THE UNITED REPUBLIC OF TANZANIA

NATIONAL AUDIT OFFICE

PERFORMANCE AUDIT ON THE MANAGEMENT OF WATER SUPPLY PROJECTS FROM BOREHOLE SOURCES IN TANZANIA

AS PERFORMED BY

THE MINISTRY OF WATER

REPORT OF THE CONTROLLER AND AUDITOR GENERAL OF THE UNITED REPUBLIC OF TANZANIA

MARCH 2019

THE UNITED REPUBLIC OF TANZANIA

NATIONAL AUDIT OFFICE

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PREFACE

The Public Audit Act No. 11 of 2008, Section 28 authorizes the Controller and Auditor General to carry out Performance Audit (Value for- Money Audit) for the purpose of establishing the economy, efficiency and effectiveness of any expenditure or use of resources in the MDAs, LGAs, Public Authorities and other Bodies. The Performance Audit involves enquiring, examining, investigating and reporting on the use of public resources as deemed necessary under the prevailing circumstances.

I have the honour to submit to His Excellency the President of the United Republic of Tanzania, Dr. John Pombe Joseph Magufuli and through him to the Parliament a Performance Audit Report on the Management of Water supply projects from borehole sources in Tanzania.

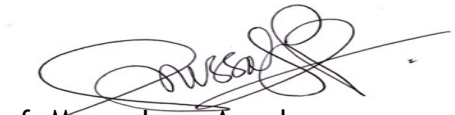
The report contains findings, conclusions and recommendations that are directed to the Ministry of Water. The Ministry has been given the opportunity to scrutinize the factual contents and comment on the draft performance audit report. I wish to acknowledge that the discussions with the Ministry of Water have been very useful and constructive.

My office intends to carry out a follow-up audit at the appropriate time with regard to the actions taken by the audited entities in relation to the recommendations provided in this report.

To ensure the successful completion of this assignment, our office subjected the performance audit report to the critical reviews of the Mr. Majura Amon Maila *Songo* who came-up with useful inputs on improving the output of the report.

This report has been prepared by Ms. Asimuna Kipingu – Team Leader and Mr. Elisante Mshana – Team Member under the supervision and guidance of Ms. Asnath Mugassa- Team supervisor, Mr. George Haule – Assistant Auditor General and Mr. Benjamin Mashauri – Deputy Auditor General.

I would like to thank my staff for their devotion and commitment in the preparation of this report. My thanks should also be extended to the Ministry of Water for their fruitful interaction with my office throughout the audit.



Prof. Mussa Juma Assad
Controller and Auditor General
United Republic of Tanzania
March, 2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

BWBs	Basin Water Boards
CAG	Controller and Auditor General
CC	City Council
CWE	City Water Engineer
DAWASA	Dar es Salaam Water Supply and Sanitation Authority
DC	District Council
DDCA	Dams Drilling and Construction Agency
DWE	District Water Engineer
IWRMDP	Integrated Water Resource Management and Development Plan
IDBWB	Internal Drainage Basin Water Board
LGA	Local Government Authority
LVBWB	Lake Victoria Basin Water Board
M^3	Cubic Meters
MC	Municipal Council
MISs	Management Information Systems
MoW	Ministry of Water
PBWB	Pangani Basin Water Board
PO - RALG	President's Office – Regional Administration and Local Government
RS	Regional Secretariat
SWAP	Sector Wide Approach
UWSSAs	Urban Water Supply and Sanitation Authorities
WDMI	Water Development Management Institute
WRBWB	Wami /Ruvu Basin Water Board
WSDP	Water Sector Development Program
WSSAs	Water Supply and Sanitation Authorities
WSSR	Water Sector Status Report
WUA	Water User Association

EXECUTIVE SUMMARY

Groundwater is one among the important sources of water in Tanzania and accounts for more than 25 percent of the domestic water consumption in the country. Groundwater, as the main source of drinking water in the world, accounts for more than 95 percent of the world freshwater resources.

Despite having a substantial amount of freshwater resources, Tanzania still encounters the problem of insufficient water supply due to its inadequate capacity to access such freshwater resources including groundwater resource. As far as the issue of water supply is concerned, the World Bank Indicators of 2008 revealed that the problem of water shortage in Tanzania has been increasing, and it was noted that, in the year 2008, the country had 1977 cubic meters per capital use per year while in 2025, it is estimated to be 150,000 cubic meters per capital.

Redressing the problem of water shortage, the Government through the Ministry of Water implemented various interventions including Water Sector Development Programme (WSDP) I and II from 2007 – 2018. Despite these government efforts, there have been frequent public outcries regarding the ineffective performance of the Water supply projects from borehole sources in terms of quality and quantity of water. These public outcries have been coming from both the technocrats and politicians who have been complaining of the delays in the completion of water projects as well as questioning the sustainability of the boreholes water supply projects in the country.

In order to have a clear understanding of the performance of the boreholes water supply projects in Tanzania, the Audit has been conducted with the main objective of examining whether the Ministry of Water (MoW) has effectively managed the implementation of boreholes water supply projects to ensure the communities have sustainable access to clean and safe water.

The audit mainly focused on the effectiveness of the existing boreholes water supply projects, starting from the planning and implementation of the boreholes water supply projects as well as the effectiveness of the monitoring and evaluation mechanisms which are in place for tracking the progress and performance of the boreholes water supply projects. The audit covered a period of six years of the implementation of Water Sector Development Program (WSDP) I and II, commencing from 2012/13 to 2017/18. This was basically the period when the boreholes water supply projects were implemented.

The following is the summary of major findings, conclusion and recommendations developed from this performance audit.

Main Findings

The completed Water supply projects from borehole sources did not yield the intended results

Through the review of Water Sector Status Reports of 2014 and 2018 respectively and interviews held with the selected officials from PO-RALG and the Ministry of Water, the audit noted that the completed boreholes water supply projects were not effective. This was evidenced by the presence of dry boreholes which actually did not yield the intended results to the communities in the country in terms of quality and quantity of water.

The audit revealed that 490 (33 percent) out of 1,485 boreholes which were drilled during the period of implementing WSDP I and WSDP II were found to be dry and unproductive. This is a clear indication that, despite the investments which were made to the projects, sustainable supply of water to the communities, being the intended result of these projects, was not realized. On top of that, the audit noted that a total of TZS 764 million was spent for drilling the boreholes which were later found to be dry. Actually this sum of funds was just wasted as it was used to execute the boreholes water supply projects which did not yield the intended results.

The review of Water Sector Status Report (2016) pointed out that, for domestic use, 709 (10.7 percent) out of 6,615 boreholes water samples which were analysed did not meet the recommended quality standards. The main constraining water quality parameters were high content of iron, manganese, fluoride, nitrate in some water sources and microbial contamination. In some regions, for instance, Tabora and Simiyu the groundwater was loaded with alkaline and high concentration of manganese.

The audit further noted that the main contributing factors for the ineffective boreholes water supply projects were inadequate hydrogeological aquifer mapping of groundwater zones for the entire country to determine the quality and quantity of the groundwater and ineffective hydrogeological and geophysical surveys. As a result, boreholes were drilled in areas that were not potential to produce water.

Implementation of Boreholes Water supply projects was not done in a cost effective manner

The audit found out that the boreholes water supply projects were not implemented in a cost effective manner. This has been indicated by the clear fact that these projects were implemented beyond the set budget, where the percentage excess costs range from 12 to 52 percent above the set budget. Furthermore, the drilling cost was above the average drilling cost per depth in all 14 visited LGAs. The highest percent of the boreholes water supply projects that were above LGAs average costs were noted in Kinondoni and Dodoma MCs

where the values were 67 and 80 percent of the total drilled boreholes respectively.

Delay in Completion of the Boreholes Water Supply Projects

All contracts for the boreholes water supply projects in the 14 visited LGAs were delayed. The main contributing factors for the delay in project completion were inadequate capacity of contractors, delay in disbursement of funds and delay in payment of the interim payment certificates. Delay in completion of the boreholes water supply projects in the visited LGAs ranged between 50 percent and 100 percent. For instance, the Audit found out that in eight LGAs the delay in completion was 100 percent, one LGA delayed completion for about 50 percent while the other LGA delayed completion for about 78 percent.

Ineffective Monitoring & Evaluation Mechanisms for Boreholes Water Supply Projects

The audit found out that M&E for the boreholes water supply projects were inadequately conducted due to the weak established monitoring and evaluation mechanisms. The Ministry of Water lacks performance indicators to monitor the progress and performance of boreholes water supply projects.

The review of monitoring and evaluation plan of the Ministry of Water revealed that, there are no specific indicators set for the purpose of monitoring the progress of implementation and performance of the boreholes water supply projects in the country. There were only generally set indicators for monitoring the progress and performance of all water projects regardless of their sources. It was also noted that the Ministry of Water and Basin Water Bodies did not effectively conduct groundwater monitoring to measure the levels, groundwater abstraction and water quality. However, this was due to the absence of risk based groundwater monitoring stations.

General Conclusion

Based on the findings of this audit, it is concluded that the Ministry of Water, through LGAs and UWSSAs, does not effectively manage the implementation of boreholes water supply projects to ensure the communities have access to adequate supply of clean and safe water. The reason for this is that a significant number of completed boreholes water supply projects are not effective as it has been evidenced by the presence of unproductive and non-functioning completed boreholes. However, even those boreholes which are claimed to be productive, most of them do not produce sufficient and quality water.

The period from 2014 to 2018 marks the implementation of WSDPI and II whereby 490 (33 percent) out of a total of 1,485 boreholes drilled in the whole country were found to be dry and unproductive. During this period, it was

further noted that a total of 58 (29 percent) out of 203 drilled boreholes from 14 visited LGAs were not productive. Unexpectedly, a total of TZS 764 million was spent in executing the boreholes water supply projects which were later found to be dry, and consequently did not yield the intended results in the visited 14 LGAs. Therefore, the value for money in this situation is far from being realized.

Furthermore, significant number of completed boreholes did not yield water that meets the recommended quality standards for domestic use, as these boreholes were found to have water which had high content of iron, manganese, fluoride, nitrate, microbial contamination and alkaline. Therefore, exposing the communities in a situation which possesses poor quality of water has the potential risk to human health.

Finally, despite the big investments made in respect to the boreholes water supply projects in the country, sustainable water supply to the communities, as the main intended result of these projects, has not been realized. Failure to adequately realize the intended result of the boreholes water supply projects is mainly attributed to lack of sustainable plans for boreholes water supply projects, ineffective implementation of the boreholes water supply projects and lack of specific monitoring and evaluation mechanisms for performance tracking of the boreholes water supply projects by both the Ministry of Water and PO-RALG.

Recommendations

The audit acknowledges the Government efforts through the Ministry of Water and PO-RALG towards improving access to clean water by the communities in the country. However, based on the facts presented in chapter three, the Ministry of Water needs to put more interventions for the purpose of improving the management of Water supply projects from borehole sources so as to be able to guarantee availability of adequate and sustainable water supply to the communities in the country. Therefore this Audit provides recommendations as follows:

Improving Plans for Boreholes Water Supply Projects

The Ministry of Water should:

a) Conduct and properly document the groundwater mapping in the entire country. The results should be effectively disseminated to all key implementers for its implementation in their respective areas;

b) Ensure hydrogeological survey is conducted by competent consultant using appropriate technology, and the results are disseminated and used by all key implementers during the design and implementation of Water supply projects from borehole sources; and

c) In collaboration with PO-RALG establish sustainable funding mechanism for the implementation of Water supply projects in the country.

Improving the Implementation of Boreholes Water Projects

The Ministry of Water should:

a) Establish effective supervision mechanisms of the Water supply projects from borehole sources from the exploration stage to the project operation stage; and

b) Ensure that assessment of the capacity to perform drilling work of the contractors is conducted before issuance and renewal of the drilling permit and licence.

Improving Monitoring and Evaluation of Boreholes Water Projects

The Ministry of Water should:

c) Develop and implement an effective groundwater monitoring network on risk basis; and
d) Develop specific performance indicators for monitoring the progress and performance of the boreholes water projects.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Audit

One of the important sources of water in Tanzania is groundwater which accounts for more than 25 percent of the domestic water consumption (Gosling 2001; JICA 2002). Moreover, groundwater accounts for more than 95 percent of the world freshwater, the fact which makes it one of the main sources of drinking water in the world (Bowell et al., 1996; Brindha and Elango 2011).

Despite having a substantial amount of freshwater resources, Tanzania still encounters the problem of insufficient water supply due to its inadequate capacity to access such freshwater resources including groundwater resource. As far as the issue of water supply is concerned, the World Bank Indicators of 2008 revealed that the problem of water shortage in Tanzania has been increasing, and it was noted that, in the year 2008, the country had 1977 cubic meters per capital use per year while in 2025, it is estimated to be 150,000 cubic meters per capital.

The surface water crisis Tanzania has been experiencing since 1997 has been the main factor for a surge in the utilization of groundwater resources in the country. In Dar-es-Salaam alone, more than 10,000 of public and private groundwater sources have been built since 1997 (Mjema *et al.*, 2012 and Mtoni *et al.*, 2013). Moreover, the government of Tanzania embarked on the program for harnessing the groundwater resources during the implementation of the Water Sector development Program I (WSDP I) (2007-2014). Each district was supposed to develop at least ten boreholes for the purpose of reducing water scarcity especially in the rural areas (WSDP I 2007-2014).

Based on the National Water Policy, the Ministry of Water (MoW) developed a National Water Sector Development Strategy (NWSDS), for implementing National Water Policy and National Strategy for Growth and Reduction of Poverty. Following preparation of the Strategy, MoW launched a Water Sector Development Programme (WSDP) in February 2007, in order to realize both the policy and strategy. The Programme was designed under Sector Wide Approach to Planning (SWAP) to address shortfalls in urban and rural water supply infrastructure, to improve water resource management primarily through upgrading the country's nine (9) Basin Water Offices (BWOs), and to strengthen the sector institutions and their capacities.

Under the WSDP I, it was aimed that 79,754 water supplying facilities should be constructed until 2025 for the 34.5 million people with unsupplied water[1]. According to the programme, 91 percent of the planned facilities were to rely on the groundwater. For achieving the goal, 1,200 boreholes in average per year were required to be drilled.

1.2 Motivation of the Audit

The audit was motivated by the frequent public outcries on ineffective performance of the water supply projects from borehole sources in terms of quality and quantity of water. Also the public outcries have been directed on the delays in the completion of water projects, and they have been coming from both the technocrats and politicians. For instance, the Minister for Water during his 2017/18 and 2018/19 budget speeches respectively commented on the ineffective performance of the water supply projects from borehole sources. The same outcry was raised by the Permanent Secretary for the Ministry of Water when conducting site visits of water projects sometimes in the year 2017[2].

Furthermore, the Controller and Auditor General (CAG) in his Annual General Report of 2017/18 pointed out that there are significant delays in the completion of boreholes water supply projects. CAG noted that ineffective performance and delays in completion of boreholes water supply projects have significantly affected the communities by denying them the opportunity to benefit from water projects through having access to sufficient clean and safe water. Additionally, these delays in the completion of the boreholes water supply projects have the potential of resulting into a cost overrun for the projects.

On the other hand, there have been public outcries on the sustainability of water supply projects from borehole sources. For instance, the Irao boreholes projects in the Singida region were drilled to supply water in the municipality but the quantity of water dropped down for about 60 percent[3]. The citizens, on their side, provided their complaints on the implementation of boreholes water supply projects and noted that these projects were not completed on time, and some of the constructed infrastructures were not unable to provide water services despite enormous amounts of money incurred for their construction. It was further noted that 46 percent of the established boreholes water supply projects do not always work[4].

Therefore, the Controller and Auditor General decided to conduct a performance audit to ascertain as to whether the boreholes water supply

[1] URT (2006) Water Sector Development Programme I
[2] The Guardian newspaper on 25th June 2017
[3] Projects annual progress report, 2017/2018
[4] http://www.raiamwema.co.tz/tatizo-la-maji-tanzania-ni-janga-la-kitaifa cited on 9/4/2015

projects are effectively managed focusing on the effectiveness of the projects, sustainability of the plans, effectiveness of the implementation of the projects and in the monitoring of the progress and performance of the boreholes water supply projects.

1.3 Audit Design

1.3.1 Objective of the Audit

The main audit objective was to examine whether the Ministry of Water have effectively managed the implementation of water supply projects from borehole sources to ensure the communities have sustainable access to clean, safe and adequate water.

In order to address the main audit objective, the following three specific objectives were used as stated hereunder:

- To determine the extent to which sustainable plans for the boreholes water supply projects are developed, documented and implemented by the implementing agencies;
- To determine whether the Ministry of Water have effectively implemented the boreholes water supply projects in terms of time, cost, quality and set objectives; and
- To assess whether the Ministry of Water effectively and efficiently conducted M&E to track the progress and performance of LGAs and UWSSAs while managing the borehole water supply projects to ensure quality and sustainability of the projects.

The audit questions and sub-questions to this audit are appended as ***Appendix 2***.

1.3.2 Scope of the Audit

The main audited entity was the Ministry of Water as it is the responsible institution required to ensure that the communities have access to clean and safe water in the country. MoW fulfils this obligation by formulating the National Water Policy, promoting the development, management and use of nation's water resources. For the purpose of realizing the objective of this Audit, Information and data were also collected from PO-RALG. The rationale for collecting data from PO-RAGL is that this the institution which is responsible for monitoring the performance of LGAs in the implementation of the water supply projects from borehole sources and provision of water services in the areas under their jurisdictions.

Likewise, the audit covered the agencies and entities that work under the Ministry of Water. These include Drilling and Dam Construction Agency (DDCA), Water Supply and Sewerage Authorities (WSSAs) and Basin Water Boards. DDCA is one of the contractors involved in boreholes drilling and dams construction in the country, while the Basin Water Boards (BWBs) are responsible for management of all water sources in the country. Water Supply and Sewerage Authorities (WSSAs) are responsible for implementation of the water projects for boreholes including protecting and maintaining the water sources from which they abstract water.

The audit mainly focused on the effectiveness of the existing water supply projects from borehole sources in terms of planning and implementation of the boreholes water supply projects as well as the effectiveness of the monitoring and evaluation mechanisms used for tracking the progress and performance of boreholes water supply projects. Dwelling on this focus enabled the audit team to conclude whether boreholes water supply projects in the country are effectively managed to ensure availability of clean and safe water and thereafter be in the position to issue recommendations for improvements.

The audit focused on two types of water supply projects from borehole sources namely, *borehole water project* which is a stand-alone and involving the installation of hand pump or water pump; and *borehole water supply project* which involves the installation of water supply network.

In terms of the duration, the audit covered the period of six years starting from 2012/13 to 2017/18. This period was relevant as it was the timeframe for the implementation of the Water Sector Development Program (WSDP) phase I & II). For WSDP, the implementation of the boreholes water supply projects was among its targets.

With regard to the geographical coverage, the audit covered the entire country, however data were collected from the selected seven (7) Regional Secretariats, six (6) UWSSAs, and fourteen (14) LGAs from which the national status on the performance of the borehole water supply projects was drawn from.

1.3.3 Audit Criteria

In order to assess the performance of the Ministry of Water in managing the implementation of the water supply projects from borehole sources in the country various criteria have been drawn from legislations, regulations, policies and guidelines governing the management of water projects. The criteria for the audit were based on the specific audit objectives which were focusing on planning, implementation and monitoring of the boreholes water supply projects as provided below:

(a) Effectiveness of the boreholes water supply projects

Basin Water Boards are required to have better management of groundwater resources by determining safe yields of aquifers, facilitating groundwater recharge and promoting groundwater use based on aquifer characteristics; and managing and controlling. Groundwater exploration and drilling activities (*Item 4.1.2 of the WSDP I*)

(b) Development and documentation of sustainable plans for boreholes water supply projects

The Ministry of Water is required to have sustainable plans for development of water resources (Item 4.4.2 of the National Water Policy, 2002). On matters pertaining to the sustainable management of water resources, the Director of Water should conduct national water resources management planning and develop an implementation strategy (*Section 16 (b) of the Water Resource Management Act, 2009*).

The Ministry of Water should ensure that hydrogeological and hydrological surveys are adequately conducted prior to the drilling of the boreholes and consultants are required to undertake a geophysical survey using at least two methods and of which one is a VES resistivity survey (*The Groundwater (Exploration and Drilling) Licensing Regulations, 2013*)).

The Ministry of Water is required to provide initial funds for operation and maintenance of the stations while the financial capacity of the Basin Offices is being built, with a clear time frame for implementation (*Item 4.1.2. of the WSDP I*).

(c) Managing Implementation of the boreholes water supply projects with regards to time, cost, quality and objective

The Ministry of Water is required to ensure that water supply facilities are cost effective and efficient (Item 3.2.3 (d) of the WSDP I). The procuring entity is required to monitor costs and timely delivery of goods and services in the correct quantities and to the quality specified in each contract (*Regulation 114 (a) of the Public Procurement Regulations*).

The procuring entity is required to monitor the progress and timely completion of works in accordance with the terms of each contract; meet its contractual obligations by ensuring timely payments are made to the contractors and consultants; and ensure that commitments are recorded against voted funds (*Regulation 114(b) of the Public Procurement Regulations, 2013*).

(d) Monitoring and Evaluation to track the progress and performance of the boreholes water supply projects to ensure their sustainability

The Ministry of Water and PO-RALG are required to establish an efficient and effective monitoring and evaluation of water projects (including boreholes water supply projects (Para 7 Water Sector Development Programme 2006 – 2025). Where a Basin Water Board has granted a Water Use Permit subject to the construction or alteration of works, the Basin Water Board shall have powers to monitor and enforce the requirement for such construction or alteration of works in accordance with regulations made by the Minister (*Section 85 of the Water Resources Management Act 2009*).

The Ministry of Water through BWBs is required to monitor all water abstractions (Item 4.1.2 of the National Water Policy, 2002). MDAs have to establish national performance indicators in order to feed strategic planning, budgeting, policy analysis, programme evaluation and decision making (*National Five Years Development Plan II 2016/2017 to 2020/2021*).

Management Information Systems (MISs) should be used to collect, store, analyse and disseminate information and data on boreholes water supply projects (WSDP I par 7).

There should be at least three (3) rounds of technical audits and internal audits (technical) visits for each project (*WSDP II)*

The Ministry of Water is required to have correct and timely data and information for proper water resources planning, design, operational and management decision making (*Item 4.5 of the National Water Policy, 2002, Item 4.1.2 of the WSDP I).*

1.3.4 Methodological Approach

The methodological approach used in this audit is as provided below:

i) Sampling Methods

The audit team used stratified and purposeful sampling methods. The main reason for using these types of sampling methods is their usefulness when the population has many different categories and no single sample is sufficient to adequately describe the population.

In this case, the regions were found to have a wide range of geographical features that affected the boreholes water supply projects, especially during drilling. Thus, the regions were divided on the basis of their geographical locations strata and then in each stratum, a region was purposeful selected based on availability of implemented water project from boreholes.

Furthermore, in each selected region two LGAs, one from Urban and the other from the rural set-up, were selected. The seven (7) selected regions, fourteen (14) LGAs and five (5) UWSSAs covered during the audit are indicated in **Table 1.1** below.

Table 1.1: Visited Regions, LGAs and UWSSAs

Selected Region	Selected UWSSAs	Selected LGA
Dar es Salaam	DAWASA	Kinondoni MC and Temeke MC
Simiyu	-	Bariadi DC and Meatu DC
Ruvuma	Songea Urban Water Supply and Sanitation Authority (SUWASSA)	Songea MC and Tunduru DC
Dodoma	Dodoma Urban Water Supply and Sanitation Authority (DUWASSA)	Dodoma MC and Bahi DC
Tabora	Tabora Urban Water and Sewerage Authority (TUWASA)	Tabora MC and Urambo DC
Arusha	Arusha Urban Water Supply and Sanitation Authority AUWSSA)	Arusha CC and Longido DC
Lindi	Lindi Urban Water and Sanitation Authority (LUWASSA)	Lindi MC and Kilwa DC

***Source**: Auditors' Analysis (2018)*

The audit team also collected data from four (4) Basin Water Boards (BWBs) namely, Wami/Ruvu, Lake Victoria, Pangani and Internal Drainage Basins. These are the basins which work within the selected regions.

The audit team visited a total of 58 out of 421 boreholes water supply projects present in the selected regions, whereby productive boreholes were 35 which is equivalent to 60 percent of the selected sample and unproductive boreholes

were 23 which is equivalent to 40 percent of the selected sample. The list of the visited boreholes water supply projects is indicated in ***Appendix 3***.

ii) Methods of Data Collection

The audit team used three methods of data collection to gather information from the audited entities and stakeholders. The methods used were *Interviews, Documentary reviews* and *Observations* as detailed below:

Documentary Review

The audit team reviewed various documents from the Ministry of Water, PO-RALG, selected Regional Secretariats, LGAs, UWSSAs, DDCA, and Basin Water Bodies covering the financial years 2012/13 to 2017/18. This enabled the audit team to get comprehensive, relevant and reliable information related to planning, implementation and monitoring of the water supply projects from borehole sources. The list of the documents which were reviewed is appended as ***Appendix 4***.

Interviews

Interviews were conducted to confirm or provide explanations to the information gathered from the reviewed documents. The rationale was to give clues to the relevant information in the cases where clarity in the formal documents was lacking or missing. Interviews further provided context and additional perspectives to the information gathered through documentary reviews. Interviews were conducted with officials from the Ministry of Water, PO-RALG, Regional Secretariats, DDCA, UWSSAs, BWBs and the respective LGAs in the selected regions.

Furthermore, interviews were carried-out with the selected individuals/local officials who were directly impacted by the boreholes water supply projects from both the operational and managerial levels. The list of interviewed officials with the corresponding reasons for being interviewed is appended as ***Appendix 5***.

Observation

The audit team visited the selected boreholes water supply projects in order to observe the extent of implementation of the boreholes water supply projects and the existence of the identified performance problems when reviewing various document and conducting interviews with the identified officials. During the field visit, the audit team observed the projects currently under construction, completed projects and those in operation whereby the audit team took photos to demonstrate the actual situation of the projects.

The team also took notes on the quality of the implemented works as compared to the approved project design, functioning of the projects, completion status of the work compared to the reported work. The audit team also reviewed available project site documents to determine the extent of sites visits made by the relevant authorities and site instruction books. The audit team visited a total of 58 projects out of 421 water projects for boreholes implemented in the visited regions.

iii) Methods of Data Analysis

The audit used both quantitative and qualitative data analysis methods, whereby, for quantitative analysis, trends, ratios, graphs, cross tabulations and averages were used. Also in some cases quantitative analysis through the computation of means, modes and standard deviations was applied. For qualitative data analysis, context and thematic methods were used.

1.4 Data Validation

The Ministry of Water and PO-RALG were given the opportunity to go through the draft report and comment on the figures and information presented. They confirmed on the accuracy of the figures used and information being presented in the audit report. Furthermore, the information was cross-checked and discussed with experts on the field of boreholes water supply projects to ensure validation of the information obtained.

1.5 Standards Used for the Audit

The audit was done in accordance with the International Standards for Supreme Audit Institutions (ISSAIs) on Performance Auditing Standards issued by the International Organization of Supreme Audit Institutions (INTOSAI).These standards require that the audit is planned and performed in order to obtain sufficient and appropriate evidence to provide a reasonable basis for the findings and conclusions based on the audit objectives.

1.6 Structure of the Audit

The remaining part of the report covers the following:

- *Chapter Two* describes the system and process for the management of boreholes water supply projects, where responsibilities of different key actors in the implementation of boreholes water supply projects are described;
- *Chapter Three* presents the audit findings of the audit;
- *Chapter Four* presents the audit conclusion; and
- *Chapter Five* outlines the audit recommendations to be implemented in order to improve the current situation.

CHAPTER TWO

SYSTEM FOR MANAGING THE IMPLEMENTATION OF WATER SUPPLY PROJECTS FROM BOREHOLE SOURCES IN TANZANIA

2.1 Introduction

This chapter describes the system for managing boreholes water supply projects. It includes policies and laws governing the management of implementation of boreholes water supply projects in the country, the roles and responsibilities of the key players and the process for managing the implementation of boreholes water supply projects.

2.2 Policy and Legal Framework for Managing Borehole Water Supply Projects

2.2.1 Policy

National Water Policy, 2002

The National Water Policy provides a comprehensive framework for promoting optimal, sustainable and equitable development and use of water resources for the benefit of the present and the future generations. The policy also, aspires to have sustainable groundwater resources for the present and future generations.

2.2.2 Governing Legislations

Water Resource Management Act, 2009

The Water Resources Management Act covers various aspects of water resources including the development and management of surface and groundwater resources. The Act also addresses issues of groundwater governance such as groundwater control areas, exploration and abstraction. It further requires anybody lawfully engaged in groundwater drilling or exploration activities to record and submit any relevant data on groundwater to the Basin Water Board. It also gives power to the Minister responsible for water to regulate the profession of groundwater drilling.

The objective of this Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled, preventing and controlling pollution and degradation of water resources. In addition to that, Section 70 and 74 of the Act provide duration for the water use permit and conditions attached to a water use permit respectively.

Water Supply and Sanitation Act No. 12 of 2009

The Water Supply and Sanitation Act No. 12 provides for the roles and responsibilities of the Ministry of Water, Regional Secretariats, LGAs and Water Authorities in ensuring the availability and reliability of water sources as it has been provided in Part 3.3 of the Act. According to Section 20 of the Act, Water Authorities are required among others to protect and maintain water sources amongst which are the boreholes; develop and maintain waterworks; plan and execute new projects for the supply of water.

2.2.3 Regulations and Guidelines

The Ground Water (Exploration and Drilling) Licensing Regulations, 2013

The regulations provide for the requirements and procedures for application and issuance of groundwater exploration licence. Regulation 4 (1) requires any person or entity who wishes to undertake groundwater exploration activities to apply for the licence.[5]

Guidelines for Groundwater Exploration and Well Drilling

This provides a guide for monitoring and controlling groundwater development. Its objective is to guide and control groundwater activities in the country and ensure that they are conducted by relevant experts with professional ethics. It is a tool to enable enforcement of the Water Resources Management Act, No 11 of 2009 and the Groundwater (Exploration and Drilling) Licensing Regulations, 2013.

2.2.4 Strategies and Plans for Ground water Development

National Water Sector Development Strategy, 2006

The National Water Sector Development Strategy Item 3.9.5 (b) requires the Ministry of Water to introduce water allocation procedures, guidelines for prioritizing and granting water use and discharge permits for a limited time. Item 6.3.3.1 of the National Water Strategy identifies two primary sources of recurrent costs to be used for water resources management. The sources are the funds through budgetary allocations to the Ministry of Water as well as the funds from the Development Partners (DPs).

Water Sector Development Programme (WSDP)

The WSDP prioritizes activities and budgets in a three-phased timeline of five years each (first phase 2007-2014; second phase 2014-2019 and third phase 2019-2025). Implementation of Phase I of the Water Sector Development Programme commenced on 1st July, 2007 through June, 2016. The WSDP follows

[5] Regulation 4 (1)

a Sector Wide Approach to Planning (SWAP), with an overall objective of strengthening sector institutions for integrated water resources management and improve access to water supply and sanitation services. The rationale is to attain the aspirations of the National Development Vision 2025; which envisions universal access to water supply services in the urban areas by 2025; and covering at least 90 percent of the population with water supply services in the rural areas by 2025.

Implementation of the Programme is done by all Local Government Authorities (LGAs), Basin Water Boards (BWBs), and Urban Water Supply and Sanitation Authorities (UWSAs) throughout the country.

2.3 Administrative Framework

This section describes the key actors, stakeholders and their responsibilities in the management of boreholes water supply projects.

2.3.1 Key Actors and their Responsibilities

(a) The Ministry of Water

According to the Water Resource Management Act, 2009 and Water Supply and Sanitation Act, 2009, the Ministry of Water is responsible for formulation and revision of the National Water Policy, promoting the development, management and use of nation's water resources. It is also responsible for providing strategic guidance, technical and operational support to Water Supply Authorities and Water Resource Boards to enable them to carry out their mandated functions including groundwater source assessment, monitoring and regulation.

Moreover, the Ministry of Water is responsible for providing guidance and support to the Water Supply Authorities and Basin Water Board enforcement functions, managing the national register of water use permits, water user associations and other user groups, coordinating and supporting activities related to the management of boreholes water supply projects. These functions are implemented under the Water Resource Division, Water Quality Division, Planning and Policy Division and Project Preparation, Coordination and Delivery Unit. The brief role for each division is as presented hereunder:

i) Water Resource Division

Water Resource Division is responsible to oversee sustainable management and development of water resources in the country. It is mainly responsible for collecting hydrological, hydrogeological and hydro-meteorological information and disseminate to other Government institutions and the public at large. Other functions include building capacity of Regional Secretariats and Local

Government Authorities in water resources management and to provide technical support and supervise the operations of the Basin Water Offices.

ii) Water Quality Service Division

Water Quality Service Division is mainly responsible for providing expertise and services in water quality management. It is also responsible for the preparation and provision of information required for effective water quality management.

iii) Policy and Planning Division

Policy and Planning Division mainly provides expertise and services in policy formulation, implementation, monitoring and evaluation. It is also responsible for coordinating plans and budget as well as monitoring activities carried out by the Ministry of Water.

iv) Project Preparation, Coordination and Delivery Unit

The unit supports project preparation and delivery and facilitates cooperation with the development partners and other stakeholders in the water sector. Among other activities, the unit is responsible for issuing standard for water design and management; maintaining database of water projects (completed, ongoing and prospective) and building capacity of implementing agencies' technical staff for the cost effective project execution.

(a) President's Office - Regional Administration and Local Government (PO-RALG)

President's Office - Regional Administration and Local Government through Local Government Division is responsible for local governance and service delivery in Local Government Authorities[6]. PO-RALG is responsible for overseeing the implementation of boreholes water supply projects by the Local Government Authorities; strengthening LGAs capacity to fulfill their mandates; monitoring and inspecting the performance of LGAs in the management of boreholes water supply projects, and to provide service technical support to LGAs.

(b) Regional Secretariat (RS)

The Regional Secretariat works on behalf of the PO-RALG at the regional level. According to the National Water Supply and Sanitation Act, 2009, Regional Secretariats are responsible for:

6 http://www.tamisemi.go.tz/menu_data/About_us/Organization_Structure/pmoralg-organization-structure-and-functions.pdf accessed on 24th July, 2018

i) provision of advice and guidance to Local Government Authorities on water supply and sanitation matters;
ii) monitoring and evaluation of the projects in the Local Government Authorities as well as providing technical backstops; and
iii) Overseeing and compiling LGAs plans and reports and forwarding the same to PO-RALG.

(c) Local Government Authorities (LGAs)

Local Government Authorities through the District Water Engineers (DWE) are responsible for proposing water projects, procuring contractors and supervision of the boreholes water supply projects within their jurisdiction. They are also responsible for monitoring the performance of the boreholes water supply projects. District Water Engineers (DWEs) receive funds for operating and implementing their activities from the central government and from the MoW[7] for earmarked water projects in their areas of jurisdiction.

2.3.2 Roles of Other Key Stakeholders

Dams Drilling and Construction Agency (DDCA)

Drilling and Dam Construction Agency (DDCA) provides services such as groundwater prospecting, drilling and construction of dams on profit. The Agency is a sole national drilling agency mandated to launch the hiring equipment business and technical instruction to the private water well drilling sector.

Water Supply and Sanitation Authorities

Water authorities were established to provide water supply to the public by the Ministry of Water. Section 20(d) of Water Supply and Sanitation Act, 2009, requires the Water Authorities to protect and maintain the water sources from which they abstract water and they are required to pay water use fee to the Basin Water Boards.

Water Users Association (WUA)

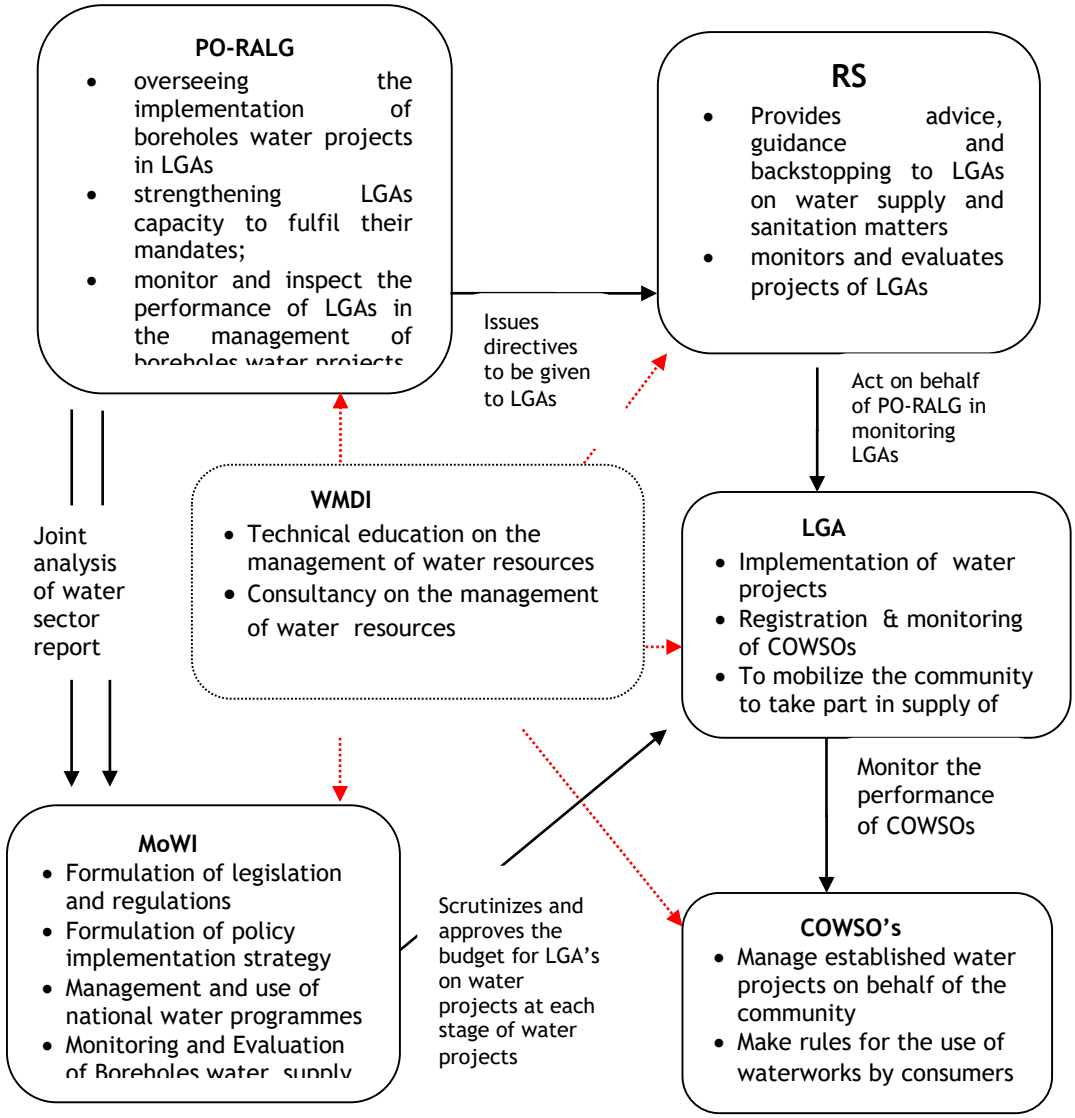
Water User Associations are established under Section 80(1) of Water Resources Management Act of 2009. These associations were formulated to manage, distribute and conserve water from a source used jointly by the members of the water users association; acquire and operate any permit under the provisions of water resource management act; resolve conflicts between members of the association related to the joint use of a water resource; collect water use fees on behalf of the Basin Water Board; and represent the special interests and values arising from water used for a public purpose, such as in an

[7] https://www.maji.go.tz/?q=en/node/34 accessed on 16/08/2018

environmental or conservation area, or for the purpose of managing groundwater controlled area.

Community Owned Water Supply Organizations (COWSOs)

Community Owned Water Supply Organizations were established under Section 31 of Water Supply and Sanitation Act, 2009 with the purpose of ensuring sustainability of the water projects in the rural areas. Powers and functions of COWSOs include managing, operating and maintaining public taps and or waterworks and provide adequate and safe supply of water to their jurisdiction. **Figure 2.1** presents the summarized roles of each stakeholder:



Key:
Means provision of expertise in water projects

Figure 2. 1: Roles of key stakeholders in the Management of Boreholes Water Supply Projects

2.4 Resources for Managing the Implementation of Boreholes Water Supply Projects

The management of boreholes water supply projects requires both financial and human resources. The detail for the allocated resources for the last six financial years is as follows:

2.4.1 Funding for Water Projects

Water projects are funded by the Government of Tanzania (GoT), Development Partners such as GiZ, DFID and Water Aid UK. Other sources of funds come from Faith Based Organisations such as African Muslim Agency, Tanzania Episcopal Conference, Christian Council of Tanzania and other interested partners. However, there are no funds specifically allocated for the boreholes water supply projects rather the budget is included in the general budget for water projects. Budget and actual allocation for the period of six financial years as indicated in **Table 2.1**.

Table 2. 1: Approved Budgets for the Water Projects in the MoW (billions TZS)

Financial Year	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Budgeted	465.7	553.3	488.9	485.3	781.7	619. 1
Actual release	200.7	126.2	249.3	100.0	231.0	342.5

***Source**: MoW Budget 2012/13 to 2017/18*

Table 2.1 indicates that less than 50 percent of the budget was released for water projects from the financial year 2012/13 to 2017/18.

2.4.2 Allocated Human Resources at the Ministry of Water

Availability of the technical personnel is important as it is directly linked with the general technical performance of the Ministry. Table 2.2 shows staffing level at the Ministry of Water.

Table 2. 2: Distribution of human resources at the Ministry of Water

Division	Position				
	Hydrologist	Principal Engineers	Senior Engineers	Engineers	Technicians
Water Resource	**75**	**3**	**o**	**17**	**346**
Water Quality	**1**	**1**	**1**	**1**	**94**
Water Supply and Sanitation		**11**	**7**	**69**	**149**
Project coordination Unit	**1**	**2**	**2**	**3**	**1**

***Source**: Staffing Establishment from Ministry of Water (2017)*

2.5 Management Processes of Boreholes Water Supply Projects

According to the Water Resource Management Act of 2009, the management of boreholes water supply projects involves several aspects such as issuing of water use permit which indicates clearly the amount of water to be abstracted and the terms and conditions which the abstractor needs to adhere to.

There are four categories of boreholes based on their depth namely: shallow wells (up to 30m), medium boreholes (31-50m), deep boreholes (51-80m) and very deep boreholes (more than 80m)[8].

Water supply projects from borehole sources

There are two types of water supply projects from borehole sources that are implemented by the Ministry of Water through LGAs and UWSSAs. There are:

Borehole water project: this is a stand-alone borehole project involving the installation of hand pump or water pump. It does not involve construction of any supply network.

Borehole water supply project: this involves the installation of water supply network whereby infrastructures such as pumps, piped network, treatment plants and storage tanks which are needed to facilitate supply of water to the users mainly households or Domestic Points (DPs), etc.

All these categories are managed in various stages of project cycles as detailed below:

2.5.1 Planning Phase

Planning is a fundamental requirement of the quality management system. The Ministry of Water through the Water Resources Division and Water Supply and Sanitation Division plays a key role in planning for the coming water projects. The LGAs and Water and Sanitation Authorities propose water projects and submit their proposals to the Ministry of Water.

After agreeing to the proposed projects, LGAs and Water and Sanitation Authorities prepare the bidding documents which are approved by the Procurement Management Unit of the Ministry of Water. The Water and Sanitation Division provides advice on the project tendering, bidding, cost control and quality management. After approval of the bidding documents, the LGAs and Water and Sanitation Authorities in collaboration with Water Resources Division of the Ministry of Water procure a consultant to conduct feasibility study, hydrological, geological, hydrogeological and geophysical surveys, and thereafter develop the design of the borehole water supply

[8] Bauman et al 2005)

project. The Water and Sanitation Division through the Design and Construction Management Section Coordinates, reviews and approves the proposed designs of the prospective projects.

2.5.2 Implementation Phase

During the implementation of water projects (contracts) the contractors are required to execute the works in accordance with the agreed terms and conditions. Activities covered in this phase include drilling, borehole design and construction, test pumping or aquifer test (quantity and quality tests) installation of pumps and supply pipes for big projects and handing-over to COWSOs which are responsible for managing the operations of the projects and collection of revenues.

During the implementation, the awarded contractors are supervised by the project managers/consultants who represent the Ministry of Water and PO-RALG. The Ministry also deploys counterpart staff at the sites to be part of the supervision team and for knowledge transfer and marking of the developed underground infrastructures. The Water and Sanitation Division through the Design and Construction Management Section is responsible for this role.

Further, the Ministry of Water through the Division of Water Quality Services is responsible for ensuring the quality of water. During the drilling works, samples of the ground water are taken to the water laboratory for the quality tests.

2.5.3 Monitoring Mechanisms

In managing the boreholes water supply projects in the country, the Ministry of Water is supposed to monitor boreholes water supply projects through the reports sent to them by Basin Water Boards (BWBs) and conduction of Performance Assessment Framework (PAF). Feasibility studies and project designs are being supervised and reported to Water Supply and Sanitation Division.

At the construction stage, the Ministry of Water through Design and Construction Management Section is responsible for monitoring the progress of all ongoing projects by deploying project coordinators to all ongoing water construction projects. Further, LGA carries out monitoring of the projects through their Council Water Committees which report to the District Executive Committee and the LGA. In the project where Consultants were involved in the supervision of the Project, the Project Managers/Consultants are required to submit to the respective LGAs monthly and quarterly progress reports. Moreover, they are also required to submit site records containing daily progress of work, machinery, materials and personnel assigned to various activities and financial matters. **Figure 2.2** presents the process for the management of boreholes water supply projects.

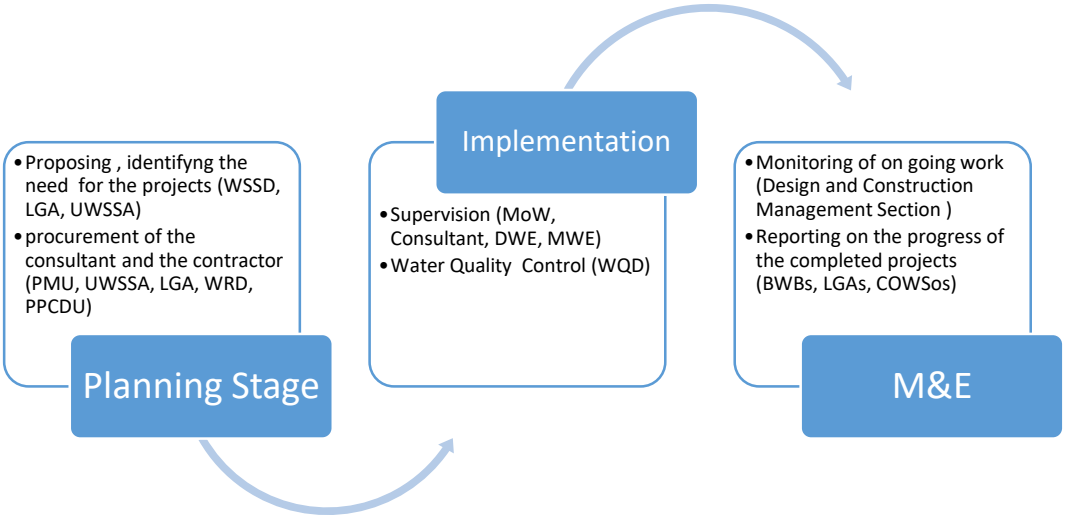


Figure 2. 2: Process for Management of Water Supply Projects from Borehole Sources

CHAPTER THREE

FINDINGS

3.1 Introduction

This chapter presents the findings on the extent to which the completed water supply projects from borehole sources are effective. The effectiveness of the completed boreholes was measured against the expected outputs/ results in terms of quantity and quality of water produced. Also, the sustainability of boreholes was checked in terms of period for which the projects were functioning. Below are the findings:

3.2 The completed boreholes water projects did not yield the intended results

Through the review of Water Sector Status Reports of 2014 and 2015 respectively and interviews held with officials from PO-RALG and the Ministry of Water, the audit noted that the completed boreholes were not effective. This was evidenced by the presence of dry boreholes and those which did not yield the intended results in terms of quality and quantity of water as detailed below:

3.2.1 Significant number of completed boreholes did not yield the intended results

Through the review of Water Sector Status Reports of 2014 and 2015, the audit team noted that significant number of completed boreholes water supply projects did not perform and yield the intended results. Interviews held with Water Resource Division's officials at the Ministry of Water and Sector Coordination officials responsible for water sector at PO-RALG revealed that, the WSDP I focused on the exploration and extraction of groundwater through 'the 10 villages project approach' whereby every LGA was required to have boreholes water supply project in ten (10) villages.

However, according to the review of Water Sector Status Reports of 2014 and 2015 respectively, the 10 villages' projects implemented in various LGAs were not productive. The percentage of unproductive boreholes water supply projects ranged from 0 to 75. The situation from National level to LGAs level is as detailed below:

Situation at the National Level

Through the review of Water Sector Implementation reports 2014-2015, it was noted that for the whole country a total of 1,485 boreholes were drilled during the period from 2014 to 2015. It was further noted that 490 out of 1,485

boreholes that were drilled during the implementation of WSDP I and WSDP II, were found to be dry and unproductive. This is equivalent to 33 percent of the drilled boreholes in the country. This shows that, despite the investments made to the projects, the intended results which is supply of water to the communities was not realized.

Situation at the Regional level

Similar analysis was done for the visited 7 regions, and the result is as presented in **Table 3.1.**

Table 3.1: Percentage of Dry boreholes in the Visited Regions

Name of the region	Total Number of drilled boreholes	Total number of Dry boreholes	Percentage of dry boreholes (%age)
Tabora	97	54	56
Dodoma	109	55	50
Arusha	80	37	46
Simiyu	52	15	29
Lindi	91	20	22
Dar es Salaam	45	5	11
Ruvuma	71	7	10
Total	**545**	**193**	**35**

Source: *Analysis of the Boreholes water supply projects report extracted from the MIS on July 2018*

Table 3.1 above shows that 193 out of 545 drilled boreholes in the seven (7) visited regions, which is equal to 35 percent, were dry. The percentage of unproductive boreholes in the visited regions range from 10 percent to 56 percent; whereby Tabora revealed the worst scenario by having 56 percent of unproductive boreholes followed by Dodoma with 50 percent of the dry boreholes.

Situation at the Local Government Authority level

Further analysis was made to check the percentages of the dry boreholes for the selected 14 LGAs. As depicted in **Figure 3.1** below, despite the efforts to drill boreholes in LGAs, the dry boreholes ranged from 0 to 75 percent.

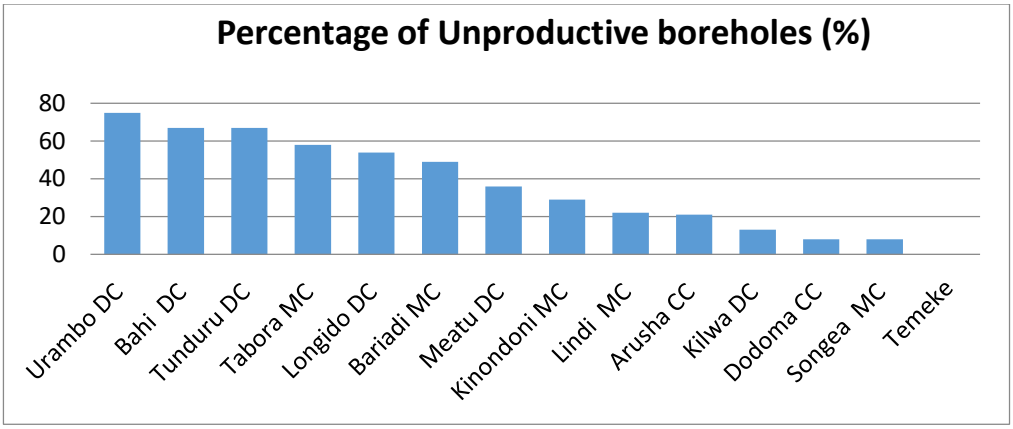


Figure 3. 1: Percentage of dry boreholes against drilled boreholes in the Visited LGAs

Source: *Auditors' Analysis, 2018*

As it has been indicated in the **Figure 3.1** above, 58 out of 203 drilled boreholes from 13[9] selected LGAs, which is equivalent to 29 percent, were dry. Urambo DC in Tabora revealed the worst scenario by having 75 percent of the drilled boreholes which were dry. Second to Urambo DC were Bahi DC and Tunduru DC which had 67 percent of the dry boreholes. This shows that, despite the investments made to the boreholes water supply projects, the intended results which is to supply water to the communities was not realized.

Through the interviews held with the In-charge of the Lake Tanganyika Basin sub-office at Arusha, the In-charge provided that the main reasons for having unproductive boreholes were inter alia poor setting and quality of borehole construction and ineffective hydrogeological and geophysical surveys as well as aquifer mapping to identify groundwater development potential areas prior to the drilling of the boreholes water supply projects. As a result, the boreholes were drilled in the areas which were not potential for production of water.

The presence of dry boreholes had significant financial cost implications. The audit analysed the total cost spent for the total dry boreholes and noted a total of TZS 674,956,367 were lost in executing boreholes water supply projects which were dry and consequently did not yield the intended results in the visited LGA's **Figure 3.2** shows the amount of funds spent on dry boreholes in the visited LGAs.

[9] One LGA which is Temeke had no dry borehole

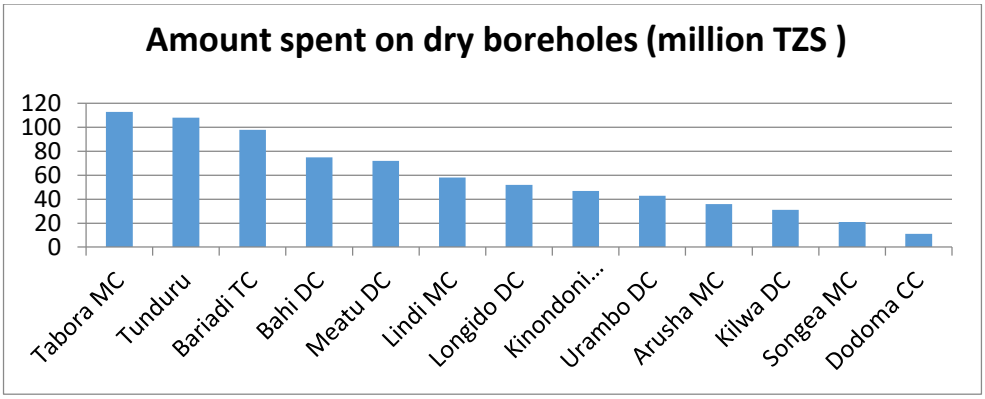


Figure 3. 2: Costs of the Total Dry Boreholes in the Visited LGAs

Source: *Analysis of the Boreholes water supply projects report extracted from the MIS in July 2018*

As indicated in **Figure 3.2,** the visited LGAs spent 11 to 113 million TZS for boreholes water supply projects which did not yield the intended results i.e. supply of water to the communities. The highest amount of funds spent was noted in Tabora MC in the Tabora region.

3.2.2 Significant number of completed boreholes produced low quantity of Water

Reviewed Water Projects Implementation Status Report, 2014-2016 and boreholes drilling completion reports of the visited UWASSAs indicated that, the significant number of boreholes did not yield the expected quantity of water.

Nevertheless, the drilling completion reports from the visited LGAs did not show the expected quantity of water but only revealed the actual yield after drilling. However, the interviews held with the Water Engineers of the visited LGAs confirmed this whereby they pointed out that, the LGAs did not estimate the quantity of water to be obtained in the boreholes. The officials further indicated that for drilled boreholes that were noted to have less quantity of water, they were backfield and replacement boreholes were drilled at another site.

The audit team further analysed the boreholes water supply projects which were managed by the visited UWSSAs and the results are as provided in **Table 3.2.**

Table 3.2: Projects which did not yield the expected quantity of water

LGA/UWASSAs	Number of completed and productive boreholes projects (n)	Number of projects which yielded less amount (n)
DAWASA	4	2
DUWASA	25	No information
AWSSA	13	5
TUWASSA	Nil[10]	Nil
Lindi-UWASSA[11]	Not Available	Not Available
Songea-UWASSA[12]	Not Available	Not Available

***Source**: Extracted from the Boreholes Water Supply Projects Completion Reports*

Table 3.2 shows that out of 42 productive boreholes implemented by the three UWSSAs, 7 projects which is equivalent to 17 percent yielded less than expected quantity of water.

Detailed analysis of the yield for sampled boreholes water supply projects from the two (2) Water Authorities[13] was done to determine the extent of variation of the actual volume from the expected volume of water. **Figure 3.3** indicates the extent of variation of the expected quantity of water and the actual yield in the two (2) UWASSAs.

[10] TUWASA and Bariadi did not have boreholes water projects rather they were implementing the abstraction of water from Lake Victoria
[11] Lindi-UWASA did not execute boreholes water projects, rather they were operating projects transferred to them by Lindi MC
[12] Does not have water projects from boreholes sources
[13] DAWASA & AUWSA

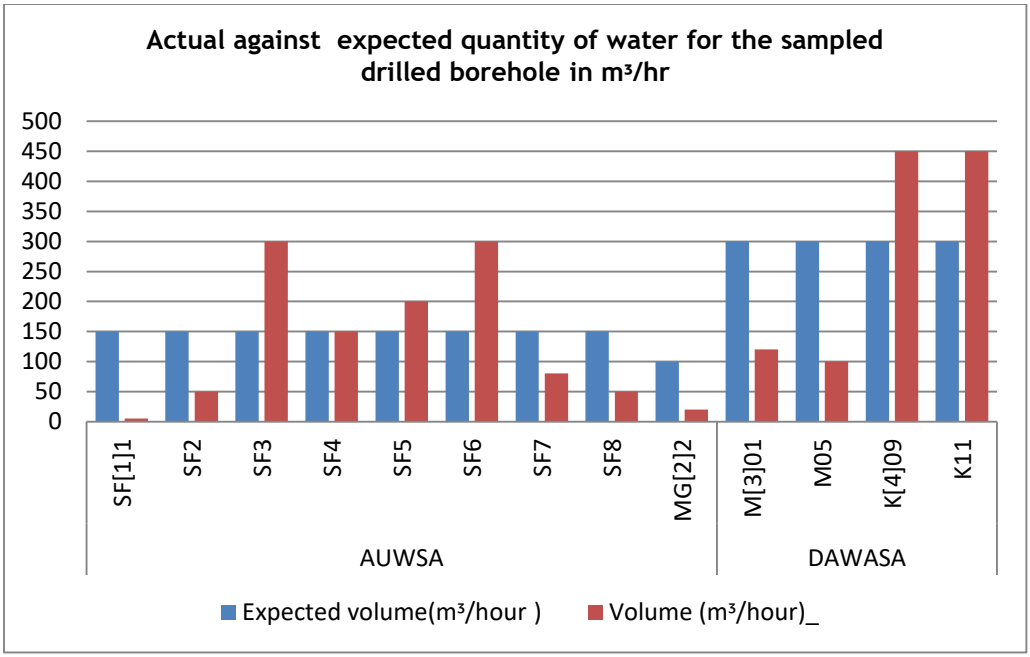


Figure 3. 3: Variation of Quantity of Water for sampled boreholes water supply projects in the visited UWASSAs

***Source**: Analysis of data extracted from the Boreholes completion reports of the respective UWSSAs*

Figure 3.3 indicates that there was a significant difference between the actual yield and the expected yield for the sampled drilled projects, whereby the highest percentage was noted in the AUWSA followed by DAWASA. For the AUWSA projects, 5 out of 9 drilled boreholes at Seed Farm and Magereza yielded less than the expected amount while 4 yielded more than the expected amount. The variance of low yield range from $70m^3$ /hour to $145m^3$ /hour while the variance of high yield range from 50 to $150m^{3/}$/hour. For the case of DAWASA, 2 out of 4 completed boreholes yielded less than the expected quantity whereby the variance was $180m^3$ and $200m^3$. Also, two projects yielded more than the expected quantity with a variance of $150m^3$ for each.

Interviews held with the projects coordinators at DAWASA and DUWASA revealed that the variation is associated with the absence of technology to ascertain the quantity and quality of boreholes water project in order to able to give the correct figures. The current technology used for the hydrogeological and geophysical surveys provide an indication of the possibility of having groundwater in the respective surveyed areas, but cannot estimate the quantity of water to be produced.

This huge variation led to failure to supply the expected water to the intended beneficiaries. On the other hand, it indicates a loss of government funds that were used for the construction of the unproductive boreholes.

3.2.3 Unsatisfactory Quality of Water from Completed Water Projects from Boreholes Source

Through the review of the WSDP monitoring report of Zone 5[14], it was noted that, the quality of available groundwater in the covered regions like Tabora and Simiyu was not satisfactory. Having boreholes water supply projects in such areas seems to be contrary to the requirement of Item 4.1.2 of the WSDP I. This item requires the Basin Water Boards to determine safe yields of aquifers and promote groundwater use based on aquifer characteristics. It was further noted that the decision to implement boreholes water supply projects in such areas is against the requirements of the National Guideline on Drinking Water Monitoring and Reporting (2018) that emphasizes on the quality of water as the uppermost factor from the planning to the implementation stages of water projects. Moreover, it is the requirement that the quality of water should guide the planning from source selection to the choice of technology for the maintenance of the completed systems. In addressing water quality problems, early 2019 the Ministry of Water developed a guideline for monitoring the quality of water from the boreholes sources and later the guideline was disseminated to all LGAs.

The Water Sector Status Report (2016) pointed out that, for domestic use, 709 out of 6,615 boreholes water samples analysed, which is equivalent to 10.7 percent, did not meet the recommended quality standards for domestic use. The report further revealed that the main constraining quality parameters were high content of iron, manganese, fluoride, nitrate in some water sources and microbial contamination. Through the review of the WSDP II monitoring report of Zone 5[15] the audit noted that, in some regions like Tabora and Simiyu the groundwater was loaded with alkaline and high concentration of manganese.

Based on groundwater quality standard parameters, the audit team analysed a number of LGAs which were faced with the respective groundwater problem, and the results is as presented in **Table 3.3:**

Table 3. 3: Analysis of Ground Water Quality Problem and the affected Visited LGAs

Ground water Quality Problems	Number of LGAs Affected (n)	Names of Concerned LGAs
High concentration of Fluoride	6	Arusha CC, Bariadi MC, Meatu DC and Longido DC
High concentration of Chloride	7	Dodoma CC, Songea MC, Tunduru DC, Lindi DC, Kilwa DC, Temeke MC and Kinondoni MC

[14] Kagera, Simiyu, Singida, Mara, Shinyanga, Kigoma and Tabora
[15] Kagera, Simiyu, Singida, Mara, Shinyanga, Kigoma and Tabora

Ground water Quality Problems	Number of LGAs Affected (n)	Names of Concerned LGAs
High concentration of Manganese	6	Tabora MC, Bariadi MC, Meatu Urambo DC and Kinondoni MC
High concentration of Iron Contents	6	Tabora MC, Urambo DC, Lindi DC, Kilwa DC, Temeke MC and Kinondoni MC
Low pH Values	2	Temeke MC and Kinondoni MC
High Hardness	4	Dodoma CC, Lindi MC, Temeke MC and Kinondoni MC

***Source**: Reviewed Boreholes Completion reports from the visited LGAs, Extracted from WSDP II monitoring report of year 2017*

Table 3.3 shows that, high concentration of chloride, fluoride, manganese, iron and nitrate were the most common boreholes water quality problems that affect large number of visited LGAs.

Out of these common boreholes quality problems, the audit team performed further analysis of two (2) quality parameters namely manganese and fluoride so as to determine the extent to which the boreholes water meets both National and International (WHO) quality standards. This is because these parameters have impact to human health. According to the reviewed boreholes completion reports of the visited LGAs and UWASAs, the audit team noted that fluoride and manganese were the most constraining water quality parameters. The details for each parameter is as presented below:

i) Extent of drilled boreholes with high concentration of Manganese

Analysis of the number of sampled projects from the visited LGAs was made and the results are presented in Table 3.4(a).

Table 3. 4(a): Sampled Boreholes with High Concentration of Manganese

Name of the LGA's /UWSSAs	Number of productive Boreholes	Average Manganese concentration for the sampled Projects (mg/l)	Number of projects with high content of manganese above national standards[16]	Number of projects with manganese above WHO standard[17]
UWSSAs				
AUWSA	13	Not reported	Not reported	Not reported
DUWASA	5	0.01	0	0

[16] National standard 0.5
[17] WHO standard 0.10

Name of the LGA's /UWSSAs	Number of productive Boreholes	Average Manganese concentration for the sampled Projects (mg/l)	Number of projects with high content of manganese above national standards[16]	Number of projects with manganese above WHO standard[17]
DAWASA[18]				
LGAs				
Tunduru DC	3	1.55	1	1
Tabora MC	2	0.66	2	2
Bariadi DC	7	0.16	Nil	7
Meatu DC	4	0.15	Nil	4
Longido DC	5	Nil	Nil	Nil
Arusha CC	12	Nil	Nil	Nil
Songea MC	39	Nil	Nil	Nil
Lindi MC	7	1.6	1	1
Kilwa DC	20	1.75	2	2

***Source**: Extracted from Individual LGAs Boreholes Completion reports, 2015-2018*

From **Table 3.4 (a),** 6 out of 99 productive boreholes from the visited LGAs have high manganese contents (above the national standards) which is 0.5mg/l; while 13 out of those projects the manganese contents were above the WHO standards which is 0.1 mg/l. The case was different for those sampled from visited UWSSAs where 5 out of 18 sampled projects were within both national and WHO standard.

Although the manganese contents is less toxic to human, but excessive consumption of manganese can potentially cause serious health issues. It can cause toxicity to the nervous system particularly in children, elderly, and pregnant women. For young children and infants who cannot break down manganese in their bodies as effectively as adults, high concentration of manganese can affect early brain development, leading to learning difficulties in later ages.

ii) Extent of drilled boreholes with High concentration of Fluoride

Through the interviews held with the City Water Engineer of Arusha CC and the projects coordinator of AUWSSA, it was revealed that, the quality of water in the drilled boreholes is not satisfactory due to high concentration of fluoride. The same was revealed through the review of the boreholes water supply projects report of AUWSSA, which indicated that, for some of the completed

[18] They don't have completed water projects from boreholes sources that have undergone pump test

borehole water supply projects, the fluoride content range from 4-7mg/l which is above the recommended amount of WHO and Tanzania Standards.

The audit team analysed the number of projects which have high concentration of fluoride from the sampled productive boreholes water supply projects. The result is as presented in **Table 3.4 (b).**

Table 3. 4 (b): Sampled Projects with high concentration of Fluoride in the Visited LGAs

Name of the LGA's and UWSSA's	Number of productive Boreholes	Number of projects fluoride above national standard[19]	Number of projects with above WHO standard[20]	Average Fluoride concentration for the sampled Projects (mg/l)
UWSSAs				
AUWSA	13	8	8	5.5
DUWASA	5	0	0	0.35
LGAs				
Meatu DC	4	4	4	4.5
Bariadi DC	7	6	7	5
Arusha CC	12	3[21]	11	5.5
Longido DC	5	5	5	1.43
Total	**41**	**26**	**35**	

Source: *Extracted from the Individual LGAs and UWSSAs boreholes water supply projects completion reports, 2015-2018*

From **Table 3.4 (b),** 26 out of 41 sampled completed boreholes water supply projects equivalent to 58.8 percent had high concentration of fluoride above the national standard. It also shows that 35 out of 41 sampled boreholes water supply projects which equivalent to 82 percent had high concentration of fluoride above the WHO standards. From 2018 the Ministry of Water changed the Flouride specification to 1.5 mg/l which is similar to WHO standard.

The situation was worse in Arusha CC and Bariadi DC for the case of LGAs, and AUWSA which was among the 5 visited UWSSAs, where the concentration extremely exceeded the allowed amount in mg/l for both the National and WHO standards which are 1.5-4 mg/l and 1.5 mg/l respectively.

[19] 4.0mg/l
[20] 1.5mg/l

Persistence consumption of water with high concentration of fluoride can cause dental problems and adverse effects on bone, including increased risk of fracture at concentrations in excess of 1.5 mg/L. It was also noted that the risk gradually increases with the total intake of fluoride.

Reasons for having completed boreholes with unsatisfactory water quality

Interviews held with officials from the visited LGAs and UWSSAs, revealed the following as the reasons for having unsatisfactory quality of water for the completed boreholes:

Absence of technology that provides accurate results for quality of water: Interviews held with projects coordinators at DAWASA and DUWASA revealed that the variation is associated with the absence of technology to correctly ascertain the quality of boreholes water supply project. The current hydrogeological and geophysical survey technology used can only provide an indication for the possibility of presence of groundwater and salinity content in the respective surveyed areas.

Improper identification of borehole water locations: Through the interviews held with officials of the Water Quality Department from the Ministry of Water it was revealed that, the quality of groundwater is mainly affected by the nature of parent rocks (i.e. existence of parent rock material at the area); climate conditions (especially arid and semi-arid); geographic condition; stream flow; human effects such as Improperly disposal of both solid and liquid wastes and major economical practices performed around the area; possibility of seawater intrusion due to over pumping; over extraction/exploitation of groundwater sources and less recharge of aquifers caused by climatic changes especially to the uppermost aquifers. If these factors are not well captured during the identification of drilling points, they are likely to provide a big chance ending up with water which does not meet the right specifications.

Inadequate consideration of the nature of the drilling sites: Interviews held with officials from Water Quality Division at the Ministry of Water revealed that, unsatisfactory quality of the ground water was due to the fact that, implementation of WSDP I through the ten village projects approach did not consider the geological nature and parent rock materials of the areas before drilling the boreholes. For instance the programme covered Arusha, Urambo and Bariadi and other volcanic terrain regions where the groundwater is challenged by high fluoride and manganese concentration.

Inadequate application/use of hydrogeological and geophysical survey results: The audit further noted that, the existence of boreholes with unsatisfactory quality of water was caused by inadequate use of the results obtained from the exploratory hydrological survey prior to the actual drilling of the boreholes. It was also revealed that little efforts were invested in the identification of the parent rock materials in the identified drilling sites prior to the drilling.

Consequences for having boreholes with unsatisfactory water quality

Through the interviews held with officials from the visited UWASSAs and District Water Engineers from the visited LGAs, it was noted that some projects were abandoned and others closed due to unsatisfactory quality of water that was characterized as not fit for human consumption. Table 3.4(c) shows boreholes water projects that were closed/ abandoned due to unsatisfactory quality of water in the visited LGAs and UWSSAs.

Table 3.4 (c): Percentage of Drilled Boreholes that were abandoned due to Unsatisfactory Quality of Water

Name of the LGAs /UWSSAs	Number of Productive boreholes	Abandoned/closed projects due to unsatisfactory quality of water	Percentage of the abandoned/closed boreholes
Meatu DC	4	3	75
Longido DC	5	3	60
Arusha CC	13	4	31
Tabora MC	8	1	13
Kinondoni MC	17	2	12
Urambo DC	2	0	0
Bariadi MC	7	0	0
Dodoma CC	12	0	0
Temeke MC	13	0	0
Bahi DC	4	0	0
Songea MC	39	0	0
Tunduru DC	3	0	0
Lindi MC	7	0	0
Kilwa DC	20	0	0

Source: *Analysis of data extracted from Boreholes water supply projects progress reports*

As it has been provided in **Table 3.4 (c),** a total of 13 out of 154 drilled boreholes water supply projects from the visited LGAs were abandoned/ closed due to unsatisfactory quality of water. Furthermore, during the site visit conducted to Mwamishali and Mwambiti, Meatu on 19th February, 2019 the audit team observed the abandoned boreholes water supply projects due to unsatisfactory quality of water as shown in **Photo 3.1.**

***Photo 3.1**: An abandoned borehole at Mwamishali and Mwambiti-Meatu as taken on 19th February, 2019. Source: Field observations by audit team*

3.2.3 Existence of non-functioning Boreholes Infrastructure[22]

Review of the annual progress reports of the visited LGAs for the year 2017/18 revealed that, there is a significant number of successfully completed boreholes which are not functioning due to damage on the infrastructure. The non-functioning boreholes water supply projects infrastructure affected the availability of water to the communities. Table 3.5 shows non-functioning boreholes water supply projects in the visited LGAs due to damaged infrastructure.

Table 3.5: Non-functioning boreholes due to damage of infrastructures

Name of the LGA's	Name of the Visited Project	Observation
Tabora MC		
Urambo DC	Kisima Cha Hospitali	Not Working due to failure of the valve
	Relini	Burnt water pump due to electrical fault
	Kalemela A	Failed water pump foundation
Bariadi DC	Nyangokola	No pipes
Meatu	Mwambiti	Abandoned due damage of infrastructure (pumps and pipes)

[22] Pumps, casings and taps

Name of the LGA's	Name of the Visited Project	Observation
Arusha MC	Elerai	Pump failure due to electrical fault
	Urundini	Burnt water pump
Longido DC	Tembo	Non-functioning of the pump due to decreased water quantity
	Utepesi 2	Damaged hand pump
Bahi DC	Bankolo and Mpinga	Damaged of pump and collapse of casing
Lindi DC	NIL	NIL
Kilwa DC	NIL	NIL
Songea MC	NIL	NIL
Tunduru DC	NIL	NIL

***Source**: Auditors observation during the site visit, (2019)*

Table 3.5 reveals that, in 7 out of the 14 visited LGAs there were boreholes that were not functioning due to damaged infrastructure.

During the site visit at Relini area in Meatu and Longido, the audit team observed the non-functioning boreholes water supply projects due to damage of infrastructure as seen in **Photos 3.2 (a), (b) and (c).**

Photo 3.2a: Borehole with a failed pump due to electrical fault as taken at Relini area-Urambo on 15th February, 2019

Photo 3.2b:Failed pump foundation as taken at Urambo on 15th February, 2019

3.2c: A borehole with a damaged hand pump as taken at Longido on 22nd February, 2019

Further, interview with the Production and Distribution Manager of DAWASA revealed that, some boreholes water supply projects are not functioning due to damage of infrastructure such as pumps, pipes, fittings and valves in the distribution system and water points i.e. damage of taps and pumps. This was also noted during the interview with the City Water Engineer of Dodoma CC.

Table 3.6 shows non-functioning boreholes water supply projects' water points for the visited LGAs due to damage water infrastructure.

Table 3. 6: Percentage of Non- functioning boreholes water points in the Visited LGAs

LGA	Total Number of Boreholes Supply Water points	Total Number Functional Water Points but needs repair	Total Number of Non-functional Water Points	Percentage of Non-functional Water Points
Tunduru DC	373	12	282	76
Meatu DC	8	0	4	50
Urambo DC	16	0	8	50
Arusha MC	90	3	40	44
Temeke MC	266	0	110	41
Lindi MC	101	22	37	37
Kilwa DC	528	9	187	35
Dodoma MC	540	113	189	35
Bariadi TC	840	3	258	31
Bahi DC	388	43	117	30
Tabora MC	38	3	13	34
Longido DC	11	0	1	9
Songea MC	42	0	3	7
Kinondoni MC	115	69	6	5
Total	**3356**	**277**	**1255**	

***Source**: Extracted from Water Points Status Data base of the Ministry of Water*

Table 3.6 shows that 277 out of 3356 boreholes projects' water points, equivalent to 8 percent, are functioning but needs repair, while 1255 water points, equivalent to 38 percent, are not functioning because of the damaged infrastructure.

Tunduru DC had the worst cases among other LGAs, whereby 75 percent of total water points were not functioning. Non-functioning of the existing water points and damaged infrastructure denied the communities access to clean and safe water.

Factors affecting functionality of completed boreholes water infrastructure

Inadequate Maintenance of Boreholes Infrastructure

Through the interviews held with the officials from the visited LGAs and UWSSAs and review of the Water Sector Status Report 2014/2015 and 2015/2016, it was noted that inadequate maintenance was the main contributing factors for this problem. This is contrary to the Ministry of Water

operational guidelines of technical procedures which require UWSSAs to ensure that the facilities and infrastructure for water supply are properly maintained and a comprehensive preventive maintenance program is in place.

Interviews held with Water Engineers of the visited LGAs revealed that, they had no plans and schedules set specifically for the maintenance of boreholes water supply projects after the expiry of the defect liability period. The officials provided that maintenance is done on ad-hoc basis whenever the problem occurs and it always depends on the availability of funds.

Further, interviews which were held with Municipal Water Engineer from the visited LGAs pointed out that, for the projects which are handed over to the communities for operations, maintenance is facilitated by the formed water committees which are responsible for running the project. They further revealed that, these water committees are required to submit the reports on the progress and performance of the project including maintenance, however they rarely submit such reports to the relevant authorities especially when there is a problem. Inadequate maintenance of the boreholes water supply projects resulted into collapse of some boreholes water supply projects which ultimately causes inadequate supply of water to the communities.

The existence of this problem of ineffective completed boreholes water supply projects was caused by a number of factors. These include absence of sustainable boreholes water supply projects plans, ineffective implementation of the boreholes water supply projects as well as ineffective and inefficient performance tracking of the boreholes water supply projects by both PO-RALG and the Ministry of Water.

Therefore the subsequent sections provide the detailed presentation of these contributing factors for ineffective implementation of boreholes water supply projects.

3.3 Absence of Sustainable plans for Water Projects from Borehole Sources

Item 4.4.2 of the National Water Policy, 2002 requires the Ministry of Water to have sustainable plans for development of water resources. Again, Section 16 (b) of the Water Resource Management Act, 2009 requires the Ministry through the Water Resource Division to develop national water resources management plan and an implementation strategy in order to ensure the sustainable management of water resources.

The extent of sustainability of plans for boreholes water supply projects was assessed under three dimensions. These include adequacy of hydrological and geological surveys carried-out, groundwater mapping and database as well as the availability of operational and funding plans. During the audit, the audit team noted that the Ministry of Water inadequately developed, documented

and implemented sustainable plans for boreholes water supply projects. This was justified by the following reasons:

3.3.1 Inadequate Hydrogeological Surveys

According to the Groundwater (Exploration and Drilling) Licensing Regulations, 2013 the Ministry of Water is required to conduct geological and hydrogeological and geophysical surveys prior to the drilling of the boreholes for the projects undertaken by the Ministry and its Agency In this case the Ministry of Water was required to ensure consultants undertake a thorough geophysical survey using at least two methods of which one being Vertical Electrical Sounding (VES) resistivity survey to determine the availability of groundwater prior to the drilling.

Through the interviews held with the officials from Water Resource Division of the Ministry of Water, it was revealed that LGAs and UWASSA conducted both geophysical/hydrogeological surveys. The rationale is to study geological formation of the drilling sites prior to the drilling of the boreholes for WSDPI and II. Moreover, the audit review of the geophysical and hydrogeological survey process in the visited LGAs and UWSSA noted the following weaknesses:

The hydrogeological survey reports were not submitted to the Basin Water Boards

Interview with the Lake Tanganyika Water Basin officers revealed that, consultants who carried out the hydrogeological surveys did not submit the results to the Basin Water Board offices for review and updating the database for future groundwater assessment. This is contrary to the requirement of Regulation 11(2)[23] which requires the consultants to perform the hydrogeological survey and submit a copy of the report to the Basin Water Office.

There was insufficient consultation made to the Basin Water boards

Interviews held with the Water Engineers of the visited LGAs revealed that, the consultants conducted hydrogeological surveys rarely consulted the Basin Water Boards who had the knowledge and experience of the suitability of a proposed site for exploration of groundwater. This is contrary to Regulation 9(1)[24] which requires a person who intends to undertake groundwater exploration to consult the respective Basin Water Board prior to commencing of exploration. As a result, Basin Water Boards could not provide their inputs regarding their plans for development of boreholes based on the results of the surveys.

[23] The Ground water (Exploration and Drilling)Licensing Regulations, 2013
[24] Ibid

Inadequate technical review of hydrogeological surveys/geophysical surveys

Review of the hydrogeological survey reports submitted to the LGAs revealed that there was no technical review of hydrogeological surveys conducted by consultants. Inadequate supervision of hydrogeological and geophysical surveys was caused by lack of hydrogeologists in the LGAs. Further, interviews conducted with the Water Resource Division officials at the Ministry of Water revealed that, the LGAs did not have hydrogeologists who could interpret geophysical survey reports before drilling of boreholes. This led to inadequate assurance on whether the appropriate sites for the boreholes water supply projects were identified prior to drilling.

Through the interviews held with the officials from the visited LGAs, it was noted that lack of hydrogeologists was due to weakness in the man-level in terms of required skills and appropriate combination of experts required (as per staff establishment), which did not require the presence of the hydrogeologists in LGAs.

3.3.2. Inadequate Mapping of Groundwater for the entire Country

Groundwater mapping[25] is crucial in determining the quality and quantity of groundwater in a particular area. According to the approved functions of the Ministry of Water, 2018, the Ministry through the Water Resource Division is required to supervise the collection, processing, monitoring and dissemination of hydrological and hydrogeological data and related information in order to determine the availability of groundwater before drilling processes. The audit noted the followings:

i) Inadequate detailed Groundwater Mapping in the Country

Interviews held with officials from the Water Resource Division at the Ministry of Water revealed that, the Ministry did not conduct detailed groundwater mapping to identify zones with groundwater availability in the country. While the Ministry was expected to conduct a detailed groundwater mapping in all regions, through the interviews held with the officials at the Ministry of Water, it was revealed that the detailed groundwater/ aquifer mapping for the whole country has never been conducted.

However, the audit noted that, the detailed groundwater mapping was done in only four (4) regions namely: Arusha, Dar es Salaam, Singida and Dodoma. Further, in these four (4) regions, limited detailed groundwater mapping was conducted for specific areas in which huge boreholes water supply projects were executed such as in the Dodoma region at Mzakwe area, the Dar es Salaam

[25] Is a multi-disciplinary holistic scientific approach for aquifer characterization which leads to aquifer based groundwater management

region at Kimbiji and Mpera areas and in the Arusha region, it was for AUWSA for sustainable water supply project.

The officials further revealed that, currently the Ministry of Water plans to conduct a detailed groundwater mapping for Pangani, Wami, Ruvu, and Rufiji Water Basins in financial year 2019/20. Review of the project file revealed that at the time of this audit the Ministry of Water initiated the procurement process for the consultant to undertake a detailed aquifer mapping for these 4 water basins.

Furthermore, interviews conducted with officials from the Water Resource Management and the Projects Manager at DDCA pointed out that inadequate detailed ground- water/aquifer mapping resulted in lack of sufficient and reliable information to guide the plans for boreholes water projects.

Through the interviews held with the officials from the Ministry of Water, it was noted that the reasons for inadequate coverage of groundwater mapping were that the activity was not budgeted, as it was not the focus area prior to the WSDP I. However, this activity has budgeted in 2019/2020 financial year.

Groundwater Assessment was not properly conducted

Through the review of Integrated Water Resource Management and Development Plans, 2015/2016, the audit team noted that the Ministry of Water conducted groundwater assessment to identify areas with groundwater potentiality in 6 out of 9 basins. However, interviews held with the officers in charge of the visited Basin Offices revealed that, the groundwater assessment was not conducted thoroughly as it was mostly based on the previous data of the groundwater mapping and did not proceed with other steps of assessment of the aquifer including geophysical survey and drilling of exploratory boreholes to identify areas with potentiality of water. The reason was due to inadequate funds.

Nevertheless, together with the identified gaps, the Ministry of Water when contacted declared that, recently in 2018 it has developed the Guideline for Ground Water Exploration and Well Drilling which is waiting for approval that will guide the ground water assessment.

ii) Inadequate dissemination of Groundwater mapping results to the Implementers

The Ministry of Water was expected to disseminate the groundwater mapping results to the implementing agencies that include LGAs, UWASAs and DDCA for effective implementation. However, through the interviews held with the officials from the visited LGAs and UWSSAs it was noted that, MoW did not disseminate the results to the key implementers.

Inadequate dissemination of groundwater mapping results has led to the key implementers not to have enough information regarding areas with groundwater potentiality hence, unsatisfactory performance of the drilled boreholes water supply projects.

3.3.3 Inadequate Operational and Maintenance Funding plans for boreholes Water Supply Projects

Through the review of Water Sector Status Reports of 2014/15 and 2016/17, the audit noted that the LGAs and Water Supply Authorities lacked sustainable funding mechanisms for the operation and maintenance of completed boreholes water supply projects. This was indicated by absence of the plans for boreholes water supply projects due to the following:

Inadequate disbursement of budgeted funds for Operational and Maintenance of boreholes in LGAs

Through Interviews conducted with the officials from the Ministry of Water and PO-RALG and reviews of annual plans and budgets of the 14 visited LGAs, it was revealed that the LGAs did not allocate budget for maintenance and operation of boreholes water supply projects. It was further noted that 1 out of the 14 LGAs visited namely Kinondoni MC allocated funds for operational and maintenance of boreholes water supply projects. However, the audit team noted that it is only 15 out of 42 million TZS budgeted for the five years starting from 2013/14 - 2017/18 was disbursed.

Interviews held with Water Engineers of the visited LGAs revealed that, they did not budget for operational and maintenance because after completion the projects were handled over to the COWSOs who were responsible for operation and maintenance. Non allocation of O&M budget resulted to most of the boreholes water supply projects to depend on the revenue collected from the communities for operation. This is not a reliable source of funds for proper management of these projects, it depends on the willingness and ability of the community to contribute.

Furthermore, through the interviews which were held with the Municipal Water Engineer of Temeke MC, the revenue collected from water users were poorly managed by the COWSOs. Although COWSOs were expected to collect revenues from the communities who are using the completed boreholes and ensure that the revenue are used to cover maintenance costs of the boreholes, it was noted that the LGAs did not ensure COWSOs properly manage the revenue collected. Further, in some areas, communities were not willing to contribute funds for maintenance. This has resulted into insufficient readily available funds to cater for preventive maintenance of the boreholes. Generally in this situation, it is clear that there are no sufficient funds to meet operation costs of the boreholes water supply projects especially for those operations which require fuel and electrical power.

3.4 Ineffective Implementation of Boreholes Water Supply Projects

The audit assessed the implementation of boreholes water supply projects with regards to time, cost, quality and the extent of achievement of its objective, and noted that it was not effectively done. The ineffectiveness was indicated through the following weaknesses:

3.4.1 Inadequate Use of the Results of Hydrogeological Surveys

The Ministry of Water was required to ensure that the LGAs and UWSSAs take into consideration the results of the hydrogeological and geophysical surveys conducted prior to the drilling of the borehole.

The reviewed hydrogeological surveys and the drilling reports of the visited LGAs indicated that, LGAs did not adequately consider the recommendations of the geophysical surveys when designing and drilling boreholes.

The percentage of the projects which were implemented by considering the hydrological surveys during the design and execution of the boreholes water supply projects in the visited LGAs and UWSSAs is as indicated in **Table 3.7 and 3.8** below:

Table 3. 7: Extent of deviation from the Hydrogeological Surveys recommendations in the Visited UWSSAs

Name of the LGA's/UWSSA	Number of Projects	Percentage of hydrological survey reports taken on board	Percentage of hydrological survey recommendations not taken on board
UWSSAs			
DUWASA	25	50	50
DAWASA	20	80	20
AUWSA	9	92	8
Lindi UWASA[26]	NIL	NIL	NIL
Songea UWASA[27]	NIL	NIL	NIL

***Source**: Geophysical survey and drilling reports of the visited UWSSAs (2012/13-2017/18)*

Table 3.7 reveals that 2 out of 5 visited UWASSAs implemented more than 50 percent of the recommendations issued in the hydrogeological surveys. The situation in the visited LGAs is as presented in Table 3.8.

[26] Did not construct boreholes water supply projects
[27] Did not construct boreholes water supply projects

Table 3. 8: Extent of deviation from the given Hydrogeological Surveys recommendations in the Visited LGAs

Name of the LGA's/UWSSA	Number of Water Borehole	Percentage of hydrological survey reports taken on board	Percentage of hydrological survey recommendations not taken on board
Songea MC	38	42	58
Kinondoni MC	17	48	52
Dodoma MC	12	50	50
Temeke MC	16	50	50
Tabora MC	19	50	50
Urambo DC	8	50	50
Bariadi DC	16	50	50
Meatu DC	11	50	50
Bahi DC	12	50	50
Tunduru DC	9	50	50
Lindi MC	9	50	50
Kilwa DC	23	50	50
Longido DC	8	66	34
Arusha CC	14	70	30
Total	**260**		

***Source**: Geophysical survey and drilling reports and drilling reports (2012/13-2017/18*

Table 3.8 provides that 12 out of 14 visited LGAs did not adequately take into considerations more than 50 percent of the hydrogeological surveys recommendations. It is further noted that only two (2) LGAs namely Kinondoni and Songea MC had implemented more than 50 percent of the recommendations issued in the hydrogeological survey reports.

The audit team analysed the extent to which the hydrogeological recommendations were implemented by the visited LGAs and UWSSAs, and the results are presented in **Table 3.9** and **3.10**.

Table 3.9: Extent of the Implementation of the Hydrogeological Surveys Recommendations by UWSSAs

Categories of Hydrogeological Recommendation Issued	Number of UWSSAs which Implemented	Number of UWSSAs which did not Implement the recommendation	Concerned UWSSAs	Reason for not implementing
Depth	1	2	DAWASA, AUWSA	Change of design
Diameter	2	1	DAWASSA	Change of design
Casing material	Nil	Nil	Nil	Nil

Categories of Hydrogeological Recommendation Issued	Number of UWSSAs which Implemented	Number of UWSSAs which did not Implement the recommendation	Concerned UWSSAs	Reason for not implementing
Proposed drilling method[28]	3	0	DAWASA, AUWSA, DUWASA	
Borehole testing	3	0	DAWASA, AUWSA, DUWASA	
Screen slot size	Nil	Nil	Nil	
Proposed drilling site	3	1	DAWASA[29]	
Casing material	Nil	Nil	Nil	

***Source**: Auditors' Analysis of information extracted from* boreholes water projects completion reports *2019*

As indicated in **Table 3.9**, UWSSAs deviated mostly on the depth of the boreholes. Further, review of the project files indicated that, the reason for deviation was associated with changes of design. It was explained that during drilling the water level was reached before or after the depth recommended in the hydrogeological and geophysical survey report.

The situation in the visited LGAs is as presented in **Table 3.10**.

Table 3. 10: Extent of the Implementation of the Hydrogeological Surveys Recommendations by LGAs

Categories of Hydrogeological Recommendation Issued	Number of LGAs which Implemented	Number of LGAs which did not Implement the recommendation	Concerned LGAs	Reasons
Depth	10[30]	10	Bariadi TC Meatu DC Arusha MC Bahi DC Longido DC Tabora MC Dodoma CC	Availability of water above or below the recommended depth, change of quality, loss of water

[28] Some of the projects used mixed methods due to the change of soil condition during drilling
[29] Advised not to implement huge project at Mpera but implemented hence low yield
[30] Implemented for some projects and did not implement for some as shown in table 3.7

Categories of Hydrogeological Recommendation Issued	Number of LGAs which Implemented	Number of LGAs which did not Implement the recommendation	Concerned LGAs	Reasons
			Urambo DC Temeke MC Kinondoni DC	
Diameter	No information	No information		
Casing material	Nil	Nil	Nil	
Proposed drilling method[31]	13	Nil	Nil	
Borehole testing	13	0	All	
Screen slot size				
Proposed drilling site	11	2	Kinondoni MC and Urambo DC	No reasons were given

***Source**: Auditors' Analysis of information extracted from* boreholes water supply projects completion reports *2019*

As indicated in **Table 3.10**, for the case of LGAs, most deviation was on the depth of the boreholes, whereby 10 out of the fourteen (14) LGAs deviated from the issued recommendations. The reason for deviation as pointed out by the interviewed Water Engineers of the visited LGAs was that during drilling the contractors were able to find water above or below the recommended depth.

Further, review of the project files indicated that, contractors did not state as to why there were deviations from the given recommendations and there were no any correspondence from the LGAs or consultants which required the contractor to state the reasons.

Table 3.10 also reveals that the other deviation was noted on the proposed drilling sites, where two LGAs of Kinondoni MC and Urambo DC did not adhere to the recommendations given.

The audit further noted that, inadequate consideration of the recommendations of the hydrogeological survey during the design and execution of the boreholes water supply projects was attributed to inadequate supervision during the implementation of the boreholes water supply projects.

[31] Some of the projects used mixed methods due to the change of soil condition during drilling

The impact of disregarding the hydrogeological recommendations has resulted into the following:

Failure of projects to achieve the quantity of water: Kinondoni Municipality ignored the Groundwater Survey, 2010 and implemented the boreholes water supply project on the aquifer of Msumi area in 2012/13 which was expected to be sandy. As a results it ended up with a dry borehole costing TZS 12,066,500/. The same situation happened at DAWASA projects of Kimbiji and Mpera boreholes water supply projects whereby the borehole exploratory report suggested that the execution of large projects to be carried at Kimbiji as there was huge potentiality of water, but DAWASA deviated and executed eight boreholes water supply projects at Mpera which resulted into low yield of water.

3.4.2 Boreholes Water Supply projects Implementation was not done in a Cost Effective manner

The Ministry of Water is required by Item 3.2.3 (d) of the WSDP I to ensure that water supply facilities are implemented in cost effective and efficient way. Also Regulation 114 (a) of the Public Procurement Regulations requires the procuring entity for this case LGAs and UWSSAs to monitor costs and timely delivery of works in the correct quantities and to the quality specified in each contract. The audit noted that boreholes water supply projects were not implemented in a cost effective manner due to the following factors:

i) Boreholes Water Supply Projects Implemented Beyond Budget

Review of the projects budgets allocation and implementation report revealed that, there were projects which were implemented beyond the allocated budget and contract price. Table 3.10 shows the extent of projects which were implemented beyond the contract cost from the completed boreholes sampled from the visited LGAs and UWASSAs.

Table 3. 11: Utilization of fund by UWSSAs in implementing boreholes

Name of the LGA's/UWSSA	Number of boreholes contracts reviewed (n)	Number of boreholes projects that exceeded the contract cost (n)	Total Amount over utilised billion (TZS)	Percentage excess from the original contract for the sampled (%)
DAWASA	1	1	1.3	30
DUWASA	25	0	Nil	
Tabora UWSSAs[32]	NA	NA	NA	
Lindi UWSSA	Nil	Nil	Nil	
Songea UWSSA	Nil	Nil	Nil	
AUWSA	Nil	Nil	Nil	

[32] No boreholes projects were implemented by Tabora UWSAs

***Source**: Auditors analysis of the projects budget and implementation report*

Table 3.11 reveals that one (1) project of DAWASA out of 26 project contracts sampled in the two (2) UWSSAs of DAWASA and DUWASA utilized TZS 1.3 billion higher compared to other UWSSA's. Despite this revelation up to the time of this audit, this project was still ongoing. The variation of price was due to the delay in the implementation of projects. The situation in respect to the utilization of the funds in the visited LGAs is as presented in **Table 3.12**:

Table 3. 12 : Utilization of fund by LGA in implementing boreholes water supply projects

Name of the LGA's/UWSSA	Number of boreholes contracts reviewed (n)	Number of boreholes projects that exceeded the contract cost (n)	Total Amount over utilised billion (TZS)	Average percentage excess from the original contract for the sampled contract (%)
Longido DC	7	2	1.9	51
Lindi MC	10	3	0.9	22
Kilwa DC	2	1	0.2	21
Dodoma MC	11	5	0.2	18
Bariadi DC	6	1	0.1	12
Kinondoni MC	2	0	0	0
Temeke MC	10	0	0	0
Arusha CC	6	0	0	0
Tabora MC	2	0	0	0
Urambo DC	0	0	0	0
Songea MC	11	0	0	0
Tunduru DC	9	0	0	0
Meatu DC	3	0	0	0
Bahi DC	11	0	0	0
	91	**12**	**3.3**	

***Source**: Auditors analysis of the projects budget and implementation report*

Table 3.12 reveals that 5 out of 14 LGAs had projects which were completed above the contract cost. Among these LGAs, Longido DC utilised TZS 1.9 billion above the contract cost for the two (2) projects at the higher cost compared to other LGAs. The percentage cost excess ranged from 12 to 52 percent whereby the highest cost was noted at Longido DC.

On the other hand, through interviews which were held with the District Water Engineers from the visited LGAs and the Project Coordinators of the visited UWSSAs, it was noted that, the increase of contract price was caused by change of plan and design of the project. Nevertheless, review of the project files of the boreholes water supply projects in the visited LGAs revealed that, utilization of fund beyond the allocated budget was also caused by the delay in completion of the project which created additional cost associated with the

change of material prices, interest cost and supervision cost for the consultants. Other factors were poor design and inadequate hydrogeological and geophysical surveys.

The extent to which these factors affected the boreholes water supply project is as presented in **Table 3.13.**

Table 3. 13 : Effect of each factors on the Boreholes Water Supply projects

Reasons for Cost Overrun	Number of Water Projects from boreholes affected	Remarks
Inadequate design	0	**Nil**
Inadequate hydrogeological survey	0	**Nil**
Delay in completion of projects	2	20 boreholes project by DAWASA and Arusha Sustainable Urban Water And Sanitation Delivery Project by AUWSA(56 boreholes)
Delay in payment of contractors	1	7 boreholes project at Bariadi DC
Change of specification	2	20 boreholes project by DAWASA and Arusha Sustainable Urban Water And Sanitation Delivery Project by AUWSA
Change of scope of work	1	20 boreholes project at Kimbiji and Mpera by DAWASA

Source: *Auditors' Analysis, 2018*

As indicated in **Table 3.13**, a large number of sampled boreholes projects, variation of cost was associated with the delay in payment of contractors, delay in completion of projects and change of specifications.

ii) Drilling Cost was above standard average drilling cost per meter

The audit team also noted that the drilling cost was above the average drilling cost for the particular LGAs. A comparison of the cost of drilling boreholes in the 14 visited LGAs and respective UWSSAs in the same LGAs using the depth per cost for specific boreholes against the LGAs average was made by the audit team and the results are presented in **Table 3.14:**

Table 3. 14: Drilling cost per depth in the visited UWSSAs

Name of the UWSSAs	Average drilling cost per meter (TZS)	Percentage of projects below average	Percentage of implemented projects above the average drilling cost/ meter
DAWASA	214,442	0	0
DUWASA	137,582	0	0

Name of the UWSSAs	Average drilling cost per meter (TZS)	Percentage of projects below average	Percentage of implemented projects above the average drilling cost/ meter
AUWSA	242,999	0	0
Tabora UWSSA33	226,137	NIL	NIL
Lindi UWSSA[34]	Nil	Nil	Nil
Songea UWSSA	Nil	Nil	Nil

***Source**: Auditors Analysis, (2019)*

As indicated in **Table 3.14**, for the visited UWSSAs all sampled projects were implemented within the average drilling cost. To some extent the situation was different in the visited LGAs as presented in **Table 3.15**.

Table 3. 15: Percentage of Boreholes with above Drilling cost per meter in the visited LGAs

Name of the LGA	Average drilling cost per meter (TZS)	Percentage of projects below average	Percentage of implemented projects above the average drilling cost/ meter
Songea MC	213,448	13	88
Dodoma CC	137,582	20	80
Longido DC	115,912	30	80
Kinondoni MC	137,237	33	67
Urambo DC	220,139	40	60
Temeke MC	214,442	47	53
Arusha MC	242,999	50	50
Tabora MC	226,137	50	50
Bariadi DC	134,416	50	50
Lindi MC	236,198	50	50
Kilwa DC	349,749	50	50
Bahi DC	137,582	0	0
Meatu DC	157,437	0	0
Tunduru DC	No Records	No Records	No Records

***Source**: Auditors analysis from budget and boreholes completion reports of 10 village boreholes*

As provided in **Table 3.15**, the implementation costs in a significant number of projects in the visited LGAs were higher than the average cost. The percentage

[33] TUWASA has no borehole projects, rather it abstracts water from Igombe dam and recently they are implementing the abstraction of water from Lake Victoria project

[34] LUWASSA did not have projects which started from the drilling. They are operating 7 projects tranfered from Lindi MC and currently they expect to receive 8 projects from MoW which are under construction.

of the boreholes water supply projects that were above the LGAs average costs were 67 and 80 percent in Kinondoni and Dodoma Municipalities respectively.

The extent to which the cost per meter varies from the average drilling cost per meter is as indicated in **Table 3.16**

Table 3. 16: Drilling cost per meter in the visited LGAs

Name of the LGA	Average drilling cost per meter (TZS)	Range of price below average drilling cost/ meter (TZS)	Range of prices above the average drilling cost/ meter (TZS)
Dodoma CC	137,582	104,710-136,125	138,569-179,188
Bahi DC	137,582	0	0
Kinondoni MC	137,237	86,957-94,464	137,469-168,253
Temeke	214,442	125,752-200,654	228,785-291,292
Longido DC	115,912	110, 231-114,192	120,523-145, 211
Arusha MC	242,999	200,100-239,318	246,000-250,867
Tabora MC	226,137	185,000-220,000	240,999-280,263
Urambo DC	220,139	115,200-190, 708	221,439-290, 301
Bariadi	134,416	114,239-128,771	135, 403-148,299
Meatu DC	157,437	0	0
Songea MC	213,448	184,500	217.583
Lindi MC	236,198	82,805-161,017	236,849-577,785
Kilwa DC	349,749	236,643-274,842	458,070-429,440
Tunduru DC	No records	No records	No records

***Source**: Auditors analysis from budget and boreholes completion reports of 10 village boreholes*

According to interviews held with the officer in charge of Tanganyika Water Basin Office, the variation of cost per meter depends on the geological formation as well as costs for mobilisation and demobilisation of the equipment and personnel to the site. However, the audit noted that the average drilling cost per meter in Temeke MC is 37 percent higher than the drilling cost per meter in Bariadi. The audit expected the costs at Bariadi to be higher than that of Temeke due to its geological formation as well as the distance to the drilling sites. This is due to the fact that the drilling cost in the soft rock formation is lower than in the hard rock formation, likewise the mobilisation and the demobilisation costs.

3.4.3 Untimely Completion of the Boreholes Water Supply Projects

The Ministry of Water was required to monitor the progress and timely completion of works in accordance with the terms of each contract and ensure it meets its contractual obligations by ensuring timely payments are made to the contractors and consultants, and ensure that commitments are recorded against voted funds[35].

[35] Regulation 114(b) of the Public Procurement Regulations, 2013

The audit noted that, there had been significant delays in completion of boreholes water supply projects. Analysis of the timeline for completion of boreholes water supply projects in the visited LGAs and UWSSAs indicated that, the delay ranged from 2 to 48 months. **Table 3.17 and 3.18** present the percentage of borehole water supply projects which experienced delays in the visited UWSSAs and LGAs respectively.

Table 3. 1730: Percentage of boreholes not completed within the contract time from the UWSSAs

Name of UWSSAs	Total Number of Sampled Water Project contracts from Borehole Source	Total Number of Sampled Water Project contracts from Borehole Source with delays	Percentage of Sampled Water Project contracts from Borehole Source with delays
DAWASA	1	1	100
AUWSA	3	Ongoing	
DUWASA	5	4	75
Lindi-UWASA	Nil	Nil	
Songea-UWASA	Nil	Nil	

***Source**: Auditors Analysis, (2019)*

From **Table 3.17**, all the visited UWSSAs did not manage to ensure the implemented borehole water supply projects in their areas were completed within the contract time. The percentage of the projects which were delayed ranged from 75-100. The situation in the visited LGAs is as presented in **Table 3.18.**

Table 3.18: Percentage of water supply projects from borehole sources not completed within the contract time from the visited LGAs

LGA/UWASSAs	Total Number of Sampled contracts of Water projects from Borehole Sources	Total Number of contracts of Water projects from Borehole Sources with delays	Percentage of Sampled contracts of Water projects from Borehole Sources with delays
Dodoma CC	10	10	100
Longido DC	9	9	100
Arusha MC	6	6	100
Tabora MC	3	3	100
Lindi MC	3	3	100
Bariadi DC	7	7	100
Kinondoni MC	1	1	100
Temeke MC	9	7	78
Bahi DC	12	6	50
Songea MC	4	1	25
Kilwa DC	4	1	25

Tunduru DC	2	0	0
Meatu DC	4	0	0
Urambo DC[36]	Nil	Nil	Nil

***Source**: Auditors Analysis, (2019)*

From **Table 3.18**, it can be seen that 11 out of 14 visited LGAs did not manage to ensure the implemented water supply projects from borehole sources in their areas were completed within the contract time. Seven (7) LGAs out of 14 visited LGAs had 100 percent of the sampled projects' contracts which were delayed in completion.

Through the interviews held with the officials from the visited LGAs and UWSSAs, the audit noted that a number of factors were provided as the main causes for the delay. Further analysis was made to establish the extent of contribution to the delayed completion time for each of the factor in 74 sampled boreholes water supply projects from the visited LGAs and UWSSAs. **Table 3.19** presents the outcome of that analysis:

Table 3. 1931: Summary of the Reasons for delays in the completion of Water Projects Contracts for boreholes in the Visited LGAs and UWSSAs

Reasons for Delay	Number of project affected out of total 74 boreholes water supply projects	Concerned LGAs/UWASAs
Late payment of raised payment certificates	9	Bariadi TC
Inadequate Supervision of projects	11	Bariadi TC, Tabora MC and Meatu DC
Incompetent contractors	1	DAWASA
Inadequate disbursement of funds for boreholes water supply projects	9	DAWASA
Weather conditions specifically heavy rainfalls	0	
Unavailability of constructions materials	0	
Change of scope	1	DAWASA
Negotiation with the community for land to establish water infrastructure	0	
Unsolved exemptions of tax issues	1	Arusha Sustainable Urban Water And Sanitation Delivery Project by AUWSA
Construction of road	0	
Order of materials outside the country	0	

[36] Urambo DC had no projects implemented within the scope

Reasons for Delay	Number of project affected out of total 74 boreholes water supply projects	Concerned LGAs/UWASAs
Late site possession	1	Kinondoni MC
Absence of contractors from site	0	
Delays to respond letters of requests from contractors	0	
Missing of underground source of water	Nil	
Presence of rock	Nil	
Reconstruction of areas affected by rainfall	Nil	

***Source**: Auditors' analysis of project files and letters requesting and approving the extension of time from visited LGAs and UWSSAs (2018)*

Extent of the delay

The audit analysed the extent of delay on the strategic project of drilling 20 boreholes at Kimbiji and Mpera by DAWASA contract no. DAWASA/CW/2012-2013/10 between DAWASA and Serengeti in Joint Venture with NSPT LTD for drilling boreholes at Kimbiji and Mpera. The contract commenced on 2nd August, 2013 and was expected to be completed on 31st December, 2015. At the time of this audit the contract was not completed. **Figure 3.4** presents the extent of delays for the Kimbiji and Mpera Boreholes water supply projects.

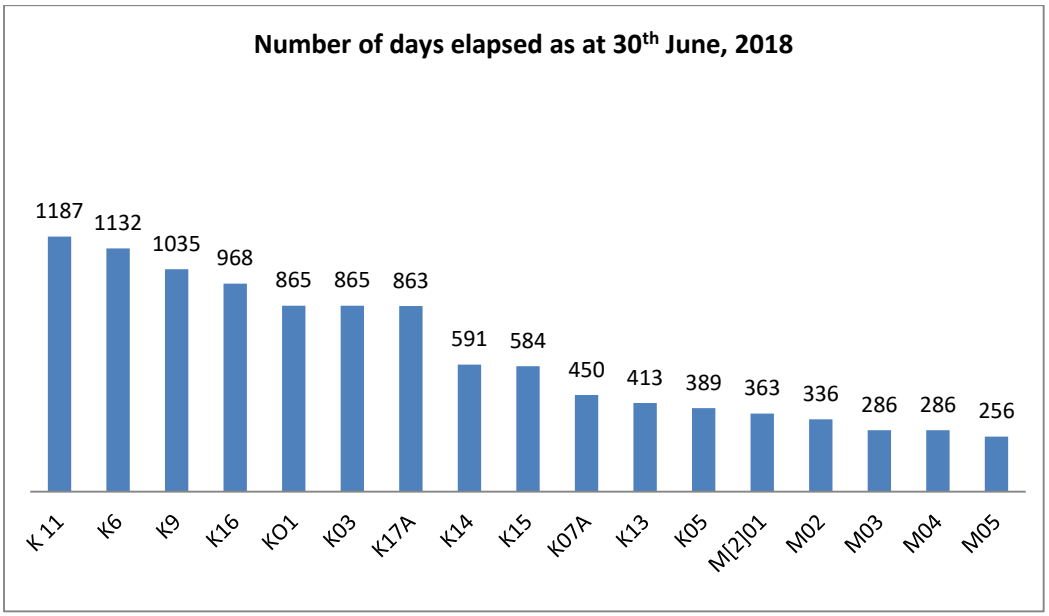


Figure 3. 4: Delays in Implementation of Kimbiji and Mpera borehole water supply projects

***Source**: Monthly Report no 55 for Drilling 20 boreholes at Kimbiji and Mpera, December 2018*

From **Figure 3.4,** the extent of delay for Mpiji and Mpera water supply project ranged from 256 to 1186 days. The audit noted that the following were the causes for delays in the implementation of boreholes water supply projects:

(a) Contractors with insufficient capacity were awarded tenders

Regulation 116 (1) (a) of the PPR, 2013 requires a tenderer to possess the necessary professional and technical qualifications, financial resources, equipment, managerial capability, reliability, experience and reputation, in order to qualify to participate in procurement proceedings.

The audit noted that, delays in completion of boreholes water supply projects reports were attributed by awarding contracts to contractors who had inadequate capacity in terms of finance and skills. For instance, review of the progress report for DAWASA 20 boreholes drilling project at Kimbiji and Mpera, revealed that, the project delayed due to inadequate financial capacity of the contractor, as a result project delayed for about 60 months as of 30th June 2018.

The following were the causes for awarding the contracts to incompetent contractors:

Inadequate post qualification of Contractors by UWSSAs and LGAs

Regulation 224 of PPR 2013 requires any procuring entity to undertake post qualifications to the lowest evaluated tenderer and determine whether it has the legal capacity, capability and resources to carry out the assignment. It also requires the procuring entity to seek independent references of a tenderer and the results of reference checks may be used in determining the award of contract resources which were in their submitted and evaluated bids.

According review of the project files at the visited LGAs, i.e. Kinondoni MC, Temeke MC and Dodoma CC the audit has noted that post qualification/due diligence of the bidders for boreholes water supply projects were not carried out as required.

Interview with Director of Finance at DAWASA revealed that, in some instances the authority awarded tender to the contractor on the basis of past experience. For instance, DAWASA awarded contract of executing Kimbiji and Mpera projects to M/s Serengeti on the basis that he successfully completed other DAWASA Projects without conducting post qualification/ due diligence on his capacity. This resulted into stalk of the project due to contractor's inability to fully sustain the completion of work.

Nevertheless, the WSDP Implementation report of 2015 indicated that post qualification as done in the project did not always reveal the true picture of capacities. **Table 3.19** illustrates the weakness that indicates inadequacy of post-qualifications of the boreholes drilling bidders.

Table 3. 32: Extent of Post Qualification of Bidders across LGAs

Name of the LGA's/UWSSAs	Number of Contracts	Post qualification (conducted/not conducted)
Dodoma MC	One contract to drill 10 boreholes	Not conducted
Bahi DC	2 contracts for drilling and installation of water network	Not conducted
Longido DC	2 contract for drilling and installation of water network	Conducted
Arusha MC	2 contracts for drilling and installation of water network	Not conducted
Tabora MC	2 contracts for drilling and installation of water network	Not conducted
Urambo DC	2 contracts for drilling and installation of water network	Not conducted
Bariadi DC	3 contracts for drilling and installation of water network	Conducted for one contract
Meatu DC	2 contracts for drilling and installation of water network	Not conducted
Kinondoni MC	3 contracts to drill 10 boreholes	Not conducted
Temeke MC	2 contracts for drilling and installation of water network	Not conducted
Songea MC	1 contract for drilling exploratory and productive boreholes for water supply including civil works and installation of pumps	Not conducted
Tunduru DC	2 contracts for building distribution network	Not conducted
Lindi MC	9 contract for drilling exploratory and productive boreholes, pump testing and development of productive boreholes	Not conducted
Kilwa DC	2 contracts for drilling exploratory and productive boreholes and construction of distribution network	Not conducted
UWSSAs		
DAWASSA	1 Contract for Kimbiji and Mpera projects	Not conducted
DUWASA	Single source contract to DDCA	n/a
AUWSA	3 contracts to drill 41 boreholes	Conducted

***Source**: Auditors' analysis of the information extracted from the projects file contract document, 2019*

As shown in **Table 3.19**, post qualification was not adequately done in all 14 LGAs visited and 2 out of 5 visited UWSSAs. It also shows that, post qualification was done in only 5 out of 20 contracts which were equal to 25 percent of all awarded contracts.

Inadequate assessment of contractors prior to the issuance of drilling permits

The Ministry of Water is required to assess the capacity of the contractors before issuing the drilling permit. The contractors are required to submit to MoW Copy of company's registration, Copy of certificate of Tax payer, Details of owned equipment (drilling rig, compressor, pumping test unit), CV for employees, Company profile, Copy of work permit of foreign employee if any. The provisional permit for six months is given to the new applicant of drilling permit, a one year permit after elapse of six months period without performance problem. The renewal of the permit shall be done based on the investigation of the performance conducted by the companies in a past year.

The audit noted that the assessment of boreholes drilling companies prior to the issuance of drilling permit was not adequately done. Interviews held with officials from Ministry of Water Division of water resources pointed out that assessment of the drilling companies to ascertain the capacity of each drilling company resources such as human resources, financial resources and availability of tools for drilling activities was rarely conducted.

Review of the Ministry of Water drillers' registry revealed that a total of 66 drilling licenses were issued to the groundwater drillers from 2015/16 to 2017/18 but no assessment was conducted to ascertain the capacity of the licensed drilling companies.

Interviews held with the Water Resource Division officials at the Ministry of Water revealed that insufficient assessment of drilling companies was due to lack of financial resource for visiting and verifying the existence and competence of the drilling companies based on the submitted documents. However, review of the Water Resource Division annual plans and budgets revealed that the Ministry did not plan for this activity.

(b) Inadequate supervision of boreholes water supply projects by competent personnel/consultant

Monitoring involves mainly the project supervision through site visits, inspections of on-going works, taking measurements on completed work and ensuring that supervision reports are produced. The reviewed geophysical survey reports recommended that supervision of the boreholes should be done by hydrogeologists. Through the interviews conducted with the officials from Ministry of Water and the Water Engineers of the visited LGAs as well as the

review of project documents and files, the audit noted that boreholes water supply projects were not adequately supervised by competent personnel from the LGAs and UWSSAs.

Table 3.21 provides the number of boreholes contracts supervised by the competent personnel in the visited UWSSAs.

Table 3.21: Extent of supervision of Boreholes Water Supply Projects by UWSSAs

Name of UWSSAs	Number of contracts	No contracts of Supervised by hydrogeologist/consultant
DUWASA	5	5
AUWSA	3	3
DAWASA	1	1

***Source**: Auditors analysis, 2019*

As seen in **Table 3.21,** all the 3 visited UWSSAs that implemented water projects for boreholes managed to conduct supervision of the projects during construction. DUWASSA presents the best case as they managed to conduct supervision for 100 percent.

The situation in the visited LGAs, is as presented in **Table 3.22.**

Table 3.22: Extent of supervision of Water Projects from Boreholes by LGAs

Name of LGAs	Number of contracts	Number of contracts supervised by hydrogeologist/consultant
Kinondoni MC	3	3
Longido DC	2	2
Arusha MC	2	2
Meatu DC	2	2
Dodoma MC	1	1
Temeke MC	2	1
Bahi	2	0
Tabora MC	2	0
Urambo DC	2	0
Bariadi DC	1	0
Songea MC	1	0
Tunduru DC	2	0
Lindi MC	9	0
Kilwa DC	2	0

***Source**: Auditors' analysis, (2019)*

As provided in **Table 3.22,** 6 out of 14 visited LGAs managed to conduct supervision of the projects during construction. The supervision of projects in the remaining 8 LGAs were not done by the competent personnel.

It has been pointed out in the WSDP (I) implementation report and WSDP (II) 2016-2019 fields monitoring report that inadequate supervision of contractors resulted into poor execution of boreholes water supply projects. The review of Quarterly Reports of the Ministry of Water revealed that LGAs failed to conduct adequate supervision due to following factors:

Absence of plans and budgeted funds for supervision of borehole water supply projects: It was noted that, LGAs and UWSSAs did not have funds for supervision of the boreholes water projects. During the construction, the supervision was only done by the consultants and no supervision by client counterpart.

Insufficient number of qualified personnel: It was noted that LGAs did not have sufficient personnel such as hydrogeologists, geophysicists, engineers and technicians to supervise the execution of the boreholes water supply projects. **Table 3.23** shows the extent of shortage of technical staff at the Water Engineers' Offices in the visited LGAs.

Table 3.23: Technical staffing level in water department for the visited LGAs

LGA	ENGINEERS			TECHNICIANS		
	Required	In place	Deficit	Required	In place	Deficit
Dodoma MC	3	2	1	5	0	5
Bahi DC	2	2	0	18	6	12
Bariadi MC	4	2	2	13	4	9
Meatu DC	7	3	4	6	5	1
Tabora MC	3	1	2	6	2	4
Urambo DC	4	2	2	6	3	3
Arusha MC	4	3	1	22	3	19
Longido DC	4	5	1	22	1	21
Temeke MC	5	2	3	8	2	6
Kinondoni MC	5	1	4	8	1	7
Lindi MC	4	1	3	7	4	3
Kilwa DC	4	1	3	7	5	2
Songea MC	3	1	2	6	1	5
Tunduru DC	4	2	2	11	4	7
TOTAL	**56**	**28**	**30**	**145**	**37**	**104**

Source*: *Extracted from a staffing lists of the visited LGAs

From **Table 3.23**, there is a deficit of a total of 30 water engineers out of 56 required water engineers in the visited LGAs which is equivalent to 53.6 percent. It has also been noted that there is a deficit of 104 out of the required 145 Water Technicians which is equivalent to 71.7 percent. Inadequate number of qualified personnel results into inadequate supervision of the ongoing boreholes water supply projects as well as managing the progress of the completed projects.

The shortage of staff led to huge load to the LGA staff responsible for supervision of boreholes water supply projects under their areas of jurisdiction.

However, based on the data provided in **Table 3.23,** the audit team carried out an analysis to assess the ratio of technical staff per boreholes water supply project required to be supervised. The analysis considered technical staff such as engineers who were found in every visited LGA. The result is as presented in **Table 3.24**:

Table 3.24: Staff ratio per the boreholes water supply projects in the visited LGAs

LGA	Total Number of Staff Available		Number of Boreholes project to be supervised (C)	Ratio	
	Engineers (A)	Technicians (B)		Ratio (Engineers /borehole project) (A:C)	Ratio (Technician/borehole project) (B:C)
Songea MC	1	1	38	1:38	1:38
Kilwa DC	1	5	23	1:23	1:5
Tabora MC	1	2	19	1:19	1:10
Kinondoni MC	1	1	17	1:17	1:17
Lindi MC	1	4	9	1:9	1:3
Tunduru DC	2	4	9	1:5	1:5
Temeke MC	2	2	13	1:7	1:7
Dodoma MC	2	0	12	1:6	Nil
Bahi DC	2	6	12	1:6	1:2
Bariadi MC	2	4	10	1:5	1:3
Longido DC	5	1	8	1:6	1:8
Arusha MC	3	3	14	1:5	1:5
Meatu DC	3	5	11	1:4	1:2
Urambo DC	2	3	8	1:4	1:3

Source: *Auditors' Analysis of Technical Staff Available in Visited LGAs, 2018*

As indicated in **Table 3.24,** there was high ratio of engineers per boreholes water supply projects in Songea MC, Kilwa DC and Tabora MC where 1 engineer was required to supervise 38 boreholes water supply projects in Songea MC and 23 in Kilwa DC. The least with regard to engineer's ratio was noted in Urambo and Meatu DC, where 1 engineer was require to supervise only 4 boreholes water supply projects. The same trend was noted for the technicians where Songea MC indicated high ratio of 38 boreholes water projects per 1 technician

while Bahi and Meatu indicated low ratio of technicians per projects by having two (2) projects per one (1) technician.

This means that, there is an uneven distribution and allocation of staff to LGAs with more boreholes water projects as compared to those with fewer boreholes water supply projects. This is well observed when the situation in Urambo DC or Meatu DC is compared with the one of Songea MC. Urambo has more engineers with few boreholes water projects compared to Songea that has 38 boreholes water projects and only 1 engineer.

(c) Inadequate disbursement of funds for boreholes water supply projects

The audit team noted that, inadequate disbursement of funds was among the factors that contributed to the delay in completion of projects. It was also noted that LGAs and UWSSAs started implementation of the boreholes water supply projects without having assurance of the availability of adequate funds. This is contrary to the provision of the Public Procurement Regulations which requires the Ministry of Water and PO-RALG to ensure LGAs and UWSSAs are assured of the availability of funds before commencing any procurement proceedings for the boreholes water supply projects[37].

Further, the audit team noted that the financing of boreholes was not adequate as per approved budgets of the Ministry of Water and PO-RALG. **Table 3.25** presents the extent to which LGAs received funds based on the approved budget:

Table 3.25: Percentage of Allocated funds from the Approved budget in the visited LGAs for the period of five years 2014/15-207/18

Name of LGAs	Total Approved Budget(billion TZS)	Actual Allocated Funds (billion TZS)	Percentage of actual allocated from the approved budget (%)
Urambo DC	0.7	3.2	528
Longido DC	1.6	8	500
Meatu DC	2.1	5.3	252
Kilwa DC	3.7	4.9	132
Lindi MC	2.3	3.0	130
Dodoma CC	2.7	3.0	111
Temeke MC	2.8	2.6	92
Songea MC	5.6	5.1	91
Bariadi DC	3.9	3.2	80
Tunduru DC	8.6	5.9	69
Bahi DC	5.3	3.5	66
Arusha MC	3.3	2	59
Kinondoni MC	4.5	1.8	40
Tabora MC	3.9	0.7	18

[37] According to Public Procurement Regulation, 2013, Section 243(2)

***Source**: Individual Council MTEF 2014/15-2017/18*

As provided in **Table 3.25,** all 14 visited LGAs received fewer amounts from what was approved. The percentage released ranged from 40 to 500 for the period of four years. Although 4 out of 14 LGAs were receiving more than 90 percent of the budgeted amount, still there were delays in the completion of projects, as funds were not disbursed timely as detailed hereunder:

Untimely Disbursement of boreholes water supply project funds

Interviews held with the Project Managers and District Water Engineers from the visited LGAs indicated that, most of the boreholes water supply projects were not financed as agreed. In some projects, the fund were released only to execute the drilling of the boreholes while funds for installation of infrastructure were delayed; and sometimes not released hence the projects were not functioning due to lack of infrastructure particularly pumps and distribution pipes.

Review of the projects progress report of Bariadi TC revealed that nine (9) completed boreholes were not functioning due to delayed disbursement of funds for construction of distribution network. Further, according to the interview with the District Water Engineers and the project managers from the Ministry of Water, it was found out that, financing of water projects by development partners was associated with many challenges. Most of the time funds were not disbursed on time as per the agreement with the Development partners. The interviewed officials also pointed out that the funds delayed for about four to five months on average. This has resulted into failures to complete the projects on time, cost over runs and delays in the provision of this important service to the citizens.

Insufficient Disbursement of funds for boreholes water supply project by the Ministry of Water

According to the review of budget implementation reports of the Ministry of Water for 2012/2013 to 2017/2018, the audit noted that there was inadequate disbursement of funds for the implementation of boreholes water supply projects as depicted in **Table 2.1** in chapter two of this report.

According to the interviews held with the District Water Engineers and the project managers from the Ministry of Water, it was found that for the donor funded projects in which the government was supposed to contribute as a counterpart, there had been insufficient disbursement of the counterpart funds.

For instance in Arusha Sustainable Urban Water And Sanitation Delivery Project implemented by AUWSSA funded by the Africa Development Bank (AfDB), the government was supposed to contribute a total of TZS 22,953 billion but up to 31st September, 2018 the government disbursed only TZS 2.5 billion which is equivalent to 4 percent of the whole commitment.

Also, the review of the WSDP implementation report revealed that, although the government was required to contribute 20 percent of the implementation funds for the whole projects, at the time of this audit no amount was disbursed.

Insufficient disbursements of fund for the implementation of boreholes water supply projects led to untimely completion of the projects, and thereby affecting the availability of clean and safe water to the communities.

(d) Delays in Paying Contractors

According to the WSDP II field monitoring report, 2017 there have been delays in paying contractors which resulted into delays in the completion of the boreholes water supply projects. For instance, Kinondoni DC during the construction of water projects at Madale, Kisauke and Mpakani areas within Goba Ward, payments were delayed to the contractor for almost five months of the whole period stipulated for the completion of the projects. Review of the projects files in Kinondoni MC revealed that, contractor Ms. Ganda Classic Company Limited complained on the delay of funds for the commencement of the project through letter CCC/MK/KND/KT/GB01/2016 dated 26/01/2016 and GCC/MK/KND/GB04/2016 dated 18/04/2016 despite the fact that he was already on site and purchased equipments such as pipes and pumps. **Table 3.26** shows the extent of delay in payment to contractors.

Table 3.26: Extent of delays in payment to the contractors based on the IPCs

Name of LGAs	Total Number of IPCs	Number of IPC delayed in payment	Total amount delayed (Million TZS)
Arusha MC	6	3	1,295
Longido DC	5	5	931
Songea MC	11	11	924
Tunduru DC	8	8	709
Temeke MC	6	6	675
Bahi DC	3	3	560
Bariadi TC	9	9	536
Lindi MC	25	25	428
Kilwa DC	8	8	3,907
Meatu DC	4	3	358
Tabora MC	Nil	0	0
Dodoma CC	Nil	0	0
Urambo DC	Nil	0	0
Kinondoni DC	Nil	0	0
Total	**85**	**81**	**10,323**

Source: *Individual Interim payment certificates and Projects progress reports*

As seen from **Table 3.26**, there were delays in payment of IPC, whereby 81 out of 85 sampled IPCs amounting to about TZS 10,323 million were not paid on time in the visited LGAs. Through the interviews held with the officials from the visited LGAs and Ministry of Water, it was noted that, the delay in payment of IPCs is attributed to the delays in disbursement of funds from the central government. According to the reviewed Water Sector budget disbursement from the government to the LGAs for the financial years 2011/12 to 2015/2016, the audit noted that normally the funds to LGAs experience a delay for about four to five months on average. Thus inadequate financing and disbursement of funds lead to delays in completion of the projects as well as increasing the project costs due to charged interests.

3.5 Ineffective Monitoring and Evaluation Mechanisms

The Ministry of Water and PO-RALG were supposed to establish an efficient and effective monitoring and evaluation mechanisms of water projects (including boreholes water supply projects). Also, where a Basin Water Board has granted a Water Use Permit subject to the construction or alteration of works, the Basin Water Board shall have powers to monitor and enforce the requirement for such construction or alteration of water. Monitoring of the implementation of the boreholes water supply projects is done through PO-RALG monitoring and evaluation framework, Internal Audits, LGAs Water and Sanitation Management team and LGAs Water and Sanitation Teams.

The review of the WSDP I Evaluation Report, 2016 and interviews held with the officials from the Ministry of Water revealed that, M&E for the boreholes water supply projects were inadequately conducted due to the noted weaknesses in the established M& E mechanisms as follows:

3.5.1 Lack of performance Indicators to monitor the progress and Performance of Boreholes water supply projects

The Ministry of Water and PO-RALG are required to establish national performance indicators in order to feed strategic planning, budgeting, policy analysis, programme evaluation and decision making.[38]

The review of MoW M&E plans revealed that, there are no indicators specifically set for monitoring the progress of implementation and performance of the boreholes water supply projects. The set indicators are general for monitoring the progress and performance of all water projects regardless of the source. This is despite the differing challenges on water projects from different sources of water.

[38] National Five Years Development Plan II 2016/2017 to 2020/2021

Lack of performance indicators to monitor and evaluate the boreholes water supply projects result into failure of the Ministry of Water to track the progress of the boreholes water supply projects

3.5.2 Information captured in the Ministry of Water MIS is inadequate for tracking the progress of boreholes water supply projects

Through the review of the MIS of the Ministry of Water, the audit team noted that, the system lacks M&E component for boreholes water supply projects. Non integration of the Management Information System (MIS) with M&E functions hampers constant updating of data and information such as physical progress reporting, implementation, supervision and reporting framework. Important information such as contract payments data and addenda are also not updated into the MIS by LGAs.

Further, interviews held with the officials from the Ministry of Water, it was revealed that, the MIS is not updated regularly by the LGAs. Interviews held with the officials from DWEs offices from the visited LGAs revealed that, some of the projects were initiated at the national level hence some important information and data are not disseminated to the LGAs hence difficult for them to update the MIS. This was confirmed by the interviews held with officials from the Ministry of Water at the Project Preparation and Coordination Unit. Lack of M&E component in the MIS hampers the monitoring and evaluation function of boreholes water supply projects.

3.5.3 Inadequate Technical supervision/Audits

Technical supervisions are important to ensure the progress of the water project. According to WSDP (II), there should be at least three (3) rounds of technical audits and internal audits (technical) visits for each project.
The review of Water Sector Status reports indicates that technical supervisions were not conducted regularly by the Ministry of Water officials to ascertain the quality of the implemented water projects.

Further, interview conducted with the officials of the Water Supply and Sanitation Division revealed that, in most cases technical supervisions at the LGAs level are conducted by Civil Engineers who are also responsible for implementing those projects, thus it will be difficult to point out their own challenges facing the projects. According to the WSDP I implementation report, inadequate technical supervisions and audit leads to poor execution and performance of boreholes water supply projects. **Table 3.27** shows the extent to which technical supervision of the boreholes water supply projects are conducted in the visited LGAs.

Table 3.27: Extent technical supervision conducted on boreholes water supply projects

Visited LGA	Number of undertaken boreholes water supply projects	Number of required Technical Supervision	Number of Conducted technical supervision
Dodoma MC	10	30	0
Temeke MC	12	36	No data
Kinondoni MC	19	57	12
Bariadi Mc	7	21	3
Meatu DC	4	12	0
Tabora MC	8	24	6
Urambo DC	2	6	0
Arusha MC	13	39	3
Longido DC	5	15	5
Bahi DC	12	36	9
Lindi MC	9	27	9
Kilwa DC	20	60	12
Songea MC	38	114	38
Tunduru DC	9	27	9
TOTAL	80	240	29

***Source**: Auditors Analysis (2018)*

From Table 3.27, no technical supervision was carried out for the 80 projects implemented by three (3) LGAs[39]. Through the interviews held with the officials from the Ministry of Water, it was pointed out that inadequate technical audit was attributed to shortage of staff and financial resources at the Ministry of Water. Further, the Ministry did not plan for this activity for the reason that boreholes water supply project were not among the focus areas when WSDP I was initiated.

3.5.4. Ineffective mechanisms for routine monitoring of quality of boreholes water supply projects

Assessment of water quality trends in water sources in urban and rural water supply systems is paramount in quantifying levels of natural and human induced contaminants for public health and ecosystem management interests. According to Integrated Water Resources Management and Development Plans (IWRMDP) for groundwater resources, groundwater monitoring involves collecting regular time series data on ground water levels, groundwater abstraction; and groundwater quality on the monthly basis. Further, the IWRMDP requires the BWBs to monitor the ground water resources on the monthly basis.

According to interviews which were held with the Water Resource Division officers at the Ministry of Water, BWBs did not effectively conduct groundwater

[39] Temeke MC, Kinondoni MC and Dodoma MC

monitoring to measure the levels, groundwater abstraction and groundwater quality is achieved. The officials pointed out that, basin water bodies did not conduct regular monitoring. **Table 3.28** shows the frequency of groundwater monitoring across basins.

Table 3.28: Frequency of Monitoring Groundwater Resources across Basins

Name of the Basin Water Board	Frequency of monitoring		
	Groundwater levels	Groundwater abstraction	Routine groundwater Quality
Pangani	Rarely[40]	Rarely	Rarely
Wami Ruvu	Rarely	Rarely	Rarely
Ruvuma	Rarely	Rarely	Rarely
Internal Drainage	Rarely	Rarely	Rarely
Lake Nyasa	Rarely	Rarely	Rarely
Lake Rukwa	Rarely	Rarely	Rarely
Rufiji	Rarely	Rarely	Rarely
Lake Tanganyika	Not done	Not done	Rarely
Lake Victoria	Not done	Not done	Rarely

***Source**: Auditor Analysis, 2019*

As provided in **Table 3.28,** all basin water boards either did not or rarely conduct ground water monitoring. Moreover, interviews held with Water Engineers from the visited LGAs revealed that groundwater monitoring in their LGAs was measured during the construction of the boreholes but after that there were no routine monitoring to check changes in water quality, water levels and abstraction rate of boreholes.

Furthermore, the audit team noted that, inadequate groundwater monitoring of the boreholes water supply projects was due to the following factors:

Lack of water quality monitoring plans and funds

Interviews held with the District Water Engineers revealed that, the main reason for not conducting routine monitoring of water quality cited by the officials from the selected LGAs was lack of funds for monitoring the quality of groundwater. Further, the review of the visited LGAs budgets for the past three years (2015/2016, 2016/2017 and 2017/2018) revealed that there was no fund allocated for the monitoring of the groundwater quality. This indicates that the LGAs did not prioritize this activity

Inadequate Water Quality Monitoring *Stations across Basin Water Boards*

Furthermore, review of the Water Sector Status Report of 2015/16 revealed that, lack of routine monitoring of groundwater was caused by insufficient and malfunctioning of the water quality monitoring stations. **Table 3.29(a)** and **(b)**

[40] Not carried out on a monthly basis

show the existing groundwater monitoring stations and their status for all basin water boards.

Table 3. 29(a): Available ground water monitoring stations across basins

Name of the Basin Water Board	Number of required ground water monitoring stations	Number of available groundwater monitoring stations	Deficit
Pangani	There is no optimal GW monitoring stations because of absence of IWRMD Plan. But roughly about 50 stations (including 10 existing stations)	10	40
Wami Ruvu	48	28	20
Ruvuma	21	6	15
Internal Drainage	9	31	Vandalized
Lake Nyasa	10	0	10
Lake Rukwa	21	NONE	21
Ruvu	60	27	33
Lake Tanganyika	30	0	30
Lake Victoria	20	Nil	20
Total	**269**	**102**	**189**

***Source**: Auditors analysis of the data extracted from the BWBs annual reports*

From **Table 3.29(a)** the country has 102 groundwater monitoring stations across the nine BWBs out of 269 required, hence Tanzania has a deficit of 167 groundwater stations across all BWBs in the country.

Table 3.29 (b) shows the status of the present groundwater monitoring stations in terms of working and non- working as well as reasons for non- working stations.

Table 3. 29 (b): Status of the Present Ground Water Monitoring Stations

Name of the Basin Water Board	Number of working groundwater monitoring stations	Number of non-working stations	Reasons for not working
Pangani	8	2	Monitoring boreholes collapsed
Wami Ruvu	18	10	Loggers are not functional and wells need flushing.
Ruvuma	6	6	These stations are working manually not automatic as

Name of the Basin Water Board	Number of working groundwater monitoring stations	Number of non-working stations	Reasons for not working
			required because Loggers are not functional.
Internal Drainage	9	3	Inadequate fund to reach their locations.
Lake Nyasa	NA	NA	NA
Lake Rukwa	NONE	NONE	
Ruvu	7	20	4 vandalized 16 are newly drilled BHs which are not installed with data loggers
Lake Tanganyika	Nil	Nil	Nil
Lake Victoria	Nil	Nil	Not available

***Source**: Auditors' analysis of the data extracted from the BWBs annual reports*

From **Table 3.29(b)**, 41 out of 102 groundwater monitoring stations, equivalent to 40.2 percent of the available groundwater monitoring stations, were not working due to different reasons as depicted in the table.

Interviews held with officials from the Water Resource Department revealed that, insufficient groundwater monitoring stations may result into insufficient data for groundwater monitoring; unavailability of groundwater quality and quantity data of the existing boreholes; difficult to assess the availability of groundwater potentiality in the country and failure to know the status of groundwater in the basins.

Lack of risk based groundwater monitoring stations

According to the Integrated Water Resources Management Plans, 2014, groundwater monitoring stations are supposed to be placed in high risk areas such as areas with high groundwater abstraction, groundwater recharge areas to quantify groundwater recharge rates, groundwater pollution risk areas and these areas should be easily accessible. The audit noted that the groundwater monitoring stations are not located in areas which are of high risk. The review of integrated water resources management plans revealed that basin has identified high risk areas. However according to interviews held with the officials at the Ministry of Water, Division of Water Resources, groundwater monitoring stations are not placed in the areas of high risk due to financial constraints.

CHAPTER FOUR

CONCLUSION

4.1 Introduction

This chapter draws the audit conclusion based on the findings presented in the previous chapter. The basis for drawing audit conclusion is the overall and specific objective of the audit as presented in chapter one of this report.

4.2 General Conclusion

Based on the findings as assessed by overall objective of this audit, it is concluded that the Ministry of Water, through LGAs and UWSSAs, does not effectively manage the implementation of water supply projects from borehole sources to ensure the communities have access to the adequate supply of clean and safe water in the country. This is due to the fact that a significant number of completed boreholes water supply projects are not effective as it has been evidenced by the presence of unproductive and non-functioning completed boreholes. Also there are those boreholes water supply projects which are claimed to be productive, however they do not produce sufficient quantity and quality of water.

The period from 2014 to 2018 marks the implementation of WSDPI and II, whereby 490 (33 percent) out of a total of 1,485 boreholes drilled in the whole country were found to be dry and unproductive. During this period, it was further noted that a total of 58 (29 percent) out of 203 drilled boreholes from 14 visited LGAs were not productive. Unexpectedly, a total of TZS 764 million was spent in executing the boreholes water supply projects which were later found to be dry, and consequently did not yield the intended results in the visited 14 LGAs. Therefore, the value for money in this situation is far from being realized.

Furthermore, significant number of completed boreholes did not yield water that meets the recommended quality standards for domestic use, as these boreholes were found to have water which had high content of iron, manganese, fluoride, nitrate, microbial contamination and alkaline. Therefore, exposing the communities in a situation which possesses poor quality of water has the potential risk to human health.

Finally, despite the big investments made in respect to the boreholes water supply projects in the country, sustainable water supply to the communities, as the main intended result of these projects, has not been realized. Failure to adequately realize the intended result of the boreholes water supply projects is mainly attributed to lack of sustainable plans for boreholes water supply projects, ineffective implementation of the boreholes water projects and lack of specific monitoring and evaluation mechanisms for performance

tracking of the boreholes water supply projects by both the Ministry of Water and PO-RALG.

4.3 Specific Conclusions

The following are specific conclusions based on the audit objectives:

4.3.1 Absence of Sustainable plans for Water Projects for Boreholes

The Ministry of Water lacks sustainable plans of water projects from boreholes sources. This is because the Ministry of Water did not conduct water mapping for the whole county to identify zones with groundwater potentiality, the act which has led to having inadequate knowledge on the regional groundwater levels and yearly water level fluctuations. Hydrogeological and geophysical surveys are inadequately conducted and in some instance the results have not been taken into consideration. This has resulted into having dry boreholes on one hand, while on the other hand; other boreholes produced very low quantity of water compared to the investments made.

LGAs and Water Supply Authorities are lacking sustainable funding mechanisms for the operation and maintenance of completed boreholes water supply projects. Most of the LGAs do not budget for the maintenance and operation of boreholes water supply projects. This has resulted into insufficient readily available funds to cater for the preventive maintenance of the boreholes, hence not sufficient to meet the operational and maintenance costs of the boreholes water supply projects. As a result, most of the water points' infrastructures for the completed boreholes are not functioning due to lack of maintenance.

4.3.2 Water projects from borehole sources are not effectively implemented

The Ministry of Water did not ensure that LGAs and UWSSAs adequately implement water projects effectively with due regard to cost, time and quality. The Ministry of Water has failed to ensure LGAs and UWSSAs effectively control contract costs, time and quality. As a result, high percent of completed boreholes experienced cost overrun and delay in completion of the projects, limiting the water facilities in use and scarcity of water to the community.

Furthermore, the Ministry of Water did not ensure LGAs and UWWSAs implement boreholes water supply projects following the hydrogeological and geophysical survey results. This is due to the fact that LGAs and UWSSAs did not adhere to the recommendations stated in the survey reports such as boreholes specifications i.e. depth, diameter and location of the drilling sites. Some of the boreholes were not drilled to the recommended or desired depth and the aquifers were not fully penetrated, and boreholes run dry in a very short period. As a result, the boreholes drilled were unproductive and others

experienced poor quality water to the extent that some of drilled boreholes water supply projects were abandoned or closed due to unsatisfactory quantity and quality of water. Boreholes drilled in or close to human settlements are bacteriologically contaminated due to the presence of faecal coliform.

Low discharge or yield and high water level drawdown of boreholes in some visited LGAs is not only due to aquifer characteristics but also a result of their design and construction methods. Some boreholes have high potential groundwater resources and installed with high capacity pumps but small size of inside casing diameter, pump positions and aquifer screening limits their performance which leads to low discharge and high drawdown, Irao boreholes in Singida are example.

The main cause for inadequate implementation of pumped piped water scheme projects for boreholes is due to the absence of technical supervision, monitoring and plans for appropriate interventions whenever the project is implemented and henceforth absence of sustainability. This has led to poor quality borehole construction, water facilities have broken down leading to limited/absence of water supply in rural areas.

No existing and reliable electronic borehole database in the entire country, all borehole data are compiled and kept as paper files and are not available in electronic or digital database such as Excel spread sheets or Geographical Information System (GIS). In fact some of the data are missing and not consistent. In addition there are no hydrogeological technicians for collecting and monitoring the groundwater data, instead pump attendants without groundwater knowledge are utilised which compromises quality control.

Over all findings indicate that there is inadequate provision of water and poor maintenance of water facilities in rural areas. Lack of preventive maintenance has led to an abandonment of many boreholes in the visited areas. The existing abandoned boreholes need rehabilitation or reconstruction and installed with appropriate pumps to improve and increase their performance in water supply production rather than drilling new boreholes. Boreholes sustainable yield estimation has to be carried out based on pumping tests data in order to ensure borehole sustainability. This audit report therefore strongly recommends rehabilitation of the existing boreholes before embarking on drilling new boreholes.

4.3.3 Ineffective M& E Mechanisms to ensure boreholes water supply projects are of required quality and quantity

The Ministry of Water does not have the effective M&E mechanisms to ensure boreholes water supply projects are of required quality and quantity. Similarly, there is inadequate groundwater monitoring due to lack of adequate groundwater monitoring stations across basins. The Basin Water Boards lack sufficient groundwater monitoring stations, and 42 percent of the available stations are not functioning hence difficult to get sufficient data regarding groundwater potentiality across the basins as well as the quality of the available groundwater.

The Ministry of Water also does not have key performance indicators specifically for tracking the performance of the boreholes water supply projects, instead the Ministry is using general indicators for water projects which are not appropriate to the actual situation facing the boreholes water supply projects.

CHAPTER FIVE

AUDIT RECOMMENDATIONS

5.1 Introduction

This chapter contains recommendations to the Ministry of Water with regards to the management of water supply projects from borehole sources. The weaknesses were noted on three main areas covering the development of sustainable plans for the boreholes water supply projects, implementation of the developed plans and monitoring and evaluation of progress and performance of boreholes water supply projects. The audit office is of the view that, these recommendations need to be implemented so as to improve implementation of boreholes water supply projects in order to ensure quality and sustainability of these projects.

The National Audit Office believes that based on principles of 3Es of Economy, Efficiency and Effectiveness, these recommendations need to be fully implemented so to improve community access to clean and safe water through sustainable and reliable boreholes water supply projects.

5.2 Specific Recommendations

The audit acknowledges the Government efforts through MoW and PO-RALG towards improving community access to clean and safe water in the country. However, MoW needs to come up with more interventions to improve the management of boreholes water supply projects to able to guarantee the availability of adequate and sustainable water supply to the communities. Therefore, this Audit provides the following specific recommendations:

5.2.1 Improving Plans for Boreholes Water Supply Projects

The Ministry of Water should:

a) Conduct and properly document the aquifer mapping in the entire country. The results should be effectively disseminated to all key implementers for implementation in their respective areas;

b) Ensure hydrogeological survey is conducted by competent consultant using appropriate technology and methodology (integrated groundwater investigations), and the results are disseminated and used by all key implementers during the design and implementation of water supply projects from borehole sources; and

c) In collaboration with PO-RALG establish sustainable funding mechanism for the water supply projects implemented in the country.

5.2.2 Improving the Implementation of Boreholes Water Supply Projects

The Ministry of Water should:

a) Establish effective supervision mechanisms for boreholes water supply projects from the exploration, design and construction stages through the operation and maintenance of the project; and

b) Ensure that assessment of the capacity to perform drilling work of the contractors is conducted before issuance and renewal of the drilling permit and licence.

5.2.2 Improving Monitoring and Evaluation of Boreholes Water Supply Projects

The Ministry of Water should:

a) Develop and implement an effective groundwater monitoring network on risk basis; and

b) Develop performance indicators specifically for monitoring the progress and performance of the boreholes water supply projects.

APPENDICES

Appendix 1: Responses from the Audited Entities

This part covers the responses from audited entity namely, the Ministry of Water. The responses are divided into two i.e. general comments and specific comments in each of the issued audit recommendations. This is detailed in appendices 1(a) and 1(b) below:

Appendix 1(a): Responses from the Ministry of Water

A: Overall responses

The Ministry of Water agreed with the all the recommendations and is committed to take proper action so as to improve sustainability of water supply projects from boreholes.

B: Specific Responses

No.	*Recommendations to the Ministry of Water*	*Comments of the Ministry of Water*	*Action(s) to be taken*	*Time line*
1.	conduct and properly document the groundwater mapping in the entire country. The results should be effectively disseminated to all key implementers for its implementation in their respective areas	The Ministry planned to conduct the groundwater mapping for the entire country.	The Ministry is in the process of procuring the consultant to conduct the groundwater mapping in four basin water boards, which are Pangani, Internal drainage, Rufiji and Wami/Ruvu basin water board.	FY 2019 - 2020
			Disseminate groundwater maps	By December 2020

2.	ensure hydrogeological survey is conducted by competent consultant using appropriate technology, and the results are disseminated and used by all key implementers during the design and implementation of boreholes water projects	Groundwater investigations are conducted by licensed groundwater exploratory companies. Up to date 14 companies were granted groundwater exploratory licenses.	Prepare guidelines on methodology used in groundwater resources exploration, development and utilization;	June 2019
		Groundwater Exploration license issued to a company with an exploratory equipment and experienced groundwater experts (Hydrogeologist)	Enhance enforcement to ensure that all groundwater survey reports are submitted to respective BWBs for approval before granting drilling permits	By December 2019
3.	in collaboration with PO-RALG establish sustainable funding mechanism for water projects implemented in the country	The Ministries allocate funds for identifying ground water sources as well as establishing monitoring boreholes in the area where the groundwater projects are implemented.	MoW to improve the budgeting and Financing mechanism for water projects through the newly established RUWASA	By July 2019
4.	establish effective supervision mechanisms for boreholes water projects from the exploration stage to operation of the project	Groundwater experts from the Ministry of Water and Basin Water Boards should be involved in groundwater exploration and borehole	To advice on the technical issues and enforcement of the regulation and guidelines of exploration and drilling of boreholes.	Daily Basis

		drilling supervision in order to obtain relevant groundwater information suitable for the sustainability of groundwater projects.		
5.	ensure that assessment of the capacity to perform drilling work of the contractors is conducted before issuance and renewal of the drilling permit and licence	Assessments are conducted to drilling company before issuing and renewal of drilling permit and license. Drilling license issued to the company which owns the drilling machines and with groundwater professionals. Renewal of drilling license issued after the Ministry assessed the drilling work conducted by the company if comply with drilling standards.	Conducting inspections to the drilling companies to ensure that they are performing their duties according to the drilling guideline.	Quarterly

6.	develop and implement an effective groundwater monitoring network on risk basis	Establishment of the groundwater monitoring boreholes for observation of fluctuation of groundwater levels.	Basin Water Bodies to be facilitated to drill construct and install and groundwater monitoring instruments.	June 2020
			Facilitate BWBs to operationalize groundwater monitoring stations and maintain proper data acquisition and storage systems.	By December 2020
7.	develop performance indicators specifically for monitoring the progress and performance of the boreholes water projects	The performance indicators are established for monitoring the progress and performance of the borehole water projects.	To develop key performance indicators for monitoring the progress and performance of the borehole water projects.	Quarterly

Appendix 2: Audit Questions and Sub audit Question

This part provides the list of four main audit questions and their respective sub-questions:

Audit Question 1	**To what extent Water Projects for Borehole sources implemented by the Ministry of Water are effective?**
Sub-question 1.1	*Do the completed water projects for borehole sources yield the intended results?*
Sub-question 1.2	*Are unproductive and/or dry boreholes exist and a common phenomenon?*
Sub-question 1.3	*Are the Quantity and Quality of water from completed Boreholes satisfactory?*
Audit Question 2	**Do MoW ensure that sustainable plans for boreholes water supply projects are developed, documented and implemented by implementing agencies?**
Sub-question 2.1	*Are adequate Hydrological and geological surveys carried-out using sufficient technology?*
Sub-question 2.2	*Is mapping of ground water zones for the entire country done and adequately communicated to all implementing agencies?*
Sub-question 2.3	*Are operational and funding plans for water projects for boreholes adequately done?*
Audit Question 3	**Do MoW have effectively implemented water projects for boreholes with regards to time, cost, quality and objective?**
Sub-question 3.1	*Are the hydrological and geological survey reports taken into consideration during designing of the boreholes water projects?*
Sub-question 3.2	*Are the implemented water projects for boreholes cost effective?*
Sub-question 3.3	*Are the drilling contracts awarded to the qualified contractors?*
Sub-question 3.4	*Are the water projects for boreholes completed on time as stipulated in the contracts?*
Sub-question 3.5	*Do the implemented water projects for boreholes meet the intended objectives?*
Audit Question 4	**To what extent did MoW effectively and efficiently conduct M&E to track the progress and performance of the water projects for boreholes to ensure quality and sustainability of the projects?**
Sub-question 4.1	*Are the M&E mechanism of MoW effective in ensuring the quality of water projects for boreholes?*
Sub-question 4.2	*Are there identified performance indicators, baselines and milestones set to monitor and report on the*

	progress of implementation and performance of water projects for boreholes?
Sub-question 4.3	*Is the MoW MIS effective in tracking the implementation of water projects for boreholes?*
Sub-question 4.4	*Are the technical audits conducted by MoW effective in improving the quality of water projects for boreholes?*

Appendix 3: Visited Water Projects for Boreholes

This part provides the list of visited water projects for boreholes in the 14 visited LGAs and UWSSAs:

LGA/UWSSAs	Water Projects for Boreholes
Bariadi TC	Nyaumata project, Sanungu Maina project and Nyangokolwa Project
Meatu DC	Mwamishali project , Ngonoko project and Mwambiti project
Arusha MC	Urundini project, Elerai project, Lemara kati project
Longido DC	Mairowa and Kiserian
Tabora MC	Kakulungu village project, Imalamihayo project and Kalunde project
Dodoma CC	Ntyuka, Michese, and Ng'hong'hona
Urambo DC	Kalemela A Project, Kisima cha Hospitali project and Kisima cha Relini Projects
Temeke MC	Tuangoma-Goroka and Mianzini projects
Kinondoni DC	Mbezi Mtoni project, Makongo mbuyuni project, Boko Dovya project and Changanyikeni primary school project
Lindi MC	Tulieni and Mtange projects
Kilwa DC	Mtandi project and Nanjilinji project
Songea MC	Chandarua and Mtendewawa projects
Tunduru DC	Mitani and Lukumbule projects
DAWASA	K05, K17 and K11
AUWSA	SF 6, SF 8 and M1
DUWASA	Ihumwa project
Lindi uwssa	No water project for boreholes

Appendix 4: Documents Reviewed

This part provides the details of the document reviewed as part of the data collection methods. The document falls under the planning and strategies, policies and guidelines and performance categories.

Category	Documents
Plans and Strategies	• National Rural Water Sustainability Strategy, 2015-2020 • Annual plans under district water engineer's office • National water development Strategy 2006-2015 • Strategic plan-MoW • Strategic plan-PO-RALG • Integrated Water Resources Management And Development Plans
Policies and Guidelines	• National Water Policy, 2002 • The Water Supply and Sanitation Act, 2009 • Groundwater (Exploration and Drilling)regulations, 2013 • National Guideline on Drinking Water Quality, 2018 • WHO Guideline for Drinking water
Performance/ implementation Reports	• Hydrological and geological survey reports • Quarterly reports • Performance reports • Annual internal audit reports • Water Sector Status Reports 2012-2017 • Monitoring reports from DWE • Boreholes drilling completion reports • Correspondence files • Procurement Evaluation reports • Water quality reports • Boreholes pump testing reports • Contracts • Tender documents

Appendix 5: Interviewed Officials

This part provides the details of the interviewed officials from various visited areas.

Institution Covered	Title of the official Interviewed	Reasons for interview
Ministry of Water and Irrigation	Ag. Director-Water Resources	To know the extent of the problem in managing boreholes water projects.
	Director and officials - Water quality Division	To understand challenges facing the Ministry when enhancing the accessibility of quality water.
	Director of project Coordination Unit	To know various challenges in implementing water projects
	Head and officials-PMU	To know the procurement process for water projects
DUWASA	Managing Director	To understand in general the problems hindering the completion of the boreholes water projects
	Technical manager	
	Manager of projects	To understand the construction challenges facing water projects from boreholes sources and action is taken to address them
	Head PMU	To know the procurement process for water projects
DAWASA	Director of Finance	To know the available mechanisms and strategies for controlling finance required for implementation of water projects
	Director of Water Production and Distribution	To know the available mechanisms for managing the production and distribution of water from the boreholes source.
	Head of Communications	To know the coordination mechanism among the stakeholders involved in the management of water projects from boreholes sources

Institution Covered	Title of the official Interviewed	Reasons for interview
	Ag. Director of Infrastructure Development	To know the progress and performance of the ongoing water projects from the boreholes sources
	Project Engineer	To know the factors hindering the timely completion of the water projects from the boreholes projects.
	Operation and maintenance manager	To know the available plans and mechanisms for operation and maintenance of the water projects form the boreholes sources
	Director of Procurement	To know the procurement process for water projects
AUWSA	Operation and Maintenance Engineer	To know the available plans and mechanisms for operation and maintenance of the water projects form the boreholes sources
	Head of PMU	To know the procurement process for water projects
	Project Coordinator	To know the factors hindering the timely completion of the water projects from the boreholes projects.
	Electrical engineer	To know the management of the electrical systems and facilities of the water projects from the boreholes sources
	Hydrologist	To know the extent to which the ground water quality and quantity are being monitored
Basin Water Bodies	In-charge of the basin sub offices, Officials responsible for management of water sources and Hydrologists	To know the extent to which the ground water quality and quantity are being monitored
PO-RALG	Officials from sector coordination directorate responsible for the water sector	To know the available plans and strategies for ensuring the completion and sustainability of the boreholes projects

Institution Covered	Title of the official Interviewed	Reasons for interview
	Officials from the Directorate of Local Government	To understand the plans and strategies for ensuring availability of water in urban areas and big cities
Selected LGAs	District Water Engineers , City water engineers, technicians and procurement officers	To know the status of availability of water and the implementation of water projects in their respective areas.