi Mukosi Dam.

² Refer to Figure 1 on the composition of the dam life cycle stages (Stage 1).

2.2.2 Utilisation of Tugwi Mukosi water resources

Section 4.2 of the National Water Policy (2013) and Section 32 of the Water Act [*Chapter 20:24*] outlines the purposes for use of primary water resources in national dams. The Ministry should ensure that water resources are utilized at all times in an efficient manner having special regard to its value and the economic and other benefits that may be derived from it in accordance with Section 6(2)(e) of the Water Act [*Chapter 20:24*]. The ultimate responsibility for the management, utilisation and care for water is vested with the state, the use of which is subject to national control. To ensure utilisation of the dam, the Ministry drafted the Tokwe-Mukosi Dam Integrated Development Framework and systems for issuing Water Permits and Billing of users.

Tugwi - Mukosi Dam Integrated Development Framework

The Ministry through various stakeholders as approved by the Cabinet in 2017, came up with an Interministerial Committee to spearhead development activities and utilisation of Tugwi - Mukosi Dam (14 Project Anchors). Specific development strategies according to the key thematic areas relevant to the dam and its environs are outlined in **Annexure D**.

To achieve the desired goals and objectives, all the development initiatives are supposed to be spearheaded by a wide variety of agencies and individuals that would need to be technically and institutionally integrated. The Interministerial Committee will be there to crosscheck all proposals received by the relevant regulatory authorities. The crosscutting strategy include an inclusive strategy for all development projects.

All individuals or companies who intend to use water are supposed to apply and get water agreements and permits from ZINWA.

Water Permits and Billing of users

Section 34 (1) of the Water Act [*Chapter 20:24*] indicates that no individual or company shall abstract water for primary purposes except in terms of a permit. In terms of Statutory Instrument 242 of 2000, the Catchment Councils are responsible for receiving applications and granting permits for water use. Section 5(1) of the ZINWA Act [*Chapter 20:25*] highlights that water pricing is a responsibility of ZINWA. Section 43(1)(a) of the Water Act [*Chapter 20:24*] provides that the holder of a permit should install a meter or other measuring device for measuring and recording the amount of water drawn.

2.2.3 Sustainability³ of the Dam

Dam Inspections and Maintenance

Section 7.6.3 of the National Water Policy (2013) stipulates that dams require inspections and maintenance without which their integrity may be compromised leading to catastrophic failure. The Policy indicates that an Independent Regulator of Dam Safety shall be established to oversee competent, transparent, regular and independent inspections of large dams as well as routine maintenance of all dams in line with the Water Act [*Chapter 20:24*] and international standards and norms.

³ The assurance and guarantee for continued existence of the Dams serving the purpose for which it was constructed, uninterrupted.

Section 5(h) of the Water Act [*Chapter 20:24*] stipulates that the Ministry through the Authority shall operate and maintain any water works owned or managed by it. Section 105(1)(d)(iii) of the same Act requires that for each successive period of five years reckoned from the date of completion of construction of the large dam, the Ministry shall cause a detailed engineering inspection by an approved dam engineer. Also, every large dam should have an Operation and Maintenance Manual describing all technical features of the dam, and inspections are to be carried out by approved dam engineers at five yearly intervals. In the case of large dams, it is the Ministry's policy to have inspections every year.

Section 96 of the Water Act [*Chapter 20:24*] requires that appurtenant works be put in place and include gauging stations which are used for measuring flow, movement and pore water pressure, seepage, strain, velocity, temperature or uplift pressure, whether in the structure of the large dam or separate therefrom. A gauging station is used as a flow monitoring tool in and out of the dams. Some gauging stations may be manual or automated, sending the hydrological data they collect to a central data logging facility. ZINWA Standard Operating Procedures for dam inspection requires establishment of gauging stations at the dams which are used to take measurements of water inflows into the dam, data regarding water height, chemistry, velocity and temperature.

Dam Silt Surveys

The Zimbabwe National Water Authority is supposed to conduct silt surveys in line with best practice which requires every large dam to be surveyed after every 5 years. Siltation of rivers and dams is one of the major threats to water resources availability the country is faced with. The dams will lose their storage capacity leading to failure to sustain water supply.

The primary objective of the silt survey is to establish the capacity of the dam and then produce the new rating curve/table. The silt survey also checks whether the present capacity has changed as a result of siltation over the past years and then come up with measures to control the accumulation of silt in the dam. When carrying out silt survey, the engineers can use both land and hydrographic methods to ensure that all areas either under water or on the ground are captured.

Afforestation

In order to protect the dams from siltation, the afforestation activities should be done within the dam servitude and catchment area. Monitoring of environmental activities within the catchment area help sustain the dam water capacity.

Dam Safety and Security

Section 96 of the Water Act [*Chapter 20:24*] requires that appurtenant works⁴ be put in place which includes:

- Outlet works and penstocks, pipelines, tunnels and other water conduits, whether running through the structure of the large dam or the abutments thereof.
- Gated and ungated spillways and erosion control and energy dissipating works, whether in the structure of the large dam or separate therefrom.

⁴ Means any works which contribute directly or indirectly to the functioning, operation or safety of a large dam.

- Anchoring, buttressing, drainage and other stabilising works in original earth or rock slopes, whether downstream or upstream of the small dam or large dam.
- Devices or works for measuring flow, movement and pore water pressure, seepage, strain, temperature or uplift pressure, whether in the structure of the large dam or separate therefrom.

CHAPTER 3

3 FINDINGS

This Chapter presents findings on:

- Functionality of the Tugwi Mukosi Dam and Environs Combination Master Plan Authority (**Paragraph 3.1**).
- Approval of the Master Plan (**Paragraph 3.1.1**).
- Utilisation of Tugwi Mukosi water resources (**Paragraph 3.2**).
- Existence of water agreements for Tugwi Mukosi Dam (**Paragraph 3.2.1**).
- Implementation of Tugwi Mukosi Integrated Development Framework projects. (**Paragraph 3.3 up to 3.3.14**).
- Sustainability of the dam (**Paragraph 3.4**).
- Adequacy of dam safety inspection and maintenance mechanisms (**Paragraph 3.4.1**).
- Development of a crack on saddle 3 at Tugwi Mukosi Dam (**Paragraph 3.4.2**).
- Availability of gauging stations for collection of hydrological data (**Paragraph 3.4.3**).
- Silt Surveys (**Paragraph 3.4.4**).
- Availability of Security Systems for Tugwi Mukosi Water Resources (**Paragraph 3.4.5**).

The following are the findings on the utilisation of Tugwi Mukosi Dam;

3.1 Functionality of the Tugwi Mukosi Dam and Environs Combination Master Plan Authority.

Statutory Instrument 135 of 2021 established the Tugwi Mukosi Dam and Environs Combination Master Plan Authority. Section 6(1) (a-h) of the same Statutory Instrument indicates that the Authority shall comprise of members from Chivi Rural District Council, Masvingo Rural District Council, Zimbabwe Parks and Wildlife Management Authority, Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, Zimbabwe Tourism Authority, Zimbabwe Council for Tourism and Environmental Management Agency. The Authority is responsible for formulating policies and general proposals for the planning area in respect of development and land use.

At the time of audit in March 2023, there was no evidence submitted for review to show that the Authority was functional. Interviews with officials from Ministry of Lands, Agriculture, Fisheries, Water and Rural Development in Masvingo Province revealed that there were no formal meetings held since promulgation of Statutory Instrument 135 of 2021. There was no evidence provided to audit outlining the terms of reference of the Authority and obligations of each party.

Interviews held on March 17, 2023 at Provincial Offices with the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, ZIMPARKS and ZINWA officials confirmed that the Authority was not operational. There was no evidence presented to audit by the Ministry of Local Government and Public Works on whether appointments to the Authority were done and the list of members thereof. Refer to **Table 2** for the required representation of members as per Statutory Instrument 135 of 2021 and the position as at the time of audit in March 2023.

Table 2: Composition of the Combination Authority

Name of Member	Number of Representatives as per Statutory Instrument 135 of 2021.
Chivi RDC	4
Masvingo RDC	4
ZIMPARKS	2
Ministry of Lands, Agriculture, Fisheries, Water and Rural Development	2
Zimbabwe Tourism Authority	1
Zimbabwe Council of Tourism	1
Environmental Management Agency	1
Any other member appointed by the Minister	1

Source: Section 6(1) (a-h) of Statutory Instrument 135 of 2021 and Interviews with stakeholders.

Non-functionality of the Authority was attributed to non-implementation of the provisions of Statutory Instrument 135 of 2021 requiring appointment of representatives from various stakeholders. Non-appointment of the Authority members resulted in delays in coming up with the Master Plan and resolving any aspects of boundary disputes that may arise due to overlapping mandates amongst the members.

Management Response

The Combination Authority was operationalised by the appointment of the specific representatives by the Minister of Local Government and Public Works in 2022 and was constituted specifically for the preparation of the masterplan. The Combination Authority proceeded to make inputs towards the contents of the masterplan and then officially adopted the plan before it was presented to Cabinet for approval.

Evaluation of Management Response

There was no evidence produced for the appointment and meetings held by the Combination Authority.

3.1.1 Delays in the Approval of the Master Plan.

Section 14 (2) of the Regional, Town and Country Planning Act [*Chapter 29:12*] requires the establishment of a Master Plan for Tugwi Mukosi Dam before construction.

Contrary to the requirement of establishing a Master Plan before construction, the Ministry resumed the process of coming up with the plan after completion of the Tugwi Mukosi Dam. Five (5) years after the commissioning of the dam, an approved Master Plan was not available. Minutes of a meeting held for the implementation of The Tugwi Mukosi Integrated Development Framework, held on July 9, 2018 indicated that the Officials agreed a timeline of approximately eighteen (18) months to October 2019 for the development of the Master Plan. However, at the time of audit in March 2023, the Master Plan for Tugwi Mukosi was still at draft stage. The Master Plan had delayed by three (3) years six (6) months. Failure by the Ministry to have a Master Plan before construction was due to inadequate planning. The Ministry initially engaged foreign consultants after commissioning of the dam in May 2017 but failed to raise the required foreign currency and in October 2020, local experts (Consortium of Universities) were engaged.

The Consortium of Universities produced and presented the Draft Written Statement in July 2022 after a period of one (1) year ten (10) months to the Ministry of Local Government and Public Works for consideration. The Written Statement's purpose was to compare policies, strategies and land use proposals which would formulate the basis for coming up with the Master Plan. The agreed target between the Ministry and the Consortium of Universities was to finish the Master Plan by March 2023. However, this had not been achieved at the time of Audit in March 2023.

The delay in establishment of the Master Plan affected implementation of the eight (8) out of fourteen (14) developmental projects by Government that solely depended on the plan. Refer to **Annexure E** for an analysis of projects whose implementation was delayed due to the absence of the Master Plan. However, there were some short term projects that did not require the Master Plan for them to be implemented, mainly in the area of development of plans for certain projects. On the contrary there were some short, medium and long term projects that relied upon the finalization of the Master Plan for them to be implemented.

Non-functionality of the Authority⁵ and delays in the approval of the Master Plan led to under-utilisation of the Tugwi Mukosi Dam.

Management Response

The process of the development of the Tugwi Mukosi masterplan began with the approval of the Development Framework by Cabinet in 2017. After the framework was approved, it was proposed to have the masterplan developed by an Independent Consultant.

The dam did not have a masterplan at its time of completion but had an Irrigation feasibility study which had been done in 1996. It was agreed that the feasibility study be reviewed and updated so as to align with the current situation on the ground. The review process was awarded to a foreign based consultant and the process was being spearheaded by Infrastructure Development Bank of Zimbabwe (IDBZ).

The development of the main masterplan was not awarded to foreign consultants. After the realisation by Government that they might not have the foreign currency to pay foreign consultants, it was agreed by the parties involved to have a consortium of universities develop the masterplan being funded through PSIP.

Due to tight fiscal space with disbursements not being timely availed to the Consultants the masterplan took some time to be completed. The masterplan was approved by Cabinet in May 2023.

Section 14 (2) of the Regional Town Country Planning Act does not prescribe the time exactly when the master plan for areas around the dams need to be completed but usually there is a feasibility study for these major dams which include the proposed water utilisation activities. After the construction of Tugwi Mukosi Government realised the need to have a holistic approach to the developments in and around the dam to avoid destruction of the dam hence the development of an integrated masterplan. Government has now adopted the policy of having masterplans on major national dam projects e.g. Gwayi Shangani.

⁵ Refers to the Tugwi Mukosi Dam and Environs Combination Master Plan Authority.

Evaluation of Management Response

The Management Response has been noted. However, the Cabinet Minute for the approved Master Plan was not availed for audit inspection.

3.2 Utilisation of Tugwi Mukosi Dam water resources.

Section 32 of the Water Act [Chapter 20:24] and Section 4.2 of the National Water Policy (2013) outlines the primary purpose of water resources in national⁶ dams. The Ministry should ensure that water resources are utilized at all times in an efficient manner having special regard to its value and the economic and other benefits that may be derived from it in accordance with Section 6(2)(e) of the Water Act [Chapter 20:24].

Analysis of water release reports for the years 2018, 2020, 2021 and 2022 as compared to the average yield for the respective years indicated that there was underutilization of Tugwi Mukosi water resources ranging from 21-71%. In 2019, water released exceeded the average yield by 2%. **Table 3** below highlights comparison between the yields of the Tugwi-Mukosi Dam against volumes of water that were utilised from 2018 to December 2022.

Table 3: Analysis of volumes of water that was utilised from 2018 to December 2022

Year	Average yield per Year (Mega litres) - Available for use	Volume utilised per year (mega Litres)	Over/(Under)utili sation- Yield versus utilised in Mega litres	Over/(Under) utilisation as a Percentage
2018	400 000	316 091	(83 909)	(21)
2019	400 000	406 475	6 475	2
2020	400 000	116 540	(283 460)	(71)
2021	400 000	161 410	(238 590)	(60)
2022	400 000	240 549	(159 451)	(40)

Source: ZINWA yield estimates and Water release records-2018-2022.

Since commissioning of the Dam in May 2017 up to the date of audit on March 13, 2023, ZINWA Runde Catchment Council confirmed that Tugwi Mukosi Dam had no water agreements or permits for use of water. Under-utilisation of the water resources was caused by the delay in approval of the Master Plan for the dam that would lead to construction of conveyance systems to potential irrigable arable lands identified by Government.

However, ZINWA was using the water resources as back up to augment supplies from other dams that were either failing to meet the demands from their clients, like Lake Mutirikwi and Tokwane Barage Dam for the supply of water to sugarcane farmers in Triangle, Chiredzi and A2 farmers in other parts of the region. A review of water release records indicated that since 2018 water was being released from Tugwi-Mukosi dam to augment supplies from other dams.

⁶ Means a dam with which its abutments, appurtenant works and foundations, is capable of storing water which:

- (a) Has a vertical height of fifteen metres or more measured from the non-overflow crest of the wall of the structure to the lowest point on the downstream face of the wall; or
- (b) Is capable of storing one million or more cubic metres of water at full supply level.

Water required by farmers was being released into the river to Tokwane Barage and then to Nyajena which then conveyed the water through canals to farmers.

Furthermore, security reports and interviews held with officials from ZINWA Runde Catchment Council as well as inspections conducted in March 2023 revealed that the Council was losing a lot of water in the canals through illegal abstractions by farmers. It was revealed that there were a significant number of illegal settlers in the region who were conducting these illegal abstractions. These settlers were considered illegal as they did not have offer letters from the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development to occupy the land. Interviews with the ZINWA officials indicated that they were unable to have agreements with farmers who did not have offer letters.

My inspection on a Tokwane Canal conveying water from Tugwi Mukosi Dam also revealed that there were a significant number of farmers who were illegally abstracting water from the canal for commercial agricultural activities. It was revealed that a penalty of US\$20 for illegal abstraction was not deterrent enough as farmers continued abstracting. According to a 2019 report produced by the ZINWA Security Department after conducting an inspection on Mutirikwi Canal, it was noted that most of the illegal abstraction activities were being carried out during the night. **Pictures B & C** below shows pipes used to abstract water from the canal to irrigate crops in the gardens.

Picture B: Illegal abstraction from canal.



Picture C: Garden being illegally irrigated.



Source: Pictures of illegal water abstraction from Canals taken by Office of the Auditor-General (OAG) on March 14, 2023.

Management Response

Cases of illegal abstractions have been increasing and local leadership together with the office of the Minister of State for Provincial affairs have been notified of this illicit activity but no conclusive solution has been found. ZINWA is carrying out sporadic checks on illegal abstractors. Various pieces of equipment have been confiscated to date but this has not deterred the illegal abstractions. Proposals to regularise these activities were made. The office of the Minister of state for Provincial affairs is expected to work on the regularisation and complete it by end of 2024.

3.2.1 Existence of Water Agreements for Tugwi Mukosi Dam.

Section 34 (1) Water Act [*Chapter 20:24*] states that no individual or company shall abstract water for primary purposes except in terms of a permit. In terms of Statutory Instrument 242 of 2000, the Catchment Councils are responsible for receiving applications and granting permits for water use.

From interviews held with officials from Runde Catchment Council, it was revealed that they had not issued any permits for utilisation of Tugwi Mukosi water resources. The dam was constructed mainly for irrigation purposes. The officials revealed that the Nyahombe Irrigation Scheme which started operating in 2022 was currently utilising water from Tugwi Mukosi Dam to irrigate 80 hectares of land. However, as at March 2023, audit discovered that the irrigation scheme did not have a water permit as their application was yet to be approved. Furthermore, due to non-availability of water permit, the scheme was not making payments to ZINWA for the water they were using.

According to the interviews, non-issuance of water permits was due to absence of prospective water users as ZINWA was yet to construct conveyance systems to identified irrigable land after the approval of the Master Plan.

Various Ministry reports and minutes pointed out that it was going to take Government a long time to start to realise the return on investment and improvement of citizens' lives due to the slow pace of the implementation of planned projects and programmes.

Management Response

Existing irrigation schemes which are abstracting water from Tugwi Mukosi dam will be made to sign water purchase agreements with ZINWA. The process will be completed by the end of 2024. It should however be noted that a huge capital outlay is required to put in place requisite infrastructure to allow for full utilisation of the dam.

3.3 Tugwi Mukosi Integrated Development Framework (August 2017).

Section 7 of the Tugwi Mukosi Integrated Development Framework (August 2017) indicates a summary schedule of the proposed main projects and programmes anchored by the Tugwi Mukosi Dam. The fourteen (14) anchors were earmarked for implementation and development utilising the Tugwi Mukosi Dam.

Documentary review of reports and minutes for the implementation of Tugwi-Mukosi Integrated Development Framework from 2017 to June 2022 and inspections carried out as at March 2023 revealed that Eight (8) out of the fourteen (14) anchor projects were not yet implemented as they solely depended on the finalisation of the Master Plan, whilst the remaining six (6) had been partially implemented. The partially implemented anchors had some short and medium term project activities that were supposed to be carried out in the absence of the masterplan.

The delay in implementation of projects has stifled Government plans and objective of realising a return on investment and improvement of citizens' lives.

Management Response

The anchor projects were sectoral proposal from Ministries Departments and Agencies (MDAs) approved by Cabinet to be implemented through PSIP funding. Due to the number of the proposed projects Government decided to develop an integrated masterplan to have coordinated projects implementation. Out of the 14, the 6 projects that did not require the masterplan to be implemented relied on Treasury for funding and due to tight fiscal space, Treasury did not manage to disburse the total amounts required to complete these projects.

The Masterplan was approved by Cabinet in May 2023 and line Ministries responsible for the anchor projects have now started in earnest to implement them. The masterplan has also opened space for Public Private Partnerships (PPPs).

3.3.1 Expansion of the Irrigation Development Programme: Project Anchor 1.

Documentary review of irrigation reports and interviews held with the Ministry and ZINWA Officials at Head Offices and Masvingo Province revealed that only 80 hectares (0.032%) out of the potential 25 000 hectares of land was under irrigation utilising Tugwi Mukosi water resources. The 80 hectares of land was at Nyahombe Phase 1 Irrigation Scheme which was completed in 2022 and was using water from the Tugwi Mukosi Dam at the time of audit on March 13, 2023. The Tugwi Mukosi Development Framework Consolidated Report of July 2021 indicated that the potential for irrigation expansion at Tugwi Mukosi Dam was extended from 25 000 to 40 000 hectares. However, the extension was not backed with a commitment of resources to achieve it, since the Ministry is still to achieve the targeted 25 000 hectares.

At the time of audit, identification of land for irrigation development and the development of the irrigation infrastructure were part of the short-term project expectations to be achieved by the Irrigation Department. Feasibility designs and irrigation planning had been completed and this included Environmental and social Impact Planning and Draft Irrigation Masterplan. However, there were no conveyance systems and other irrigation infrastructure setup as at March 2023.

According to interviews with Ministry officials, in most areas close to the dam, the soils and topography were not suitable for irrigation development. Most land that was suitable for irrigation was private land owned mainly by Development Trust of Zimbabwe (DTZ). **Table 4** shows the hectrage of land identified by the irrigation Department for short term planned irrigation activities utilising water from Tugwi Mukosi. Considering the planned irrigation projects and the existing irrigation at Nyahombe, 5% of the potential hectrage of 25 000 hectares will be under irrigation.

Table 4: Short Term Planned Projects to be irrigated with water from Tugwi Mukosi Dam as at March 2023.

Project	Hectares	District	Stage of Implementation
Nyahombe Phase 2	100	Chivi	It is funded by GCF (Green Climate Fund), and is at tendering stage.
Gororo Phase 1	150	Chivi	It is funded by GOZ. Contract negotiation underway.
Gororo (GCF block)	46	Chivi	Project planning under way.
Gororo (CAWEP block)	500	Chivi	Project planning under way.

Mutirikwe Banga Block	360	Chiredzi	The scheme is for new farmers in the DTZ areas. Tender adjudication under way.
Total	1 156		

Source: Masvingo Provincial Irrigation Engineering Department Reports (March 2023).

Management Response

The Zimbabwe National Water Authority is currently working on designs for conveyancing systems to deliver water to the various blocks which were identified for irrigation. The area exceeds the 25 000Ha earmarked for irrigation from the dam. This will ensure utilisation of the dam.

3.3.2 Implementation of the Wildlife and Parks Management Programme: Project Anchor 2.

Documentary review of reports and interviews held with the Ministry of Environment, Climate, Tourism and Hospitality Industry and ZIMPARKS Officials, revealed that despite existence of ZIMPARKS Officials at Tugwi Mukosi Dam, there were no game parks that had been established.

The short term projects that were planned for the Anchor included development of the Parks Management Plan, Gazetting of Tugwi Mukosi as a recreational park and Relocation of communities within the boundaries of the demarcated areas. At the time of Audit in March 2023, ZIMPARKS indicated that they were awaiting gazetting of the Recreational Area. The ZIMPARKS had managed to complete map coordinates, boundary description of the area and management plan. Notifications, evaluations of properties and eventual relocation of people living in the Recreational Area were to commence once the area has been gazetted as a Parks zone. According to Tugwi Mukosi Development Framework Consolidated Report of July 2021, the ecological assessment and the identification of sources of wildlife for translocating to the Recreational Area was already complete.

There were still some settlements within the Game Reserve servitude at the time of audit in March 2023. Based on head count done by ZIMPARKS in June 2013, there were 3 652 households in both Chivi District (Ward 22, 24, 28 and 30) and Masvingo District (Ward 22, 30 and 34). These settlements were supposed to be removed once the recreational park is gazetted to pave way for transfer of game.

Management Response

ZIMPARKS is seized with the gazetting issue. A bill has been passed, so ZINWA is expecting that by December 2024 the recreational park would have been gazetted.

3.3.3 Construction of Hotels, Holiday Homes, Cultural Village, Lodges and Restaurants: Project Anchor 3.

From documentary review and interviews held with Zimbabwe Tourism Authority officials it was revealed that the construction of hotels, holiday homes, cultural village, Lodges and Restaurants depended on the finalisation of the Master Plan for zoning out sites where hotels and Conference Centres are to be constructed. The short term plan for the Anchor was to Develop a tourism plan linked to the holistic masterplan, however, at the time of audit in March 2023, there was no evidence to show whether the tourism plan was developed. Through the Tourism Investor Prospect, twenty-two (22) Islands had been identified for the construction of Conference Centres. The commencement of the projects had been delayed by five (5) years.

Management Response

The Tugwi Mukosi Master Plan has been approved and the Recreational Park is in the process of being gazetted, tourism related projects will commence. Already the Ministry responsible is in the process of engaging private players to partner with.

3.3.4 Utilisation of the Dam for Crocodile Farming and Fisheries Activities: Project Anchor 4.

ZIMPARKS officials in Masvingo pointed out that there were no Crocodile farming activities at the Tugwi Mukosi Dam. The Officials indicated that the weather conditions were claimed not to be suitable for crocodile farming investment projects. However, there was no documentary evidence of the claim and whether it was communicated to the Interministerial Committee. Establishment of fish and crocodile activities farming was part of the short term planned projects to be done from commissioning date.

Documentary review of fish farming reports indicated that ZIMPARKS had issued licenses to 16 Cooperatives⁷ of which fourteen (14) were from within Masvingo and Chivi RDCs and two (2) were from outside. The Youths Cooperative was the only one not yet operational at the time of Audit in March 2023.

There were also four (4) companies licenced to do fish farming and they were operating. In the Tugwi Mukosi Dam, there was a potential of harvesting 2000 tonnes of fish per year according to the ZIMPARKS Fishing reports for the period 2017 to 2022. The cooperatives harvested thirty (30) tonnes in 2021 and seventy-four (74) tonnes in 2022 representing 1.5% and 3.7% of the potential harvest respectively. Records from 2017 to 2020 were not availed for audit due to non-submission of Annual Returns to ZIMPARKS by Cooperatives and Cage culture companies. ZIMPARKS Officials followed up with the Cooperatives and Cage Culture companies and did not manage to get the records.

The reports indicated underutilisation of the fishing capacity of the Tugwi Mukosi Dam due to undercapitalisation of the Cooperatives. All the sixteen (16) cooperatives used the gillnetting system whilst four (4) Companies used cage system. Refer to **Table 5** for details of companies that used the cage system and the number of cages each had. According to ZIMPARKS reports for 2021 and 2022, the dam's maximum carrying capacity was fifty (50) cages, but it had only 28 cages at the time of audit in March 2023.

Table 5: Cage culture companies and number of cages.

	Name of Cage Culture Company	Number of Cages
1	Tugwi Bream	20
2	Parksmed	2
3	Fesmar	3
	Fern Fancies	3
	Total	28

Source: ZIMPARKS Reports for 2021 and 2022.

During my inspections at four (4) cooperatives, Parksmed highlighted that they started operations in 2021 and they used the caging system with a capacity of 20 000 breams at harvest. The Sikanajena Cooperative started formal operations in June 2019 and had a

⁷ Barangwe, Muchandiona, Kuyedza, Tugwane Lakeside, Munhumutapa, Sojona, Shindi, Sikanajena, Masaisai, Zimbabwe Prisons Correctional Services, Shaiko, Greenfield, Fesmar Zivhu, Mutendi and Youths.

capacity of harvesting 30kgs using the gillnets. On the other hand, the Tugwi Bream Company had twenty (20) cages which had a capacity to harvest up to five (5) tonnes of fish a day.

Interviews with ZIMPARKS officials also revealed that kapenta fish were transported from Kariba but the project did not succeed as there was no trace of the fish after some time. This was attributed to lack of studies to establish whether the water resources and food was conducive for breeding and survival of kapenta fish.

Fish farming was at threat from poaching activities. My analysis showed that there was a sharp increase in poaching activities from 2017 to 2021 which resulted in some poachers apprehended. Poachers apprehended ranged from sixty-one (61) in 2017 to a maximum of two hundred and fourteen (214) in 2022. Refer to **Table 6** for number of poachers arrested per year at Tugwi Mukosi Dam. Poaching activities increased due to inadequate patrols by ZIMPARKS rangers who did not have vehicles and speed boats to use.

Table 6: Number of Poachers Apprehended per Year at Tugwi Mukosi Dam.

Year	Number of poachers arrested
2017	61
2018	93
2019	196
2020	214
2021	184
2022	92
Total	840

Source: ZIMPARKS Reports 2017 to 2022.

Delays in the approval of the Master Plan had seriously affected the operations of companies like Tugwi Bream which was in need of land for the construction of Feeding Plant, Hatchery and Ponds. The company planned to employ two hundred fifty (250) people once construction was done and at the time of audit it had thirty 30 staff members only.

Management Response

ZIMPARKS anti-poaching operations have been beefed up by the provision of a vehicle and a boat for the station, poaching will be drastically reduced by this measure. In addition, a government low-cost loan financing scheme will greatly assist existing and new players in the capture and aquaculture industry to increase their utilization capacity.

3.3.5 Construction of a Mini Hydro Power Generation Plant (15 MW): Project Anchor 5.

A review of the Tugwi-Mukosi progress report prepared in October 2022 on hydropower generation revealed that significant progress has been made. The short term planned activities for the Anchor included feasibility study, Power Purchase Agreement and Engineering, Procurement Construction (EPC) contract.

According to the report, the EIA, feasibility report, power purchase agreement, and the Engineering, Procurement Construction (EPC) proposal have all been finalised. The report indicated that construction of the hydropower plant was at 5% completion. However, my inspections at the dam revealed that nothing had been done yet as regards to construction of the power generation plant. There was only an existing water valve on the dam wall to facilitate power generation. According to the progress report of October 31, 2022, construction of the hydropower plant was expected to be completed by May 2024. Delays were attributed to

queries by ZINWA regarding the Water Supply Agreement and absence of clearance letter from the Ministry.

Management Response

Feasibility studies on the mini-hydro power plant were completed in 2018. License to generate electricity was issued in 2021. The initial Water Purchase Agreement had expired and was renewed in March 2024. Work has been awarded to a Contractor and the Contractor is expected to move to the site to start work on clearance of way-leave and construction of transmission line.

3.3.6 Construction of a Navigation Mast (Control Tower) and Harbour: Project Anchor 6.

The Anchor required site establishment and coming up with site plan design of the control tower, Construction of Robertson house for staff accommodation and office building and establishment of harbours in the short term. A review of the Tugwi-Mukosi consolidated report of July 2021 showed that tenders for the construction of the Control Tower and two (2) harbours were flighted in the newspapers. It was also revealed that ZWL\$150 million had been allocated under the 2021 budget and the siting of the control tower was established. There was no evidence availed to audit on the site plan designs and plans for construction of the Robertson house and office building. From inspections conducted on the dam, audit observed that neither construction of the Navigation Mast, Robertson house and office building nor the Harbour had commenced due to absence of Master Plan. **Picture D** shows undesignated sites currently being used as harbour by existing fishing companies.

Picture D: Sampled Harbour at the dam.



Source: Picture taken by OAG on March 15, 2023).

Management Response

The control tower is now at 40% and US\$ 108 000 has so far been disbursed towards the project. The project did not receive budgetary allocation in 2024 budget.

2XF14 Houses are now at 35% completion, US\$ 109 000 has so far been disbursed towards the project. The project did not receive budgetary allocation in 2024 budget.

The project to develop 2 X harbours and slipway is yet to start as no disbursements have been made towards project implementation.

3.3.7 Construction of Museum: Project Anchor 7.

The Tugwi Mukosi Development Framework Consolidated Report of June 2021 on progress on the implementation of the anchor projects, revealed that there were no developments that had been done to establish the Museums at the dam site by the Ministry of Home Affairs and Cultural Heritage and ZINWA since commissioning in May 2017. The museum would play a key role in preserving the history of the dam and society, telling the stories about the nation, communities and cultures and in particular those stories that could be forgotten.

The report⁸ indicated that the short term goal was to establish an interim museum soon after commissioning of the Dam in May 2017 at the existing ZINWA site office and develop a permanent museum later. However, during my inspections in March 2023, there was no interim museum at dam site. Interviews with ZINWA officials pointed to lack of coordination between the Ministry of Home Affairs and Cultural Heritage and ZINWA on establishment of interim museum in the short term. There were no clearly defined lines of authority between the two on how they should operate. Delays in the establishment of the museum may impact negatively on the preservation of the history of the dam and society as there will be no safe storage and display of the cultural material. The society will lack an in-depth knowledge about the history of the nation, communities and cultures of the country in general and immediate communities in the Dam vicinity.

Management Response

Architectural designs for the Museum were completed and a cost estimate of US\$70 million was determined. ZINWA made submissions of the design and cost estimates to Ministry of Home Affairs and Cultural Heritage for inclusion in the National Budget. To date, the proposed project has not yet been allocated funds. ZINWA will pursue this issue so that the project can be allocated funds in the 2025 National budget. The Ministry of Home Affairs and Cultural Heritages as the responsible Authority will be coordinating the implementation of this activity.

3.3.8 Implementation of the Development Programme for Administrative and Security Institutions: Project Anchor 8.

Section 7 of the Tugwi Mukosi Integrated Development Framework (August 2017) requires the establishment of a Development Programme for Administrative and Security Institutions at the dam.

From the review of the Tugwi-Mukosi consolidated report of July 2021, there was no update on the progress of the short term planned activities for development of administrative and security institutions. The Dam had been gazetted as a national security asset and needed administrative and security institutions congruent to what is at Kariba Dam. However, during my inspections at the site, I noted that ZIMPARKS had already deployed rangers to safeguard the water body against poaching activities whilst there were no security agents deployed yet by the Ministry of Home Affairs and Zimbabwe National Army. If the dam is not protected, it may be prone to vandalism or its infrastructure may be compromised.

⁸ Tugwi Mukosi Development Framework Consolidated Report of June 2021.

The delays in deployment of security officers was attributed to delay in establishment of the masterplan which would enable the security services to site areas to place their security infrastructure. However, in the interim temporary structures could have been established.

Management Response

ZINWA has deployed its internal security although it may not be sufficient to cover all security requirements for such a huge asset. ZINWA will work with all responsible institutions to ensure that the dictates of the approved masterplan are implemented.

3.3.9 Construction of Integrated Service Centre, Residential and Commercial Development Programme: Project Anchor 9.

The Tugwi-Mukosi consolidated report issued in July 2021 indicated that the integrated service centre, the residential and commercial development programmes were not yet established as the Master Plan was still to be approved five (5) years after commissioning of the dam. The short term targets for the Anchor was to develop an integrated service centre plan linked to the masterplan.

Management Response

The integrated service centre will now be established as highlighted in the approved masterplan.

3.3.10 Delays in the Development of the Area Wide Power Supply Programme: Project Anchor 10.

The Tugwi-Mukosi update report of October 2020 indicated that the short term planned activity of carrying out an assessment of the current power demand and grid impact study was said to have been completed. However, no documentation was availed for the results of the assessment and grid impact study. The delays in the establishment of a mini hydro power generation plant had a direct impact on the Area-Wide Power supply programme as there was no electricity to distribute and the positioning of distribution powerlines. Also as of March 2023, the Master Plan was not yet approved which would aid programming of the power distribution network.

Management Response

The masterplan has been completed and the construction of the mini-hydro is expected to commence.

3.3.11 Construction and Upgrading of Aerodrome: Project Anchor 11.

Identification and construction of airstrips near Tugwi Mukosi dam had not yet commenced as at the time of audit in March 2023. Upgrading of the Chivi and Masvingo Rural Districts airstrip were partially achieved. These activities were part of the short term targeted projects. The minutes of a meeting held on February 15, 2022 indicated that the delay in identification and construction of the airstrip was attributed to absence of the Master Plan and lack of funding by Treasury. Further review of the Tugwi-Mukosi progress report prepared in July 2021 indicated that preliminary runway maintenance works at Buffalo Range were in progress. According to the report, out of the allocated ZWL\$ 210 million and ZWL\$40 million had been disbursed for the Chivi and Masvingo Districts airstrip upgrading respectively. Furthermore, the progress report revealed that two sites of the airstrips in the Chivi and Masvingo districts had been identified and there was work in progress. Of the allocated ZWL\$ 210 million and ZWL\$40 million, only ZWL\$12 million and ZWL\$8 million had been disbursed respectively. The

disbursed funds were used for bush clearing and levelling at the site on runways and general maintenance of existing infrastructure among others in both Chivi and Masvingo Rural Districts airstrips.

Management Response

Buffalo Range International airport was rehabilitated on the runway and asphalt concrete overlay was done and completed in 2022. Outstanding at the airport is the apron and taxiway which were supposed to be rehabilitated with an asphalt concrete overlay. A contractor has been awarded the project but waiting for release of funds from Treasury under the 2024 budget.

The development of both Chivi and Mukosi airstrips was derailed due to non-disbursements of funds by Treasury, however RIDA in its 2024 plans intends to use in-house equipment to complete the outstanding gravelling and compaction.

3.3.12 Construction of Multi-Disciplinary Institute for Research and Advisory Services: Project Anchor 12.

According to the Tugwi Mukosi Development Framework Consolidated Report of June 2021, on progress on the implementation of the anchor projects, Tugwi Mukosi Multi- Disciplinary Research Institute (TMMRI) was not yet established to cover disciplines like Tourism, Agriculture, Processing, Engineering, Ecology, Local Governance, and Marketing. Establishment of the Institute would help conducting scientific and innovative research in water, climate, livelihoods, and waste management to mention a few. This project was categorised amongst the projects that were supposed to be achieved in the short term. However, ZINWA was using the existing camp left by the contractor (Salini Impreglio) for its in house training for engineers and hosting university students. The Institute was not yet registered by the Ministry of Higher and Tertiary Education, Science and Technology Development at the time of audit in March 2023. However, it was pointed out by ZINWA that the conceptualization and design of the Tugwi Mukosi Multi- Disciplinary Research Institute (TMMRI) was going to be finalized following the completion of the Master Plan. The Ministry of Lands, Agriculture, Fisheries, Water and Rural Development and ZINWA were to construct an innovation hub, industrial park and an administration block at the existing camp site.

Management Response

The ZINWA School of excellency will be registered with the Ministry of Higher and Tertiary Education by the end of 2024. Its operations will be independent of the proposed Multi-Disciplinary research institute whose establishment is indicated in the master plan.

3.3.13 Implementation of Value Addition Intended Activities around the Dam: Project Anchor 13.

Value addition intended activities included fish canning, sugar milling, fruit juice manufacturing, cooking oil production, ethanol production, cereal milling, beef and molasses production. A review of the Tugwi-Mukosi progress report prepared in July 2021, revealed that the Ministry had planned to establish an Innovation hub, an industrial park and an Administration block at the campsite after the commissioning of the dam in May 2017. The Ministry had also set out to conduct scientific and innovative research in climate, water, livelihoods, waste management etc. During inspections at the dam site in March 2023, I noted that all these activities had not commenced. The progress report noted that the Master Plan for the dam had not yet been finalised and as a result, the activities could not commence.

Management Response

Besides finalisation of the Master Plan, Government would need to roll out a huge capital outlay for the establishment of requisite infrastructure which will enable these activities to commence.

3.3.14 Afforestation Activities in the Tugwi Mukosi Dam Catchment Area: Project Anchor 14.

A review of Tugwi Mukosi Afforestation Program report highlighted that from 2020-2023 the department of Forestry Commission had managed to partner with Zimbabwe Community Option for Protection and Empowerment Trust (ZICOPE) and Aquaculture Zimbabwe to plant a total of 18 644 trees of assorted varieties against a target of 10 000 in the Tugwi Mukosi catchment area. The trees comprised of gum and fruit trees, and the bulk of which were indigenous trees.

According to interviews, progress update reports and inspections conducted, audit noted that the Forestry Commission had come up with a number of nursery projects in partnership with communities. Amongst these projects was a nursery project owned by ZICOPE Trust at Bhuka Business Centre with approximately 15 000 assorted seedlings and Mpofu Nursery with 1 000 seedlings in Masvingo District. Apart from this Muzogwe Nursery in Chivi District had approximately 5 000 seedlings. **Picture E** below shows part of the ZICOPE Trust Nursery at Bhuka Business Centre taken during my audit inspections. Interviews with Forestry Commission official revealed that although some of the plants were being sold to willing buyers, the majority of the plants were being donated to the beneficiaries including communities, schools and clinics. Audit observed that as a result of the low uptake by Forestry Commission in its programmes, schools and clinics, most plants in the nursery had wilted and matured to the extent of bearing fruits.

Picture E: Nursery at Bhuka Business Centre- ZICOPE Trust Nursery.



Source: Picture taken by OAG at Bhuka nursery on March 14, 2023.

To assess on the success of the donated seed plants, audit carried out inspections at Gunikuni Primary school in Masvingo District and Chindiro homestead in Chivi District. Out of 1 000 donated gum tree seedlings planted at Gunikuni Primary School, more than 50% had not survived. Hot and dry weather conditions in the area, were cited as major reasons for poor

survival of planted seeds. Audit noted that there were no fire guards where the plants were planted to safeguard them from fire hazards. Also Forestry Commission did not monitor whether the plants were being given proper care to increase the chances of survival. The Forestry Commission officials indicated that they were not carrying out monitoring and inspection activities as they have only one vehicle (Mazda B2200) which was old and obsolete.

Picture F shows the state of the plants at Gunikuni Secondary School. Audit also visited Chindiro homestead in Chivi District to assess on the plants that had been planted. The plants included fruit and indigenous trees. According to interviews with family members at the homestead the survival rate of the plants was well below 50%. Hot and dry weather conditions in the area, were again cited as major reasons for poor survival of planted seeds. Refer to **Picture G**.

Picture F: Gum Plantation-Gunikuni Secondary School in Chivi.



Picture G: Orange Plantation-Chindiro Homestead in Masvingo District.



Source: Pictures taken by OAG on March 11, 2023.

Despite efforts by the Forestry Commission to avert deforestation through afforestation, it was revealed that deforestation was exceeding afforestation efforts. Review of progress update reports and interviews with Forestry Commission officials indicated that there was a high rate of deforestation in the Tugwi Mukosi dam catchment area. The report, noted that there was a high rate of deforestation in Chivi and Masvingo District especially on indigenous trees identified as Mikamba (*Azelia Quansensis*), Mukwa (*Pterocarpus Angolensis*) And Mipfura (*Sclerocararya Caffra*). According to the interviews held, the major cause of deforestation in the catchment area was illegal settlements.

From the interviews it was revealed that most of the illegal settlers were people who were returning back from Chingwizi resettlement area where people were initially settled on construction of the Dam. Interviews held with some of illegal settlers indicated that they had resorted to move out of Chingwizi as the living conditions could not sustain their lives. They had no land to conduct any income generating activities. In addition, review of the Progress update report as at December 2022 indicated that deforestation was being escalated due to high rates of wood curving along Chivi- Ngundu highway, fish poachers who were cutting trees

to make boats from tree barks as well as increase in food outlets using firewood at Ngundu and other surrounding business Centres.

Management Response

Tree planting in Tugwi Mukosi Dam catchment as at November 2023 was 22 899 assorted trees at an average price of US\$3 per tree totalling US\$68 697.

Tree planting from December to date, Gwatuta area in ward 22 planted 500 trees, Zvehuru community in ward 9 planted 300 trees i.e. 800 plants for Masvingo district at US\$3 totalling \$US2 400.

Chivi District planted 400 seedlings in Tsaurai village ward 11 at US\$3 totalling \$US1 200 and 65 trees planted at Dumbuguru ward 28 at \$US3 totalling US\$195. Training on seedling production was done in ward 22 and two trainings on woodland management were done at Mapaike and Zvehuru. Total number of trees planted to date totalling 24 176 with a value of US\$69 974.

The survival rate of trees planted is not good in some areas due to harsh weather conditions experienced within the catchment. Forestry Commission plans to intensify ownership of the project by responsible authorities, especially on schools to enhance sustainability.

Forestry Commission is also collaborating with other partners in achieving results in the catchment. More trainings in the communities on how to protect and conserve the already existing forests and woodlands will be done.

3.4 Sustainability of the Dam.

Documentary review of safety reports and interviews with various stakeholders indicated that there were inadequate measures in place to ensure sustainability of the dam. This entails the assurance and guarantee for continued existence of the Dam serving the purpose for which it was constructed. There were some inadequacies of dam safety inspections and maintenance mechanisms, unavailability of gauging stations for collection of hydrological data, absence of silt surveys and security systems for the Tugwi Mukosi Dam.

3.4.1 Dam Safety Inspection and Maintenance Mechanisms.

Section 105(1)(d)(iii) of the Water Act Chapter [20:24] requires that for each successive period of five (5) years reckoned from the date of completion of construction of the large dam the Ministry shall cause a detailed engineering inspection by an approved civil engineer. This is also in compliance with the requirements of the International Commission on Large Dams (ICOLD).

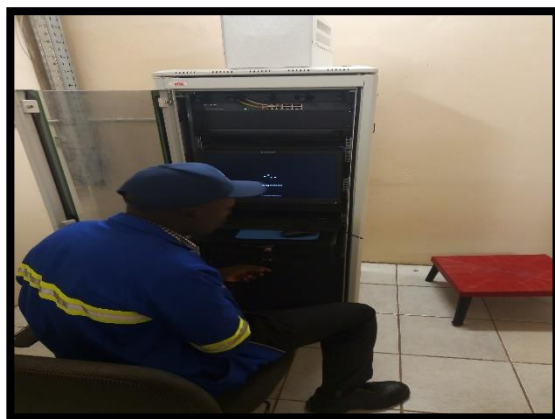
From interviews held with ZINWA Runde Catchment Council officials and ZINWA Head Office revealed that there was no detailed engineering inspection that had been carried out by an approved civil engineer at Tugwi Mukosi Dam in compliance with the regulations. Since Commissioning in May 2017, the dam was overdue for the major inspection. The safety of the dam is premised on the regular monitoring and surveillance, inspections as well as maintenance. There were no plans that were availed to audit as at March 2023 for the major inspection to be done at Tugwi Mukosi Dam. However, ZINWA engineers carry out adhoc inspections for specific areas. The last reported inspection of the dam was carried out in 2021 when the dam over spilled. Interviews with officials responsible for inspections revealed that the department did not have equipment to carry out comprehensive inspection and maintenance of large dams.

However, the Tugwi Mukosi Dam wall had a computerised system to monitor the behaviour of the dam structure, slope/abutment movement and water pressure induced movements within the structure among others. The dam instrumentation that was the sensors and other electrical gadgets assisted the engineers to monitor the cracks and any unusual movement of the dam wall for them to take corrective measures. During inspection of the Dam, the Water Bailiff and Security Officer took auditors through the computerised dam safety monitoring instruments that were embedded on the wall. The installed machines send signals to the data loggers and then to the server. Refer to **Pictures H and I** reflecting the computerised system. However, at the time of audit on March 14, 2023, the server was not working since September 2022 as the data loggers were not transmitting data to the server. Also there was a challenge of software that had expired which needed upgrading and the Ministry could not raise the foreign currency needed in time as per contract agreement. The software to upgrade the system was not locally available and need engagement of the contractor who installed.

Picture H: Electronic devices.



Picture I: Server.



Source: Pictures taken by OAG on March 13, 2023.

The inactiveness of the system may pose a threat to the safety of the Dam though the engineers resort to using the manual system to assess the safety of the structure. Cracks or fissures that threaten the sustainability of the structure may develop unnoticed.

Management Response

Since 2017, ZINWA has been bidding for PSIP funds for Dam inspections. Due to competing needs, Treasury has been unable to allocate funds for this critical activity. ZINWA has however been using its dam Engineers to carry out inspections and so far the results indicate that, the dam is safe. The issue of dam instrumentation has been resolved. The data loggers are now transmitting data to the server.

3.4.2 Dam Safety.

During my inspections at the time of audit in March 2023, I discovered that a deep crack was developing along Saddle 3. Refer to **Picture J**. Interviews with Runde Catchment Council officials indicated that the crack posed no threat to the sustainability of the dam. In compliance with the International Commission on Large Dams requirements on dam safety, there were no devices placed on the crack to monitor whether it is enlarging with time. There is a risk that if the wall fails, many lives and property may be lost due to flooding downstream. ZINWA Officials indicated that the crack needed an independent assessment to establish the impact of it on the structure. However, ZINWA had not yet established an Independent Regulator of Dam Safety to carry out independent dam safety assessments at the time of audit in March 2023.

Picture J: Crack that developed on Saddle 3.



Source: Pictures taken by OAG on March 15, 2023.

Management Response

From ZINWA's internal inspections, the crack is not a threat to the integrity of the Dam. The crack is being monitored every season. The Ministry of Lands, Agriculture, Fisheries, Water and Rural Development is working on the establishment of a Water Sector Regulator with dam safety component.

3.4.3 Availability of Gauging Stations for Collection of Hydrological Data.

Section 96 of the Water Act [Chapter 20:24] requires that appurtenant works be put in place and to include gauging stations which are used for measuring flow, movement and pore water pressure, seepage, strain, velocity, temperature or uplift pressure, whether in the structure of the large dam or separate therefrom. A gauging station is used as a flow monitoring tool in and out of the dams. Some gauging stations may be manual or automated, sending the hydrological data they collect to a central data logging facility. Section 43 of the Water Act [Chapter 20:24] highlights that gauge plates or any other measuring devices must be put up at the dam.

The Tugwi Mukosi Dam did not have gauging stations in its main tributaries Tugwi, Shashe and Mukosi rivers to measure inflows of water into the dam. The gauging stations were supposed to be placed approximately 5km from the entry point into the dam. From interviews held with ZINWA Runde Catchment Council officials, it was revealed that the Gauging Station which was once at Shashe River was washed away by floods in 2021. They also revealed that absence of gauging stations increased the risk of flooding and this has an impact on response time to combat floods and warning campaigns to affected areas. The major purpose of the Gauging Station is to gather hydrological data which helps the Council to balance the inflows and outflows of water so as to protect the dam wall from uncontrollable spillage (managing floods). However, there were no plans availed to audit indicating when establishment of gauging stations in the main tributaries was going to be done.

The Dam had gauging plates on the wall which they used to monitor the volumes of the water in the dam. However, the gauging plates only measured volumes from 698m to 708m above sea level. In case the dam volumes subside to volumes beyond that, there are no plates to gauge the volumes to determine the yield of the dam. **Picture K** shows gauging plates at the Tugwi Mukosi Dam wall.

Picture K: Gauging Plates at Tugwi Mukosi Dam.



Source: Picture taken by OAG March 13, 2023.

Absence of gauging station to provide on time hydrological data may result in ill preparedness by ZINWA against the risk of flooding in the upper and downstream of the river. If water is released without control there is risk that people downstream and animals will be killed, the wall may also be damaged by uncontrolled flood.

Management Response

ZINWA has been bidding for PSIP funds for the construction of upstream gauging stations for the dam. To date funds have not yet been received. A proposal to establish real time data loggers which will transmit river flow data to a central server has been put in place. Funding is expected in the 2025 PSIP budget. The Authority is also working with cooperating partners for possible funding.

3.4.4 Silt Surveys.

The Zimbabwe National Water Authority is supposed to conduct silt surveys in line with International Best practice which requires every dam to be surveyed after every five (5) years.

From interviews held with the ZINWA Head Office and Runde Catchment Council officials revealed that there was no silt survey that had been done for Tugwi Mukosi Dam since Commissioning in May 2017. During my inspections of the dam servitude area in March 2023,

I noted that the dam was prone to high rate of siltation due to excessive farming activities, overstocking and deforestation by the residents. The market gardens on the basin of the dam by illegal settlers may also contribute to the siltation of the dam. Audit witnessed gardens in Ward 24 which were less than 100m from the dam thereby posing a risk of siltation of the water body in the short to long term period. Refer to **Picture L** for a market garden within the dam basin. Cultivation of crops on the banks of the tributaries that feed the dam was rampant, for instance, Vahondo River in Masvingo Ward 24 (Museva area). These activities exposed the land to erosion which lead to gully formation in some areas in Chivi and Masvingo Rural Districts.

Picture L: Garden in the basin.



Source: Picture taken by OAG March 15, 2023).

According to interviews and documentary review, silt surveys were not being done due to lack of modern survey equipment and as a result the engineers used manual methods which delay the whole process. They indicated that these manual methods in use are labour intensity and rely most on visual judgements. Siltation had a risk of reducing the capacity of the dam from 1,8 billion mega litres to minimal levels that cannot support any activity according to interviews with ZINWA officials.

Management Response

Currently, the Zimbabwe National Water Authority does not have adequate equipment to carry out silt surveys for large dams. The Authority is however working towards procuring the equipment and the silt surveys will commence this year.

3.4.5 Availability of Security Systems for Tugwi Mukosi Water Resources.

Tugwi- Mukosi Dam was declared a national asset which therefore warrants maximum protection 24/7 by the state security.

From documentary review, inspections and interviews held with ZINWA Runde Catchment Council and Officials at the Tugwi Mukosi Dam, audit noted various shortcomings in the security system at Tugwi Mukosi Dam. During inspection in March 2023, audit noted that there were no barricades to secure the dam wall, the bi-metric, alarm and CCTV systems were not working. It was also revealed that the diamond wire erected by the contractor in 2018 was stolen. The access bridge downstream used by members of the public and the staff of ZINWA was too low and when the dam is spilling, the bridge will be flooded and people use the alternative route which passes through the no go area security zone thereby pausing security threats.

The security situation at the time of audit at Tugwi Mukosi, March 13, 2023 is summarised in **Table 7**.

Table 7: Security Situation at Tugwi-Mukosi Dam.

Guard Point	Security Measures In Place	Security Measures Not In Place
Main gate	The premise was manned by one guard 24/7 day and night and there was a flood light for provision of light during the night.	There was no firefighting equipment and ablution facilities as well as drinking water.
Borehole	The guard at the Main Gate was the one who overlooks the borehole but the site is approximately 100m away	Borehole not fenced, there was a public pathway and there was history of theft of armoured cables.
Warehouse/ Museum	The site housed valuable dam spares, good lighting system, it was fenced and the gate was always locked.	Site only manned during the night and there was no fire guard.
Dam Wall	Manned by one guard 24/7 and who would be armed during the night, there were 3 CCTV Cameras, entry at the gate needs sensory activity and there was an alarm at the gate of the Dam wall. Lighting system during the night was good.	No firefighting equipment, the alarm and 3 CCTV Cameras were not working.
Valve House	Gate always closed and locked, lighting system was good during the night, there was alarm and bi-metric security system.	The premise is being manned by a security guard at the Dam wall which is about 300m away and there was a history of unlawful entry.
River Pump	The lighting system was good during the night and it was manned by a guard 24/7.	No firefighting equipment and there was a history of theft of armoured cables according to Security Survey Report of November 18, 2020.

Source: Security Reports (2017-2022) and information obtained during inspections on March 13, 2023.

Security reports also indicated inadequate security measures along the canals which convey water from Tugwi Mukosi Dam to farming areas. Refer to **Table 8** for observations at the canals during audit inspections on March 13, 2023 and information obtained from Security Reports.

Table 8: Illegal abstractions of water along the canals.

Canal	Brief Description of Canal	Security Requirement of Canal	Observations during audit inspections on March 13, 2023 and information obtained from Security Reports
Mutirikwi and Manjirenji	The Runde Catchment Council sometimes involved in the inter basin transfer of water from Tugwi Mukosi dam to Mutirikwi dam in order to irrigate the low veld.	There are eight (8) camps along the 56 km canal and that at each camp there was supposed to be four (4) guards Along the Mutirikwi Canal. There were four (4) camps with suitable accommodation on the Manjirenji canal. Amongst the requirements needed were vehicle and motor bikes. The reasons why a vehicle was required for Mutirikwi canal was for night patrols, since the illegal abstractors were aggressive and they would be need to ferry exhibits. Normally when the illegal abstractors observed that raids were being done during the day they would resort to irrigating during the night and that was when a vehicle was required as it would be dangerous to patrol on foot at night. Distances in between camps are approximately 7 km hence security guards required motor bikes for patrols for quick identification and strategically planning for arrests. Four (4) guards would be required at every camp so that two (2) guards would be on duty whilst the other two (2) would be off duty.	The team observed that along the whole canal from the 56km peg to the water source which is Nyajena weir we found out that there was a high activity of illegal water abstraction from the canal by means of siphoning, use of De-watering pumps and vandalism to the infrastructure. It was also noted that there were some leakages to the canal which also contributed to a certain percentage of water losses.
Tokwane	The canal had an existing consortium between ZINWA and Tongaat Hullets and hence only one (1) agreement existed that is Tokwane Ngundu water agreement. The water was released from Tugwi Mukosi Dam to Tokwane dam in order to meet the demand of water by	Motor bikes will assist greatly for patrols in between the two camps that are almost 12km apart. The Security Officer Triangle Service Centre was based at Tugwi Mukosi hence for any night raids and checks required at Tokwane canal reaction would be easier from Tugwi Mukosi.	Numerous illegal abstractions were noted along the canal.

	Tongaat Hullets in Triangle.		
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Source: Security Reports and information obtained during inspections on March 13, 2023.

However, in trying to avert the problem of illegal abstractions, the security team periodically carried out some blitz operations, confiscating engines and pipes along the canals. Refer to **Picture M**. In spite of that, the illegal abstractors continued to replace the engines and pipes. Interviews with ZINWA Officials indicated that there was poor coordination between Department of Lands, Zimbabwe Republic Police and Local Authorities in fighting illegal abstractions along the canals. There were supposed to carry out regular awareness campaigns and blitz operations together.

Picture M: Man at Work Loading Recovered Pipes in a Lorry used by Illegal Abstractors.



Source: ZINWA Security Report- Mutirikwi Canal 2019.

Security along canal system needs to be enhanced to regularly monitor the same as a way of curbing illegal abstractions of water. There was no vehicle for the security personnel at the Tugwi -Mukosi dam at the time of audit, March 13, 2023. The availability of a vehicle would have increased the mobility of the security officers thereby reducing incidences of illegal water abstractions.

Management Response

ZINWA security personnel were given on January 10, 2024 two (2) motor cycles to carry out regular monitoring of the canals. Providing adequate security for the long canals cannot be left to ZINWA security alone as this would significantly increase operational costs. Community participation is also key.

3.5 Findings from the Pilot Study

A pilot study was carried out at Kariba and Mazvikadei Dams to benchmark on how dams were being utilised. The following are the findings from the pilot study: -

Kariba Dam

Kariba dam water resources are mainly used for power generation by Zimbabwe and Zambia. However, the water resources were also being utilised by ZINWA Kariba station and Kariba Municipality for provision of water to residents and companies. ZINWA Kariba station was abstracting water for Kariba airport, Chapungu Charlets, the ZNA Kariba and ZIMPARKS. Since November 2022 up to the time of the audit in February 2023, the station was failing to pump water to residents and companies due to dwindling water levels which left water pumps exposed. This meant that ZINWA was supposed to extend water pipes to zones where water had shifted to, and ZINWA had not managed to do so. The Kariba Municipality was also abstracting water from the dam, however the ZINWA station did not have information as to how much volume of water was being abstracted by the municipality.

Kariba dam was inspected after every five (5) years and in between there were midterm reviews on monitoring and maintenance programmes. The dam was inspected by experts with more than forty (40) years' experience on safety of dams outside Zambia and Zimbabwe since the two (2) countries are members of the International Commission of Large Dams (ICOLD). Also Interviews held on February 14, 2023 with Zambezi River Authority (ZRA) officials indicated that regular online meetings were being done with dam safety panel of experts who were scattered all over the world discussing dam safety and maintenance, governance of the safety culture, monitoring of the foundation or structure, slope/abutment movement, water pressure, movement within the structure, mechanical seals and high velocity among others. The meetings were usually done twice a year. There were also monitoring instruments installed in the dam wall to monitor the movements/behaviours in the structure.

Maintenance work was carried out in two (2) categories that was short and long term. In conducting maintenance work the Zambezi River Authority firstly conducted routine surveillance using Standard Operating Procedures (SOPs), to assess whether safety requirements were correct. Using the results of surveillance, they then determine whether to undertake short term or long-term maintenance. To do so, they check any movements on the foundation and structure of the dam as well as slope movements. During my inspections, I noted that the dam had monitoring instruments on the walls to determine the behaviour of the dam at every moment. The maintenance procedure manuals and SOPs were available at Dam site. There were also monitoring mechanisms placed on cracks that developed on the walls of the dam to determine their severity. Short term maintenance was undertaken on a daily basis by the Zambezi River Authority whilst long term was usually carried out after a period of five (5) years by independent engineers mostly from outside Zambia and Zimbabwe. At the time of audit, the Zambezi River Authority was carrying out long-term rehabilitation programme for the spill way gates and plunge pool to protect further scouring.

At Kariba Dam, there were thirteen (13) gauging stations on the points that feed Zambezi River such as at Sanyati and Gwayi in Zimbabwe, Kalonga and Ngonye in Zambia among others.

According to interviews with ZRA officials in Kariba, silt surveys were not being done. These were supposed to be done after every five (5) years. However, they indicated that the dam was at no threat from siltation.

My visit at Kariba Dam revealed that the dam wall had 24/7 security services from Zimbabwe Republic Police (ZRP), Zimbabwe National Army (ZNA) and Office of the President and Cabinet (OPC). At the Dam wall, there was a demarcated security zone where people were not allowed entry except the Security and ZRA officials only.

Mazvikadei Dam

My audit noted that water resources at Mazvikadei Dam was not being fully utilized. The volume of water billed declined from 44 557 233 mega litres in 2021 to 26 583 939 mega litres in 2022. The decline was due to some farmers who had resorted to reducing their hectrage as they were being billed for allocations that were not utilized due to electricity challenges. Underutilisation of water resources by commercial farmers was attributed to inadequate irrigation infrastructure, a problem which was being addressed through Joint Ventures and Partnerships with other Commercial farmers.

There were illegal abstractions of water by some farmers as they did not have water permits. Furthermore, existing licenced water users did not have flow meters to measure water being abstracted. ZINWA was using the crop water requirements to determine the quantity of water to be released to farmers without water flow meters.

At Mazvikadei Dam silt surveys were not being carried out after every five (5) years despite threats of dam siltation both upstream and downstream due to illegal mining and unsustainable agricultural activities.

Mazvikadei Dam had five (5) Gauging stations at the Mukwadzi and Manyame rivers as well as other tributaries that feed the dam.

There were no Wildlife and Parks Management Programmes running at Mazvikadei Dam as the game park which used to be there had been destroyed. This was confirmed through interviews held with farmers' representatives during my inspections to the dam site on February 9, 2023. The farmers further elaborated that they preferred the restoration of the game park as it helped in protecting the dam environment. At the time of audit on February 9, 2023 audit observed some illegal settlements in Ayrshire which used to be a Game Park.

Fishing projects at Mazvikadei dam were not operating on commercial basis since the fish level in the dam was very low despite getting the fingerlings from Chivero dam. The fish farmers indicated that there was need for replenishment of fish levels in the dam. There were two (2) crocodile farms at Mazvikadei Dam. Mazvikadei Crocodile Farming (Kwikpak) had 326 breeders and 202 crocodiles for slaughtering.

Dam inspections were not being carried out at Mazvikadei Dam as per the ZINWA Act Chapter [20:25] which requires inspections to be done after every five (5) years. According to Manyame Sub Catchment Council annual report for the year 2022, only private owned dams were being maintained. No major maintenance was done by ZINWA at Mazvikadei Dam, hence, was lagging behind in terms of maintenance. All the outlet valves were not functioning properly and leaking. Audit noted that there were trees and grass on the dam wall. Interviews with personnel who worked at the dam revealed that they were finding it difficult to clear the grass and trees as they were not being provided with tools of trade. However, the dam had all operations and maintenance procedures manuals.

In addition, my inspections at Mazvikadei Dam noted that there was no security services at the dam wall and a demarcated security zone which were a requirement of a national gazetted

asset. Also audit inspections at Mazvikadei on February 9, 2023 revealed that the water pump, canals and a transformer were vandalized due to absence of security services.

Management response

Audit observations have been well noted and ZINWA will put in place measures to address all the outstanding issues. Budget provisions will be made under the 2025 ZINWA and PSIP budgets.

CHAPTER 4

4. CONCLUSION

4.1 General Conclusion

The Tugwi Mukosi Dam was constructed and commissioned in May 2017. The dam has a computerised dam safety system to monitor movement of the dam structure, has security guards to provide security of infrastructure 24/7, sixteen (16) Fishing Cooperatives and four (4) cage culture Companies. However, despite all the resources and efforts that Government has invested in the construction, the Ministry has not met the targeted objective spelt out in the approved Tugwi Mukosi Integrated Development Framework. Of the developmental fourteen (14) Anchor projects outlined in the Tugwi Mukosi Integrated Development Framework eight (8) out of the fourteen (14) anchors solely depended on finalisation of the Master Plan whilst the remainder had been partially implemented. Implementation of most projects was delayed due to non-approval of the Master Plan as at the time of audit in March 2023. The delay in approval of the Master Plan was due to inadequate planning as it was not done before the construction of the dam as required by Section 14 (2) of the Regional, Town and Country Planning Act [*Chapter 29:12*].

Also there are inadequate measures in place to ensure sustainability of the Tugwi Mukosi Dam. These measures would entail the assurance and guarantee for continued existence of the Dam serving the purpose for which it was constructed uninterrupted. There were inadequacies on dam safety inspections and maintenance mechanisms, unavailability of gauging stations for collection of hydrological data, absence of silt surveys and security systems which remain a threat to the sustainability of the Tugwi Mukosi Dam.

Specific Conclusions

The following are specific conclusions;

4.2 Functionality of the Tugwi Mukosi Dam and Environs Combination Master Plan Authority.

Non-functionality of the Tugwi Mukosi Dam and Environs Combination Master Plan Authority and delays in the approval of the Master Plan resulted in failure to optimally utilize water from Tugwi Mukosi Dam.

4.3 Utilisation of Tugwi Mukosi Dam water resources.

The Tugwi Mukosi Dam water was being under-utilised. The Dam had no water agreements or permits for use of water since commissioning in May 2017 up to the date of audit on March 13, 2023. There is no revenue that is being realised from use of the water resources as ZINWA was using it as back up to cushion supplies to other dams that were failing to meet the demands from their clients, like Lake Mutirikwi for the supply of water to sugarcane farmers in Triangle and Chiredzi. On the other hand, ZINWA Runde Catchment Council is losing a lot of water in the canals through illegal abstractions by farmers without permits and agreements. Permits facilitate management of the quantity to be extracted.

4.4 Inadequate Implementation of Tugwi Mukosi Integrated Development Framework (August 2017).

Eight (8) out of the fourteen (14) anchors solely depended on finalisation of the Master Plan whilst the remaining six (6) had some short and medium term project activities that were supposed to be implemented in the absence of the masterplan. The short and medium term activities that were partially or fully implemented included development of plans, setting of

policies and regulations and setting of boundaries by responsible Government arms. Full implementation of all the fourteen (14) Anchor projects depended on the finalisation of the Master Plan. The delay in implementation of projects has affected Government plans and the objective of realising a return on investment and improvement of citizens' lives.

4.5 Sustainability of the Dam.

There are some measures put in place to monitor the behaviour of the dam wall, both manually and electronically. However, the measures are not adequate to ensure sustainability of the dam as there were gaps in terms of scheduled inspections, saddle three (3) is developing a crack, there were no gauging stations for collection of hydrological data, silt surveys are not being done and the security system at the dam needs to be improved.

CHAPTER 5

5. RECOMMENDATIONS

5.1 The Ministry should:

- Ensure that the Tugwi Mukosi Dam and Environs Combination Master Plan Authority is functional and making sure that terms of reference for the Authority should be established and made available for audit review. Clear responsibilities should be outlined for proper coordination of the Authority members. This is vital for the success of earmarked projects and activities.
- Expedite the process of implementation of the Master Plan to ensure proper allocation and distribution and execution of developmental activities.

5.2 The Ministry should ensure maximum utilisation of the Tugwi Mukosi Dam by:

- Accelerating the process of putting in place conveyance systems in all identified irrigable land to ensure access to the water. This would trigger interest in application for permits for the use of the water resources by investors and commercial farmers.
- Coming up with stiffer penalties or other measures to deter illegal abstraction of water resources along the conveyance systems so that permit holders benefit from what they would have paid for.

5.3 The Ministry should ensure that the projects planned under the Tugwi Mukosi Integrated Development Framework (14 Project Anchors) are implemented without any further delays. This will enhance the maximum utilisation of the dam for the benefit of the country and enhance economic activities in the Tugwi Mukosi environs such as irrigation development, electricity production, tourism resort facilities and fishing activities.

The Ministry should ensure availability of financial and material resources for the conclusion of all short term and medium term projects that were partially implemented.

Maximum effort on coordination of activities earmarked for the Tugwi Mukosi Dam should be done to ensure successful implementation of the short and long term integrated development projects. Monitoring mechanisms should be put in place to facilitate efficiencies.

The Ministry should expedite the process for the registration of the Multi-Disciplinary Institute for Research and Advisory Services with the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development and construction of more facilities on site to facilitate research activities.

5.4 To enhance sustainability of the Tugwi Mukosi Dam, the Ministry should ensure that detailed engineering inspection are done by an approved civil engineer after every 5 years to reduce chances of catastrophic failure in compliance with the requirements of the Water Act [Chapter 20:24] and International Commission on Large Dams (ICOLD). Regular inspections and midterm monitoring reviews should also be done.

To enhance safety of the dam, the Ministry should;

- Ensure that the available computerised system to monitor the behaviour of the dam structure is always working to detect any behavioural changes on the dam structures.

- Establish the Independent Regulator of Dam Safety in accordance with the National Water Policy (2013) to assist with independent inspections and maintenance of dams to assure on safety. Benchmarking can be done with other dams such as Kariba Dam which is regularly inspected by independent dam safety experts.
- Institute a monitoring mechanism for cracks that develop on the dam walls in line with international dam safety requirements. There is a risk that if the wall fails, many lives and property may be lost as there may be flooding downstream.
- Ensure availability of gauging stations in the main tributaries to Tugwi Mukosi Dam for collection of hydrological data that would assist in management and control of flooding in the dam catchment area and downstream.
- Comply with the requirements of the Water Act [Chapter 20:24] and International Commission on Large Dams (ICOLD) which stipulates that silt surveys should be carried out after every five years to determine the extent of segmentation in the Dam. The Ministry should capacitate the engineers with modern technologies available to aid the silt survey programmes. The modern survey equipment such as echosounders and a computer controlled positioning system are required for data computation and map generation. These modern technologies increase rate of accuracy and make use of limited labour. The initial cost for the necessary software may be high, but it is essential for the function of the siltation monitoring programme.
- Put in place adequate security systems through construction of barricades to secure the dam wall to reduce vandalism of property. The Ministry should consider increasing security along the canals to curb illegal abstractions. Vehicles should be availed to aid security personnel in patrolling along the canals. They should benchmark with Kariba Dam which has a security zone guarded or protected by armed National Security Officers 24/7.

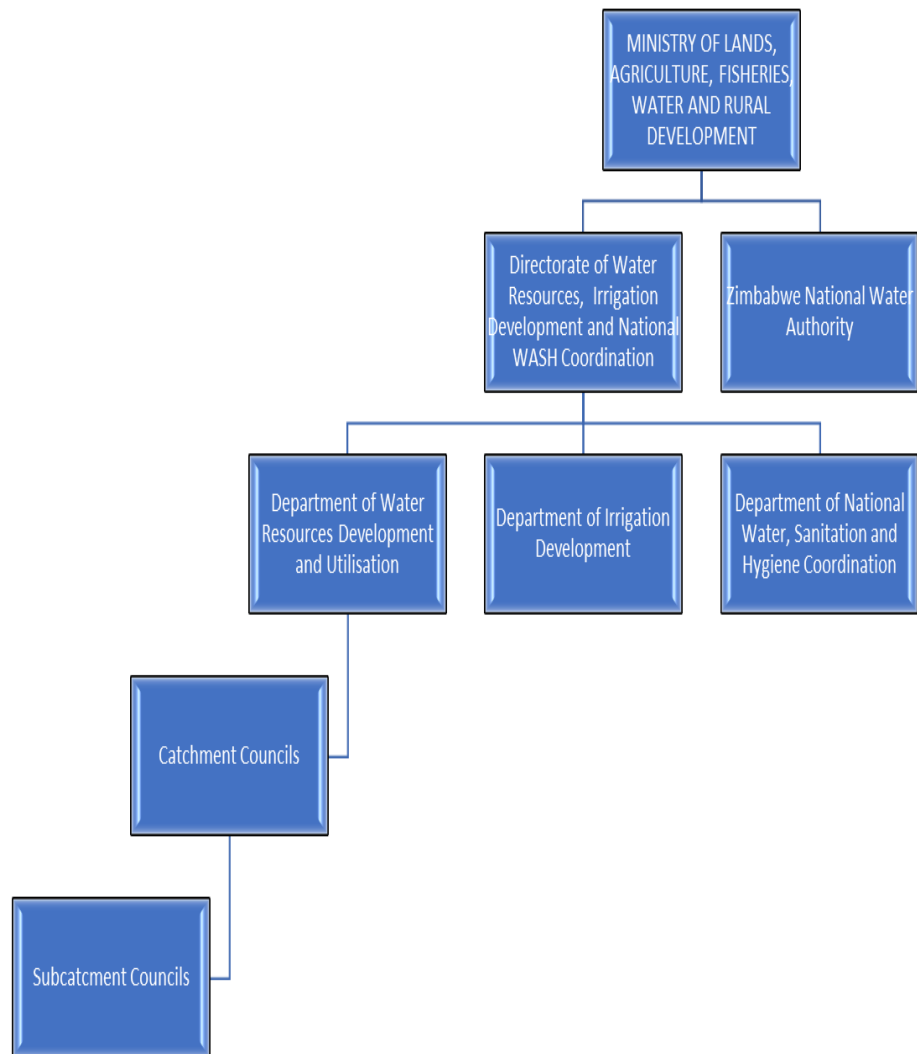
5.5 Pilot Study

From the results of the pilot study the Ministry should also consider the following recommendations for the improvement of management of Tugwi Mukosi Dam.

- Emulate the standards for maintenance and dam safety procedures and operations being implemented by Zambezi River Authority at Kariba Dam. Kariba Dam maintains high standards in accordance with the International Commission on Large Dams in areas such as dam safety, security, water utilisation, inspections, gauging stations and maintenance.
- Ensure that ZINWA is capacitated with the requisite infrastructure to continue abstracting water without interruptions for the benefit of its customers and that all the water supplied is billed.
- Adhere to regulations and best standard practices in the management of Mazvikadei Dam in areas like maintenance of the dam infrastructure, ensuring security services are available, inspections, silt survey, utilisation of water resources, sustainability and management of gauging stations.

ANNEXES

Annexure A: Organisational Structure- Directorate of Water Resources, Irrigation Development and National Water and Sanitation Hygiene Coordination.



Source: Ministry of Lands, Agriculture, Fisheries, Water and Rural Development Organogram.

Annexure B: Documents Reviewed.

Document	Purpose of Review: - To:
Water Act Chapter [20:24]. ZINWA Act [Chapter 20:25]	Understand the organisation's mandate and function.
Water Policy (2013)	Get knowledge on how Government plans to utilise water resources.
Department of Water Resources, Irrigation Development and National Washp Coordination Organisational Structure, Strategic plans	Appreciate management levels and reporting structures and organisational plans.
Tugwi Mukosi Dam Integrated Development Framework -2017, Draft Master Plan	Understand how the dam was supposed to be utilised and planned activities.
Financial Statements 2017-2022 ZINWA Budgets 2017-2022	Determine Government total investment into the dam construction project and disbursements towards various activities. Budgets were reviewed to establish the planned activities for the years towards Tugwi Mukosi Project.
National Transitional Stabilisation Plan and National Development Strategy 1	Understand the Government expectations and targets at National level for the Tugwi Mukosi Dam.
Annual Reports 2017-2021	To Get updates on the progress of development of activities at Tugwi Mukosi Dam.
Dam Inspection Reports	Understand whether inspections were being done as per schedule.
Dam Siltation Reports	To appreciate whether siltation was being monitored for the purpose of ensuring the sustainability and carrying capacity of the dam was not threatened.

Annexure C: List of interviewees.

Details	Designation
Ministry of Lands, Agriculture, Fisheries, Water and Rural Development- Water Resources, Irrigation Development and National Washp Coordination	<ul style="list-style-type: none"> • A/Director Water Resources Development and Utilisation. • A/Deputy Director Water Resources Planning and development. • Director Irrigation Development.
Zimbabwe National Water Authority (ZINWA)	<ul style="list-style-type: none"> • Director Engineering and Hydrological Services. • Internal Audit Manager. • Finance Director. • Hydrologist.
Ministry of Energy and Power Development	<ul style="list-style-type: none"> • A/Deputy Director Energy and Power Development. • Chief Engineer Energy and Power development.
Zambezi River Authority	<ul style="list-style-type: none"> • Director Finance and Administration. • Kariba ZRA Station Manager. • Dam Safety Engineers (Zimbabwe and Zambia).
Ministry of Lands, Agriculture, Fisheries, Water and Rural Development- Chinhoyi Province	<ul style="list-style-type: none"> • A/Director –Agritex.
ZINWA Manyame Catchment Council	<ul style="list-style-type: none"> • Catchment Manager. • Hydrologists x2. • Accountant. • Team Leader Zvimba District. • Water Bailiff and Assistants.
Manyame Sub-Catchment Council	<ul style="list-style-type: none"> • Chief Operations Officer. • Representative of Commercial Farmers. • Ward Councillor. • Catchment Council Chairperson. • Fish and Crocodile farmer.
Ministry of Lands, Agriculture, Fisheries, Water and Rural Development- Masvingo Province	<ul style="list-style-type: none"> • Provincial Director – Agritex. • Livestock Specialist.
ZINWA Runde Catchment Council	<ul style="list-style-type: none"> • Catchment Manager. • Accountant.
Irrigation Department	<ul style="list-style-type: none"> • Provincial Irrigation Director.
Lands Department	<ul style="list-style-type: none"> • Provincial Lands Director.
ZIMPARKS	<ul style="list-style-type: none"> • Provincial Director. • Parks Rangers.
Forestry Commission	<ul style="list-style-type: none"> • Provincial Director. • Chivi District Officer.

Annexure D: Summary Schedule of Main Projects and Programmes Anchored by Tokwe Mukosi Dam.

Project No.	Project / Programme Description	Location (Place Name Ward & District)	Main Implementing Agency	Sources Of Funding
1	Irrigation of 25 000 hectares, reorganisation of village settlements and relocations	Masvingo, Chivi and Chiredzi districts	Ministry of Lands, Agriculture, Fisheries, Water and Rural Development - Department of Irrigation	<ul style="list-style-type: none"> • GOZ • IDBZ • Joint Ventures • Private Sector investments
2	Wildlife and Parks Management Programme	Ecological zone to be designated	Zimbabwe National Parks & Wildlife	<ul style="list-style-type: none"> • Zimbabwe Parks and Wildlife management authority • Private sector involvement
3	Construction of Hotels, holiday homes, cultural village, Lodges and Restaurants	Main Island and along the shores of the dam	Ministry of Environment, Climate, Tourism and Hospitality Industry	<ul style="list-style-type: none"> • Ministry of Environment, Climate, Tourism and Hospitality Industry. • Mosi - OaTunya Development Company • Private Investors
4	Fisheries and Crocodile Farming	Main Island and selected parts of the dam	Zimbabwe National Parks & Wildlife	<ul style="list-style-type: none"> • Zimbabwe National Parks & Wildlife • Private Companies • Community groups
5	Mini Hydro Power Generation (15 MW)	Left bank downstream	Zimbabwe Power Company	<ul style="list-style-type: none"> • GOZ • Eco friendly agencies like GCF and CDM
6	Construction of a Navigation Mast (Control Tower) and a Harbour and management of	Near the Dam Wall to the West	Ministry of Transport (Department of Inland Waters Control)	<ul style="list-style-type: none"> • GOZ • Private investors

	Boating Operations			
7	Construction of a Museum	At the Existing Site Office	ZINWA	<ul style="list-style-type: none"> • GOZ • Private Sector
8	Development Programme for Administrative and Security Institutions	Selected sites near water front	Ministry of Local Government	<ul style="list-style-type: none"> • Not specified
9	Integrated Service centre, residential and Commercial development programme.	Sites to be identified over suitable terrain	Ministry of Local Government	<ul style="list-style-type: none"> • GOZ
10	Area wide Power Supply Programme	Sub Stations and Wayleaves as per ZETDC Plan	Rural Electrification Authority	<ul style="list-style-type: none"> • Rural Electrification Fund • Private Sector
11	Upgrading of aerodrome	Downstream to the east	Civil Aviation Authority of Zimbabwe	<ul style="list-style-type: none"> • GOZ
12	Training Institute for all disciplines like Engineering, Agriculture, Tourism, Ecology, Local Governance, Marketing Etc.	At Salini senior camp	Zimbabwe National Water Authority	<ul style="list-style-type: none"> • GOZ
13	Value addition to the intended activities around the dam e.g. Fish canning Sugar milling Fruit juice manufacturing Cooking oil production Ethanol production Cereal milling Molasses production Beef	Ministry of Industry and Commerce	Ministry of Industry and Commerce	<ul style="list-style-type: none"> • GOZ • Private sector
14	Afforestation	Dam servitude area	Forestry Commission	<ul style="list-style-type: none"> • Forestry Commission

Annexure E: Projects not yet implemented due to the absence of Master Plan.

Project Anchor No.	Project / Programme Description	Main Implementing Agency	Project Activities Awaiting implementation after Approval of Master Plan
1	Irrigation of 25 000 hectares, reorganization of village settlements and relocations	Ministry of Lands, Agriculture, Fisheries, Water and Rural Development - Department of Irrigation	Construction of conveyance systems to areas earmarked for irrigation schemes.
2	Wildlife and Parks Management Programme	Zimbabwe National Parks & Wildlife	Confirmation of the Parks boundary or demarcations. Parks to secure the boundaries and start moving animals into the game areas. Relocation of communities residing in the game areas.
3	Construction of Hotels, Holiday Homes, Cultural Village, Lodges and Restaurants	Ministry of Environment, Climate Change, Tourism and Hospitality Industry	Planning and Construction of Hotels, holiday homes, cultural village, Lodges and Restaurants
9	Integrated Service Centre, Residential And Commercial Development Programme	Ministry of Local Government	Planning and construction of the Integrated Service Centre, residential and Commercial
10	Area wide Power Supply Programme	Rural Electrification Authority	Planning and construction Area wide Power Supply power lines and substations.
11	Upgrading of aerodrome	Civil Aviation Authority of Zimbabwe	Planning and development of the aerodrome
13	Value addition to the intended activities around the dam e.g. Fish canning Sugar milling Fruit juice manufacturing Cooking oil production Ethanol production Cereal milling Molasses production Beef	Ministry of Industry and Commerce	Planning and development of Fish canning, Sugar milling Fruit juice manufacturing, Cooking oil production, Ethanol production, Cereal milling and Molasses production
14	Afforestation	Forestry Commission	Planting of trees in areas currently occupied by residents and farming activities within the dam servitude.

Source: Tugwi Mukosi Integrated Development Framework.