Examining institutional (policy) and administrative framework for water and sanitation (WSS) services in Zimbabwean cities to inform development of a new framework

by

Taonameso Solomon

(Student number: 11634561)

A research thesis submitted to the Department of Biochemistry and Microbiology in the Faculty of Science, Engineering and Agriculture, University of Venda in partial fulfillment of the requirements of the Doctor of Philosophy Degree (PhD) in Microbiology

Supervisor: Professor Potgieter N (UNIVEN)
Co-Supervisor: Professor Traoré AN (UNIVEN)

Co-Supervisor: Doctor Mudau SL (TUT)

September 2022

DECLARATION

I Taonameso Solomon (Student nr: 1634561) declare that the dissertation for the award of a Doctor of Philosophy degree in Microbiology at the University of Venda, hereby submitted by me has not been submitted previously for a degree at this or any other institution, that it is my own work in design and in execution, and that all reference material contained herein has been duly acknowledged.

Signature

24th February 2022

Date

DEDICATION

I wish to express my profound gratitude to my wife Jesca, my children Hazel, Shaw and Yearn for their constant support and encouragement throughout my years of study. I am greatly humbled and indebted to my son Shaw for his support and hard work during fieldwork and sample processing, may God bless you in your academic endeavours. This dissertation services as a testament to your unconditional love and support.

ACKNOWLEDGEMENTS

First and foremost, to God be the glory for the great things He has done for me throughout this study.

Secondly, I express my gratitude to my principal supervisor, Prof. Potgieter Natasha and co-supervisors Prof. Traoré Afsatou Ndama and Dr. Mudau Silvia Lutendo for their constructive advice. This study would not have been possible without their patience, unwavering support and consistent guidance.

I must acknowledge as well the many friends, colleagues, Microbiology students and lecturers who assisted me during the research and writing of this thesis. I am indeed thankful for their inspiring, invaluable constructive criticism and friendly advice. I must also acknowledge

Finally, I would like to express my appreciation to the various institutions and organizations that supported throughout my studies. I thanks the Research and Publication Committee of the University of Venda, South Africa, for their financial and technical support. I am also grateful to the officials from the cities of Masvingo and Harare, the Masvingo Urban Residents Ratepayers Association (MURRA), the Combined Harare Residents Association (CHRA), the Department of Health, the Zimbabwe National Water Authority (ZINWA) and the many important stakeholders that I have not listed here for their assistance during my filed research and data collection.

ABSTRACT

Examining institutional (policy) and administrative framework for water and sanitation (WSS) services in Zimbabwean cities to inform development of a new framework

Student: Taonameso Solomon (11634561)

Supervisor: Professor N. Potgieter (UNIVEN)

Co-Supervisor: Professor A.N Traoré

Co-supervisor: Dr. L.S Mudau (TUT)

The lack of access to water supply and sanitation (WSS) services in developing countries has caused various waterborne diseases and related millions of deaths. The challenges have compelled various countries to take note of the need to incorporate both technical and policy aspects of WSS services in order to promote the delivery of these services. This research examines the current institutional (policy) and administrative framework for water services in Zimbabwean cities in order to find insights that will inform the development of a new framework. The study examines the causes of urban water conundrums by identifying qualitative gaps between the ZNWP and its implementation using both an empirical and a secondary-based study; assesses the causes of urban water conundrums by focusing on quantitative gaps between the ZNWP and its implementation in the provision of water supply services using both an empirical and a secondary-based study; evaluates the current service level on water supply and sanitation, risk assessment and audit water safety plans; and also evaluates the existing paradigm, institutional and administrative framework for WSS services in urban areas to inform the development of a new management framework. Water policy implementation gaps are examined using a four-part capacity framework that includes institutional, technical/human, financial and social capacities. The framework for assessment of service level is informed by the human rights principles on water and sanitation provision that incorporates the human rights normative and cross-cutting criteria. Data for the study is collected from a literature review, semi-structured interviews with households and other stakeholders that include water service authorities and other institutions that were systematically selected. Additional data is collected from water sampling using the Compartment Bag Test (CBT), field observations across communities in Masvingo and Harare city councils with residential (suburb) categories used as units of analysis. Both descriptive and inferential and risk assessment. The Statistical Package for Social Sciences (IBM SPSS) version 26 is used to analyse quantitative data and a thematic approach used to analyse qualitative data. Themes are drawn phenomenon under study and data coded and put into categories based on the research aims. The study also identifies the elements of implementation of the ZNWP that constrain the provision of services in urban areas in the City of Masvingo and Harare and these are: financial, institutional, technical/human and social capacities. Other constraints that include political al meddling in city council duties by the central government, financial and technical/human resource capacity shortages that impact on urban local authorities (ULAs)'s capacity to deliver on WSS services are also considered in the study. The results show that financial capacity is needed to support the ZNWP programmes that include the provision of drinking water and recruitment of skilled staff among others. The notes the need for adequate political support to implement the ZNWP programmes, adequate financial support to be offered to ULAS by central government to assist in capital intensive programmes investments such as WSS service augmentation, and for transparency , communication, education and awareness to be enforced at all levels in

ULAs. The study recommends that there be an urgent development of water safety plans including education on household water treatment and safe storage (HWTS), and for the establishment of an emergency response plan by ULAs to safeguard public health and protect the right to safe drinking water for all. Consequently, the study proposes a new institutional and administrative framework that includes modifications of the old framework to reduce or eliminate the identified gaps, incorporates an independent WSS regulator who must enforce regulation of WSS services, and consists of a component of urban WASH that should be overseen by the Ministry of Health and Child Welfare's Department of Health in light of recent episodes of drinking water related diseases which are mostly the result of poor hygiene including poor storage drinking at household level. The new institutional and administrative framework should also ensure an active role of water users by including civil society organisations (CSOs) such as the rate payers' associations as legal entities in the management of WSS services.

Key words

Water policy, implementation gaps, Compartment Bag Test, household water treatment and safe storage, water safety plan.

LIST OF ACRONYMS

AC	Asbestos Cement
AfDB	African Development Bank
AFIDEP	African Institute for Development Policy
AMCOW	African Ministers' Council on Water
CAWST	Centre for Affordable Water and Sanitation Technology
CBD	Central Business District
CBM	Community Based Management
CBO	Community-based Organisation
CBT	Compartment Bag Test
CC	Catchment Council
CCT	Constitutional Court
CDC	America Centre for Disease Control
CESCR	Committee on Economic, Social and Cultural Rights
CHRA	Combined Harare Residents Association
CMAs	Catchment Management Agencies
COHRE	Centre on Housing Rights and Eviction
COP	Catchment Outline Plan
CZI	Confederation of Zimbabwe Industries
DDF	District Development Fund
Defra	Department for environment, Food and Rural Affairs
DEH	Department of Environmental Health
DID	Department of Infrastructure Development
DMA	District Metered Area
DW	Drinking Water
DWAF	Department of Water Affairs
DWR	Department of Water Resources
DW	Drinking Water
DWSS	Drinking Water Supply System
EC	European Commission
EIA	Environmental Impact Assessment
EMA	Environmental Management Agency
EMB	Environmental Management Board
EMNF	Expected Minimum Night Flow
ENF	Expected Night Flow
EPA	Environmental Protection Agency (USA)
ERP	Emergency Response Plan
ERSAR	Portuguese Water and Wastewater Services Regulation Authority
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GDWQ	Guidelines for Drinking Water Quality
GNI	Gross National Income
GOZ	Government of Zimbabwe
GTZ	German technical assistance
HACCP	Hazard Analysis and Critical Control Points
HCC	Harare City Council
HRC	Human Rights Commission

HRT	Harare Residency Trust
HRWS	Human Rights to Safe drinking Water and Sanitation
HWTS	Households Water Treatment and safe Storage
IBM SPSS	Statistical Package for the Social Sciences
ICWE	International Conference on Water and Environment
IFIs	International Financial Institutions
IDBZ	Infrastructure Development Bank of Zimbabwe
IDAs	International Development Agents
IO	Indicator Options
LPCD	Litre Per Capita per Day
IRWSSP	Integrated Rural Water Supply and Sanitation Program
ISO	International Organisation for Standardisation
IWA	International Water Association
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Program
KIWASCO	Kisimu Water and Sewerage Company Limited
LAC	Latin America and the Caribbean
MAMID	Ministry of Agriculture, Mechanisation and Irrigation Development
MDC-A	Movement for Democratic Change-Alliance
MDC-T	Movement for Democratic Change-Tsvangirai
MDG	Millennium Development Goal
MEDP	Ministry of Energy and Power Development
MENRM	Ministry of Environmental and Natural Resources Management
MLGPWNH	Ministry of Local Government Public Works and National Housing
MLGRUD	Ministry of Local Government, Rural and Urban Development
MNF	Minimum Night Flow
MoE	Margin of Error
MoEn	Ministry of Environment and Natural Resources Development
MoF	Ministry of Finance
MoHCW	Ministry of Health and Child welfare
MoTCID	Ministry of Transport Communication and Infrastructure Development
MoWAGCD	Ministry of Women's Affairs Gender and Community Development
MURRA	Masvingo United Residents and Ratepayers Association
MWRDM	Ministry of Water Resources Development and Management
NAC	National Action Committee
NCC	National Consumer Council
NCU	National Coordination Unit
NEC	National Environment Council
NGO	Non-Governmental Organization
NHRI	National Human Rights Institutions
NIHR	National Institute of Health Research
NJDEP	New Jersey Department of Environmental Protection
NMPWS&S	National Master Plan for Water Supply and Sanitation
NPA	National Prosecution Authority
NSF/ANSI	American National Standards Institute
NWA	National Water Act
NWP	National Water Policy
NWSP	National Water and Sanitation Program

NWSSP	National Water Supply and Sanitation Policy
NWSSU	National Water Supply Services Utility
O&M	Operation and Maintenance
OECD	Organisation for Economic Co-operation and Development
OFWAT	Office of Water Services (England and Wales)
OHCHR	Office of the High Commissioner for Human Rights
OPEC	Organisation of Petroleum Exporting Countries
PHHE	Participatory Health and Hygiene Education
RA	Risk Assessment
RBZ	Reserve Bank of Zimbabwe
RCDF	Rural Communications Development Fund
RDC	Rural District Council
RM	Risk Management
RS	Risk Score
SADC	Southern African Development Community
SAZS	Standards Association of Zimbabwe
SCC	Sub-Catchment Council
SDGs	Sustainable Development Goals
SLB	Service Level Benchmark
SWM	Sustainable Water Management
TDS	Total Dissolved Solids
UCAZ	Urban Councils Association of Zimbabwe
UKP	United Kingdom Parliament Organisation
ULA	Urban Local Authority
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Economic Program
UNESCO	United Nations Education Scientific and Cultural Organisation
UNESCO-WWAP	United Nations Education Scientific and Cultural Organisation World Water Assessment Programme
UNWD	United Nations Water Decade
US$	United States Dollar
VAC	Vulnerability Assessment Committee
WA	Water Act
WAG	Water Action Group
WARN	Water/Wastewater Agency Response Network
WASH	Water Sanitation and Hygiene
WB	World Bank
WHO	World Health Organisation
WHO/UNICEF	United Nations/United Nations Children's Education Fund
WIN	Water Integrity
WOP	Water Operators Partnerships
WSP	Water Safety Plan
WSS	Water Supply and Sanitation
WWAP	World Water Assessment Programme
WWRU	Water and Wastewater Regulatory Unit
ZANU-PF	Zimbabwe African National Union Patriotic Front
ZEC	Zimbabwe Electoral Commission

ZIMCODD	Zimbabwe Coalition on Debt and Development
ZINWA	Zimbabwe National Water Act
ZIP	Transparency International Zimbabwe
ZNWP	Zimbabwe National Water Policy

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1
INTRODUCTION TO THE STUDY

1.1 CHAPTER INTRODUCTION

This chapter outlines a brief background to the study, the research questions, study objectives, study aims and the impact of the study.

1.2 GENERAL INTRODUCTION

The current estimates on the attainment of Sustainable Development Goals (SDGs) indicate that more than one third of the countries are not on track to achieving universal household access to 'improved' drinking water sources by 2030 (WHO/UNICEF, 2017). The provision of water and sanitation services, waste management and health are intricately associated with the well-being of urban residents. However, the universalisation, quality and sustainability of these services delivered at a global scale constitutes one of the early 21st century's major challenges for the world and particularly for developing countries(Dube and van der Zaag, 2002; Castro and Heller, 2009). Consequently, the World Health Organisation (WHO, 2003) indicates that the international community entered the new millennium without meeting the most fundamental condition of human development, which is the universal access to water.

The United Nations declared the 1980s as the United Nations Water Decade (UNWD) with the aim of improving universal access to essential volumes (around 40 litres) of safe drinking water by 1990 (UN General Assembly [UNGA], 1980). The objective has not been fully met. Research shows that in the year 2000, 1.1 billion people constituting 17% of the world population lacked access to safe drinking water, while approximately 2.4 billion (40%) lacked access to an improved drinking water source (WHO/UNICEF, 2014). The WHO/UNICEF (2019) reported that large geographic, socio-cultural and economic inequalities in access persist and have increased in some places. Despite increases in global coverage, the latest published information on access to clean water show that, globally, more than 785 million people did not have access to at least basic water services and more than 884 million people did not have safe water to drink in 2017 (WHO and UNICEF, 2019).

However, the past two decades have witnessed significant developing and developed countries' government investment in water policy reform and supportive institutions seeking to improve the delivery of water and sanitation services (Mérnard et al., 2017). Some of the policy reforms included devolution or decentralisation of services and functions to local government, which increased room for more stakeholders in the water sector and allowed for the formation of independent regulatory bodies (United Nations Education Scientific and Cultural Organization-World Water Assessment Programme [UNESCO-WWAP], 2006; Mérnard et al., 2017). These reforms were widely promoted and supported in developing countries by bilateral and multilateral agencies (Mérnard et al., 2017; Marumahoko et al., 2020). This enormous investment in policy reform and the associated remarkable pace of technological progress in the water supply and sanitation (WSS) sector in the last decades has note benefited a significant portion of the world's population (Castro and Heller, 2009; WHO/UNICEF, 2017). The 2015 WHO and UNICEF Joint Monitoring Programme for water supply and sanitation sheds light on the persistent inequalities and in particular the gap between urban and rural residents, gender burden of water collection and the persistent exclusion of the poor from water and sanitation services (WHO/UNICEF, 2015; WHO/UNICEF, 2017).

A study by Odafivwotu (2019) that assessed the dimensions of inequality in urban and rural WASH services in Sub-Saharan Africa reveals the existence of general inequalities in WASH services at different levels in the region and particularly between urban and rural areas. The United Nations Children's Education Fund (UNCEF, 2020) indicates that urban coverage of basic drinking water services has not kept pace with population growth. The Sub-Saharan Africa region had an urban coverage of basic drinking water services of 90% and basic sanitation of 52% (UNCEF, 2020). The number of people without access to at least basic services in urban areas increased in sub-Saharan Africa and across the least-developed countries group since 2000 (UNICEF, 202O). The Sub-Saharan Africa Sustainable Development Goals (SDG) note the region as having the largest number of countries in which urban water services are failing to keep up with population growth (UNICEF, 2020).

The bleak water and sanitation conditions in the Sub-Saharan region's urban centres need further examination here. The region has the largest disparities between basic and safely managed water services for urban populations with 50% of the population having access to water services and 20% to sanitation. Poor urban households have much lower levels of access to basic water sanitation and hygiene (WASH) services than richer households. In addition, poverty-related inequalities are prevalent across different levels of WASH services in Sub-Saharan Africa (UNICEF, 2020). The other forms of urban WASH inequalities identified in Sub-Saharan Africa include the burden of water collection which falls mainly on women and girls.

Access to safe drinking water also varies widely within countries in Sub-Saharan Africa and across the least-developed countries group, with the inequalities are worsened by affordability of WASH services (UNICEF, 2020).According to the UNICEF (2020), the urban coverage of at least basic water services in Zimbabwe was 91% in 2017. In addition, the urban population increased by 1.2 million, but the number of people with access to at least basic sanitation services decreased by 130,000 leading to a sharp reduction in coverage from 65% to 46%. Overall, the progress made to close the gap in accessing basic water services between the richest and poorest urban populations between 2000 and 2017 shows that the gap has even increased for Zimbabwe. In 2000, the gap was 6% (98% wealth quintiles and 92% poorest quintiles) and in 2017 it increased to 8% (97% wealth quintiles and 89% poorest quintiles) (UNICEF, 2020).

Finally, the SDG Target 6.1 call for all nations to ensure universal access to safely managed drinking water services by 2030), hence the need for this study to assess the implementation of the ZNWP (UNICEF, 2020). Eliminating inequalities is a basic human rights principle which is critical for realising human rights to water and sanitation and leaving no one behind in access to WASH services (UNICEF, 2020). The identified disparities are threats toward the attainment of the SDGs for WASH in Zimbabwe and the Sub-Saharan region.

1.3 PROBLEM STATEMENT

This study focuses on WSS services in Zimbabwe owing to the reality that the country's urban areas have continued to experience episodes of waterborne diseases in the past recent years. This situation paints a gloomy picture on the progress the country is making towards fulfilling the human rights to water and sanitation and the 2030 Agenda for Sustainable Development.

Therefore, the study analyses the Zimbabwe National Water Policy (ZNWP) because studies focusing on the inadequate implementation of WASH policies in some countries note that there exists f disparities in access to improved WSS services. The purpose of this study was therefore to carry out both an empirical and secondary study to determine sources of both quantitative gaps and/ or technical problems in the provision of water and sanitation services in urban areas. The study also unpacks the qualitative gaps between the Zimbabwe National Water Policy and its implementation and seeks empirical evidence on how to reduce and/ or eradicate the gaps to improve water service delivery, and inform the development of a contextualised framework for management of these services.

1.4 SIGNIFICANCE OF THE STUDY

Crucial challenges facing the water and sanitation sector worldwide are neither the result of lack of technological solutions to the problems nor the result of water scarcity. Instead, there is a paradox in these water problems since they are experienced even when best technology is available, surface water and ground water is plenty and when mean rainfall is high. It is argued that although technical problems exist, the global crisis of urban water supply and sanitation is primarily a result of poor governance and policy failure because of inadequate implementation (Davis and McGinn, 2001; Delli Prescolli et al., 2004; EUWATER NETWORK, 2005; UNESCO-WWAP, 2006; UNESCO-WWAP, 2015).

The poor state of service delivery in urban areas of Zimbabwe directly impacts on urban dwellers' well-being. Many studies have reported widespread complaints over poor municipal and local governance service delivery (Dube and Swatuk, 2002; Nicol and Mtisi, 2003; Nhapi, 2009; Chigonda, 2011; Mapfumo and Madhesha, 2014; Murimoga and Musingafi, 2014; Musingafi et al., 2015; Makurira and Viriri, 2017; Kativhu et al., 2018). There is a general decline in municipal service delivery and capital development in local authority governed areas with extreme cases noted in cities that include Harare, Chitungwiza, Bindura and Redcliff. As a result, a former minister at one stage dismissed senior officials of council and sometimes the entire council because of poor service delivery, maladministration, abuse of public funds, abuse of authority or office, fraudulent dealings and corrupt tendencies (Murimoga and Musingafi, 2014).

The poor state of governance and water services delivery in Zimbabwe's urban local authorities prompted the need to establish the state of affairs and sources of policy implementation gaps that lead to poor WSS services. The Zimbabwe National Water Policy is expected to be an effective instrument in protecting the wellbeing of all Zimbabweans. However, Tom and Munemo (2015) note that the formal policy statements and principles in the Republic of Zimbabwe National Water Act and the Republic of Zimbabwe National Water Policy, such as efficient water supply, quality potable water, rights-based access, equity, sustainability and empowerment, do not correspond with the realities of service delivery. In addition, Brinkerhoff and Crosby (2002); Pretorius (2003); Tom and Munemo (2015) and Signé (2017) concur that policies that sound "good" on paper and yet not realized in practice indicate implementation gaps and therefore signal policy failure.

This reality of a mismatch between Zimbabwe National Water Policy and its implementation has not led to an empirical study that analysed both the quantitative gaps and technical problems in the water supply sector and the qualitative gaps between the ZNWP and its implementation as possible drivers of urban water woes in Zimbabwe. Those who studied the Zimbabwean water sector restricted their studies to the quantifiable gaps and technical problems and where qualitative gaps between the

National Water Policy and its implementation were studied, the researchers restricted themselves to desk review (secondary study) to explore, discover and interpret qualitative gaps of the ZNWP and its implementation.

1.5 RESEARCH QUESTIONS

The research questions that guided the study were:

i What are the quantitative or qualitative gaps between the ZNWP and its implementation based on literature review and empirical evidence in order to explain the causes of critical potable water shortages in Zimbabwe's urban areas?

ii Which risk factors exist in the water supply and sanitation sector in urban areas and what is the current service level in urban areas?

iii What policy (institutional) and administrative framework guides urban water supply and sanitation management?

1.6 AIM AND OBJECTIVES

1.6.1 AIM OF THE STUDY

The main aim of this study was to examine the institutional (policy) and administrative framework for water and sanitation (WSS) services in Zimbabwean cities to inform the development of a new framework

1.6.2 OBJECTIVES OF THE STUDY

- To examine causes of urban water conundrums by analysing qualitative gaps between the ZNWP and its implementation using both an empirical and a secondary-based study,
- To examine causes of urban water conundrums by analysing quantitative gaps between the ZNWP and its implementation in the provision of water supply services using both an empirical and a secondary-based study,
- To examine the current service level on water supply and sanitation, risk assessment and audit water safety plans,

- To evaluate the existing paradigm, institutional and administrative framework for WSS services in urban areas to inform development of a new management framework.

1.7 CHAPTER SUMMARY

This chapter presented the background to this study and identified the problem being investigated as well as the associated aim and objectives. The chapter also outlined both a justification for and significance of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This Chapter presents an in-depth review of concepts and ideas from available scholarship on public policy and the application of these concepts to water management. The chapter starts with a review of the water policy concept and the main paradigms that are used to manage WSS services, and then goes on to focus literature focusing on urban water conundrums, the Zimbabwe constitution and legislative provisions for WSS services, water institutions in Zimbabwe and urban WSS governance in Zimbabwe. Finally, the water supply services, which also include sewerage and proper wastewater management, can be provided using either of the paradigms of water and sanitation services listed below (Juhola, 1995; in Hukka and Katko, 2003).

2. 2 GENERAL INTRODUCTION TO WATER POLICY

A “policy” is defined as the highest set of decisions, made by the highest political level in any country after a process of dialogue and consultations, which determine what and how things should be done in any given sector (MWRDM, 2012). A definition by the United Nations Development Programme Water Governance Facility and UNICEF (UNDP/UNICEF, 2015) considers a policy as a set of rules, procedures and allocation mechanisms embedded in laws and regulations that guide programmes through which services are produced and delivered. In addition, the OECD (2015) define water governance as a set of rules, practices (formal/informal) through which decisions on the management of water resources and services are taken and implemented, and processes in which stakeholders articulate their interests and decision makers held accountable. Therefore, a public water policy is the legislation (statutory law) and regulations that underpin or support water management (United Nations [UN].Global Compact, 2015; OECD, 2015).

Any national policy starts with a political decision in which the coercive powers of the state are exercised. Political decisions involve mechanisms such as elections, public administration and budgets approved by legislation (Wood, 2000; OECD, 2011; UND/UNICEF, 2015). The public policy approach to analysis of WSS policies is concerned with the implementation of programmes using financial and material resources provided compulsorily by citizens within a framework of public objectives (Wood, 2000 in Castro and Heller, 2009; OECD, 2011). The final aim of a public policy is to achieve the social goals defined by citizens through their elected representatives (Cochran and Malone, 1995). The United Nations (UN), World Bank and regional development banks have followed by developing water supply and sanitation management and policy guidelines that make it mandatory for states and governments to develop realistic policies and action plans to fulfill the basic needs of their populations (UN Millennium Project, 2005; Nawab and Nyborg, 2009).

There are three key components that must be considered in any analysis of public policy such as WSS policies (Cochran and Malone, 1995):

i) Political decisions

This term maybe understood in many ways and these include restricting it to those decisions that produce legislation, or reference to any decision in which the coercive powers of the state are exercised (Wood, 2000). Political decisions involve mechanisms such as elections, public administration and budgets that are approved by legislation.

ii) Implementation of programs

The public policy approach to an analysis of WSS policies is concerned with the implementation of programmes, using financial and material resources provided compulsorily by citizens within a framework of public objectives (Wood, 2000).

iii) Achieving societal goals

The final aim of any public policies is to achieve the social goals defined by citizens through their elected representatives.

A National water policy (NWP) should be conceived and implemented within the framework of an interdisciplinary national economic, social and environmental development policy (Salman and Bradlow, 2006). An NWP requires the definition of goals for different water uses that include the supply of safe drinking water, wastewater treatment and disposal facilities as well as water for agriculture, stock raising, industry needs, transportation and hydroelectricity in a way that is compatible with the resources and characteristics of the area concerned (Salman and Bradlow, 2006).

Public policy formulation occurs at all levels of government with the overarching legislative framework typically developed at the national or state level/provincial level, whereas management and operational aspects are implemented at the local or catchment level (UNEP, 2015; UN-Global Compact, 2015). The end goal is sustainable water management (SWM) which is a broad concept that means different things to different people with human rights activists considering SWM as a point when all humans receive adequate supplies of safe drinking water; environmentalists focusing on ensuring adequate environmental flows to sustain ecosystems; economists may think of it in relation to water pricing that can sustain a system's operational, maintenance and capital costs over the long term, and business might think of it as when reliable access to water resources is secured, thereby reducing any risks to the business.

According to the UN Environment Program (UNEP, 2015), the SWM at its most basic level refers to the management of water resources that holistically address equality, economic, and the environment in a way that maintains the supply and quality of water for a variety of needs over the long term and ensures meaningful participation of all affected stakeholders. Therefore, sustainable water management is a state when four domains of sustainability are effectively implemented (UNEP, 2015).

These domains are:

i) Social sustainability

This refers to a state where all humans have equitable access to adequate and affordable water services to meet their health and livelihood requirements, and where citizens and communities play a meaningful role in water governance and decision-making.

ii) Environmental sustainability

This refers to a state where water use and management do not compromise the biodiversity, functioning of habitats, or ecological or hydrological process that are essential to society.

iii) Economic sustainability

This refers to a state where water management is affordable and cost effective, and economic costs and financial risks are understood, minimised and balanced in a transparent, socially acceptable and institutionally sustainable way. It is a state where institutions tasked with water management have sufficient resources and social legitimacy to function over a long term.

2. 3 THE COMPLEXITY OF WATER POLICY IMPLEMENTATION

Currently, more than a third of the countries globally, are not on track to achieve universal household access to 'improved' drinking water sources by 2030 (WHO/UNICEF, 2017). The various challenges facing the water and sanitation sector worldwide are neither the consequences of lack of technological solutions to the problems nor the result of physical-natural constraints, such as water 'scarcity'. There is a paradox in these water woes since they are experienced even when the best technology, surface water and ground water is plenty and when mean rainfall is high (Tom and Munemo, 2015). The global water crisis, including the crisis of WSS services, is primarily a 'crisis of governance' (UNESCO-WWAP, 2006; OECD, 2011; Chigudu, 2014; OECD, 2016), which is a fundamentally ethical challenge that we face in the twenty-first 21st century (Davis and McGinn, 2001; Delli Prescolli et al., 2004; EUWATER NETWORK, 2005).

Governance involves the establishment of policies, and continuous monitoring of their proper implementation, by the designated members of an organisation. Public water policy is the legislation (statutory law) and regulation that underpin or support water management (UN.Global Compact, 2015; OECD, 2015). The public policy approach to analyze WSS policies is concerned with the implementation of programmes, and the use of using financial and material resources provided compulsorily by citizens within a framework of public objectives (Wood 2000; OECD, 2011). A further observation by Hayes (2001) considers policy implementation as consisting of organised activities by government that is directed towards the achievement of goals and objectives stipulated in a policy. Kalaba (2016) also describes implementation as encompassing the translation of policy decisions into on-the-ground actions that is, often supported by statutes.

On the contrary policy implementation failure, referred to as a policy implementation gap, is the variation between the establishment of a policy and the practical exercise of the policy Nadgrodkiewicz et al. (2012). According to Green (2012), “An implementation gap is where a set of institutions (often created via decentralization), policies or budgets (or all three) exist on paper, but are absent on the ground”. Furthermore, Nakagaki (2013) defines an implementation gap as the variation between documented policies or regulations and their actual execution in practice. Similarly, implementation gaps develop due to inconsistent and improper applications of laws and regulations, especially at the local level. Overall, an implementation gap is the difference between what is stated in the policy, programmes, regulation or law and what is actually noted in practice, hence, it is the failure to adhere to established regulations (Brinkerhoff and Crosby, 2002; Hagg and Emmet, 2003; Louw, 2003; Pottie, 2003; Pretorius, 2003; Magoro and Brynard, 2010; Phago, 2010; Tom and Munemo, 2015; Signé, 2017).

It has been noticed that what is stated in policy documents may not always be realised in practice and the reasons for the disjunctions are varied depending on the context. Policy analysts point out that policy implementation can be affected directly or indirectly by four capacity elements and these are: institutional; Financial; technical/human and social capacity (Minnes and Vodden 2017). These are considered, by Timmer et al. (2007), as the factors that constrain policy implementation as “capacity limitations”. Rawlyk and Patrick (2013), defines capacity as “*the ability, or capability, of a local community; local authority and water service providers to meet regulations, policies or standards that have been established*”. Therefore, the ability of institutions mandated with water service responsibilities to actively and effectively implement policy programmes constitutes capacity.

A deficient local capacity leads to limited water policy initiatives and misguided decisions, which include setting low tariffs for urban water utilities and insufficient testing for water, from local authorities in meeting best practices requirements (Baietti et al. 2006; Morgan 2017; SLB 2018). Nonetheless, an effective implementation of water policies by municipalities, water utilities, city councils, local governments or any other institution mandated to provide these services, requires financial, technical, institutional, and social/political capacity (Tom and Munemo 2015; Minnes and Vodden 2017; Imonikhe & Moodley 2018; Eledi, 2019).

The , four elements of capacity, which are institutional, technical/human, financial and social that contribute ng to implementation successes and failures of water policies such as Source Water Protection (SWP) policies, water safety plans and national water policies are outlined in (Table 2.1).

Table 2.1: Elements of Capacity for Source Water Protection (Minnes and Vodden (2017)

Element	Definitions and Indicators
Institutional	The legislation, regulations, policies, protocols, governance arrangements and delegation of responsibility to plan and enact SWP. *Examples of indicators include*: • Provincial legislation and policies that provide guidance for drinking water protection at the local level. • Municipal planning strategies and by-laws protecting current drinking water supplies. • Land use activities in municipal areas used to control fields, recharge and watershed water supply. • Land purchased for the protection of current municipal water supplies. • Plans been developed to guide municipal actions during water quality emergencies. • All responsible for SWP know their responsibilities for implementation and enforcement.

	• Integration of institutional arrangements for land and water management. • Local land use planning that supports SWP at a watershed or regional level.
Financial	The ability to acquire adequate funds to pay for SWP efforts as well as for ongoing planning, governance and management efforts. *Examples of indicators include*: • Organizations responsible for protecting source water supplies being able to maintain a balanced budget. • The ability of organizations responsible for protecting source water supplies to obtain funding from outside sources. • Water rates for customers reflecting the full cost of protecting and providing municipal drinking water (eg. treatment, distribution, maintenance, and SWP). • Availability of funding for municipal SWP projects. • The use of financial mechanisms to reduce water use (e.g., water rates charged by municipal water utility are used to reduce water consumption).
Social	The social factors that influence SWP governance and implementation. This includes social norms (e.g., values, attitudes, behaviours, sense of place, trust, reciprocity, commitment and motivation) that impact on public awareness, stakeholder involvement, community support, and public and private partnerships in SWP efforts. This also incorporates structural networks, communications and the relationships between different groups' interests and actors. *Examples of indicators include*: • Clear leadership for water quality protection at the watershed level exists. • Active linkages between municipality and provincial agencies exist (vertical linkages). • The existence of active linkages among watershed municipalities (horizontal linkages). • The maintenance of active linkages between municipality and relevant community organisations (horizontal linkages). • Community awareness and support for watershed protection.
Technical/Human	This relates to the physical and operational ability of an organisation to perform SWP management and operations adequately. This also involves having the human resources, with adequate knowledge, skills and experience to properly create source protection plans and implement needed measures.

<u>*Examples of the indicators include organisations responsible for protecting source water supplies that have*</u>:

- Employees dedicated to water management.
- Access to individuals with the necessary skills and training to manage drinking water.
- Education and training opportunities available to staff members and decision makers.
- Access to individuals with the expertise needed to undertake technical activities related to drinking water quality.
- Access to the data needed to manage water supplies, delineate watersheds and aquifers, and develop source protection plans in the case of SWP policy.

2. 3.1 ZIMBABWE'S INTERNATIONAL, REGIONAL AND NATIONAL PRINCIPLES, AND COMMITMENTS

According to Monney and Kafui (2017), a number of guidelines have been developed to assist managers in the water sector on how to develop appropriate policies for managing water resources. Amongst these are the Food and Agriculture Organization of the United Nations (FAO)'s publications on "*Reforming water resources policy – A guide to methods, processes and practices*" and "*Water sector policy review and strategy formulation*". The general framework's guidelines include the international best practices for water planning and allocation (FAO, 1995). Abrams (2000), also gives a guide on how to prepare water policies. According to Chigudu (2015), in Africa and Zimbabwe in particular, policies have invariably been formulated to cater for citizens to address previous socio-economic imbalances.

Zimbabwe has committed itself to several global, regional and national frameworks on safe water and hygiene. The Ministry of Water Resources Development and Management (MWRDM, 2012) notes that Zimbabwe has ratified a number of international, regional and national guiding principles and commitments in relation to water. The guiding frameworks against which Zimbabwe appended its signature and has obligations to fulfil include the 2002 International Covenant on Economic, Social and Cultural Rights (ICESCR) General Comment No. 15 and the United Nations General Assembly Resolution A/RES/64/292 on the human right to water and sanitation. The Zimbabwe Government committed itself to ensure that everyone is entitled to adequate, safe, physically accessible and affordable water for personal and domestic uses (MWRDM, 2012). The African Union Summit of 2008, to which Zimbabwe is a signatory, articulated the need for a commitment to accelerate the achievement of Water and Sanitation Goals in Africa. This was further buttressed by the Second Africa Conference on Sanitation and Hygiene AfricaSan +5 2008 in South Africa through the firm resolution to put sanitation and hygiene at the top of Africa's development Agenda. In addition, the Zimbabwe Public Health Act [Chapter 15:09] outlines the duty of a local authority in the provision of water supplies in line with health requirements while other agencies providing water in an area, such as the Zimbabwe National Water Authority (ZINWA), are also expected to comply with this requirement. The Public Health Act also requires the local authority to maintain existing water supplies in good working order. Finally, the Zimbabwe Disaster Risk Management policy provides a framework for realising sustainable development through reduction of the burden of disasters on the environment, the poor and most vulnerable.

In addition, the SADC Regional Water policy of 2005 provides essential guidelines that serve as a framework for policy in Zimbabwe. The policy notes that member states have a social and economic responsibility to ensure sustainable access to safe water supply for basic human needs in their respective countries; should prioritise the allocation, access and utilisation of water resources for basic human needs over any other allocation, access and utilisation; must ensure sustainability of water supply services to all areas with cost recovery underpinning all infrastructural developments and operations, i.e. users will pay an appropriate amount towards the cost of providing the services; and that based on the account Member States' social responsibilities to the poor member States will facilitate the provision of sustainable access to adequate sanitation for all urban, peri-urban and rural households.

Just like water policies of other African countries that are guided by international best practices (human rights-based principles) for water planning and allocation (FAO, 1995), the ZNWP in its policy statements articulates that '*All urban water users should enjoy* *adequate, continuous, readily accessible, safe, hygienic, sustainable and affordable domestic water and sanitation services provided by accountable, efficient, coordinated, well-funded and capacitated institutions*' (MWRDM, 2012). Provision of affordable and sustainable WASH services is also a key goal of the ZNWP (MWRDM, 2012). Thus, the Zimbabwe National Water Policy (ZNWP) and other legislation are all guided by the above listed international, regional and national principles. Table 4.2 has summarised requirements that need to be met in order for water services to be regarded as best practice.

2. 3.2 LEGISLATIVE FRAMEWORK ON WATER SERVICES IN ZIMBABWE

The Government of Zimbabwe (GOZ) introduced major water sector reform programmes after the attainment of independence in 1980. The aims of the reforms were to align national water legislations with national goals of redressing the inequitable access to the country's water resources which were embodied in the 1976 Water Act and to embrace the Integrated Water Resources Management (IWRM) principles in line with the Water Act and Zimbabwe National Water Act (ZINWA) of 1998. The Water Act of 1998 placed all forms of water under State custodianship, represented by the President. Moreover, water rights were replaced with renewable water permits which eliminated the legal concept of water rights supported by the administrative water allocation system (Nhapi, 2009). Thus, the 1998 Act sought to establish a more equitable system for the distribution of water, improve stakeholder participation and to establish the catchment as the basis for the management of water resources (MWRDM, 2012).

In addition to the Zimbabwe National Water Act (ZINWA) Chapter 20:25, there are other Acts including the Water Act (Chapter 20:24); the Environmental Management Act (EMA) Chapter 20:27, the National Water Policy of 2013 as well as Statutory Instruments like the 1913 Water Regulations By-law (Statutory Instrument 164 of 1913). The National Constitution of Zimbabwe Section 77(a) also provides for the human right to water but sanitation is excluded. The above-mentioned laws do not have provisions on the human rights to water and sanitation, which contradicts the Zimbabwean constitution's dictates that recognise the provision of safe clean water as a human right (MWRDM, 2012). The inconsistence between these laws, as stated above, bred rampant violations of human rights to water and sanitation in Zimbabwe. Hence, the new National Water Policy (NWP) of 2013 makes a call to synchronize the Water Act of 1998 (Chapter 20:24), ZINWA Act of 1998 (Chapter 20:25), EMA Act of 2002 (Chapter 20: 27), Urban Councils Act the 1996 Edition (Chapter 29:15), Rural District Councils Act (Chapter 29:13), 1996 Edition, Mines and Minerals Act (Chapter 21:05) 1996 Edition and the Public Health Act (Chapter 15:09), which underpin the water sector in Zimbabwe.

There is no single document that provides a policy framework for the management of the country's water resources, and for the provision of water and sanitation services (AfDB, 2010; MWRDM, 2012). The late 1990s witnessed the country moving towards a decentralised water resources management through the introduction of the 1998 Water Act and ZINWA Act (Dube and Swatuk, 2002; Nhapi, 2009; AfDB, 2010; Tom and Munemo, 2015). The Water Act (WA) of 1998 reformed the sector to ensure more equitable distribution of water and stakeholder involvement in the management of water resources (Dube and Swatuk, 2002; Nhapi, 2009; AfDB, 2010; Makurira and Viriri, 2017). The new stipulations prevent private ownership of water with the prior system of water rights replaced by water permits of limited duration that are allocated by Catchment Councils (AfDB, 2010; Dube and Swatuk, 2002). Thus, the Act means that water is now being be treated as an economic good with the principle of "user pays" applied thereof.

Zimbabwe also enacted the ZINWA Acts based on universally accepted principles of Integrated Water Resources Management (IWRM) and after following wide consultative processes from 1994 to 2002 (AfDB, 2010; Nhapi, 2009; Dube and Swatuk, 2002). Zimbabwe embraced potable water supply governance and institutional reforms in line with the dictates of the IWRM principle. The new policy and legislative frameworks that were enacted include, the Water Act (Act No. 31 of 1998, Chapter 20: 24), the National Water Authority Act (Act No. 11 of 1998. Chapter 20: 25). The post-1998 legislation include, the Water (Catchment Councils) Regulations (Chapter 20: 24), Statutory Instrument 33 of 2000: Water (River Systems Declaration) Notice (Chapter 20: 24), Statutory Instrument 34 of 2000: Water (Sub-catchment Councils) Regulations (Chapter

20: 24), Statutory Instrument 47 of 2000: Water (Waste and Effluent Disposal) Regulations (Chapter 20: 24), Statutory Instrument 274 of 2000: Water (Permits) Regulations (Chapter 20: 24), Statutory Instrument 206 of 2001: Guidelines for boreholes, groundwater monitoring and groundwater use (September 1999) were formulated using the IWRM principle (Musingafi et al., 2015; AfDB, 2010, Nhapi, 2009; Dube and Swatuk, 2002).

The Zimbabwe National Water Authority Act (ZINWA) of 1998 also led to the creation of ZINWA, a parastatal agency responsible for water planning and bulky supply (Makurira and Viriri, 2017; AfDB, 2010; Nhapi, 2009). The responsibilities of ZINWA include the management of water permit system, pricing of water, operating and maintaining existing infrastructure, and executing development projects. According to the African Development Bank (2010) report, ZINWA was to devolve responsibility for managing river systems and enforcing laws and regulations at a local level. The Environmental Management Act of 2002, provides for the establishment of the National Environmental Council (NEC), the Environmental Management Agency (EMA), Environment Management Board (EMB), and the Standards and environmental quality standards and environmental plans, provides for environmental impact assessments, audit and monitoring of projects, and for other matters related to management and conservation of the environment (Makurira and Viriri, 2017; AfDB, 2010; Nhapi, 2009). The Environmental Act of 2002 also empowers the government to command public and private development institutions to undertake an Environmental Impact Assessment (EIA) before undertaking any activities to protect the environment as one of the activities that require EIA.

2. 3.3 THE ZIMBABWE NATIONAL WATER POLICY (ZNWP)

Zimbabwe was the only country in Southern Africa that did not have a National Water Policy (NWP) until the Zimbabwe National Water Policy (ZNWP) came into force in 2013 through a baseline work by the Ministry of Water Resources Development and Management (MWRDM), World Bank (WB) and UNICEF. Principally, the ZNWP considers water as a social and economic resource that should be of high quality, universally accessible and affordable (Chikozho, 2002; MWRDM, 2012; Chirenda et al., 2015). The identified beneficiaries are all domestic and industrial consumers in Zimbabwe.

According to the Ministry of Water Resources Development and Management (MWRDM, 2012), the overall goal of the water sector is to achieve sustainable utilisation of water resources. The vision is that a sustainable use of water will improve: Equity in access to freshwater by all Zimbabweans, the efficient use of water among competing uses, provision of affordable and sustainable WASH services, environmental protection, protection of water sources including safety of the country's dams and groundwater, consumer and institutional viability in the water sector, the economic development of the country and the administration of the Water Act. The MWRDM (2012) notes further that, the following policies have been identified as priority policy directives that are crucial to breaking the cycle of urban water challenges in the country. The detailed policy statements contained in the National Water Policy are built on a set of policy principles which are based on core values of sound practice in the water sector. Murungweni (2011); Makurira and Viriri (2017) point out that the development of the Zimbabwe National Water Policy was guided by the following principles:

i. ***Equity in access to water***

Many Zimbabweans were relocated into commercial farming areas which partially resulted in an improvement of equity in access to water to those resettled, however this benefit was not fully accessed as most of the resettled lack financial resources, thus leading to a drastic reduction water in water utilisation.

ii. ***User pays***

All users must pay the cost of water production and sustainable running of water supply services.

iii. ***Polluter pays***

Those who pollute should be fined and obliged to clean up the environment as a deterrent to potential polluters.

iv. ***Sustainability***

Water sources need to be protected and a water demand management principle used to promote sustainable use of water to guarantee its physical availability.

v. ***Environment as a user of water***

The environment should be highlighted as one of the beneficiaries of the ZNWP to guarantee sufficient quantity and quality water in order to protect riverine life and wildlife.

vi. ***Economic feasibility***

This means water tariffs and rates must reflect the cost of water resources development, operating cost and maintenance.

vii. ***Catchment approach***

Water management should be done at catchment level since precipitation, run off groundwater levels, storage, vegetation cover and water quality are dependent on locality.

In this research, water services include both water supply and sanitation. The ZNWP identifies a range of stakeholders that are crucial to ensure efficient provision of WSS services.

The ZNWP also makes a distinction between Water Service Authorities and Water Service Providers as outlined below:

Water Service Authorities:

The ZNWP designates Urban Local Authorities (ULAs or Urban Councils) and Rural District Councils (RDCs) as Water Services Authorities that have a duty to ensure efficient, affordable and sustainable access to water services are provided to all their current and potential consumers.

Water Service providers:

The provision of water supply and sanitation services can be delegated by a ULA or RDC to a designated Water Services Provider that is a legal entity capable of carrying out water supply and sanitation services on behalf of the ULA or RDC (MWRDM, 2012). Service Authorities have the power and authority (through the Urban Councils Act and the Rural District Councils Act), to enter contractual agreements with Service Providers if they do not supply the services themselves (MWRDM, 2012). Service Providers are legal entities (public, private or mixed) that have the capacity to provide water supply and sanitation services to Service Authorities. A Service Provider, according to the ZNWP, could be the National Water Supply Services Utility (NWSSU) under ZINWA, Private Sector or any other legal entity. Individual ULAs and RDCs have flexibility to decide on the model they want. The term “Water Services” includes water supply and sanitation services. Service authorities collect payments from consumers based on government approved tariffs (MWRDM, 2012).

The MWRDM (2012) indicates that the ZINWA’s roles of planning, development and management of Zimbabwe’s water resources, have been largely unfulfilled because of a decline in revenues from agricultural water after the post-2000 land reforms in the country. Consequently, ZINWA solely depends on revenue from sales of potable water. The shift in the source of revenue compromised the water resources development and management function envisaged in the 1998 Zimbabwe Water Act (MWRDM, 2012). Nevertheless, the ZNWP redefined ZINWA’s main duties to include water resources development and management run on catchment basis and potable water provision, to be operated from appropriate administrative locations. The ZNWP has consolidated the former potable water supply functions of ZINWA into a NWSSU utility under a ZINWA dedicated to potable water supply. This allows the ZINWA parastatal to concentrate on water resources planning, development and raw water supplies (MWRDM, 2012).

The ZNWP dictates the setting up of a Water and Wastewater Services Regulatory Unit (WWSRU) as a section under the MWRDM. This establishment seeks to monitor all Water Supply and Sanitation Services; receive and assess tariff applications in collaboration with relevant ministries such as MLGRUD and MAMID; and oversee the licensing of Water Service Providers by Water Services Authorities.

The Water and Wastewater Services Regulatory Unit (WWSRU) is expected to ensure that consultations among Water Service Authorities, Water Service Providers and Consumers are undertaken prior to any adjustment of tariffs. According to the ZNWP, users cover recurrent costs of operation and maintenance of WSS infrastructure. Furthermore, the ZNWP mandates the adoption of water supply and sanitation service standards for which the recurrent costs for affordable to users (MWRDM, 2012). The ZNWP dictates that the polluter pays principle be implemented and that real deterrents and real incentives that discourage pollution be enforced. Furthermore, polluters are required to restore the environment, undertake clean-up operations and pay damages with the major threat being the withdrawal of their operating licences (MWRDM, 2012). Finally, the ZNWP institutes the control of non-point sources of pollution (such as mercury used in artisanal mining) and control of agro-chemicals used in agriculture.

The above discussion shows that the ZNWP is well equipped with principles that have a potential to take WSS service delivery in the right direction towards attainment of the SDG Target 6.1 on water and sanitation by 2030 if implemented.

2.3.4 RESPONSIBILITIES OF WATER INSTITUTIONS IN ZIMBABWE

The institutional and governance principle of subsidiarity determines the areas of responsibility and levels of authority for central, provincial and local government in the management of water resources and the provision of water services (MWRDM, 2012). According to the principle of subsidiarity, nothing that can be done by a smaller, more local and simpler organisation should be done by a larger complex organisation such as a central government. The central authority has a subsidiary role, performing only those tasks that cannot be performed effectively by a more immediate or local authority. The MWRDM (2012) stipulate that institutions should have clear, unique and unambiguous mandates that are not duplicated by other institutions or other levels of government. In addition, institutions should not have mandates that have internal conflicting interests and there should be clear separation of policy and regulation, development and service provision functions (MWRDM, 2012). Finally, all institutions and agencies with responsibility for water related matters that include agriculture, environment, local government, mining, industry, health, welfare, economic planning, and finance, are expected to coordinate, communicate and interact with each other.

The ZNWP dictates that government ministries and departments be responsible for policy and regulation, and should not engage in operations and implementation. The private sector, parastatals and civil society have an important role to play in the water sector. These institutional arrangements stem from the Zimbabwe Water Act of 1998 and the ZINWA Act of 1998. Hence, the above policy principles show the institutions of water and sanitation sector are organised by law and policy set as per their responsibilities for service provision.

The African Development Bank (2010) identifies four distinct areas of service and related institutional arrangements which are: Water resources management, urban water supply and sanitation (WSS), rural water supply and Sanitation, and Irrigation. The roles and responsibilities for the sector are spread amongst several government agencies. In June 2010, the Cabinet agreed on sector leadership, the responsibilities of key government ministries, and a coordination framework (AMCOW, 2011). Figure 2.1 presents the new sector coordination arrangements.

The main water sector roles are subdivided amongst the Ministry of Water Resources Development and Management (MWRDM); the Ministry of Health and Child Welfare (MoHCW); the Ministry of Local Government, Rural, and Urban Development (MoLGRUD); the Ministry of Transport, Communications and Infrastructure Development (MOTCID); the Ministry of the Environment (MoEn) and District Development Fund (DDF) (AMCOW, 2011). The Ministry of Water Resources Development and Management (MWRDM) leads the entire water sector and chairs a redesigned National Action Committee (NAC) responsible for sector coordination. The MWRDM is responsible for water resource management policy and development with implementation carried out by its parastatal arm, the Zimbabwe National Water Authority (ZINWA) (MWRDM, 2012, Water and Sanitation Program (2010). The Ministry of Health and Child Welfare (MoHCW) has the responsibility for rural sanitation, environmental health education and public health. The Ministry of Healthy and Child Welfare (MoHCW), through its Department of Environmental Health (DEH), is responsible for the promotion of improved public health and rural sanitation as well as individual water supply facilities such as hand dug wells and springs in rural areas.

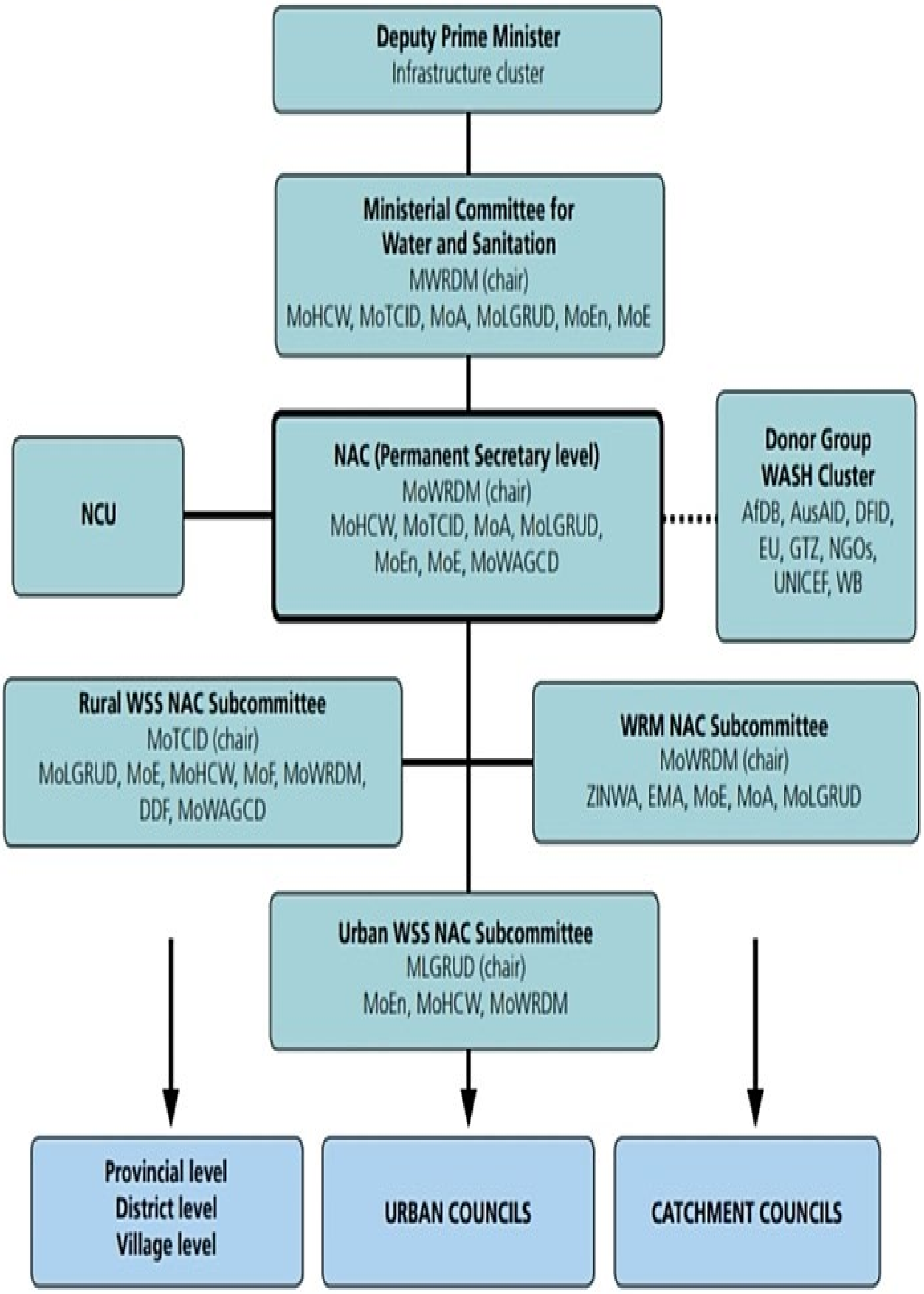


Figure 2.1: Zimbabwe water sector institutional structure as established in June 2010 (AMCOW, 2011, accessed March 2021)

The Ministry of Local Government, Rural, and Urban Development (MoLGRUD) hosts rural district and urban councils, establishes policy and supports the planning operations of the councils. The Ministry of Local Government, Rural and Urban Development (MoLGRUD), through the local authorities, are responsible for the provision of these services in both urban and rural areas. The Ministry of Transport, Communications and Infrastructure Development (MOTCID) hosts the Department for Infrastructure Development, which supervises rural infrastructure investment. The Ministry of the Environment (MoEn) houses the Environmental Management Agency (EMA) that has the responsibility of enforcing water pollution control. The District Development Fund (DDF) is a technical parastatal with responsibilities for rural water supply and maintenance. The District Development Fund (DDF), which used to be under the MoLGRUD but has been moved to the Office of the President, invests in rural water supply and their maintenance (Nhapi, 2009; AfDB, 2010; Makurira and Viriri, 2017).

For purposes of managing the nation's water resources, Zimbabwe is divided into 7 catchments that are based on the six major river basins in the country (Figure 2.2). Each catchment is administered by an elected council and with technical support from ZINWA (AfDB, 2010). ZINWA is a parastatal of the Ministry of Water Resources Development and Management and provides technical support to decentralise the management of these resources directly to Catchment Communities (Chikozho, 2002; Nhapi, 2009; AfDB, 2010; Water and Sanitation Program, 2010; MWRDM, 2012; Makurira and Viriri, 2017). ZINWA is also responsible for water supplies in the country's rural growth centers (growth points). Finally, Urban Local Authorities (ULAs or Urban Councils) and Rural District Councils (RDCs) serve as the Water Services Authorities with the duty to ensure efficient, affordable and sustainable access to water services d for all their current and potential consumers (MWRDM, 2012).

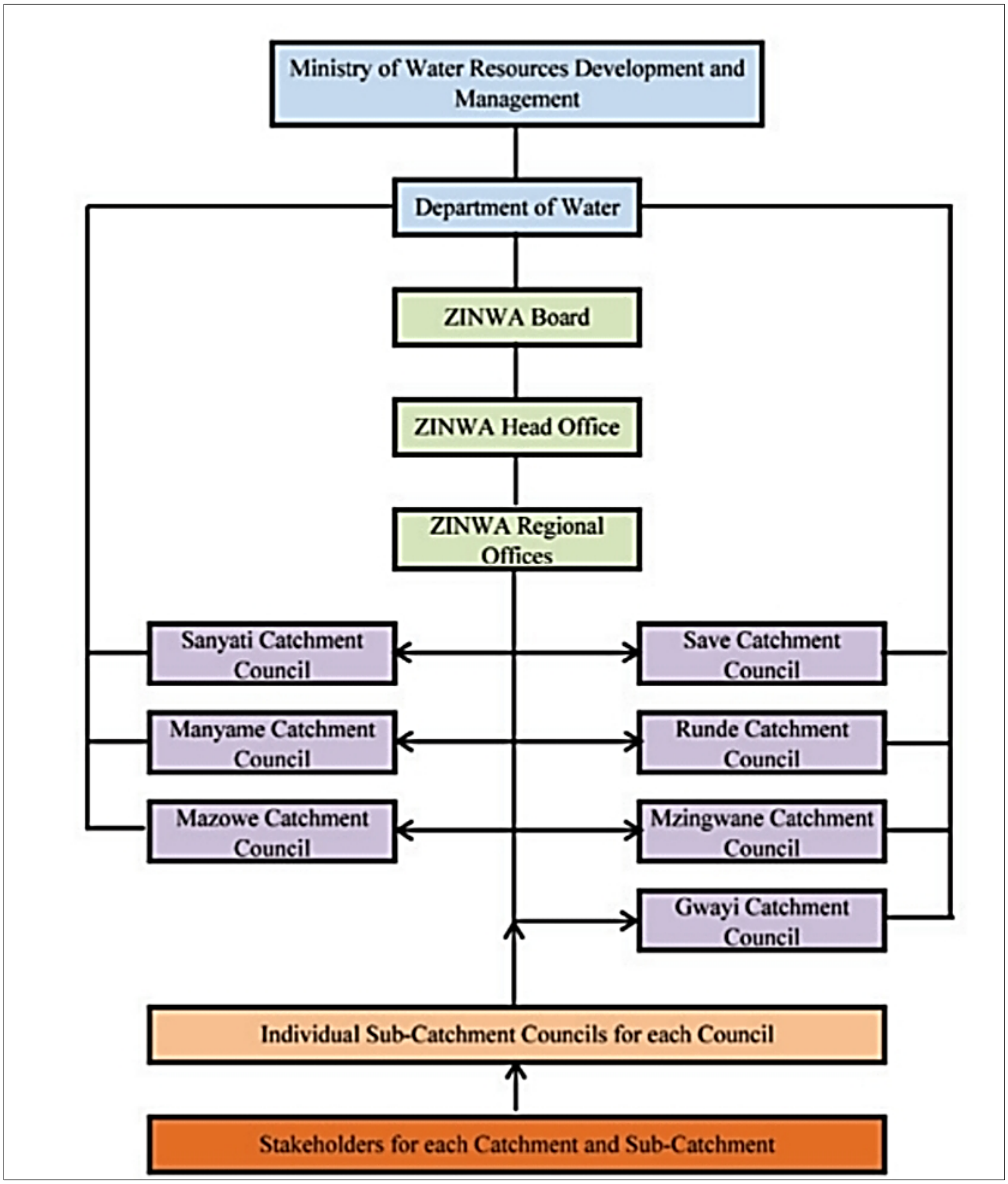


Figure 2.2: Institutional Arrangement for the Management of Water Resources through ZINWA (MWRDM, 2012, accessed November 2020)

The Minister for Water Resources Development and Management (MWRDM) provides guidance on policy matters through the Department of Water Resources (DWR). The AfDB (2010) report indicates that the DWR assists the Ministry to carry out statutory functions that include the development of water policies, laws and regulations and general directions to guide the orderly and integrated planning of the nation's water resources to ensure their optimum development, utilisation and protection. Secondly, the DWR ensures the equitable and efficient allocation of available water to all users. Thirdly, it gives effect to any international water agreements to which Zimbabwe is a signatory and lastly, it fixes the criteria for allocation and issue of permits by Catchment Councils. ZINWA is entrusted with the following functions: to advise the Minister on the formulation of national water policies and standards, exploit, and conserve water resources, ensure security of supply, and to facilitate equitable access to water by all sectors and its efficient utilisation while minimising the impact of drought, floods and other hazards.

Furthermore, ZINWA, whose head office of ZINWA is situated in Harare and has a branch office in each of the 7 catchments headed by a Catchment Manager, provides specialist advice and technical assistance to authorities and catchment councils in matters concerning the development, management and protection of water resources, in the provision of design and construction services for new works and to operate, and to maintain water supply facilities owned or managed by ZINWA. Further functions include carrying out and publishing hydrological and geographical surveys, and water-related research for the planning, development, and exploitation of water resources, as well as to effect joint management of international water resources, as directed by the Minister (AfDB, 2010).

The staff of the catchments is responsible for the statutory functions of ZINWA (AfDB, 2010). The staff typically includes expertise in hydrology, hydrogeology, water supply and quality, and administrative support. Each Catchment Council (CC) is established by the statutory instrument under the Water Act. The councils are composed of representatives of those sub-catchment councils in each catchment. The Catchment Manager's office provides technical and secretarial services to the representative catchment councils. Each council prepares a Catchment Outline Plan (COP) for its river system, determines and grants water use permits and criteria set by DWR, regulates and supervises the exercise of rights to, and use of water in respect of its river system, and ensures proper compliance with the Act and in the supervision of sub-catchment councils (SCC).

The SCC is also the operational arm of the CC. The SCC is elected from representatives of water users (see Figure 2.7). It regulates and supervises the exercise of rights to water within the area for which it was established (AfDB, 2010). The stakeholders comprise of the water users, members of government departments with legal responsibilities in the management of natural resources, and private organisations that represent interests in the basin or otherwise have a direct stake in water management in the catchment.

According to Manzungu et al. (2016), the provision of domestic water in urban areas is subject to the general regulations governing water supply in urban areas. This consists of two dimensions, which are the legal instruments dealing with the water resource and those dealing with water supply including how raw water is treated and delivered to households. Urban domestic water supply in Zimbabwe is governed by three main Acts that deal with raw water and these are: The Water Act (Chapter 20: 24) (Zimbabwe, 1998a); The Zimbabwe National Water Authority Act (Zimbabwe, 1998b) and The Environmental Management Act (Zimbabwe 2002). Furthermore, there are three Acts that deal with potable water supply in urban areas and these are the Urban Councils Act (Zimbabwe, 1996); the revised Public Health Act of 1996 (Zimbabwe, 1978) and, Food and Food Standards Act Chapter 15: 04 of 1996 (Zimbabwe, 2001).

The above indicates that Zimbabwe instituted extensive policy reforms since independence in 1980. Potable water supply in urban centres is governed by the Urban Councils Act (Madaka, 2012). Section 183 (1) of the Urban Councils Act stipulates that a Council may manage water services including taking necessary measures for the provision and maintenance of water supply. The same section provides that a Council may require private premises to be connected to a system of water supply for drinking, domestic and sanitation purposes. Both the Public Health Act (Chapter 15: 09) of 1996 and Food and Food Standards Act (Chapter 15: 04) of 1996 govern health-related aspects of bottled water provision to the public and gives local councils this responsibility.

As such, section 64 of the Public Health Act provides for the duties of the local authority to inspect and test water supplies to ensure provision of safe water for drinking and domestic purposes, and to maintain and secure water sources.

The other significant reforms occurred at Local Government. The 2002 Urban Councils Act (Chapter 29:15) resulted in the establishment of 32 Urban Councils throughout the country. The City Councils of Harare and Masvingo operate under the Urban Council's Act (Chapter 15:29) and specifically part xiii: 183 which relates to the water supply services in urban areas complimenting it with the Water Act of 1998 (Chatiza, 2010; Hove and Tirimboi, 2011; Murimoga and Musingafi, 2014; Muzondi, 2014). While the 32 Urban Councils are established under the same Act, urban councils in Zimbabwe have been accorded different status as is tabulated in below.

Table 2.2: Categories of urban councils in Zimbabwe (Chatiza, 2010)

Cities	Municipalities	Towns	Local Boards	Total
Harare	Gwanda	Rusape	Epworth	
Bulawayo	Redcliff	Karoi	Ruwa	
Gweru	Chegutu	Chiredzi	Hwange	
Mutare	Chinhoyi	Norton	Chirundu	
Kadoma	Kariba	Zvishavane	Lupane	
Kwekwe	Marondera	Shurugwi		
Masvingo	Chitungwiza	Plumtree		
	Bindura	Chipinge		
	Victoria Falls	Gokwe		
		Beitbridge		
		Mvurwi		
7	**9**	**11**	**5**	**32**

Each entity has a statutory requirement to provide water and sanitation services to their communities (AfDB, 2010; Chatiza, 2010; Muzondi, 2014). ZINWA supplies water and sewerage services in some of the smaller towns. In addition, ZINWA's responsibility in other towns is restricted to bulk water supply, which leaves the local councils of these towns responsible for treatment, storage, distribution and billing. ZINWA has supply responsibilities to 534 “ZINWA Stations”, and supplies smaller settlements that may include growth centers, health centers and small units at border crossings, National Parks, and police posts in strategic locations (Chigwenya, 2010; AfDB, 2010). However, Muzondi (2014) notes that the Urban Councils Act does not provide ample regulations on the management of urban water supply service and argues further that the policy as just a large document without authentic contextual coverage on the management of water supply systems.

It is argued that the policy only provides details on issues such as the water tariff setting procedures but there is no distinct designation of responsibility upon the regulation of water management systems in urban areas. This was identified as an anomaly since other Southern African countries like Zambia and South Africa have Urban Water and Sanitation Acts that expound all institutional arrangements in urban water management services (Muzondi, 2014; Watson, 2009). Most literature on Zimbabwe water management concur that the ZINWA Act of 1998 is an organisational based statute that provides guidelines about the catchment management rather than the urban water management systems (Tom and Munemo, 2015; Chigonda, 2011; Nhapi, 2009).

Earlier discussions on WSS service provision paradigms note that Zimbabwe is amongst the few countries in Africa that still use the local government or municipal system paradigm to manage water services. In recent years, most countries in Africa have adopted different types of privatisation. Various water professionals argue that the municipal system is liable to constant political interference at the expense of efficiency, effectiveness and transparency in service provision (Nhapi, 2009). It is argued that efficiency is essential in the provision of WSS services because poor performance affects the poor negatively and breaches their human right to these services as the rich have other coping mechanisms. Service regulation is a mandatory requirement in the provision of WSS services regardless of whatever form of paradigm is followed. However, regulation is difficult to enforce when municipalities or the government is in charge.

Service providers must be accountable to the people they serve and not to political interests (Tom and Munemo, 2015; Nhapi, 2009).

At independency in 1980, about 80% (730 000 people) of the population, predominantly in major urban centers, had access to improved water supplies (AfDB, 2010). In 1982, Zimbabwe adopted the declaration of International Decade for Drinking Water and Sanitation and under this program the government set out to provide every household with protected water with the source located at a maximum distance of 500m. The commitment led to the National Master Plan for Rural Water Supply and Sanitation (NMPWS&S) in 1985 and the Integrated Rural Water Supply and Sanitation Program (IRWSSP) (AfDB, 2010). During the period 1980-2000, Zimbabwe registered one of the highest rates of growth in water supply and sanitation. Zimbabwe achieved a 100% coverage for urban areas by 2000 and became a world leader in provision of urban water supply services among developing countries (AfDB, 2010; Water and Sanitation Program, 2010). Within the Southern Africa region, only Botswana and Namibia had 100% access to improved water in urban areas by 2000. These dramatic improvements stemmed from strong government leadership in the sector with the support from the international donor community, NGOs, and local stakeholders (AfDB, 2010, WHO/UNICEF, 2008, Water and Sanitation Program, 2010). These urban programmes were supported by the international donor community led by the World Bank, and were co-funded through the Public-Sector Investment Program (PSIP) of the Government.

The vision for urban water supply and sanitation services for Zimbabwe is: 'All urban water users should enjoy adequate, continuous, readily accessible, safe, hygienic, sustainable and affordable domestic water and sanitation services provided by accountable, efficient, coordinated, funded and capacitated institutions (Community Water Alliance, 2017). However, Zimbabwe's water sector for the past two decades has seen a drastic decline in both the quality of water services and general service delivery (Nhapi, 2009; AfDB, 2010; Manzungu, 2012, Smith, 2012; Marumahoko et al., 2020). Despite the wide support that the ZNWP has received nationally and internationally, the practical experience is contrary to what is stated in the water policy statements. Various studies argue that what is stated in policy documents may not be realised in practice and this signals policy implementation gaps and policy failure (Hagg and Emmet, 2003; Louw, 2003; Pottie, 2003; Phago, 2010; Magoro and Brynard, 2010; Tom and Munemo, 2015; Signé, 2017). Hence, the international community has been assisting with rehabilitation of Zimbabwe's WSS sector to restore the services since 2009.

The water sector received technological support from the donor community, however, activities of planning, institutional organisation and political decision-making, water resources management, social policy and public health activities did not evolve at the same pace to complement the donor support to guarantee sustainable universalisation of WSS services (Water and Sanitation Program, 2010; MWRDM, 2012). The need for institutional support to upgrade skills of local staff responsible for operation and management, and accounting functions as well as improve customer service, billing and collection for WSS services in each the urban areas led to the adoption of the Zimbabwe National Water Policy. Operations and management of WSS services were streamlined, institutional issues and challenges addressed through the new policy as a roadmap to ring fencing responsibilities, accounts and funds of WSS sector.

The new public policy on water was expected to improve municipalities through enhancing their operations. However, the rampant dearth of water services in urban areas in Zimbabwe witnessed by unreliable water supplies, burst water and sewer pipes, poor water quality (faecal contamination of main water sources), non-collection of refuse, longer walking distances to fetch drinking water, indicate a crisis in the provision of these services (Marumahoko, 2020; Nhapi, 2009). Waterborne infections episodes including cholera have become a common among urban dwellers.

2.4 PARADIGMS FOR WATER SUPPLY AND SANITATION MANAGEMENT

There are four main paradigms for the management of water supply and sanitation services and these are discussed below.

2.4.1 THE PUBLIC-SECTOR PRINCIPLES / LOCAL GOVERNMENT PARADIGM

This model or form of WSS services emphasises the role of local authorities. This is based on the principle that the provision of goods and services that are essential for collective well-being constitutes a social responsibility, a state (central/local government) duty that cannot be subordinated to the logic of private market interests since these services constitute a social right (Castro and Heller, 2009). Water supply and sanitation services must be universally available and provided as a public good guaranteed by the state (Castro and Heller, 2009). This principle is the result of protracted struggles over several decades, especially in the United States and England, where the early development of WSS services since the 18th century had been driven by private profit-oriented public policies (Hassan, 1998; Ogle, 1999; Melosi, 2000; Hayes, 2001). Hence, a public owned WSS (mainly municipally owned) services, although the acknowledgement of the right to access WSS does not imply these services should be free of charge, as the costs of providing these services need to be covered to ensure financial sustainability (Castro and Heller, 2009).

In most scenarios, water management, especially WSS management, is largely a local issue executed by the local government (urban or rural local authorities). This is closest to a subsidiarity principle, a legislation which ensures that decisions are taken as closely as possible to the citizens (EU, 2008). This principle of subsidiarity is regarded as one of the cornerstones of the EU legislation and already, in 1992, the International Conference on Water and Environment (ICWE) in Dublin agreed that the management of services should be carried out at the lowest appropriate level with full public consultation and involvement of users in the planning and implementation of water projects (UN, 1992, De Visser, 2008). Figure 2.3 below shows the key institutions in the management of water resources and the WSS services management under the principle of subsidiarity.

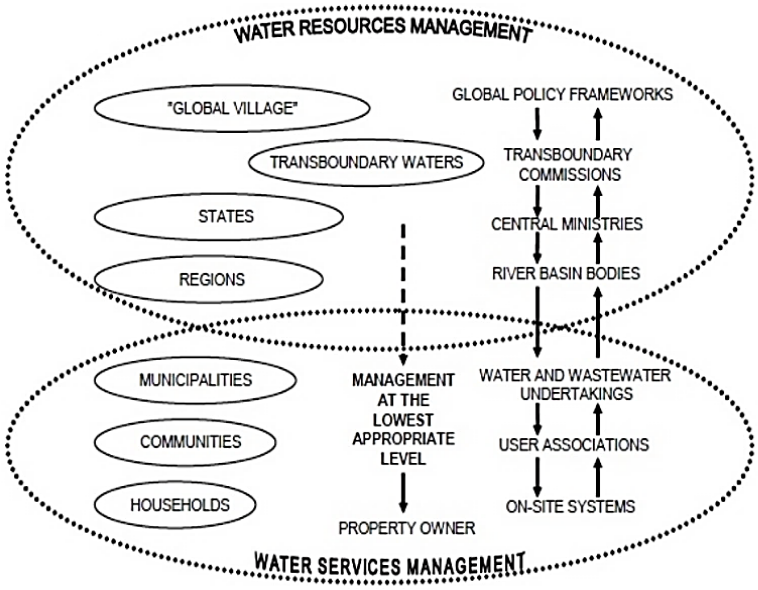


Figure 2.3: Managing water resources and services at various levels (Pietilä, 2006, accessed December 2021)

2.4.2 PRIVATE SECTOR PRINCIPLES

This model is the mainstream position, adopted by the international financial institutions (IFIs), international development agents (IDAs), and governments of developed countries, which is centered on the promotion of commercialisation, privatisation, deregulation (removal of national or local government controls or rules) and other related policies as the best solution to solve the crisis of the WSS sector (Hukka and Katko, 2003; Castro and Heller, 2009). According to (Stiglitz 2002; Windischhofer, 2007), the commercial and financial interests have seemingly increased within the international economic institutions such as the World Bank. This view of government and market which started in the 1980s, is however not universally accepted within the developed countries, but is being enforced upon the developing countries and the economies in transition (Stiglitz, 2002). However, World Bank experts argue that the ‘complete privatization of water assets’ and the creation of unregulated private monopolies, are the key to expanded WSS coverage and improve infrastructure in the poorest countries (World Bank, 1998).

2.4.3 PUBLIC-PRIVATE PARTNERSHIP PARADIGM

This is a model, as shown in Figure 2.4, where WSS services are provided through public-private cooperation in marked by public institutions outsourcing planning and design, construction and maintenance activities to the private sector (Hukka and Katko, 2003). Generally, worldwide the government is in the driver's seat as the owner and operator of WSS (Jomo et al., 2016; European Commission, 2017). These public undertakings buy their goods, equipment and services largely from the private sector based on competitive bidding.

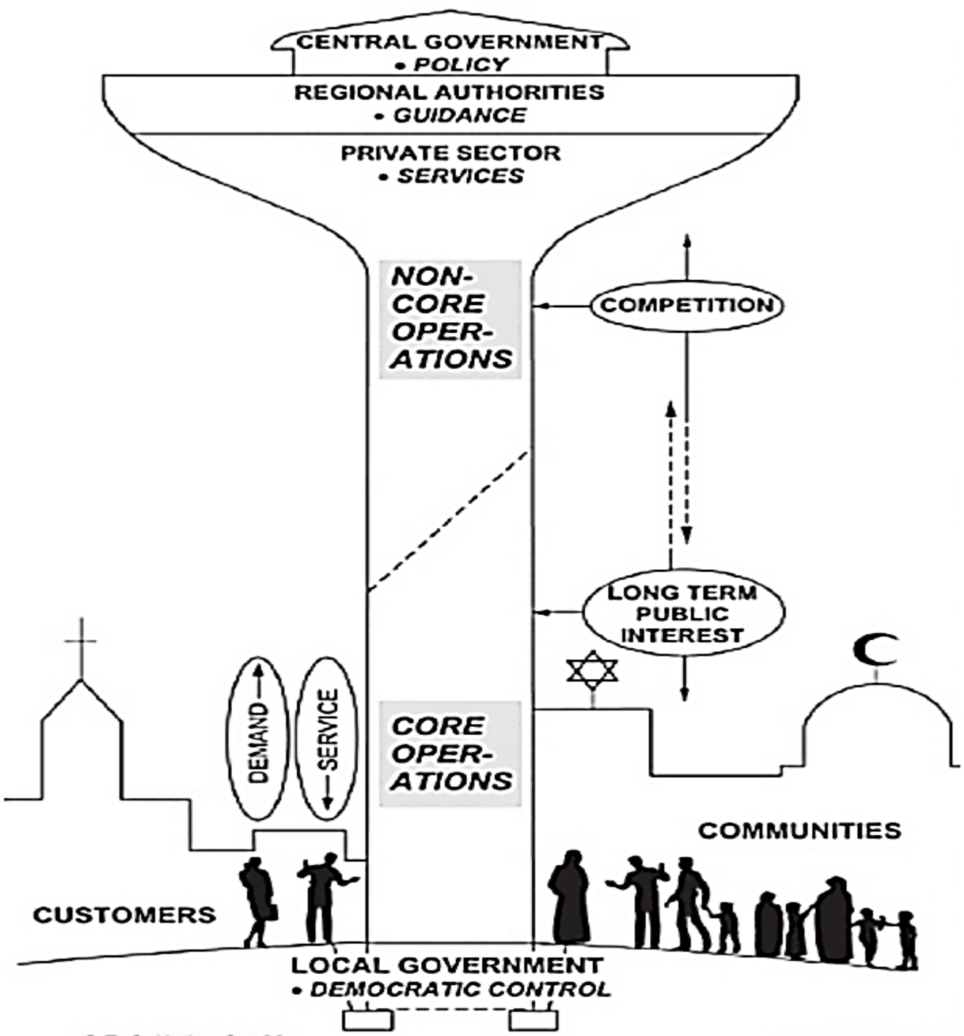


Figure 2.4: The most widely used model for public-private cooperation: Core operations performed by municipally-owned utilities and non-core operations bought from the private sector (Hukka and Katko, 2003, accessed December 2020)

The tower symbolises local government ownership and the division between core and non-core operations. The foundation of the tower of this imaginary multicultural community represents the core operations of WSS utilities and local government ownership (Hukka and Katko, 2003). The core operations consist of strategic planning and management, contracting-out that would be based on competitive bidding and overall administration of the systems. The central government, the roof of the tower: should control compliance with the set WSS policy with the support of regional authorities (Hukka and Katko, 2003).

2.4.4 COMMUNITY-DRIVEN APPROACHES/ COOPERATIVE PARADIGM

These are water utilities that are owned by users and are largely managed by them. The users are also the decision-makers. This option is particularly suitable in rural areas (Katko, 1992). These systems are small compared to municipal water works, while some of them may supply up to 1 000 people. However, the formation of a cooperative requires a 'spark plug' (Katko, 1994), a board of directors and consumers/members (Figure 2.5).

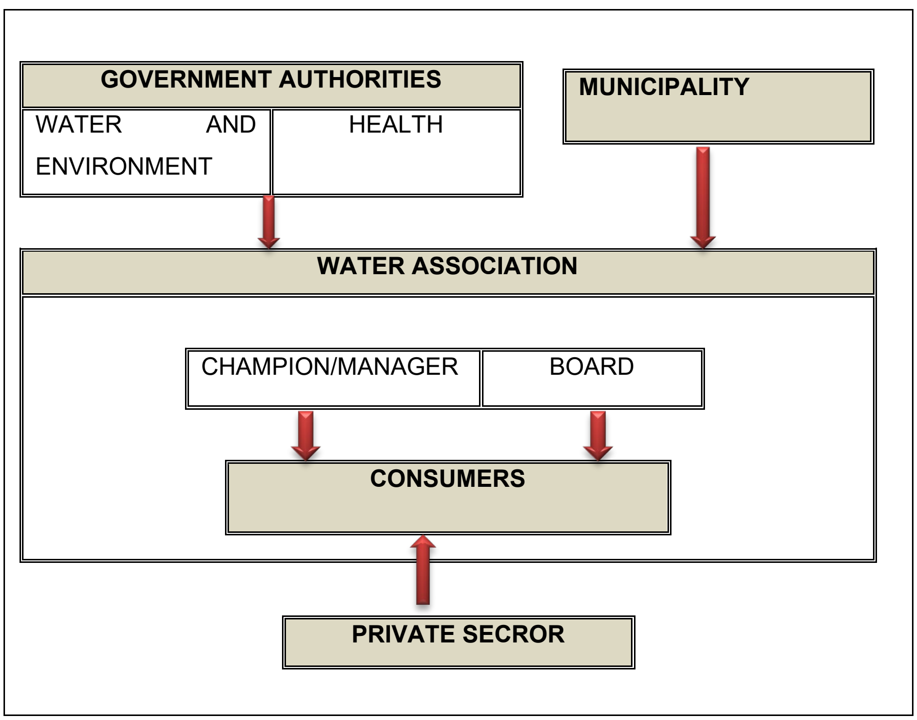


Figure 2.5: Key stakeholders related to water cooperatives (adapted from Hukka and Katko, 2003)

The role of government authorities has been negligible, although in recent years water cooperatives have obtained financial support from the government and the municipality (Katko, 1994). The main responsibility however rests on the cooperative itself. The institutions involved with WSS services in African countries are indicated in Table 2.3, which clearly shows that most countries in Sub-Saharan Africa are managed under the public-sector paradigm. The public-sector paradigm includes forms such as Central government, municipality and both state and municipality owned companies.

Table 2.3: Institutional arrangements for service provision in Capital Cities of Sub-Saharan Africa (adapted from Mwanza, 2010)

Type of service provider	Countries where this is predominant
Direct provision by Central government	Eritrea
Local/district municipality	South Africa, Zimbabwe, Namibia
State owned Company	Uganda, Rwanda, Burundi, DR Congo, Madagascar, Lesotho, Swaziland, Mauritius, Tanzania, Kenya, Ghana, Togo, Benin, Sierra Leone, the Gambia, Burkina Faso, Cameroon, Nigeria, Congo [Brazzaville], Liberia, Guinea Bissau, Guinea [Conakry], Sudan, Angola, Malawi, Mali, Central African Republic, Chad, Djibouti, the Gambia, Ethiopia, Botswana
Public companies owned by municipality	Zambia, Kenya
Private Sector participation	Cote d'Ivoire, Senegal, Niger, Gabon, Mozambique, Cape Verde

2.5 THE URBAN WATER CONUNDRUM

The Millennium Development Goals (MDGs) insisted that the world's elites wished to see the number of people without improved access to water and sanitation halved by 2015, and maintained that the private sector paradigm is the preferred vehicle for achieving this. However, the urban water supply problem remains one of the most pressing socio-environmental issues of our time (Swyngedouw et al., 2002). The WHO/UNICEF (2017) notes that increases in global coverage have not yielded much as 663 million people still lacked improved drinking water sources in 2015. Estimates indicate that 970 million urban dwellers are without access to safe adequate water supply (UNDP, 2006; Bakker, 2010). According to Bakker (2010) the world water crisis is thus at least in part an urban issue. Zimbabwe is not left out in these urban water woes, the year 2000 was the turning point in the provision of water services to urban and rural communities in Zimbabwe.

Zimbabwe fell into arrears in its debt service obligations to the international financing agencies and this led to the closure of most international assistance programs, including donor support for water supply and sanitation services (Nhapi, 2009; AfDB, 2010; Manzungu, 2012). The past two decades have seen a downward spiral in the quality of water services, along with a decline in general service delivery (Nhapi, 2009; AfDB, 2010; Manzungu, 2012; Smith, 2012; Marumahoko et al., 2020). There was virtually no new investment in service delivery for most of the past decade. Moreover, with only minimal levels of spending on maintenance and repairs, the condition of the existing infrastructure deteriorated steadily as shown in Figure 2.6.

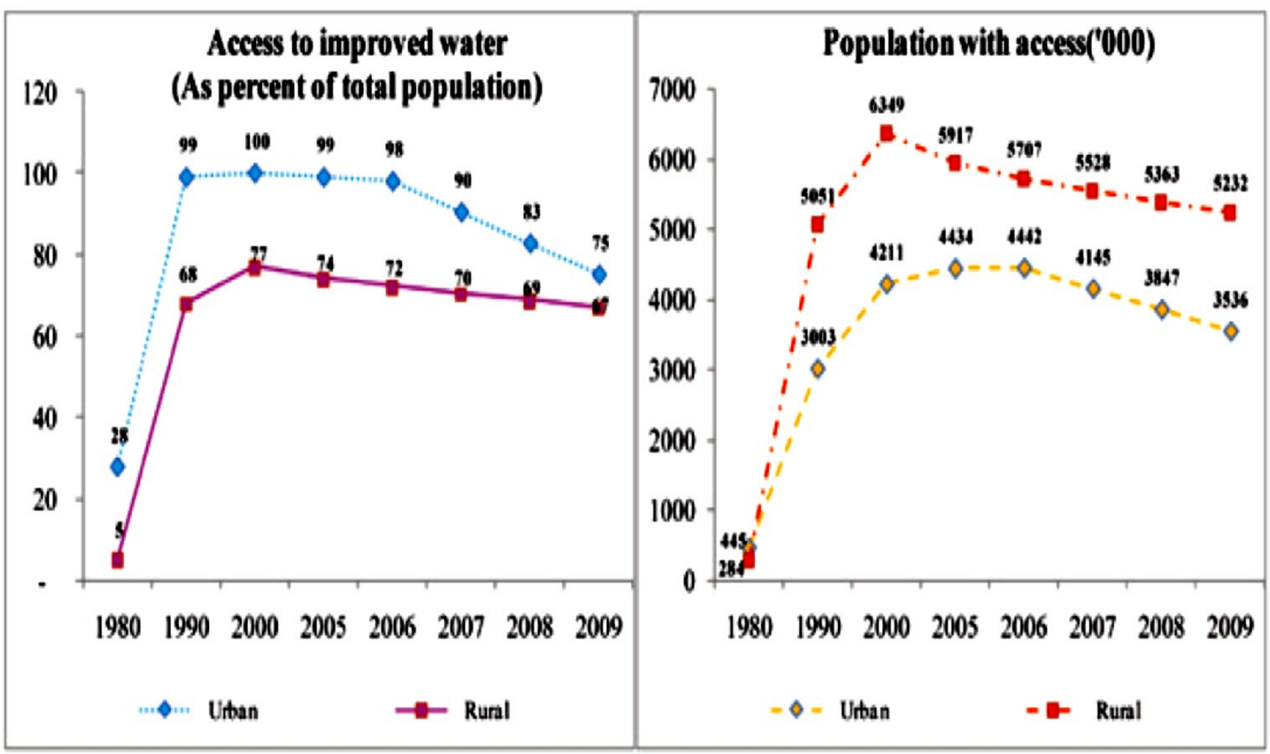


Figure 2.6: Access to improved water supply and sanitation in urban and rural areas in Zimbabwe (AfDB, 2010, accessed January 2021)

The data in Figure 2.6 indicates that access to safe drinking water in urban areas leveled off in the 1990s, and then began to decline in the early 2000s. The extent of decline in service is not known with any degree of accuracy (AfDB, 2010). There is rampant dearth of water services in urban areas in Zimbabwe epitomized by intermittent water supplies, burst water and sewer pipes, poor water quality (faecal contamination of main water sources), non-collection of refuse, and longer walking distances to fetch drinking water (Nhapi, 2009, Marumahoko et al., 2020). The full extent of the deterioration of WSS services became clear in August 2008 with the onset of nationwide cholera epidemic that resulted in more than 100 000 cases of cholera and about 4 300 deaths (AfDB, 2010). The national outbreak spread to most districts in the country and neighboring countries such as South Africa due to its strategic proximity and economic viability to most Zimbabweans. The MWRDM (2012) estimates the state of deterioration of urban water supply and sanitation services in Zimbabwe as marked by an access to urban water supply decrease from 97% in 1990 to 60% in 2008; access to urban sanitation decrease from 99% in 1990 to 40% in 2008; an hourly availability of water drop from 24hrs supply to between 6 and 12 hours per day and costs that exceed tariffs in 50% of urban local authorities as of 2012. Recent estimates by the Joint Monitoring Program (JMP), the National Action Committee (NAC), and the Vulnerability Assessment Committee (VAC) are shown in Table 2.4.

Table 2.4: Zimbabwe: Access to improved water (AfDB, 2010)

category	**Source of estimate**		
	JMP (2008)	**NAC (2008)**	**VAC (2010)**
National	82%	46	67
Urban	99	....	51-74
Rural	72	....	63-77

Rapid assessments of urban services undertaken in 2009 by the donor community indicate that service level deteriorated and so did the revenue collections, with unaccounted-for water at 40 to 50% of supply (AfDB, 2010; We Pay You Deliver [WPYD] Consortium, 2017). What is clear is that without restoration and a strong recovery in the

WSS sector, Zimbabwe will continue to face the risk of further cholera outbreaks more deaths.

2.6 WATER SAFETY PLANNING (WSP) RATIONALE IN HEALTH RISK MANAGEMENT

The water supply challenges that were discussed above could be addressed through the adoption of a preventative risk based approach for the drinking water (DW) supply. This approach considers the DW supply as a system from catchment to consumer tap. According to the WHO/IWA (2015), the water that we drink is the final product of the production chain from source to tap, which is monitored to guarantee that the DW is of sufficient quality that can protect public health. The monitoring of DW as a final product (end-product-testing) has been in use over the past decades in the water sector to determine its safety and cleanliness. However, it has become clear that end-product-monitoring can often be too little and too late to guarantee water safety (Bartram et al. 2009). Furthermore, Hrudey and Hrudey (2014) indicate that compliance monitoring of faecal indicator bacteria, such as *Escherichia coli (E. coli)* to detect risks, is inadequate for the provision of consistently safe DW as epitomised by the high morbidity from both endemic and enteric diseases (WHO/IWA, 2015, 2016). These shortcomings of end-product-testing led to the introduction of a preventative risk based approach for the drinking water supply as a system from catchment to consumer tap. This includes risk assessment (RA) for the identification of the risks and risk management (RM) for managing the risks (American Centre for Disease Control (CDC, 2009); WHO/IWA, 2016).

The WSP process encompasses understanding and describing the water supply system as a whole, identifying where and how problems (hazards) could arise, putting barriers and management systems in place to stop the problems before they happen, and ensuring that all components of the system continue to function properly (Bartram et al., 2009). The objectives of WSPs are to prevent the contamination of raw water sources, treat water to remove contaminants and prevent re-contamination during storage, distribution and handling (Summerill et al. (2010). Thus, a WSP is a proactive risk management approach for drinking water supplies recommended for implementation by all nations (IWA, 2004; WHO, 2004; WHO, 2011; Gelting et al., 2012). In addition, Bartram et al. (2009) indicate that risk management programmes such as WSPs provide a potential means to reduce public health risks. Thus, WSPs incorporate proactive process controls in drinking water production, where end-product-testing simply verifies the effectiveness of the risk management measures.

It should be noted, as noted by Gunnarsdottir et al. (2015) that, such risk management programmes were a legal requirement for all water suppliers in countries that first applied WSPs. Currently, more than 90 countries from both the developed and developing world are implementing WSPs in their water supply programmes (Schmoll et al., 2011; Vieira, 2011; IWA, 2017). WSPs share many similarities with Hazards Analysis Control Point (HACCP) and the ISO 22000 which are widely used in the food industry, however, these two RM tools apply to batch production processes unlike water supply which is a continuous process (WHO/IWA, 2016).

There are numerous documented benefits of WSP implementation broadly categorised into water quality and health impacts, financial, operational, institutional, and policy outcomes (WHO/IWA, 2017). Various case studies report improved consumer satisfaction, an increase of compliance with legislation, decrease of diarrheal incidents, improvement of drinking water quality, better monitoring in water source, better control of microbial contamination and systematic collection and processing of physicochemical and microbiological data to mention just a few (Gunnarsdottir et al. 2012; Setty et al., 2017). Overall, the CDC (2011) indicates that WSPs are linked to health with an important expectation that their implementation will safeguard health in areas that already have acceptable DW quality and will improve health in areas with poor DW quality.

2.6.1 WSP GLOBAL IMPLEMENTATION STATUS

WSPs have been embraced globally and implemented by various countries and these include Iceland where it was legislated in 1995 (Gunnarsdottir et al., 2012); Belgium, Bangladesh (Dewettinck et al., 2001); Switzerland (Bosshardt, 2003); Argentina, Bolivia, Brazil, Guyana, Honduras, Jamaica, St. Lucia, Uruguay, Ecuador, Peru and Portugal (Gelting, 2009). The implementation of WSP in the European Union was promoted by the International Water Association and supported by the WHO (IWA, 2004; WHO, 2004; Mälzer et al., 2007). The driving force behind WSP implementation varies from one country to another. In Iceland, Slovenia and Switzerland, drinking water comes under food legislation and risk assessment is mandatory, as a result, all water suppliers are bound to comply with the regulation. In some countries, such as Belgium, emerging issues (such as emerging pollutants) became the key driving force for the implementation of WSP. In some countries, WSP has been implemented as recommended by the WHO while in others there have been linkages to risk assessment and management (WHO/UNICEF, 2014). A similar approach to RM is sanitation safety planning which is used in wastewater and sanitation, and is based on WSP and also developed by the WHO (WHO, 2006).

The adoption of the WSP approach by African countries has been slow with a few studies having reported on WSP implementation (Kanyesigye et al. 2019). According to the WHO (2017), only 14 countries in Africa reported to have implemented WSPs in their water supply systems. Amongst the first countries to implement are Uganda in 2002 (Davison et al., 2005; Howard et al. 2007), the Democratic Republic of Congo where the Healthy Villages and Schools (VEA) national programme was launched by the government as the main initiative to provide safe drinking water to rural and peri-urban populations (Kanyesigye et al. 2019), and Kenya where the government through the Ministry of Health issued a policy brief on water safety surveillance and WSP implementation training for all water suppliers as a measure prevent frequent waterborne disease outbreaks in the country (African Institute for Development Policy [AFIDEP, 2016]). As a follow-up on this Kenyan policy, WSP development commenced in 2009 with the training of selected water managers from Nairobi City Water and Sewerage Company and Mombasa Water Supply and Sewerage Company Limited. WSP development was later carried out by the Kisumu Water Sewerage Company all supported by IWA (IWA, 2018; Kanyesigye et al. 2019). Senegal and Burkina Faso adopted a simplified form of WSP by omitting some recommended steps in the WSP manual since there was lack of strong institutional support and low technical expertise of the managers in these countries, and as such, WSP development and implementation in rural water supplies were launched in 2008 and 2011 respectively.

Other African countries also developed and implemented WSP. Ethiopia adopted climate-resilient WSP programmes at national level in response to water quality failures and 12 e WSPs had been implemented for urban and rural systems by 2016 (WHO, 2017). The Nigerian standard for drinking water quality in 2007 emphasised that all water service providers including State Water Agencies and Community Water Committees shall develop a water safety plan as means to minimise contamination of water supplies from source, reduce or remove contaminants through treatment processes and prevent contamination during storage, distribution and handling of DW (Ezenwaji and Phil-Eze, 2014). The other West Africa countries: Burkina Faso, Ghana, Guinea, Liberia, Senegal and Sierra Leone, adopted the WSP approach through funding from the Organization of the Petroleum Exporting Countries (OPEC-Fund) (IWA, 2014).

The South African Government introduced an Emergency Response Plan (ERP) designed by the Water Research Commission to ensure Water Safety and Security in South Africa which was developed through a field study of community water systems in three provinces: the Eastern Cape, KwaZulu-Natal and Northern Cape, whereby water supply emergencies were identified (Jack et al., 2015). Moreover, the Rand Water, one of the 15 water boards in South Africa , spearheaded the development of customised WSPs by adding "*Procedure 11*" which addresses support activities targeted at customer focus, education, employee training and awareness, communication, research and technical support. The major support activities are carried out by government institutions and Non-Governmental Organisations (NGOs) responsible for catchment management (Lubout, 2010).

2.6.2 WATER SAFETY PLANNING STATUS IN ZIMBABWE

The Zimbabwe National Water Policy (ZNWP) states that, "*WSPs are encouraged as the most effective means of maintaining a safe supply of drinking water for primary needs.*

Comprehensive risk assessment and risk management form the backbone of these plans, which aim to steer management of drinking water-related health risks away from end-of-pipe monitoring and response" (MWRDM, 2012). Furthermore, the policy stipulates that a thorough assessment of the water supply process from water source to the consumer's tap should be carried out by the water service authority to develop a WSP and enforced by Water Service Authorities. Hazards and risks should be identified and investigated following which appropriate steps should be taken to minimise the risks.

However, according to the WHO Africa (2019), Zimbabwe still did not have a water safety plan or a water quality monitoring plan and was grappling with cholera and typhoid outbreaks in 2019 as a results of poor water quality and sanitation. Furthermore, the prevailing economic hardships impacted negatively on various local authorities who were failing to provide adequate safe DW leading to the sinking of unsanctioned boreholes and shallow wells in residential areas (WHO Africa, 2019). There were serious concerns that the monitoring of water quality from these private sources was non-existent. As a result, the WHO convened a workshop from 9 to 11 January 2019 at the Mazowe Hotel in Mashonaland Central province. The meeting brought together directors, deputies and other senior managers from the Environmental Health Directorate at Ministry of Health and Child Welfare (MoHCW), directors and assistant directors of health for urban local authorities (ULAs), provincial environmental health officers, senior officers from the Zimbabwe Defence Forces department of epidemiology and disease control; and representatives from the National Coordination Unit (NCU) and the National Institute of Health Research(NIHR), with the technical facilitation provided by the MoHCW, UNICEF and WHO. The meeting tackled issues that include ng failure by ULAs to fully exercise their mandate of providing safe water due to financial constraints, and the proliferation of unsanctioned boreholes in urban areas; the inadequate monitoring and regulation of private water vendors by ULAs, and little compliance with water quality monitoring requirements by all health institutions; non-payment by ULAs for water samples submitted to the government analytical laboratories; and the negative impact of the macroeconomic environment on health programmes (WHO Africa, 2019). The workshop culminated in the development of a generic national WSP from which ULAs could develop their own specific

WSPs. These WSPs were expected to contribute to the protection of public health by promoting improvements in the quality, accessibility, coverage, affordability and continuity of water supplies (WHO Africa, 2019).

The workshop mapped the way forward for water quality monitoring and managed to standardise water quality monitoring in Zimbabwe (WHO Africa, 2019). The workshop was indispensable for provision of safe DW and came at a time when the country is grappling with waterborne diseases including diarrhoea, cholera and typhoid (WHO Africa, 2019). The continued episodes of waterborne disease may indicate that the recommendations that were made are not being implemented and, hence, the need to assess the implantation status of these WSPs in urban areas by the ULAs.

2.7 FRAMEWORK FOR EVALUATION OF WSS SERVICES

The framework against which water supply and sanitation services were evaluated is described in Appendix A. This framework is informed by the International Covenant on Economic, Social and Cultural Rights' (ICESCR) General Comment No.15 (*Articles 11* and *12*). These articles of the covenant are used to evaluate the practice (provision of WSS services in Zimbabwe's urban areas) from the standpoint of realising the human right to water and sanitation.

2.8 SUMMARY OF LITERATURE REVIEW

The literature review considered the various ways in which service delivery can be organised and managed. The water policies and legislations that govern water service delivery in Zimbabwe were discussed and a general picture of water supply challenges in Zimbabwe's urban areas noted. It was also noted that there are various Water Acts and legislations that guide Zimbabwe's water sector.

However, analysis of literature on urban water woes in Zimbabwe showed that there is currently very limited literature available that analyses water policy implementation in Zimbabwe. Most of the reviewed existing studies on water supply issues in Zimbabwe focused on technical and quantifiable problems associated with the water supply sector in Zimbabwe. In addition, the literature suggested that local authorities mandated with the provision of WSS services often lack the capacity required for effective policy implementation, which results in implementation gaps that threaten the delivery of safe drinking water (Taonameso et al., 2021). The existence of water policy implementation gaps has been attributed to numerous factors related to institutional, technical/human, financial and social capacity, especially at the local level. Thus, this study investigates the importance of each of these considerations within the Zimbabwean context. This is consistent with the thesis objective of exploring the existence of implementation gaps in the ZNWP policy in the context of Zimbabwe, factors contributing to existing policy implementation gaps, and ways to address them.

The review of studies on Zimbabwe further showed a general paucity of water policy analysis and how policy relates to water woes in urban areas. A unique trend in the studies on Zimbabwe's water supply challenges also showed an overwhelming reliance on document analysis seeking to collate data on causes of poor WSS services in urban areas (Taonameso et al., 2021). it is recommended that, in order to overcome urban water conundrums in Zimbabwe, a literature review combined with an empirical study of both qualitative and quantitative gaps between the Zimbabwe National Water Policy and its implementation be undertaken (Taonameso et al., 2021).

Finally, it was noted from the chapter that, the current study is unique in that it incorporates both a literature review and empirical study and focus on both capacity limitations in institutions (finances, and social and technical/human resources) and technical/quantitative gaps to explain the causes of critical potable water shortages in Zimbabwe's urban areas. Furthermore, this study incorporates WSS risk assessment and evaluates the current WSS service level against the human rights on water and sanitation (HRWS) principles. The incorporation of the HRWS principles to analyse the water supply issues on Zimbabwe water issues is also unique because no study has analysed the water supply issues through the lens of the HRWS normative and cross-cutting. This study is expected to shed more light on causes of urban water conundrums and provide both secondary and empirical evidence to inform solutions to these water woes.

CHAPTER 3
THE STUDY DESIGN, DATA COLLECTION AND DATA ANALYSIS

3.1 CHAPTER INTRODUCTION

This chapter provides both a full description of the study area and insight into the study design, data collection methodologies and the statistical data analysis used throughout the research project.

3.2 OVERVIEW OF THE STUDY AREA

This study was conducted in the cities of Masvingo and Harare in Zimbabwe, a country that is located in the southern part of Africa.

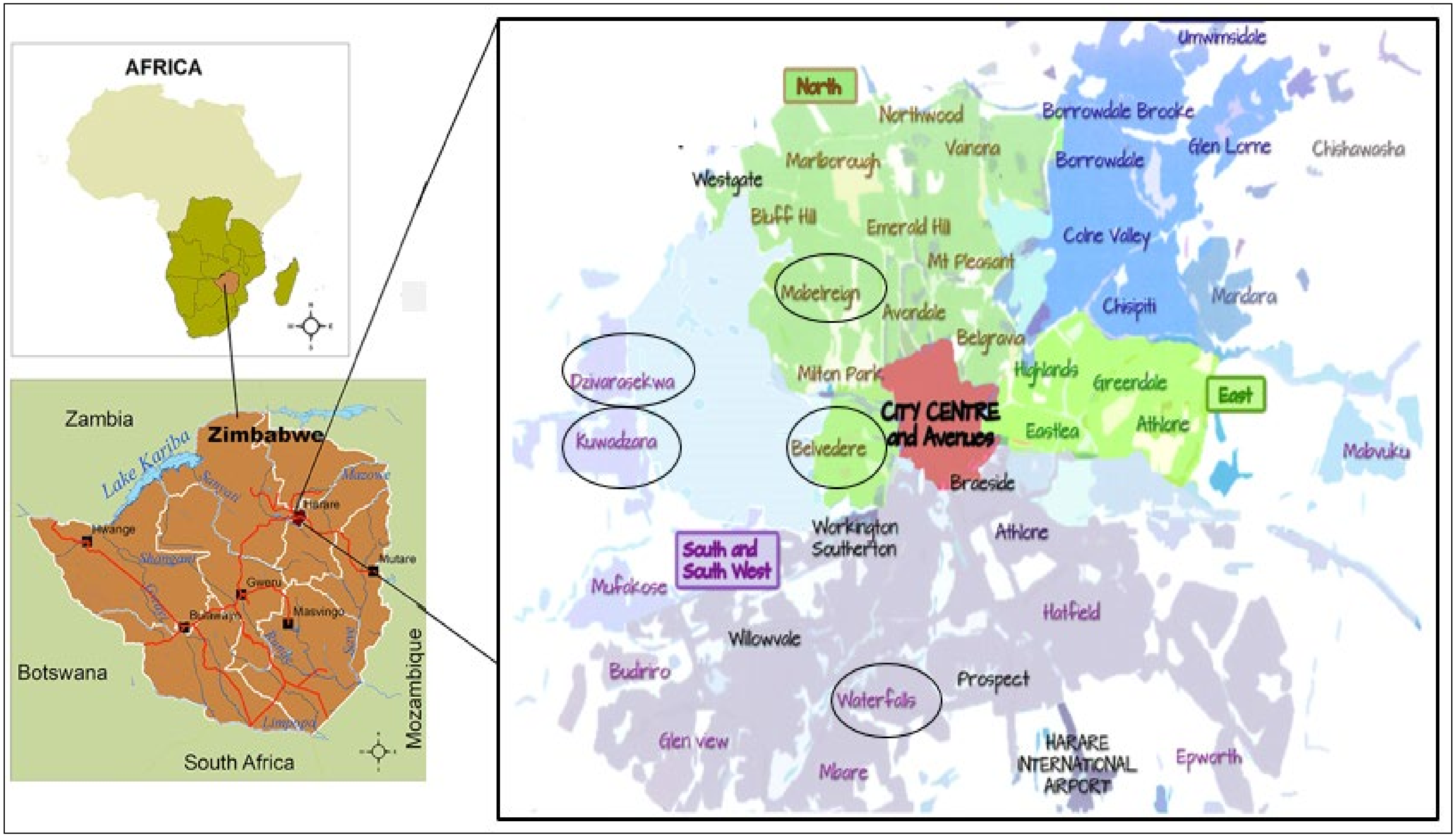
3.2.1 Study area 1: City of Harare

The City of Harare is the capital and largest city and most populous city of Zimbabwe. It is situated in the north-east of the country in the heart of the historic Mashonaland (Figure 3.1). Administratively, Harare is a metropolitan province which also incorporates Chitungwiza and Epiworth (AfDB, 2010). It is situated at an elevation of 1 483 metres above the sea level and its climate falls in the subtropical highland category. The city's suburbs include Borrowdale, Helensvale, Greendale, Chisipiti, Mbare, Highfields, Dzivarasekwa, Kuwadzana, Marlborough, Mabelreign, Vainona, Mt Pleasant and Avondale. Glenview, Budiriro, South Park, and Warren Park: the most affluent neighborhoods are to the north. The estimated population of the Harare metropolitan areas was 2 123 132 people with an urban population of 2 013 048 people in 2012 (Zimbabwe National Statistics Agency [ZimStats, 2013]). In terms of the Urban Councils Act (1996), Harare Municipality is a water authority responsible for potable water supply and sanitation in their demarcated municipal areas. The Harare metropolitan authority obtains its raw water from several dams on the Manyame River and its tributaries. Five residential areas were systematically sampled for the study including Dzivarasekwa, Kuwadzana, Mabelreign, Belvedere and Waterfalls, constituting a total population of 38 573 people (ZimStats, 2013).

3.2.2 Study area 2: City of Masvingo

Masvingo district is the central district of the seven districts in Masvingo Province, Zimbabwe (Figure 3.2). The district comprises the City of Masvingo, Masvingo Rural, Mashava Mine and Renco Mine. The district is one of the dry areas of Zimbabwe. In terms of the Urban Councils Act (1996) the city of Masvingo is a water authority responsible for potable water supply and sanitation in its area of jurisdiction, excluding the rural and communal areas, surrounding the city, which are under Masvingo Rural District Council. Masvingo City Council serves the following suburbs; Mucheke, Rujeko, Rhodene, Target Kopje, Zimre Park, Runyararo West, KMP stands, Mbudzi residential area, Eastvale, ClipSham Views, Morningside and Clovelly. The suburbs are divided into low, medium and high-density. Rhodene suburb in the northern part of the city, Eastvale in the East and Zimre Park in the Northwest are the most affluent suburbs in Masvingo. The population of Masvingo town is estimated at 87 886 people as per 2012 census.

The town was chosen for sampling to give a representative policy framework that is followed by Zimbabwe's town councils. Masvingo City council serves the largest number of consumers compared to other smaller towns. The raw water source for the city of is the 1.4 million m^3 capacity Lake Mutirikwe, which was completed in 1960 and pays Zimbabwe National Water Authority (ZINWA) for the bulk supply (Chigwenya, 2010; Mapfumo and Madesha, 2014). Apart from providing water for the city of Masvingo, Lake Mutirikwe supports water supply schemes for several farmers and large sugar cane irrigation schemes in the Triangle and Hippo Valley areas. The City of Masvingo has 3 pumps which have the capacity of pumping 30.6 mega litres per day. Treated water is pumped into Target Kopje (1 0000 m^3) and Cooden (8 000 m^3) reservoirs (Chigwenya, 2010; Mapfumo and Madesha, 2014). Residents of Masvingo were in panic mode because of the increasingly dwindling water levels before 2013-14 rain season since it was estimated to be lower than 8% and it was also almost empty during the 1991-92 drought (Mapfumo and Madesha, 2014).



<u>Figure 3.1:</u> Map of Harare showing five suburbs that were part of the City of Harare case study (adapted from Reid and Simatele, 2021)

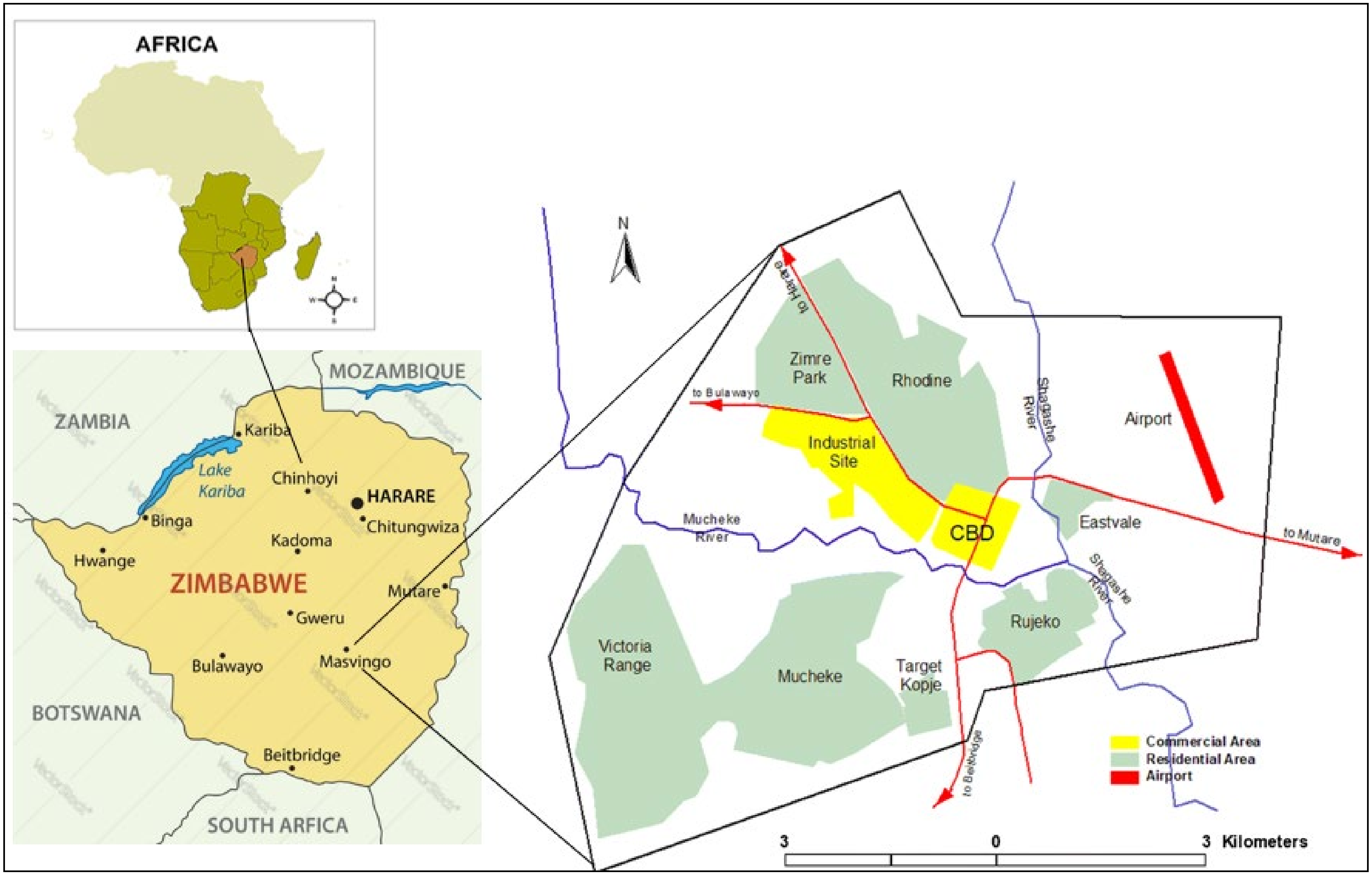


Figure 3.2: Map of Masvingo City water supply system and surrounding areas (adapted from Muzondi, 2014)

In the past few years, the NGO Action Fame has sunk boreholes in all the high-density suburbs to provide unemployed women with water for gardening. These boreholes are also used for domestic water during frequent pipe bursts and subsequent water cuts. According to Dube (2002), the city of Masvingo water works was last upgraded in 1982.

3.3 STUDY DESIGN

A ‘multi-approach’ was chosen in order to achieve the main objective of this study to examine the existence/absence and nature of policy implementation gaps in the provision of water and sanitation services in Zimbabwe’s urban areas and factors contributing to this situation. The approach is based on multiple theoretical frameworks which are explained as follows:

3.3.1 The qualitative research approach

According to Lincoln and Guba (2000), qualitative researchers study things in their natural settings in order to make sense of or to interpret phenomena in accordance with the meanings people bring to them. Qualitative research approaches were selected for this study because they involve interpretation in the natural setting (Lincoln & Guba, 2000), which allows researchers to determine the importance people assign to their involvement in activities (Bogdan and Biklen, 2003). This study included stakeholder perceptions of the factors that contribute to current WSS service delivery successes or failures. This allowed for an understanding of the meaning(s) they give to WSS services and their management. Document analysis, semi-structured interviews and case studies were employed for this study to effectively delve into procedures used to ensure provision of WSS services as well as the constraints in implementing such procedures (Conger, 1998).

Data was collated from a review of secondary sources, including document review and empirical study involving case study of the City of Masvingo and Harare. Semi structured interviews were conducted with randomly selected household respondents from systematically selected residential categories (high, medium and low density suburbs) as well as provincial government officials in both cities. In addition, the case study approach was undertaken to supplement and verify the findings from the literature review, while providing a greater depth of understanding of the water supply issues. Case studies are an effective strategy of inquiry for research that asks “how” or “why” questions and, where the focus is on a contemporary, real-life process, and the researcher cannot control events (Yin, 2014). This is relevant for this research because case studies provided further insight into the issues of WSS services and water policy implementation gaps in Zimbabwe’s urban areas, which is an ongoing “real-life” process.

3.3.2 The quantitative research approach

Already existing quantitative data and data from field observations were examined to assist in answering the question on the extent of the existence of the implementation gaps. Furthermore, water quantity, quality, accessibility and other statistical data were used to examine conditions in case study communities. It is important to note that the words qualitative and quantitative are used in describing both research design and data collection techniques. According to Neuman (2003), the main difference between qualitative and quantitative work is in the domination of words in the former and numbers in the later.

3.4 DATA COLLECTION METHODS

This study used both empirical and theoretical methods of data collection, lessons and insights were drawn from the water authorities and service providers of City of Harare and City of Masvingo. The WSS in Masvingo and Harare cities were studied using both interactive and linear models. Different data sources were used to widen the analysis and evaluate the problem in order to find answers on the provision of adequate advice seeking to bridge the gaps between policy and its implementation. The study used a literature review of studies on Zimbabwe, the Zimbabwe Water Policy and its implementation. These documents could be from municipal, national, international, NGO, and or any other institutions that address potable water challenges in Zimbabwe.

3.4.1 PRIMARY DATA COLLECTION

Primary data collection methods included semi-structured interviews, stakeholder meetings, national and municipal policy documents, service level benchmarking reports and system risk assessment, which included direct observation and water sampling.

3.4.1.1 Semi-structured interviews

A semi-structured questionnaire was used during household surveys (Appendix D) and institutional interviews (Appendix E). The Construct Reliability of the questionnaire was tested using Cronbach's alpha. According to De Vellis (2003), the Cronbach Alpha Coefficient of a questionnaire should be at least 0.70 for the questionnaire to be considered reliable (Table 3.1). The Construct Reliability is a measure of internal consistency in scale items that were being tested in the questionnaire surveys in this study. The Cronbach's alpha is a function of the number of test items and the average inter-correlation among the items. The formula for the standardised Cronbach's alpha is given below:

$$\alpha = \frac{N.\bar{c}}{\bar{v} + (N-1).\bar{c}}$$

Where:

N is equal to the number of items

C-bar is the average inter-item covariance among the items

v-bar equals the average variance.

Table 3.1: Cronbach Alpha coefficient for the Household questionnaire

	Cronbach's Alpha	No. of Items
Questionnaire	0.87	265

The overall Cronbach's Alpha coefficient of reliability for the data collection instrument was 0.87. This implies that the questionnaire was consistent and measured what it was supposed to measure adequately (De Vellis, 2003). When administered on different assertions this questionnaire could yield the same results in different occasions and would produce similar observations. The data collection instrument was 87% accurate and there was only a 13% measurement error on the items. The data collection instrument had a very high internal consistency.

3.4.1.2 Stakeholder meetings

Due to volatile relationships and infighting within the Harare City Council's top authorities that were characterised by the suspension of the City Mayor and other senior managers, the researcher could not attend any stakeholder meetings in Harare. Any request to attend meetings was not granted on suspicion of espionage. However, the researcher had an opportunity to participate at different forums held to talk about governance in Masvingo and has attended Council meetings involving the Masvingo City Council and Masvingo United Residents and Ratepayers Association (MURRA) which addressed the city water challenges, water tariffs and rate payers' concerns (Figure 3.3). In attendance were the City of Masvingo Mayor Maboke. C (number 3 from the left), MURRA Chairperson Mr. Muguti. A, and the meeting was chaired by Mr. Tsere from Masvingo City Council. The agenda included items that addressed the water crisis in Masvingo City and the lack of communication between the Masvingo City Council and residents.

<u>Figure 3.3:</u> Meeting Organised by the Masvingo United Residents and Ratepayers Alliance (MURRA) and Masvingo City Council on the 21st of November 2018

3.4.1.3 National and municipal policy documents

National and municipal policy documents and other strategic documents, such as the national and municipal WSS policy documents, communication media and television coverage whenever available, were used to obtain the data needed to analyse the water policy and its implementation in water supply and sanitation services in urban areas.

3.4.1.4 Service level benchmarking (SLB) reports

These are municipal peer reviews where officials from sister municipalities are tasked with assessing the service level and performance of sister municipalities annually in order to advice on the assessed municipality's strengths and weaknesses. These reports were seen as informative for the purpose of this study and the researcher was aware of the possible biases that may arise in the compilation of such reports.

3.4.1.5 Systems risk assessments

A comprehensive risk assessment and risk management aims to steer management of drinking water-related health risks away from end-of-pipe monitoring and response. In this study, the risk assessments were carried out through a thorough assessment of the water supply process from the water source to the consumer's tap using:

3.4.1.6 Direct observation

A direct observation of the infrastructure, household storage containers and sanitation services was carried out to collate data for risk assessment. A system description and analysis constituting "step 2" in WSP procedure was carried out in the study units (WHO 2012, 2014; Mudau et al., 2017). The first part of system description included types of water sources; treatment processes and the storage in the distribution system (number of reservoirs, their capacity, age and known design problems). Furthermore, the distribution system itself was described in relation to the terms of population served and known problems. Finally, water storage and handling at consumer level (overhead storage or buckets), water quality, and water supply problems (e.g. availability, accessibility and leakage) were also described.

The second part of "step 2" involved hazard identification and this was accomplished using the TECHNEAU Hazard Database and the WHO generic hazard identification guidelines (TECHNEAU, 2008, Bartram et al., 2009, WHO, 2011, 2014). Drinking water supply system (DWSS) on-site risk assessment were carried out to check the physical, chemical and microbiological quality of water for sources of contamination. In addition an assessment of source water protection was applied to both surface and groundwater sources. The process assessed the water abstraction system (nature of operation); treatment process (quality of treated water); and distribution system (nature of supply such as continuous/intermittent, leakage, service connection and existence of backflow prevention devices). Finally, water transportation and water use were analysed including transportation from the water point to storage at household level with aspects such as type of storage containers, duration of storage and household hygiene practices evaluated as well.

3.4.1.7 Sampling for microbiological quality

Drinking water sampling was done using the Compartment Bag Test (CBT). The study used *Escherichia coli* bacteria (*E. coli*) which are exclusively faecal in origin, and a sub-group of the faecal coliforms that produce the enzyme B-galactosidase and not urease. *E. coli* is the best indicator of faecal contamination among the commonly used faecal indicator organisms. It is the major species in the faecal coliform group with only *E. coli*, from the five general groups of bacteria that comprise the total coliforms, s generally not found growing nor reproducing in the environment. As a result, *E. coli* is the best species of total coliform bacteria that is the best indicator of faecal pollution and possible presence of pathogens (New York State Department of Environmental Protection, 2011). The WHO's (2017) guidelines for drinking-water quality, 4th edition, and the Standard Association of Zimbabwe (SAZ-560: 1997) state that none of these bacteria should be detectable in a 100 ml water sample (WHO, 1997). Of these bacteria, *E. coli* are regarded as the most reliable indicator of faecal contamination.

Water samples were collected from households in high, medium and low density suburbs that were systematically sampled in Masvingo and Harare City Councils. A total of 196 water samples from household taps and other drinking water sources were collected and analysed for *Escherichia coli* bacteria using the Compartment Bag Tests (CBT) to assess microbiological compliance with the WHO standards and guidelines. The external portion of the tap in the household was chemically sterilised using 70% ethanol. It was then opened and allowed to run for 10 to 15 seconds. A sterile Thio bag was filled to 100 mL mark with tap, borehole or stored water. The samples were then stored on ice during transport from the sources to the testing site.

The CBT protocol was followed per the manufacturer's instructions (Aquagenx, Chapel Hill, NC, USA). In the laboratory, the collected 100 mL of each sample was mixed with *E. coli* growth medium supplied by the manufacturer. The *E. coli* medium was allowed to dissolve in the water sample for 10-12 minutes until the water sample turned brown in colour. The water sample was then slowly poured into a compartment bag with the bag squeezed gently, while pouring, from its sides and tilted to move liquid between compartments and to get liquid levels to the top of the fill line. The compartment bag was sealed using a seal clip above the seal line and below the compartment top openings. The U-shape of the seal clip was placed across the width of the bag above the liquid level along the fill line but below the compartment openings. The rod-shaped part of the seal clip was snapped into the U-shape to lock in place the bag. The top of the bag was closed the yellow/white Whirl Pak seal and then rolled down the bag towards the seal clip (Figure 3.4). The processed and sealed samples were placed in an incubator at 37°C for 24 hours. A positive control was an *E. coli* positive sample while the negative control was sterile distilled water.

Figure 3.4: Water sample processing and compartment bag sealing

The *E. coli* concentration was determined by aligning compartments in correct sequence to the manufacturer's Most Probable Number (MPN) Table while a count for *E. coli* was estimated from the combination of positive and negative compartments in the bag, providing the MPN estimate of *E. coli* per 100 mL. The WHO guidelines for drinking water quality 4th edition (WHO, 2011) were used to categorise water samples based on *E. coli* (Table 3.2)

Table 3.2: WHO guidelines for drinking water quality (WHO, 2011, 2017)

Health risk category	***E. coli* CFU/100 mL**
Low risk/safe	<1
Intermediate risk/probably safe	1–10
High risk/probably unsafe	>10–100
Very high risk/unsafe	>100

The Zimbabwe National Water Policy (ZNWP) maintains that water quality, which does not meet the WHO Guidelines at the tap will not be accepted while the Standards Association of Zimbabwe (SAZ-560:1997) guidelines stipulate the zero count of *E. coli* as the recommended standard for drinking water in Zimbabwe.

3.4.1.8 Sampling for physico-chemical quality

Physical and chemical parameters including temperatures, pH, electrical conductivity and total dissolved salts were measured on-site immediately when water samples were collected as best practice in water sampling and processing. A Hanna combo meter (HI 98129) was used to measure the physico-chemical parameters. The meter was calibrated with pH 4.01 and 7.01 standard buffer solutions. Electrical conductivity calibration was done with a 1413 µS/cm calibration solution and the meter calibrations were all done at 25°C. Distilled water was used to rinse the electrodes between samples to prevent contamination from one sample to the other.

An Extech fluoride meter (FL700) was used to measure the fluoride concentration of water at the sampling point from the source. The Fl700 was calibrated between 1.0 to 10 ppm fluoride ions. A 1 ppm fluoride standard solution was prepared by placing one TISAB tablet into a sample cup that comes with the meter and then adding 20 mL of distilled water. The FL700 was calibrated by placing it into the prepared 1 ppm standard solution following manufacturer's instructions. A rinse solution, made by dissolving one TISAB tablet in 20 mL of distilled water, was used to rinse the meter between samples as sit quicken response time. Calibration of the FL700 was done prior to each new batch or if 12 hours had elapsed since the last calibration. The analysis of fluoride concentration was based on the WHO (2017) Guidelines for safe Drinking Water Quality 4th Edition (GDWQ) (WHO/IWA, 2016), the ZNWP (MWRDM, 2012) and the Standards Association of Zimbabwe (SAZ-560:1997). A concentration of 1.5mg/L (1500 µg/L) was considered the maximum permissible limit of fluoride in drinking water and the highest desirable limit being 1.0mg/l.

3.4.2 SECONDARY DATA

Secondary data sources were used to collate qualitative data collected from various search sites (e.g. Google Scholar, Cochran and ResearchGate), scientific papers, documentaries and reports. In addition, information regarding the Zimbabwe National Water Policy, water policy implementation, urban water woes, water institutional framework and management were collected from scientific papers, documentaries and reports.

3.4.3 DATA ANALYSIS

The analysis involved both quantitative and qualitative statistical assessment methods.

3.4.3.1 QUANTITATIVE ANALYSIS OF DATA

3.4.3.1.1 Descriptive and inferential statistics

The Statistical Package for Social Sciences (IBM SPSS) version 26 was used to analyse quantitative data. The quantitative data was assessed using both descriptive and inferential statistics. Descriptive statistics included measures of central tendency (mean, median, mode), measures of frequency (count, percent, frequency), measures of variation (standard deviation, variance), and relative position (quartiles, percentiles) (Stephanie, 2014).

The main descriptive statistics that was used in this study included the measurement of frequency, which was used to show how often a response was given. This information was presented in the form of tables, charts and graphs showing percentages, count or frequency.

Comparisons of different groups of respondents from different residential areas and different institutions were used to provide data for local authority survey that would assist in drawing conclusions about certain data. In such cases, inferential statistics was used to move beyond simple description or characterisation of data and draw conclusions based on the research data (Stephanie, 2014).

Finally, the Chi-Square test was used for independence to determine if distributions of categorical variables (residential status, institution, work position) differed from each other. A very small chi-square test statistic means that there is a relationship while a very large chi-square test statistic means that is no relationship.

3.4.3.1.2 Analysis of risk assessment data

The analysis of water service level was based on the WHO (2017) Guidelines for safe Drinking Water Quality, 4th Edition (GDWQ) (WHO/IWA, 2016), the ZNWP (MWRDM, 2012) and the Standards Association of Zimbabwe (SAZ-560:1997). The critical limit on accessibility is indicated as the distance travelled from a household to a water source, and this should not exceed 500m (one-way trip) (MWRDM, 2012). The ZNWP recommends water service providers to put in place alternative water supply if water is not available for 24 hours, and the provision of a minimum of 50 litres/capita/day (City of Masvingo 2019).

Furthermore, the critical limit measurement of potability states that all drinking water sources should not contain *Escherichia coli* (</100 mL) nor exceed 10/100 mL colony-forming units (WHO/IWA, 2016; SAZ-560:1997). Risk estimation for each identified hazardous event was calculated using a semi-quantitative risk matrix adapted from Bartram et al. (2009); Cunliffe et al. (2011); WHO, 2011 and Pérez-Vida et al. (2013) and recommended for WSP development. The matrix was used to estimate the risks by putting them into four risk levels: Low (< 6), Medium (6-9), High (10-15) and Very high (≥16) (Table 3.3).

Table 3.3: Definitions of likelihood of occurrence and severity of consequences (Bartram et al., 2009; WHO, 2011)

Severity number	Severity Impact	Consequences
1	Insignificant/no impact:	no water contamination, water within the building and no human health effects Not detectable.
2	Minor impact:	temporary non-compliance of some physical parameters with no direct link to human health effects. Non-fulfilment of organoleptic characteristics. There is not water insufficiency.
3	Moderate impact:	long non-compliance of some physical parameters with no direct link to human health effects. Chronic disease to insignificant part of

		population (≥ 2%). Water insufficiency <12 hours.
4	Major impact:	non-compliance of some chemical parameters with a direct link to long term human health effects e.g. acute disease in part of population (<2%). Water insufficiency 12 – 24 hours.
5	Catastrophic impact:	non-compliance of some chemical and/or microbiological parameters with a direct link to long and/or short-term health effects e.g. Acute disease in a significant part of the population (≥ 2%). Water insufficiency > 12 hours.

The likelihood of occurrence and severity of consequences were determined using the ing guidelines from Bartram et al. (2009), the WHO (2011) and Pérez-Vida et al. (2013). Numerical values (1-5) were attached to each descriptor for likelihood and severity of consequences. The risk was calculated as the product of likelihood and severity of consequences (Table 3.4).

Table 3.4: Semi-quantitative matrix adapted for risk assessment at consumer's level (Bartram et al., 2009; Cunliffe et al., 2011; WHO, 2011; Pérez-Vida et al. 2013)

		Severity of consequence				
Frequency of likelihood		**Insignificant or no impact**	**Minor impact**	**Moderate impact**	**Major impact**	**Catastrophic impact**
		1	2	3	4	5
Rare	**1**	1	2	3	4	5
Unlikely	**2**	2	4	6	8	10
Moderate	**3**	3	6	9	12	15
Likely	**4**	4	8	12	**16**	**20**
Almost certain	**5**	5	10	15	**20**	**25**
Risk score (RS)		<6	6-9	10-15	**>15**	
Risk rating (RR)		**Low**	**Medium**	**High**	**Very high**	

A risk estimation with and without control measures was also carried out as part of the risk assessment data analysis.

3.4.3.1.3 Calculation of WSS affordability

Calculations of affordability in this study used both the monthly disposable income and monthly bills of households (Table 6.22). Affordability was calculated as the percentage of household expenditure on water (Motsatsi and Gibberd, 2019).

$$A = \frac{EW}{MDI} \times 100\%$$

Where:

A = Affordability

EW = Expenditure on water

MDI = Monthly disposable income

3.4.3.2 QUALITATIVE ANALYSIS OF DATA

Thematic analysis techniques were used to analse qualitative data. Here, the researcher read through the field notes to enabled data coding. The data coding involved labelling data sets into categories based on the research objectives. The coded data sets were categorised into themes (Yin, 2014) in relation to the key contributors to the field of policy analysis that include Brinkerhoff and Crosby (2002); Pretorius (2003), Tom and Munemo (2015) and Minnes and Vodden (2017). The qualitative data was then grouped into the following themes: institutional capacity, financial capacity, human/technical capacity and Social capacity. Quantitative data, risk assessment and water safety planning, and finally water management paradigms. Themes were derived from both the field data (an inductive approach), and researcher's prior theoretical understanding of the phenomenon under study (deductive approach).

3.4.4 POPULATION AND SAMPLING

3.4.4.1 SAMPLING AND SAMPLE SIZE FOR SEMI STRUCTURED INTERVIEWS

3.4.4.1.1 Sampling for household semi-structured interviews

The sample size for household survey was calculated at 5% margin error and 95% confidence interval. The survey was conducted in 12 suburbs (7 high density, 2 medium density, 3 low density) in Masvingo urban and 5 suburbs (1 low density, 2 medium and 2 high density suburbs) in the city of Harare. The suburbs that were used as study units in Masvingo were systematically selected to include all residential categories where low income, medium income low and high income participants lived. In each of the selected suburbs, households were randomly selected for the semi-structured interviews and water sampling. Sampling in the City of Harare was slightly different because the selected suburbs had been used in previous studies and these were identified from the literature review. Instability in the City of Harare's management and political meddling also constrained sampling efforts because access to residential areas was severely restricted. City officials were very skeptical of any so-called studies in the city because they feared spying and hence opted to bar any studies in the rest of the suburbs. However, households in the 5 selected suburbs were randomly selected for the semi-structured interviews and water sampling.

It was important to find out the suburb of the respondent to enable responses to be distributed according to suburbs (Table 6.1). The sample distribution was purposefully made large for the high-density ward category because Zimbabwe's demography shows that most of the poor live in high density wards and informal settlements. Urban communities are heterogeneous and there prevails high inequities and deprivations among poor and rich urban communities while water and sanitation problems are rampant in urban high density suburbs especially the low-income communities (Tanyanyiwa and Mutungamiri, 2011; Manjengwa et al., 2016).

The community surveys included a total of 320 households that were randomly chosen in each of the study units to assess their socio-economic status, as well as their involvement in and perception of the WSS services in their community. Yamane's formula (Yamane, 1967) was used to calculate the sample size from a population of 126 456 split with 87 886 and 38 573 from Masvingo and Harare study cases, respectively (Zimbabwe National Statistics Agent [ZimStats], 2013). The Yamane sample size states that:

$$n = \frac{N}{(1 + N\,(e)^2}$$

Where:

n = Yamane sample size

N = underlying population size

e = Margin of error (MoE) and at 95% confidence limit, e = 0.05.

The calculated sample size was 398, however, a consideration of the sampling strategy, analysis flexibility, response rate and accuracy along with cost led to the use of 320 as a sample size. The Yamane formula does reflect the basic trade-offs between precision, accuracy and sample size. It was therefore possible to reduce the margin of error (MoE) to 0.06 giving the corrected sample size of 277, which shows that 320 is still a good sample size at this margin of error. The community survey used the household as the sampling unit. This was done for two reasons namely, (a) the existing and similar studies elsewhere use the household as the sampling unit; and (b) most of the indicators that were sought for in the research could only be measured at household level.

3.4.4.1.2 Sampling for institutional semi-structured interviews

Semi-structured institutional interviews were conducted with key informants and stakeholders that include representatives of local government bodies and relevant Ministries involved in water supply and sanitation, as well as those from participating non-governmental organisations (NGOs), and residents rate payer's associations in each of the two case studies (City of Masvingo and Harare). Information sort included the Zimbabwe National Water Policy and its implementation in urban areas, water tariffs and how the tariffs are determined, and an evaluation of the policy model that is used in these areas. The structured interviews with institutions that are directly engaged in WSS services targeted the following institutions: Urban councils or Urban Local Authorities; Department of Health; Urban Local Government; Zimbabwe National Water Authority;

Ratepayers Associations and representatives of funding Organisations and NGOs. The participants were chosen using a combination of purposive and snowball sampling. The use of purposive sampling was to focus on individuals and organisations that have the knowledge and experience of WSS management and service delivery to help the researcher in answering the research questions. In addition, snowball sampling was also used to identify other potential interviewees.

The initial plan for institutional interviews was to interview heads of city council departments in Masvingo and Harare and at least three subordinates in these departments. The departments include the Town Clerk's Office, Chamber Secretary, City Treasury, City Health, City Engineering, Housing and Community Services. The snowball sampling assisted in identifying additional institutions that provided their invaluable contributions towards the study's effort to answer the study questions. In the end, the number of participants for institutional interviews ended up being dependent on chance rather than by design.

3.5 ETHICAL CONSIDERATIONS

This research followed the University of Venda research ethics policy. As a result, the researcher observed the following ethical issues during the study:

i. ***Written permission:***

The University of Venda gave permission for the research to be conducted (Appendix B).

ii. ***Informed consent and voluntary participation:***

Participants were informed about the purpose of the research. They were also informed that their participation was on voluntary basis and that they could withdraw their participation whenever they felt uncomfortable. Participants were also required to sign a consent form upon agreement to participate in the study.

iii. ***Confidentiality and privacy:***

No identities or traceable data from the participants was collected. Confidentiality was maintained throughout the data collection, processing and reporting.

3.6 CHAPTER SUMMARY

This chapter outlined an overview of the methodology used in conducting this study. It described the study approaches and process through which data was collected and analysed.

CHAPTER 4

STUDY OBJECTIVE 1: EXAMINING CAUSES OF URBAN WATER CONUNDRUMS THROUGH THE STUDY OF QUALITATIVE GAPS BETWEEN THE ZNWP AND ITS IMPLEMENTATION

4.1 CHAPTER INTRODUCTION

This chapter examines qualitative policy implementation gaps as identified from both empirical and document analysis. The chapter focuses on capacity limitations faced by those mandated to provide WSS services in Zimbabwe and institutional, financial, and social and technical/human capacity.

4.2 MATERIALS AND METHODS

The study methodology used is described in Chapter 3. Themes were identified from the empirical data using guidelines given by public policy analysts. Qualitative gaps between policy and its implementation were identified as per Minnes and Vodden's (2017) four capacity elements that constrain water policy implementation: institutional; financial; ttechnical/human and social capacity.

4.3 RESULTS AND DISCUSSION

4.3.1 GAPS IDENTIFIED FROM THE LITERATURE REVIEW

The following gaps between the Zimbabwe National Water Policy and its implementation in urban areas were identified according to Tom and Munemo (2015):

i) Institutional capacity

The institutional constraints to the implementation of the ZNWP included lack of wide policy support; lack of predicted consequences during policy design and implementation; conceptual and ideological contestations including rampant politicisation of public policies by political parties for political expediency together d with excessive bureaucratic procedures (top-down policy implementation approaches); political instability that leads to economic meltdown and donor apathy; duplication of roles between water institutions, and lack of authority as well as of continuity in government policies owing to the electoral cycle.

ii) Financial capacity

Major financial constraints and the existence of unintended beneficiaries of the ZNWP that include politicians failing to pay water bills, illegal abstraction of surface water and unsanctioned boreholes drilled in urban areas, as well as lack of empowerment of residents by the ZNWP revealed poor service delivery

iii) Human/Technical capacity

Two human capacity constraints to the effective implementation of the ZNWP included ineffective organisational and human resources and lack of accountability in the public sector.

iv) Social capacity

The social capacity constraints that were identified include rampant corruption and lack of practice of democratic culture that includes debate, consultation and participation.

4.3.2 QUALITATIVE GAPS IDENTIFIED FROM THE EMPIRICAL STUDY

This part presents results from the household and stakeholder semi-structured interviews and other sources of empirical data. Table 4.1 provides a summary of qualitative gaps that were identified from the empirical study. All four capacity elements listed above were found to constrain the implementation of the Zimbabwe National Water Policy leading to urban water woes in Zimbabwe. The identified qualitative gaps between the ZNWP and its implementation were found to contribute immensely to the failure or effective attainment of the intended policy goals.

Table 4.1: Results from field observations and survey results of qualitative gaps between the ZNWP and its implementation

Element	Definitions and Indicators
Institutional	The legislation, regulations, policies, protocols, governance arrangements and delegation of responsibility to plan and enact SWP policies. **Identified institutional gaps included**:

	• Failure by central government to encourage politically, financially, as well a morally-local government officials to appropriately implement the ZNWP policies; • Vagaries of the political cycle affect continuity in government policies owing to the electoral cycle; • Political instability, which leads to economic meltdown and donor apathy; • Lack of discretionary power together ed with excessive bureaucratic procedures- top-down policy implementation approaches; • Lack of governance/regulation; • Overlapping of institutional boundaries; • City Councils water management strategies that do not protect drinking water supplies; • Lack of local by-laws to control urban agriculture; • Inadequate or no plans have been developed to guide municipal actions during water quality emergencies; • Lack of collaboration by stakeholders responsible for the implementation and enforcement of the ZNWP; • Institutional arrangements for land, environment and water management are integrated and, • Interference in urban local councils' activities and duties by political parties for political expediency.
Financial	The ability to acquire adequate funds to pay for ZNWP programmes as well as for ongoing planning, governance and management efforts. **Identified financial gaps included**: • Misplacement of available resources and g lack of a finance ring-fencing epitomised by funds from water fees being used to cover non-water service projects; • Low level of economic activity by city councils resulting in user fees as the only source of funding; • Politicians failing to pay water bills and the various f unsanctioned boreholes drilled in urban areas causing financial losses to the city councils; • City councils are unable to maintain a balanced budget; • City councils are unable to obtain funding from outside sources including from the Central Government and there are no subsidies to cover intensive capital investment such as infrastructure upgrade; • Water rates for customers do not reflect the full cost of providing municipal drinking water (including abstraction, treatment, distribution, maintenance and WSP); • Affordability threshold for WSS services in Zimbabwe's urban areas was between 7.5% and 13.3% far above the recommended threshold of 3-5%.
Social	The social factors that influence ZNWP governance and implementation include social norms such as values, attitudes, behaviours, sense of place, trust, reciprocity, commitment and motivation, and these that impact public awareness, stakeholder involvement, community support, and public and private partnerships in SWP efforts. This also incorporates structural

	networks, communications and the relationships between different groups' interests and actors. **Identified social gaps include:** • Lack of clear leadership for water quality protection and WSPs at city council and local government; • Lack of practice of democratic culture that include debate, consultation and participation of water users or civil societies representing ratepayers; • No active linkages between City Councils and government ministries and agencies (EMA, MHCW (vertical linkages), nor linkages with ratepayers associations and relevant community organisations (horizontal linkages); • Lack of community awareness and support regarding WSP and household hygiene; • Corruption.
Technical/Human	The physical and operational ability of an organisation to perform WSP management and operations adequately. In addition, having the human resources with adequate knowledge, skills and experience to properly create water safety plans and implement needed measures. *Examples of indicators include organisations responsible for water safety planning that have:* • Employees dedicated to water management ; • Access to individuals with the necessary skills and training to manage drinking water; • Education and training opportunities available to staff members and decision makers; • Access to individuals with the expertise needed to undertake technical activities related to drinking water quality; • Access to the data needed to manage water supplies and develop WSPs plans as required by the ZNWP. **Identified social gaps included:** • High brain drain in municipalities as skilled manpower emigrate to other countries due to poor remuneration; • No employees dedicated to execute water safety planning responsibilities; • Lack of service user experiences; • Lack of accountability in the public sector characterised by uncompleted projects that include a major sewerage augmentation project in Masvingo City; • Corruption; • Absence or limited information on drinking water supply system including lack of data on system description for water safety planning.

The literature review indicated that the causes of the water policies' failure to achieve their intended goals (Chapter 2) are linked to technical matters as technical solutions are handy and they play a fundamental role. There are other solutions to urban water challenges. Water policy analysts argue that, in complimenting technical solutions to urban water challenges, cities must ensure that the existing institutional structures are "*fit to fix the pipes*" (Romano and Akhmouch, 2019). This includes putting in place mechanisms that ensure that information is accessible and capacity is adequate. Furthermore, there should be sufficient funding, transparency and honesty, meaningful stakeholder engagement and coherence across sectoral policies (Romano and Akhmouch, 2019).

4.3.3 INSTITUTIONAL CAPACITY

According to Ménard et al. (2017), the adoption of national water policies and laws should not be seen as an end in itself. Instead, it should be the start of a longer process that requires much more than formal changes, substantial investments and dedication in financial, social and political capital and in establishing human capabilities. Thus, an effective implementation of water policies by municipalities, water utilities, city councils, local governments or any other institution mandated to provide these services requires financial, technical, institutional, and social/political capacity (OECD 2011; Howlett et al. 2015; Ménard et al. 2017; Minnes and Vodden 2017; Romano and Akhmouch 2019; Eledi, 2019).

i Failure by Central Government of Zimbabwe to encourage, politically, financially and morally, local government officials to appropriately implement the ZNWP policies

The literature review showed that WSS services in most African countries are mostly constrained by qualitative gaps between national water policies and water services (Tom and Munemo, 2015; Imonikhe and Moodley, 2018; Eledi, 2019). Despite the ZNWP being well designed, there were challenges regarding support from Government and other important stakeholders. The interviews with local authorities have shown that the central government of Zimbabwe is failing to encourage politically, financially and morally the local government officials to appropriately implement the ZNWP policies. This was supported by the lack of Government subsidies to local authorities, especially given that the local councils have experienced severe financial shortages that have resulted in inadequate service delivery in most city councils. The current state of affairs is that, local authorities have to finance their activities such as capital intensive infrastructure development. An assessment of the infrastructure and an internal informal audit with concerned stakeholders has shown that the Central Government of Zimbabwe does not provide financial support nor subsides for capital investment in water and sanitation with the costs borne by service providers through user fees. However, the ZNWP indicates that investments in primary water for the basic needs of urban areas could be subsidised during the first five years of the ZNWP (2013-2017) while recurrent costs are borne by the users to ensure sustainability. Thus, the Government of Zimbabwe (GOZ) is failing to meet I the obligation to "*fulfil*" which encompasses the obligation to facilitate positive measures that assist individuals and communities to enjoy the right to water by taking targeted steps, which include empowering citizens through financing capital intensity WSS infrastructure, proper education on household water storage and hygiene, water safety planning and ways to reduce water wastage (Levin et al., 2009).

The above observation is supported by the results of this study on the assessment of methods used by city councils to collect water rates (Figure 6.25). The Figure shows that at least 27% of users in high, medium and low density suburbs got disconnected from the municipal water supply system after failing to pay up their water bills. This study identified a failure by the GOZ to take positive measures to assist individuals and communities to enjoy the right to water as is seen in rampant water meter disconnections after household fail to cope with the exorbitant water bills (Figures 6.25 and Figure 6.26). Smets (2009) notes that scenarios where certain individuals fail to pay for WSS services because of reasons beyond their control demand that, public authorities lessen the burden of the increase in water price by improving efficiency, providing higher water subsidies for all or by setting up social tariffs or aid targeted on the poor. In addition, Coalition Eau (2009) notes that government practices seeking to make water prices affordable for poor households may include subsidised household water and reduce water taxes; lightening the burden on small consumers (for instance by increasing the price paid by large consumers and nondomestic consumers); support programmes that improve economic efficiency in the water sector; and the reduction of household water consumption levels (reducing wastage).

Unfortunately, the results from interviews with local authorities showed that there are no subsidies from the Local or Central Government in Zimbabwe to cushion water prices for poor households. It is argued that measures directed towards the full realisation of the right to water should be put in place. These measures include adopting a national water strategy and plan of action to realise this right; ensuring that water is affordable for everyone; and facilitating improved and sustainable access to water, particularly in rural and deprived urban areas (CESCR, 2003; Liven et al., 2009; Murthy, 2013; Meier, 2014). The other ways in which governments can support financially is through implementation of social assistance measures. That is, the government can increase housing assistance and specific measures to make water more affordable for low-income households by providing assistance to repair leaks and reduce wasteful use; providing assistance to help users access the different social support systems available and thus be better able to pay their various bills, including water; creating reduced water tariffs for low-income households (social tariff); and/or providing targeted aid to the same effect.

Ideas noted form the literature review are significant here. Hutton (2012) indicates that many developing countries have adopted policies to promote an affordability index for poor households of 3-5% and implement measures to reduce the burden of water expenses for people living in poverty. Smets (2009) argues with reference to France and Mexico that, while spending on WASH services of poor households is generally below that of richer households, the burden of these expenses on poorer households is usually disproportionally higher if expressed as a proportion of household budget. In conformity with this development, Smets (2009) observes, with regards to developing regions that: in Latin America, most countries have affordability indices above 4% for median households; and that social tariffs (discounted price plans to vulnerable consumers) mean that the affordability ratio for poor households does not exceed 10% and would generally be around 6% for the first decile of income.

The Zimbabwean urban situation demands that, government subsidies should be mandatory. This is because city councils are unable, for reasons beyond their control, to realise the right to water themselves by the means at their disposal since national economic challenges have crippled their financial base (CESCR, 2003). Household surveys have shown that many households cannot afford to pay for their water services because the affordability index is way above the recommended 3-5%. A scenario was identified where a household was disconnected from the main water supply and no effort was made to ensure the right to water and sanitation for the occupants was restored (Figure 6.26).

A study of the South Africa National Water Act (NWA, Act 36 of 1998) by Folifac (2007) indicates that political will and policy framework are essential to achieve policy goals. Consequently, a high-level political will and policy support is reported to be a key element if policies are to achieve what they are intended to achieve. The commitment to enact policies by the South African Government is identified as the first step towards successful implementation of the NWA and this was proved by the Department of Water Affairs (DWAF) implementation of water projects that were aimed at improving water services. This led to the successful implementation of NWA and when the NWA was moved from paper to action, it resulted in the creation of Catchment Management Agencies (CMAs) and Water User Associations as stipulated by the NWA.

Furthermore, an international partnership, the National Water and Sanitation Programme (NWSP), was also created to assist the poor to gain access to WSS services with government funding provided from 1994-2002 to DWAF and the private sector. This programme led to the construction of water and sanitation services to cover 7 million people. Concomitantly, the right to water was enacted in the South African National Constitution (a formal institution which provides the framework for all other legislation, rules and regulations) to redress past racial discrimination (Folifac, 2007; Ménard et al., 2017; Maphela and Cloete, 2020). Most of the policy gaps identified above come from flaws in these macro-institutions as underscored in the observation that "badly defined property rights can introduce loopholes in procedures of implementation, opening room for opportunistic behaviour all the way up to bribery and corruption" (Ménard et al., 2017).

ii Overlapping of institutional boundaries

With further reference to the South African case, the South Africa Water Service Policy of 1994 (WSP) established an enabling environment by clearly articulating roles and responsibilities of different levels of government. Thus, one can argue that the South African government made sure that a fit institutional framework was in place to define rules and norms and ensure that they are defined, implemented and operationalised.

Analysts of the ZNWP decry that, the existing policy structures still exist on paper only and that there is no enabling environment to support policy programmes by Urban Local Authorities (Hove and Tirimboi, 2011; Marumahoko et al., 2020). Defining roles in policy implementation is important because it imparts a sense of responsibility and creates meaningful linkages in the policy's implementation. According to Folifac (2007), the South African government, through parliament and the judiciary (macro-institutions), set out the rules of the game properly. However, in Zimbabwe, the Water Act and the ZNWP are still being used interchangeably and there is still confusion regarding statutory responsibilities between certain government ministries and departments. An overlapping of institutional boundaries were shown by the Zimbabwe National Water Authority's continued responsibilities of providing drinking water services despite this responsibility having been removed by the adoption of the ZNWP. The ZNWP requires that the National Water Supply and Sanitation Services Utility (NWSSU) which would provide water supply services be formed to carry out these responsibilities. In addition, the Central Government, through the Ministry of Local Government, still controls activities of ULAs such as the decision-making component. Anything that is likely to pose a negative political connotation on the party that the Minister represents would not be accepted.

The OECD (2011, 2015) argues that, creating institutional devices that allow the inclusion of subnational governments, private and community stakeholders, making room for 'voice' in the policy-making process, is a necessary condition to make realistic, implementable policies. The institutional framework in South Africa identified NGOs as essential stakeholders whose resources could be harnessed to foster policy implementation. In addition, the government provided overwhelming support by channelling financial resources towards construction of basic infrastructure, training of communities to undertake governance, administration, operation and maintenance of water services, and these finances were channelled through the DWAF (Folifac, 2007). Both the empirical data and literature review showed that political interference and lack of stakeholder participation in the policy-making process and the elimination of ratepayers' associations and civil societies in the ZNWP lead to the suppression of citizen voices and apathy (MURRA, 2019; Marumahoko et al., 2020).

iii Vagaries of the political cycle affect continuity in government policies owing to the electoral cycle

The vagaries of the political cycle that has affected government policies owing to the electoral cycle has impacted the service provision by local councils. Both Masvingo and Harare City witnessed a recalling of the, elected mayors and councillors of the main opposition party Movement for Democratic Change Alliance (MDC-A) by a rival group MDC Tsvangirai (MDC-T) after the Supreme Court ruled that the rival MDC-T was the legal party. All elected mayors and councillors who refused to comply with the order and remained affiliated to the main MDC-A were recalled in 2020 leaving over 754 000 voters in 26 constituencies without elected representation. It should be noted that *Section 160* and *161* of the Constitution of Zimbabwe dictates that for purposes of electing members of Parliament, the Zimbabwe Electoral Commission (ZEC) divides the country into 210 constituencies. Each constituency is made up of several wards for purposes of election of local authorities such as ward councillors (ZEC, 2018). Nonetheless, the recalling of members of Parliament and councillors, resulted in various citizens remaining without representation and no one to account for service delivery (Allafrica.com, 25 September 2021). In some cases, competent mayors or councillors were replaced by incompetent counterparts after political inference within their party or outside their party. Residents in Masvingo City noted that their former mayor (Hebert Fidze) of the MDC was so competent as they never experienced issues with service delivery and yet the 2018 government elections witnessed rival opponents within his party rigging the primary elections such that he did not go for the national elections and this resulted in the fielding of a new mayor.

Hence, the town lost a competent mayor who was replaced, through political interference, by one with limited city administration capabilities.

iv Interference in urban local councils' activities and duties by political parties for political expediency

Political parties' interference in urban local councils' activities for political expedience is still rife with some council decisions either being accepted or rejected depending on how they are perceived by the Minister of Local Government. The post-2018 national elections squabbles between the two MDCs escalated to another level that resulted g in the expulsion of the elected Harare City Council (HCC) Mayor Jacob Mafume. The MDC-T is reportedly believed to be affiliated to ruling party ZANU PF and being used to destabilise the main opposition the MDC-A. The local news Bulawayo24.com (28 September 2021), reported that the HCC was on autopilot since the 17th of September 2021 when the minister of Local Government (July Moyo) reportedly suspended Jacob Mafume on trumped charges of obstructing the course of justice following allegations of corruption, and replaced him the rival MDC-T councillor (Stewart Mutizwa) as an acting mayor. The suspension of the mayor came regardless of a Harare High Court clearing the Mayor of the alleged charges and giving a directive of the mayor's return to his position. The minister exploited Section 104 (2) of the Urban Councils Act (Chapter 29:15) which grants the minister the powers to appoint council mayors if the city council fails to do so by itself. The minister defiled the High Court ruling which rejected the application by the National Prosecuting Authority (NPA) to bar the mayor from the HCC (Bulawayo24.com 28th September 2021).

The Zimlive.com (30 September 2021) indicated that the situation at HCC was dire to such an extent that no binding decisions were being made on issues of service delivery. At one point the city of Harare had two mayors: Stewart Mutizwa and Jacob Mafume while Council committee resolutions were piling up without implementation and thus, leading to a negative impact on service delivery (Harare Residents Trust [HRT, 2021]). The HRT (2021) indicated that "*Councillors are elected by ratepayers to represent them, make laws and play oversight roles without compromising any of these roles at the altar of political expediency*". The HRT decries that the minister failed to assist the HCC and instead repeatedly issued directives that paralysed the operations of the HCC. The imposition of Stewart Mutizwa against the voters' will is regarded as one of these political interferences by the minister for political expediency.

Another example cited refers to the way the then Minister of Local Government (Ignatius Chombo) used blackmailing, manipulation and vote buying to win back support for the ruling party, the Zimbabwe African National Union Patriotic Front (ZANU PF), in the urban areas (Marumahoko et al., 2020). It is reported that shortly before the 2013 presidential elections, the Minister directed urban local authorities to '*write off debts in respect of rentals, unit tax, development levy, refuse charges and water and sewer fees'* (Jonga, 2013; Ministry of Local Government, 2013; The Herald 22 June 2013). The decision to write off debts is perceived to have nearly crippled service delivery while some urban local authorities never recovered (Marumahoko et al., 2020).

v Political instability which leads to economic meltdown and donor apathy

The protracted political instability since the onset of land redistribution process which saw violations of human rights led to political and socio-economic deterioration, international isolation, donor apathy, hyperinflation, economic woes and a shrinking of local government revenue needed to support service delivery (Bland 2011). The situation was exacerbated by corruption and lack of accountability by public office bearers in both government and ULAs. The economic meltdown caused by political instability seriously affected attempts by local authorities at sourcing external funding and local revenue since the most water users live far below the poverty datum line and cannot afford to meet their obligation to pay for water and sanitation services. Consequently, funding towards infrastructure upgrade and maintenance was seriously reduced.

vi Lack of discretionary power coupled with excessive bureaucratic procedures-top-down policy implementation approaches

The Urban Local Authorities claim that the approval of their applications for foreign currency to buy spare parts for WSS service maintenance takes longer than is expected. It was argued that the people who handle these forex applications do not know that residents' lives will be at stake if funding is delayed. During the study period, the Masvingo City Council went for almost 2 months (mid-September to November) operating with one pump and most residential areas on high ground had dry taps for more than 2 months. This observation confirms household survey results where respondents in some residential areas claimed that they did not get water supply for more than a week and had to resort to borehole water and in some cases used unimproved water sources such as dug wells (see Chapter 7).

Lack of discretionary power together with excessive bureaucratic procedures marked by a top-down policy implementation approaches have been identified as one of the institutional capacities that hinder the implementation of the ZNWP. The structure of urban local government in Zimbabwe and how it operates has implications for the efficiency and effectiveness of service delivery (Marumahoko et al., 2020). The results from an internal audit of the city council officials has shown that they do not have discretionary powers to pass any resolutions, the decision lies with the Minister of Local Government whose decisions are influenced by the political party that he/she represent in parliament. Indirectly, the national government, through the Ministry of Local Government, which is accountable to parliament, plays roles that include facilitation; advice; monitoring; oversight; directing; promotion; and capacity building (Chakaipa, 2010).
The Ministry achieves these roles through its Department of Urban Local Authorities. The Local Government Board, a unit of the Department of Urban Councils, is responsible for employing the departmental heads, including town clerks of urban local authorities and in most cases this is influenced by politics of patronage (Tanyanyiwa and Mutungamiri, 2011).

vii Lack of governance/regulation

Assessment of water supply and sanitation service regulatory bodies through interviews with council officials and relevant stakeholders shows that despite the ZNWP dictating the requirement to form a water supply and wastewater services regulatory unit, during the study period, no regulatory body was in existence. The Water and Wastewater

Services Regulatory Unit (WWRU) is supposed to ensure that uniform standards across the country are met and water service authorities monitored. Furthermore, the WWRU makes sure that ULAs are accountable for the services they provide as part of best practice and an international requirement. The internal audit found out that no regulator is available to regulate these services as is required by the ZNWP. There is no Regulator to promote best practices in the water sector and monitor and enforce standards.

The current set-up is that Water Services Authorities account to the Minister of Local Government who is a non-technocrat with no skills on services and service standards regulation. The WWRU was expected to:

- Enforce Water Supply and Sanitation Services performance standards including service level, levels of unaccounted for water losses, conditions of employment in the water supply and sanitation sector, consumer satisfaction levels, and the technical capacity of water supply authorities and providers,
- Receive and assess tariff applications in collaboration with relevant ministries such as MLGRUD and Ministry of Agriculture, Mechanization and Irrigation Development [MAMID],
- Monitor and provide guidance to Water Services Authorities related to the licensing of Water Service Providers by Water Services Authorities, and
- Ensure and promote dialogue among all concerned parties on all issues related to water service delivery and particularly prior to revision of tariffs.

Unfortunately, eight years since the ZNWP's adoption, ULAs are not regulated and a minister of Local Government cannot have the capacity to do such a technical responsibility of an independent regulator as is expected by the ZNWP. The proposed creation of the WWSRU is still on paper. It is important that this policy instrument of the ZNWP be implemented in practical terms. This lack of regulation means that, the water sector in Zimbabwe is still not meeting the requirements of best practice and international experience.

At the same time, regulation serves interests of consumers and the economy. It is important to ensure that water supply and wastewater services are developed and provided to uniform standards across the country and to ensure that Water Services Authorities are monitored and kept accountable for the services they responsible for (MWRDM, 2012).

The lack of regulation, despite the ZNWP's stipulations that it is mandatory for the construction and legal occupation of urban houses to be preceded by the development of road, water supply and sewerage services, most urban developments do not observe this regulation. This regulation ensures that service delivery keeps pace with housing development. Cross-subsidies from wealthier sections of urban areas to poorer sections are expected to advance principles of universal access to all (MWRDM, 2012). The ZNWP was designed to address this situation but 7 years since its inception, urban water woes persist and, in some cases, have increased.

viii City Councils water management strategies do not protect drinking water supplies

City Councils water management strategies do not protect drinking water supplies, there is still no clarity on who should protect water sources. Raw sewerage flows into rivers and contaminates catchment areas.

ix Institutional arrangements for land, environment and water management are integrated and lack of local by-laws to control urban agriculture

There are no local by-laws to control urban agriculture and this has resulted in source water pollution that leads to eutrophication and dam siltation. Currently, the City of Harare is grappling with heavily contaminated source water from Lake Chivero. Masvingo City also raised their concerns to stakeholders over gold panning and rural settlements close to Lake Mutirikwi, the main source of drinking water for the city. Institutional arrangements for land, environment and water management are still unclear. The Environmental Management Authority (EMA) seems to ignore urban pollution and sewerage spill management. This follows the argument by city authorities that land rehabilitation after sewerage spillage is the responsibility of EMA and not city councils. EMA seems to confine its responsibilities to other areas other than the urban. There is no action on land pollution through sewerage, most probably because the land belongs to city councils. However, ownership of urban land cannot be taken as an excuse not to fulfil their statutory obligation of environmental protection and pollution control.

x Lack of collaboration by stakeholders responsible for the implementation and enforcement of the ZNWP

There is a general lack of collaboration between the Ministry of Health and Child Care's Health Department and the ULAs regarding household hygiene and household water storage. The unreliable water supplies compel residents in urban areas to used stored water as the alternative source of drinking water. This is supported by an assessment of continuity which showed 66% of respondents in the high density suburbs indicating that water flow is not continuous (see Chapter 6.3.3.1.2). As such, there is need for the Department of Health to extend its responsibility for WASH to include urban residents. In addition, city councils should collaborate with all relevant stakeholders to develop WSPs and plans to guide municipal programmes during water quality emergencies.

xi Inadequate or no plans have been developed to guide municipal actions during water quality emergencies

Results from interviews with ULAs show that there are no tangible policy programmes that inform emergency planning in cases of serious service interruption. It was noted that there is a lack of enough water boreholes to serve urban communities. There were no public toilets to use when there is no water supply to households for extended periods of time and this resulted in open defaecation.

4.3.4 FINANCIAL CAPACITY

The WHO (2019) considers that weak systems and funding gaps jeopardise the provision of WSS services in the world's poorest countries. According to Eledi (2019), the level of spending on water policy and implementation by a water institution influences the institution's ability to invest in expensive technical programs such as monitoring or undertaking technical studies. The study identified the following financial gaps:

i Misplacement of available resources including lack of a finance ring-fencing epitomised by funds from water fees being used to cover non-water service projects

An internal audit with city officials showed that accounts are still not ring-fenced. Some funds from water fees were used to cover non-water service projects including road maintenance. An assessment of water service backlogs showed a plethora of factors including mismanagement of funds by councils. The respondents during local authority interviews indicated that employment costs are a major expense that is incurred by local authorities. It was indicated that about 50% of council revenue was being used to pay salaries. Furthermore, local authorities are spending less than 10% of their expenditure on repairs and maintenance. The WPYD (2018) indicates that, failure to invest in maintenance of WSS infrastructure, makes the future of service delivery to not be guaranteed.

A typical example was given where the City of Gweru's employment costs were 44.38% of total expenditure in 2016 and as of July 31st 2017, Gweru city's employment costs accounted for 63.3% of total expenditure (WPYD, 2018). Furthermore, a benchmarking report by the SLB (2018) shows a constant property coverage at 82% for the year 2016 to 2017 with no investment in water infrastructure despite the backlogs in infrastructure. This meant that local authorities are not investing in new infrastructure and there is very little investment in maintaining WSS infrastructure, which leads to water service backlogs.

ii Low level of economic activity by city councils resulting in user fees as the only source of funding

The ULAs do not have any economic activity that generate revenue for the council except from user fees, taxes and levies. The only economic activities that were somewhat viable were the beerhalls and house renting.

iii Politicians fail to pay water bills, there are a lot of unsanctioned boreholes drilled in urban areas causing financial losses to the city councils

The Ministry of local government and government departments, including the security services (police) and prisons, owed the Masvingo City Council hundreds of thousands of United States dollars (US$) in unpaid bills. At one point, the police department was sued by the Masvingo City Council, however, politics still plays a big role as no meaningful resolution was reached to recover the money.

iv City councils are unable to maintain a balanced budget and cannot obtain funding from outside sources including from the Central Government and there are no subsidies to cover intensive capital investment like infrastructure upgrade

The city councils have failed to maintain a balanced budget due to the volatility of the local currency, hence, ULAs are always in a deficit that end up jeopardising service delivery. Interviews with city officials indicated that it was not easy to secure funding from outside sources including from the Central Government and, there are no subsidies to cover intensive capital investment like infrastructure upgrade. Non-payment for services by water users resulting in millions of dollars in unpaid bills was one of the factors that drags service augmentation. This is supported by the SLB (2018) report that shows a decrease in cost recovery in water supply from 168% in 2016 to 163.2% in 2017. Consequently, city council officials decry the lack of responsibility and commitment by consumers towards bill payment Reference was also made to political interference, such as the cancellation of water bills by the Government of Zimbabwe towards the 2013 presidential elections to buy electoral votes, which caused serious losses to local councils.

The unreliability of drinking water supplies has compelled various households in urban areas to start using unsafe water sources and digging wells in their backyards (Figure 6.8). These residents' initiatives contribute immensely to financial losses by the city councils because many households have stopped paying water bills. Although technically the water affordability is far higher than the recommended 3-5% for most households, water rates do not reflect the full cost of providing municipal drinking water (including abstraction, treatment, distribution, maintenance and WSP) because they are paid in local Zimbabwe dollar which has depreciated significantly.

v Water rates for customers do not reflect the full cost of providing municipal drinking water (including abstraction, treatment, distribution, maintenance and WSP). Affordability threshold for WSS services in Zimbabwe's urban areas was between 7.5% and 13.3% far above the recommended threshold of 3-5%

All the 20 respondents in stakeholder semi-structured interviews agreed that the current tariff structure does not cover costs incurred to produce water. Tariffs were reportedly lower than expected and there were conflicting forces, including economic hardships where ratepayers' source of income does not suffice their basic needs for survival. This forces the government to disapprove any tariff hike proposals by city councils because approval would further burden the already suffering masses. It was indicated that even the current tariff structures are still a big burden to most household. This is confirmed by the water service affordability index which is far higher than the international stipulated level of 3-5% for most households in urban areas. The current income for most urban dwellers automatically makes them to have very high affordability indexes making water services unaffordable. Unfortunately, the central government does not subsidize water services and there are also no social tariffs to cushion the hard-hit households from unaffordable tariffs.

Given that city councils are sourcing most of their consumables including spare parts outside and need foreign currency, which when they convert their local currency to source the forex, the money that they get does not suffice to cover the costs incurred for water production. To aggravate the situation, the affordability threshold for WSS services in Zimbabwe's urban areas was between 7.5% and 13.3% far above the recommended threshold of 3-5% meaning that many households struggle to pay their bills (Figure 6.18). Thus, households do not use adequate volumes of water for hygiene purposes thus, creating public health concerns. Unfortunately, the problem of affordability and user income is something more political than economical because the Government has stagnated workers' salaries at very low levels because the country's economy is in shambles.

However, stagnating salaries at uneconomically viable levels does not cut on the costs incurred in providing services. Consequently, tariffs are also stagnated by the Government through the Minister of Local Government so that workers cannot demand salary increment. This situation is creating a vicious cycle in the provision of WSS services. A study by Imonikhe and Moodley (2018) showed that Nigerian state utilities are seriously affected by inadequate finances due to low tariffs and non-payment of water bills.

Similarly, most scholars concur with the view that water utilities in developing countries and in small towns and municipalities or small communities in the developed countries, are challenged by limited financial resources, caused by low efficiency and subsidised tariffs, shrinking and aging populations (Timmer et al., 2007 Minnes & Vodden, 2014; Eledi, 2019). Moreover, the WHO (2019) considers that weak systems and funding gaps jeopardise the provision of WSS services in the world's poorest countries. A study by Eledi (2019) indicates that the level of spending on water policy and implementation by a water institution influences the institution's ability to invest in expensive technical programmes such as monitoring or the undertaking of technical studies. For example, a WSP needs to be able to support assessments of the vulnerabilities of water supply to contamination and the effectiveness of the protection strategy. According to Morris (2017), there is a need for utilities to have the capacity to transform financial resources into worthwhile projects and ventures. Thus, funding is a key driver to the achievement of micro-level water policies like water treatment, increasing human capacity, data management, infrastructure provision and maintenance.

In the absence of government subsidies, city councils' funding challenges limit their capacity to the provision of the ZNWP recommended 10 m^3 free water because their current costs are higher than the income they generate from water sales.

4.3.5 SOCIAL CAPACITY

The study identified the following social capacity gaps that influence service delivery in the study area:

i Lack of clear leadership for water quality protection and WSPs at city council and local government

Water safety planning requires a team leader who is a self-starter, focused and duteous. Breach (2012) indicates that a team leader should be appointed to implement programmes such WSP projects and maintain focus on priority tasks. The absence of functional WSP teams in both city councils shows lack of clear leadership for water quality protection. In Masvingo, the City Engineer who oversaw the augmentation of the sewerage system from Runyararo West to Rujeko suburbs failed to lead the project and the investment that took millions of United States dollars was abandoned with most of the material that was used damaged beyond recovery. Consequently, the engineer's contract was terminated for failing to lead the project. Breach (2012) indicates that a team leader should have sufficient delegated authority, however, city councils do not have full control of own programs as these should be approved by the minister before they can implement them.

ii Lack of practice of democratic culture including debate, consultation and participation of water users or civil societies representing ratepayers

The HRWS call for the observation of the "*cross-cutting criteria*" for a full realisation of the human rights to water and other rights. Furthermore, the 1992 Rio Earth Summit endorsed the Local Agenda 21 which emphasises the need for people from all sections of the community to take joint responsibility in decision-making processes for service delivery. Unfortunately, both the household survey and interviews with local authorities showed a lack of practice of democratic cultures including debate, consultation and participation of water users or civil societies representing ratepayers. Most respondents decry lack of communication, consultation and transparency (Figure 6.23).

The Local Authorities Circular No. 3 of 2017 of the Ministry of Local Government gives guidelines for budget preparation. These guidelines are based on: realistic forecasts, citizen engagement, compliance with International Public Sector Accounting Standards, cost control measures, cost recovery of services, capital investment program, management of debt, gender sensitivity among others (Ministry of Local Government, Public Works and National Housing [MLGPWNH, 2017]). The MLDPWNH on citizen engagement stipulates that "*Citizen Participation is imperative during both budget formulation, review and implementation processes*…" Furthermore, all local authorities are required to be innovative and come up with various mechanisms to improve citizen engagement. An annexure should be attached with disintegrated data on citizens engaged (sex, age, disabled etc.) and the process must also deal with restoring rate payer confidence and trust in the local authority.

Engagements must be seen to be genuine and necessary not just for compliance (MLGPWNH, 2017). Unfortunately, there is still a wide gap between the policy statements and the real implementation of these legislations by ULAs as is revealed by results on WSS service standards in urban areas reported in Chapter 7.

Information regarding meetings to discuss budgets or tariffs is not received timely or shared efficiently (see chapter 6.35.3). There is also a tendency by the ULAs to suppress citizen voices by not recognising ratepayer's associations arguing that the Urban Councils Act (Chapter 29:15) does not cater for their participation in decision making. ULAs argue that ratepayer association blow issues out of proportion and as such are considered a nuisance during consultative meetings (City of Masvingo, 2019). ULAs do not want to account to ratepayers and hence use illusive means to eliminate user voices. The deliberate lack of proper communication of crucial meetings undermines the call for transparency and accountability.

iii No active linkages between City Councils and government ministries and agencies (EMA, MHCW (vertical linkages), nor linkages with ratepayers associations and relevant community organizations (horizontal linkages)

Results of interviews with ULAs show lack of active linkages between City Councils and government ministries and agencies (EMA, MoHCW (vertical linkages), nor linkages with ratepayer's associations and relevant community organisations (horizontal linkages) (City of Masvingo, 2019, MURRA, 2019)). It was observed that EMA, the Department of Health and ULAs do not collaborate to deal with source water pollution, environmental protection and urban WASH (see chapter 6.3.8.2). This resulted in the contamination of drinking water at source, during distribution and household storage and led to episodes of waterborne diseases in urban areas. Linked to this situation is the lack of community awareness and support regarding WSP and household hygiene because of lack of collaboration between stakeholders in WASH and drinking water supply (Figure 7.1).

iv Corruption

Household respondents in some areas cited corruption by water truck drivers. Water bowsers were reportedly only servicing certain areas where the officials had some personal interests. One case was cited where the driver of the water bowsers would always go to one sport in the suburbs to deliver water and later the community figured out that water trucking driver had a girlfriend who was staying in that area or drivers would frequent to areas where their families stay.

v Lack of community awareness and support regarding WSP and household hygiene

The community survey also assessed data from the respondents on whether they were aware of the causes of the water problems that haunt them. The human rights principles indicate that water users need to be capacitated through sharing essential information which concern them especially status of services and issues that affect services. The results from an assessment of user knowledge on causes of water-cuts show that at least 18% of residents in all three residential categories did not know the possible causes of the water shortages in their communities. Respondents in both household and local authority interviews had very little if any knowledge about water safety planning and household hygiene practices including safe household water storage.

4.3.6 TECHNICAL/HUMAN CAPACITY

The study identified the following technical/human capacity factors that influence the delivery of WSS services by the ULAs:

i High brain drain in municipalities as skilled manpower immigrate to other countries due to poor remuneration. No employees dedicated to execute water safety planning responsibilities.

According to OECD (2015) and Hudson et al. (2019), the purpose of creating a knowledge base (capacity building) is to invest in skills that will enable an organisation to meet future implementation challenges. However, local municipalities in Zimbabwe have lost skilled manpower because of emigration to other countries due to poor salaries and work conditions. Thus, various city councils experience skilled manpower shortages. It was observed that both the Masvingo and the Harare City Councils did not have employees dedicated to water safety planning responsibilities because of a shortage of technical staff. Hence, this shortage in manpower prevents the implementation of WSP programmes, which leads to poor water quality being delivered to consumers.

ii Lack of accountability in the public sector characterised by uncompleted projects including a major sewerage augmentation project in Masvingo City

Lack of accountability in the public sector, characterised by uncompleted projects including a major sewerage augmentation project in Masvingo City as already mentioned, is also a human capacity matter. The community survey and internal audit results showed that despite the economic and political elements that impact on the implementation of the ZNWP, corruption and unaccounted for expenditure is rampant. This was revealed in the y literature review where most city councils would conceal information regarding council accounts. No data was availed to SLB peer reviewers regardless of the reality that peer reviewing is an official programme that is catered under the Urban Councils Act to help promote service delivery (SLB, 2018).

iii Lack of service user experiences

Most households lack knowledge of household water storage as a complement of WSP. A lot of drinking water contamination occurs at household level as a result of ignorance and lack of experience on household storage and treatment.

iv Absence or limited information on drinking water supply systems including lack of data on system description for water safety planning

The lack of or limited information on drinking water supply systems and g lack of data on system descriptions for water safety planning shows lack of technical expertise needed to develop WSPs despite the high call for their implementation by the ZNWP. There was reportedly slow or no response to reports of burst pipes and reasons included shortages of manpower together with lack of fuel and corruption where council employees would demand kickbacks to provide the services.

It is argued that in most African countries, municipalities are run by mayors, councillors and local government officials who are non-technocrats. As a result, the understanding of WSS issues by these officials needs to be raised through workshops and in-service training. Competent service providers or utility operators are an important resource for the delivery of safe drinking water. Similarly, Hudson et al. (2019) and the Zimbabwe Service Level Benchmarking Report (SLB, 2018) conclude that WSS service provision requires an adequate technical capacity to implement sustainable operational and maintenance programmes including source water protection plans, water safety plans, risk management systems, infrastructure capital investment and repairs. For example, South Africa relies on 1,100 municipal plumbers countrywide to operate and maintain water infrastructure under the NWA (Maphela and Cloete, 2020).This supports the view that capable managers are indispensable for an efficient water system (Lebel and Reed, 2010). In addition, the OECD (2015) acknowledges that the unavailability of competent human resources is the greatest challenge to efficient water service regulation and provision in developing and emerging economies.

4.4 CHAPTER SUMMARY

The literature review on Zimbabwe water management showed that there is that lack of community involvement from initial stages in water provision and argue that local knowledge and experience leads to a formulation of solutions that are relevant to the local scenarios. Similarly, studies in Nigeria by Imonikhe and Moodley (2018) and Obeta (2018) assessed the challenges of effective policy implementation in state water authorities and identified qualitative gaps that include funding, incomplete devolution of powers, illegal connections and vandalism as the key factors in all Nigerian state water authority cases and that these undermine effective policy implementation. It was argued that incomplete devolution impacts local government because the councils would not have the powers to take decisions regarding staff management, infrastructure management and financial expenditures. Consequently, local governments cannot make any decision that passes.

It was also argued that autonomy (devolution) and capacity building makes it easier for utilities to deliver water policies and plans without having to seek approval from the central government (Imonikhe and Moodley, 2018). Hence, devolution allows utilities to move from developing tactical plans, business cases and project proposals to implementing them without having to go through tedious bureaucratic processes. Similarly, the Zimbabwe situation was reportedly characterised by lack of authority where city councils had no autonomy in their decision-making processes.

The literature review on Zimbabwe also showed that continuity of government seriously impacts policy implementation of the ZNWP. Every five years, elections are held to elect new local authorities including mayors and ward counsellors. This process sometimes sees a complete change in the management board of the city councils. It is argued that the new staff who take over the management roles may come in with their own priorities regarding services. Furthermore, it was argued that when officials know that they may not be re-elected in the next political cycle, they tend not to care about accountability especially towards the end of their political cycles. In some cases, competent officials are victimised or removed from their positions of management due to their political affiliations as was reported in Harare between the ruling party and the opposition mayors or counsellors.

Four capacity factors affecting implementation of the ZNWP programmes have been identified. The results demonstrated that limited capacity (qualitative elements) including financial, institutional, technical/human and social factors) are the main reasons for the ZNWP implementation gaps in the Masvingo and Harare City. The study results further revealed that capacity limitations negatively impacted the ability of city councils to employ and retain qualified drinking water operators. Skilled manpower flight was rampant and impacted provision of WSS services as directed by the ZNWP. Financial and human resource capacity challenges were found to impact ULAs' capacity to deliver services to urban residents. The study results also showed that regulation needs to be enforced and that financial capacity is essential to support ZNWP programmes and the provision of drinking water and recruitment of skilled staff.

The qualitative and quantitative gaps between policies' implementation noted in this study are not unique to the Masvingo and Harare alone, but are evident in numerous local authorities in Zimbabwe and even common internationally among other communities (Hanharan and Dosu, 2017; Eledi, 2019). The study found that the levels of ZNWP implementation gaps varied from one ULA to another due to several factors. These factors included resources availability with financial and human resources being particularly critical and these factors (such as insufficient financial capacity, limited funds, lack of awareness, amongst others) are discussed in detail below.

The results revealed insufficient financial capacity as the most dominant factor contributing to the existence of policy implementation gaps in ULAs in Zimbabwe. The view by Timmer et al. (2007) and Wang (2013) that communities require financial capacity to successfully develop, implement and maintain WSS policies and regulations supports the results of this study. Lack of sufficient funding creates constraining factors that hinder the implementation of policy programmes, such as public education and WASH awareness, communication, staff recruitment and retention, information dissemination and professional development (Wang, 2013).

The study results suggest that ULAs lack the necessary funds required for the purchase of spare parts. It took more than two months for the Masvingo City to source spare parts for a water pump because the authorities did not have foreign currency to buy the spare parts from South Africa. The application to get foreign currency allocation from the Reserve Bank of Zimbabwe (RBZ) took longer than was expected. The interviews with ULAs also showed that the Masvingo City Council had to seek assistance from individuals who had forex and these bought the spare parts for the Council, which then payed the said persons later. Limited financial capacity results in policy implementation gaps as

ULAS are unable to completely comply with the ZNWP provisions on 24 continuity, 50 l/c/d, quality services, equitable access, free lifesaving water for poor communities, creation and implementation of WSPs among other programmes.

Results also suggested that ULAs do not have the financial capacity to employ qualified water operators to manage their drinking water supply and repair the expensive technology. This was noted in the maintenance of the Lake Mutirikwi (Lake Kyle), which took many years to fix the water loss due to leakage. Experts were hired from German to carry out the required repairs because there were no local experts with the required skills. This gap in human resources capacity is discussed further below.

Human resource capacity includes workers with adequate knowledge, skills and experience needed to properly create the ZNWP programmes (infrastructure repairs and system augmentation, abstraction, treatment, pumping, storage, distribution and source water protection including WSP) and implement related measures. The results suggest that recruiting and maintaining qualified and well-trained staff for WSS service provision and drinking water management in urban areas is a major challenge for many city councils. Municipal representatives indicated that there is high manpower flight, especially people with the right qualifications and training who are needed to operate and maintain the water system. The results also indicated that some municipal government officials and drinking water operators lack the technical capacity for understanding WSP. As a result, the provision of education and training for WSS technical staff is important in order to achieve a successful ZNWP implementation. This concurs with the assertion by Hamdy et al. (1998) that training and staff development should have high priority for source water protection and other drinking water management programmes that include WSP.

The results also underscored institutional capacity as one of the major factors that constrain the implementation of the ZNWP. Institutional capacity refers to legislation, regulations, policies, protocols, governance arrangements and delegation of responsibility to plan and enact the water policy. Evidence of institutional capacity challenged noted during the study included limited enforcement and the lack of regulation of WSS services. The ZNWP proposed the creation of the Water and Wastewater Services Regulatory Unit (WWSRU), however this legislation is still on paper. It was found that the lack of regulation of WSS services leaves urban communities under threat from abuse by third parties for, there is bound to be financial abuses, corruption and negative impact on service development in the absence of checks and controls by an independent regulator.

There should be regulation or enforcement instead of relying on SLB reports that are mere peer reviews and literature review has shown that some ULAs do not disclose all information to the reviewers coupled with sharing of unreliable data. This was revealed by peer reviewers in SLB reports where the "Reliability Scores" (RS) are very low for most of the data collected during SLB reviews, see Table 6.13.

The central government failed to encourage ULAs to implement the ZNWP politically, financially and morally. This is supported by the fact that government fails to subsidise capital intensive projects such as infrastructure upgrade. Local authorities finance their activities, however, the ZNWP indicates that investments in primary water for basic needs of urban areas could be subsidized during the first five years of the ZNWP (2013-2017) while recurrent costs are borne by the users to ensure sustainability. Furthermore, the obligation to "*fulfil"* which encompasses the obligation to facilitate requires that the State takes positive measures to assist individuals and communities to enjoy the right to water by taking targeted steps including empowering citizens through proper education on household water storage and hygiene, WSP and ways to reduce water wastage (Levin et al., 2009). Government subsidies become mandatory given the current economic situation where city councils are unable to realize the right to water by themselves, the financial capacity at their disposal can hardly suffice the capital-intensive infrastructure investments required.

The results also found that the unexpected changes caused by the political cycle impact implementation of ZNWP programmes in a negative way. An example was given of the

City of Masvingo where a competent Mayor was replaced due to the changes in the political cycle and it was reported that it was difficult to find a perfect fit to take up the mayoral responsibilities in a similar manner as the former mayor. On another note, the recalling of councillors and mayors by opposition political rivals left more than 754, 000 voters without representation and no one to account for their basic services. Political interference in council operations by political parties was a major factor crippling the urban service provision and implementation of the ZNWP. Lack of discretionary power and excessive bureaucratic procedures been identified as one of the institutional capacities that hinder implementation of the ZNWP. It was found out that the final decision on implementation of ZNWP programmes lies with the Minister of Local Government whose decisions are influenced by the political party that he/she represents in parliament. There is incomplete devolution of power because the Central Government can still influence local decisions indirectly through the minister of Local Government.

Another institutional capacity deficiency that was identified relates to the conflicting responsibilities of the ZINWA parastatal in the provision of WSS. Regardless of this issue being mentioned in various literature internationally and locally and recommendations being made to address these conflicting responsibilities, ZINWA continues to provide drinking water services. Some of the instruments of the ZNWP are still to be implemented if a meaningful improvement in the WSS services is to be effected. Amongst these is the creation of the National Water Supply and Sanitation Services Utility (NWSSU) which should provide water supply services as an independent entity under ZINWA.

The study found that local by-laws on urban agriculture need to reviewed and implemented to protect source water from pollution. In Masvingo City, gold panning and rural settlement close to Lake Mutirikwi was identified as a serious hazard that requires urgent attention. In addition, institutional arrangements for land, environment and water management are is still unclear with the Environmental Management Authority (EMA) appearing to be ignoring urban pollution including sewerage spill management. This follows the argument by city authorities that land rehabilitation after sewerage spillage is the responsibility of EMA and not city councils. EMA seems to confine its responsibilities to other environmental issues other than urban pollution, this was shown by lack of action on sewerage spills that are an eye-sore in some sections of the urban communities that go unabated. Furthermore, lack of collaboration between the Ministry of Health and Child Care's Health Department and the ULAs regarding household hygiene and household water storage, means the Department of Health needs to urgently include urban communities in its efforts to help protect public health. This is so because the bad state of WSS services has left urban residents with no option but to store water in households.

The study also identified an important capacity deficiency with regards that was identified by the study was social capacity. There were no functional WSP teams in both city councils, this translated to an absence of clear leadership for water quality protection and WSPs at city council and local government. The argument was based on Breach (2012) who indicates that a team leader should be appointed to implement programmes such WSP projects and maintain focus on priority tasks. In Masvingo City Council, the City Engineer who oversaw the augmentation of the sewerage system from Runyararo West to Rujeko suburbs failed to lead the project resulting serious financial that need to be covered by ratepayers again. Breach (2012) indicates that a team leader should have sufficient delegated authority, however, city councils do not have full control of own programmes as these must be proved by the minister before they can implement them.

The results also showed that there is a lack of democratic culture practices by ULAs. There was little or no transparency because there were no systems for information dissemination, customer complaints desks and residents' participation was very minimal mostly because of lack of information regarding council meetings. Moreover, ULAs were reportedly suppressing citizen voices by not recognising rate payers associations arguing that the Urban Councils Act (Chapter 29:15) does not cater for their participation in the making of decisions. The Constitution of Zimbabwe Amendment (No. 20) Act (2013*)* provides for civil participation in matters that concern them. Hence, civil societies that represent residents should get an equal opportunity to express their views in decisions regarding service delivery. The deliberate lack of proper communication of crucial meetings was regarded as undermining the call for transparency and accountability.

There were neither active linkages between City Councils and government ministries and agencies (EMA, MoHCW (vertical linkages), nor linkages with rate payers associations and relevant community organisations (horizontal linkages). The EMA, Department of Health and ULAs do not collaborate to deal with source water pollution, environmental protection and urban WASH. This has resulted in the contamination of drinking water at source, during distribution and household storage and led to episodes of waterborne diseases in urban areas. Linked to this situation is the lack of community awareness and support regarding WSP and household hygiene because of lack of collaboration between stakeholders in WASH and drinking water supply.

Technical/human capacity impacted local municipalities in Zimbabwe. Skilled manpower flight is high owing to poor salaries and work conditions. Many city councils experience skilled manpower shortages. Both the Masvingo and the Harare City Councils had no employees dedicated to executing the water safety planning responsibilities because technical staff were in short supply. This shortage in manpower prevented WSP programmes from being implemented leading to poor water quality being delivered to consumers. Most households lack knowledge of household water storage as a complement of WSP. A lot of drinking water contamination occurs at household level as a result of ignorance and lack of experience on household storage and treatment.

The results also showed a lack of accountability by public office bearers in the water sector characterised by uncompleted projects. Corruption is an important human capacity that was reported in both household surveys and interviews with officials from various departments and organisations. There was a lot of unaccounted for expenditure in city councils. Information pertaining to financial accounts is hardly accessible even to SLB peer reviewers, which showed that financial accountability is a serious problem in ULAs. Water bills were not based on actual meter reading, instead, they were based on estimates, which appeared to give city councils an advantage given the high levels of unaccounted for water. If councils were to use actual readings, billed water would be constituting a lesser proportion compared to water that is lost in the distribution system which would translate into losses.

The lack of information on drinking water supply systems and lack of data on system description for water safety planning shows lack of technical expertise to develop WSPs despite the high call for their implementation by the ZNWP. It was argued that competent service providers or utility operators are an important resource for the delivery of safe drinking water. Similarly, Hudson et al (2019) and the Zimbabwe Service Level Benchmarking Report (SLB, 2018) both conclude that WSS service provision requires an adequate technical capacity to implement sustainable operational and maintenance programmes including source water protection plans, water safety plans, risk management systems, infrastructure capital investment and repairs.

Results from the literature review showed that funds from water sales are not ring-fenced. Revenue from water sales is used to cover projects that have nothing to do with water services. It was found out that most of the revenue for ULAs comes from user fees, taxes and levies. There are a lot of unintended beneficiaries, including government departments and top politicians, who do not pay for water bills. Moreover, many households in urban areas have resorted to digging wells in their backyards and all this worsened revenue collection by councils. The volatility of the local currency has affected council budgets as revenue is eroded before the targeted projects are completed, thus affecting service delivery. Furthermore, it was reported that the process of securing foreign currency from the RBZ involves a long bureaucratic process that takes a very long process and thus, jeopardising service delivery by ULAs. The WSS affordability index was between 7.5% and 13.33% meaning, poorer household struggle to pay for the services.

Government has kept salaries stagnated to justify rejections of applications for tariffs hikes by ULAs, which resulted in insufficient revenue to finance drinking water supply and maintenance. A vicious cycle in the provision of WSS services was evident from the study results. Similar results were reported in other countries such as Nigeria where state utilities were seriously affected by inadequate finances due to low tariffs and non-payment of water bills.

CHAPTER 5

STUDY OBJECTIVE 2: EXAMINING CAUSES OF URBAN WATER CONUNDRUMS THROUGH THE STUDY OF QUANTITATIVE GAPS BETWEEN THE ZNWP AND ITS IMPLEMENTATION

5.1 CHAPTER INTRODUCTION

This chapter examines the causes of urban water conundrums. It analyses the quantitative gaps between the Zimbabwe National Water Policy and its implementation in the provision of water supply services using both an empirical and a secondary-based study approaches.

5.2 MATERIALS AND METHODS

The study methodology is described in Chapter 3. Data was obtained from household surveys and interviews with local authorities and ng other stakeholders with interest in water services. Field observations and document analysis were also used to complement the above data collection methods.

5.3 RESULTS AND DISCUSSION

5.3.1 QUANTITATIVE GAPS IDENTIFIED FROM THE LITERATURE REVIEW

Most of the studies in Zimbabwe focused on technical/quantifiable problems faced in the water sector. The identified technical/quantifiable problems include inadequate wastewater treatment plants; rapid urbanisation; expensive technology; obsolete water supply infrastructure; low water storage capacity; and an increase in the urban population and urban agriculture. The blame on poor source water quality was placed on inadequate treatment plants that lead to raw sewerage being discharged into rivers. Inadequate treatment plants also lead to water wastage as waste water cannot be recovered or recycled for reuse (Nhapi, 2009). This was considered as the cause for the high-water demand compared to supplies. Rapid urban expansion, which happen at a much faster pace than infrastructure investment, was blamed for the water deficit that has seen some sections of the urban population going for days without water supply (Muzondi, 2014).

Furthermore, some technologies are reportedly expensive and require skilled manpower and capital to maintain. It was noted that the high employee flight caused by poor remuneration resulted in some technologies ending up lying idle. A typical example was given in Masvingo City where the sole source of water for the city, Lake Mutirikwi, Kyle Dam developed a technical default with its stop valve. There were no local technicians to attend to the valve leading to large volumes of water being lost from the lake. The city of Masvingo experienced acute water supply challenges because of this technical problem. A group of experts were then finally hired from German to attend to this problem because there were no longer skilled manpower to fix the problem, this illustrated one example of expensive technologies and their impact on WSS service delivery (City of Masvingo, 2019).

Most water and sanitation infrastructure was reportedly aged and decrepit (Tom and Munemo, 2015). Consequently, most studies recommend the replacement of the aged water infrastructure and purchasing of water plant spare parts. The studies on causes of water woes in Zimbabwe (Hove and Tirimboi, 2011; Muzondi, 2014; Imonikhe and Moodley, 2018) also highlight the misalignment between demand and supply. There are fewer or smaller treatment plants, low storage capacity and incompatible distribution pipes that were meant to serve small urban communities. Distribution lines and pumps are reportedly under stress due to high demand that has resulted in frequent failures that lead to service interruption. Urban agriculture is also identified in literature as contributing to poor source water quality (Muzondi, 2014). Run-off from agriculture carries fertilizers and silt to dams and this affects water quality through eutrophication. In addition, cost of water treatment increases with increase in pollution.

5.3.2 QUANTITATIVE GAPS FROM EMPIRICAL STUDY

The HRWS normative criteria were used to assess water adequacy. Any deviations from the normative criteria meant policy implementation failures (gaps). An analysis of empirical data (field observations and survey results) identified quantitative gaps between the ZNWP and its implementation. These gaps also contribute to the failure or effective attainment of the intended water policy goals. The gaps are:

i. ***Shortages in emergency infrastructure for water supply and sanitation services***

The household survey results for alternative water source(s) that are available during water flow interruptions identified three major alternative sources of water during water cut-offs in all the 3 residency categories including boreholes, taps and bowsers (water trucking) in decreasing order of frequency of use (Table 5.1). A total of 48 (21%), 8 (15%) and 10 (24%) from high, medium and low density suburbs, respectively, had access to water from taps but these taps were not community taps. Well-wishers in low lying areas allowed residents to fetch water from their households, and in rare cases residents got water from low lying municipality water reticulation points but these were not found in many the residential areas since they just occurred by chance, and were not official water sources *per se*.

Table 5.1 shows more than 60% of the residents used municipal boreholes as alternative sources of drinking water during flow discontinuity. A small fraction 7 (3%) and 14 (6%) in high density suburbs used springs and wells as sources of water.

Table 5.1: Alternative water sources available during water cut-offs

	High Density	Medium Density	Low Density
River	0%	0%	0%
Tap	21%	15%	24%
Borehole	62%	73%	65%
Spring	3%	0%	0%
Well/Canal	6%	0%	0%
Other (bowsers/water trucking)	8%	12%	11%
Total	**100%**	**100%**	**100%**

Similarly, results from interviews with local authorities identified boreholes as the main alternative sources of potable water during service interruption. Water trucking was also identified as one of the measures in place in city councils to handle prolonged water supply discontinuity and assisting critically affected areas including at funerals. Authorities acknowledged that certain residents dug up wells, however, they could not guarantee the dug wells as safe water sources. The local authorities admitted that water cuts occurred daily but they were staggered. The Masvingo City Council indicated that they have 31 boreholes around the residential areas and there were efforts to install high roof plastic water tanks (Jojo tanks). The Jojo tank project was still on a pilot stage (Figure 6.28).

Nonetheless, there were very few back-up municipal boreholes in urban areas to maintain water supply continuity during tap water supply disruptions. People in some residential areas in both cities travelled more than 1km one way to get water for basic needs (Table 6.18). Some available boreholes were contaminated and as per WHO definition of service accessibility, the sources must be improved and safe for use. Once the sources are unsafe, then there is no accessibility to safe drinking water. The city of Masvingo only had three water bowsers to service a city of approximately 90 000 people. It can be seen from the results (Table 5.1) that water trucking is very uncommon as an alternative source of drinking water during water supply interruptions. The most cited reasons for the low frequency on water trucking included: unavailability of trucks to cater for all suburbs, unavailability of fuel because fuel shortages were rampant throughout the country and aggravated by the general lack of funds to buy fuel coupons.

During the study, residents were seen scrambling at water bowsers during water rationing (Figure 5.1). The incident revealed how the disabled, elderly, sick, pregnant women and children losing their dignity at the water collection points. This vulnerable group could not stand the pressure and fights that frequently broke out as people scrambled for the scarce resource. In such situations, men would always be at an advantage because they could overpower women and get access to the water first. However, this situation is a clear indication that the back-up facility of water trucking was both inadequate and inefficient to ensure service continuity during piped water supply interruptions.

Figure 5.1: Scenes at the water collection point when bowsers deliver water to a high density suburb in Masvingo (November 2018)

This situation should be given top priority in the budget allocation by the city councils as contingency measures to maintain the right to drinking water during service discontinuity. Moreover, service continuity reduces the burden of waterborne diseases in communities and help safeguard public health. There was a general unavailability of water services during service interruption because of lack of alternative safe sources of drinking water.

The above assertion is further supported by the proliferation of unsanctioned residential dug wells. Tanyanyiwa and Mutungamiri (2011) noted that communities that did not have piped water nor alternative sources provided by authorities resorted to the digging of shallow wells in their backyards (Figure 6.8). This phenomenon of illegal dug wells in residential areas is not uncommon in informal settlements and slums. The cities of Harare and Masvingo have in recent years witnessed the mushrooming of sanctioned and unsanctioned residential areas. It is argued that the blame should be borne on the local authorities for failure to provide water infrastructure to accommodate these new settlements. In the City of Masvingo, Victoria Range and Garikai residential areas and Budiriro, Hatcliffe Extension, Crowborough near Kuwadzana in the City of Harare just mention a few have high proliferation of unsanctioned boreholes and dug wells (Masvingo City Council, 2019).

Similarly, alternative sanitation facilities were not available for emergency purposes. The results from household and local authority surveys show that more than 30% of the respondents practiced open defaecation since there were no alternative sanitation facilities and this is caused by intermittent water supplies that prohibited the use of waterborne/flush toilets and left people stranded. About 32% of the respondents in all three residents' categories used pit latrines, 10% used septic tank while 4.7% used chemical toilet and this was only reported in low density suburbs while 19.4% used other types of sanitation facilities (Table 5.2).

Table 5.2: Alternative sanitation facilities irrespective of residential type

Sanitation type	Frequency	Percent
Pit latrine	102	31.9%
Chemical toilet	15	4.7%
Septic tank	33	10.3%
Bush	108	33.8%
Other	62	19.4%
Total	**320**	**100%**

The analysis of sanitation data by residential type/category indicates that many urban dwellers use the bush toilet and that open defaecation is a serious hazardous event with serious public health risks. In addition, the s analysis of alternative sanitation facilities by residency categories shows that most people in high density suburbs practiced open defaecation (Table 5.2 and Table 6.10).

ii. Infrastructure dearth

There are severe infrastructure decays in both Harare and Masvingo and these are characterized by frequent pump failures, pipe bursts an unreliable sanitation infrastructure. The state of the infrastructure was pathetic and daily pipe bursts were common whenever water pressure was high. This systematic infrastructure failure accounted for the rampant water supply discontinuity because burst pipes affected pressure in the distribution lines and thus, causes supply cuts to many areas, especially those on high ground.

The results of household survey on causes of water-cuts challenges show that the main causes include pumping problems with 40%, 31% and 35% of respondents from high, medium and low densities suburbs, respectively, indicating this problem. Power outages were cited as second in contributing to water supply shortage with 18%, 28% and 15% of residents in high, medium density and low density suburbs, respectively, citing this problem (Figure 5.2).

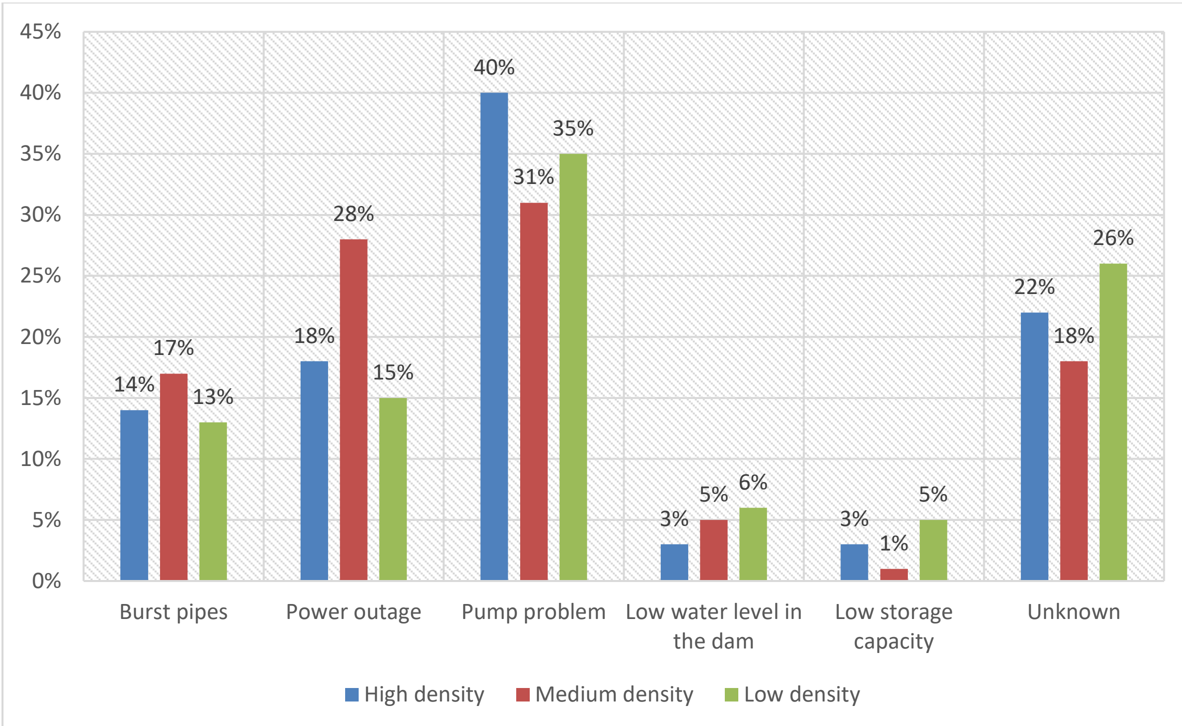


Figure 5.2: Causes of water cuts

At least 13% of the respondents in all residential categories (high, medium and low density suburbs) cited burst pipes as one of the main causes of water shortages in their communities. Most of the council and ratepayer's association officials who were interviewed indicated that the water treatment plants were more than 40 years old. Most of this infrastructure was installed during the colonial period and no augmentations have done since then. A total of 16 (80%) of the local authority respondents indicated that the distribution pipes were equally old as the treatment plants. The age of pumps was between 10 to 20 years with 10% of the respondents indicating that some pumps were more than 40 years old and now a liability to the city councils because they required repair every now and again. Some of these pumps' spare parts were even hard to get from the market as the pump models were no longer in use. In addition, the results of internal informal audits found that the existing water supply system infrastructure is not compatible with the current demand. Some of the existing infrastructure is reportedly more than 40 years old and was meant to serve small urban populations.

An assessment of the sources of unaccounted for water (Non-revenue water), through interviews with city council officials, identified the main causes of water loss from the system as: loose valves, worn-out valves, and non-computerisation of the reticulation system to detect leaks. Most of the blame lies on the aging infrastructure. Mangizvo and Kapungu (2010) confirms that aging equipment is one of the contributing factors to water shortages in urban areas in Zimbabwe. The infrastructure for water supply is dilapidated because of old age (Mangizvo and Kapungu, 2010). The pumping equipment has reportedly outlived the efficiency of its design, therefore, causing huge maintenance costs by the city councils to keep them running. Mangizvo and Kapungu (2010) note further that the obsolete equipment resulted in the water treatment plant producing far less water quantities per day than what the existing demand. In the same study, Mangizvo and Kapungu (2010) indicate that there are extensive leakages along the main pipe line that supplies water to the city of Harare from the waterworks, hence, contributing to approximately 30% unaccounted for water. Chaminuka and Nyatsanza (2013) indicate that water pipe bursts were frequently experienced in the oldest reticulation mains feeding the residential areas.

Furthermore, the water system was reported to have several underground leakages with small leaks amounting to an estimated volume of more than 500,000 litres of unaccounted for water per year. These were all attributed to the age of the pipes.

Chaminuka and Nyatsanza (2013) corroborate the assertion by residents that water shortages were also a result of power outages. Zimbabwe has been experiencing serious power shortages, which have resulted in power cuts that h have negatively affected water pumping and consequently provision of water services in most cities by councils. Moreover, there is no system used to detect leakages in possible areas of leakages and urban planners and engineers have been blamed for failing to attend to these leakages resulting in high water bills passed to consumers to ensure continued viability of utilities. Chapter 6 (Figure 9) shows perennial leakages observed in the city of Masvingo that have turned into swamps. Such a scenario does not reflect the financial resources channelled in water purification and supply. This results in lack of motivation amongst residents to report burst pipes.

iii. Inadequate treatment, pumping, storage and distribution infrastructure

An average of 4% of the residents in all residency categories cited low water levels in the dams as one of the causes to their water woes. Low water storage capacity was also indicated as a reason for the water crisis that the communities were experiencing. The other reason that was given by respondents as contributing to urban water challenges was the incompatibility of the drinking water and sanitation system with respect to the current service demand. The treatment plants are too small to produce enough drinking water for the urban dwellers. Similarly, the sanitation infrastructure is reportedly not capable of accommodating the current demand, which is exacerbated by unplanned settlements that have led to perennial sewerage spills (Figure 6.34).

Overall, the pumps and distribution lines for both water and sanitation services need to be upgraded to meet the current demand, which according to Nhapi (2009) and Muzondi (2014), is exacerbated by a rapid population growth in urban areas in recent decades. This requires a long-term investment in infrastructure with support from the Central Government of Zimbabwe since such major capital intensive projects are not feasible given the population size and financial constraints that are faced by most city councils in Zimbabwe. Moreover, the ZNWP stipulates that investments in primary water for the basic needs of urban areas would be subsidised during the recovery period (2013 to 2017) and that recurrent costs would be borne by the users to ensure sustainability.

Furthermore, the ZNWP indicates that the Central Government provides interim subsidies to Urban Authorities through Public Sector Investment Programme (PSIP) and Development Partner financing that is coordinated within a Water Sector Investment Framework to finance the rehabilitation and expansion of infrastructure during the recovery period (2013-2017). The long-term financing in the normalised growth phase after 2017 is the responsibility of Urban Local Authorities. In addition, government is expected to facilitate the development of a concessional loan facility with a creditworthiness appraisal mechanism for ULA projects, managed by the Infrastructure

Development Bank of Zimbabwe (IDBZ). The Central Government is expected to facilitate the provision of pro-poor grants from PSIP and Development Partner financing.

iv. Urban expansion is not keeping pace with capital investment in water and sanitation infrastructure

The interviews with council officials show that the City of Masvingo's residential areas of Victoria Range and Garikai were developed without the City of Masvingo's involvement. These residential areas did not have any infrastructure developed to cater for the new residents. Similarly, in the City of Harare, a lot of unplanned residential areas mushroomed in areas such as Budiriro, Hatcliffe Extension and Crowborough near Kuwadzana (Muzondi, 2014). According to Muzondi (2014), there are linkages between rapid urbanisation and the disruption of the service delivery systems, poor water supplies, dearth of sanitation and deterioration of waste management but, these are manifestations of a crisis in urban planning. Muzondi (2014) decries the increased concentration of populations into developing countries' cities that are devoid of the proper planning for service delivery, and culminating in urban systems becoming incrementally overwhelmed. This corroborates the assertion by the Ministry of Water Resources Development and Management (MWRDM, 2012) that 29% of Zimbabweans live in urban areas and that urbanisation is increasing at a rate of almost 4% per year. According to MWRDM (2012), Zimbabwe's urban water supply and sanitation (WSS) services development has been historically driven by principles of high service levels and standards, and universal access for all, making them unique in Africa.

5.4 CHAPTER SUMMARY

Four quantitative gaps in the implementation of the ZNWP were discussed and these technical gaps need urgent attention to help improve the current water service level in Zimbabwe's urban areas. The identified gaps can lead to the rapid spread of waterborne diseases, incessantly cause dearth of water and sanitation services and a deterioration of the urban service delivery systems.

A multitude of quantitative factors affecting the implementation of the ZNWP programmes have been identified. The identified quantitative gaps from empirical study include shortages in emergency infrastructure for water supply services, infrastructure dearth, inadequate treatment, pumping, storage and distribution infrastructure and, urban expansion that does not happen at the same pace as capital investment in water and sanitation infrastructure. Results from literature review identified the following quantitative gaps: inadequate wastewater treatment plants; rapid urbanization; expensive technology; obsolete water supply infrastructure; low water storage capacity; increase in urban population and urban agriculture. The negative impact of these factors on the ZNWP implementation could explain urban water woes in Zimbabwe.

Reference was made to arguments presented by policy analysts and the researcher concluded that some of these quantitative gaps are the result of deficiencies in one or all of the identified capacities (institutional, financial, social and technical/human) (OECD 2011; Howlett et al. 2015; Ménard et al. 2017; Minnes and Vodden 2017; Romano and Akhmouch 2019; Eledi, 2019).

CHAPTER 6

STUDY OBJECTIVE 3: TO EXAMINE THE CURRENT SERVICE LEVEL ON WATER SUPPLY AND SANITATION, RISK ASSESSMENT AND AUDIT WATER SAFETY PLANS

6.1 CHAPTER INTRODUCTION

This chapter presents results from an analysis of household demographic data for the study area, service level indicator data from semi-structured interviews and other data sources as described in the materials and methods. The guiding principles for assessing and monitoring water supply and sanitation services, which are internationally accepted (Giné-Garriga et al., 2017; WHO/UNICEF, 2017), were derived from Appendix A.

6.2 MATERIALS AND METHODS

Demographic data was collected through semi-structured interviews at household level and at institutional level with key informants. Data on service level indicators was collected from both the household and local authority semi-structured interviews as described in Chapter 3. Other sources of primary data included service level benchmark (SLB) reports, national and municipal policy documents and stakeholder meetings. The literature review also provided data that enabled the assessment of service level. The data collection of drinking water samples to determine water quality/safety/portability and physico-chemical analysis is described in Chapter 3.

The framework for identifying WSS service indicators followed the normative criteria for good practices in the provision of these services as described in Appendix A. The normative criteria for good practices include availability, quality/safety, acceptability, accessibility and affordability. The following human rights cross-cutting criteria were also considered in the analysis of service level: accountability and transparency; participation and empowerment (which incorporates the principles of information accessibility) and non-discrimination.

6.3 RESULTS AND DISCUSSION

6.3.1 HOUSEHOLD DEMOGRAPIC DATA

The survey was conducted in 12 suburbs (7 high density, 2 medium density, 3 low density) in Masvingo urban and 5 suburbs (1 low density, 2 medium and 2 high density suburbs) in Harare city. A total of 5 suburbs representing low income, middle income and high income sections of the population were selected in Harare and from these, households were randomly selected for the semi-structured interviews and water sampling. It was important to find out the suburb of the respondent in order for the responses to be distributed according to suburbs (Table 6.1). The sample distribution was purposefully made large for the high-density suburb category because, according to Zimbabwe's demography, most of the poor live in high density wards and informal settlements. Urban communities in Zimbabwe are reportedly heterogeneous and there are high inequities and deprivations among poor and rich urban communities. Water and sanitation problems are also rampant in urban high density suburbs and other low income communities (Tanyanyiwa and Mutungamiri, 2011; Manjengwa et al., 2016).

Table 6.1 shows that most households 228 (71.3%) where the participants were drawn from were high density suburbs. A total of 51 (15.9%) households were from medium density suburbs and 41 (12.8%) households were from low density suburbs.

Table 6.1: Number of respondents by residential suburbs

Study area		High residential category	Medium residential category	Low residential category	Total
Masvingo	**Suburb count**	7	2	3	**12**
	Household numbers (%)	160 (71.1%)	36 (16%)	29 (12.9%)	**225 (70%)**
Harare	**Suburb count**	2	2	1	**5**
	Household numbers (%)	68 (71.6%)	15 (15.8%)	12 (12.6%)	**95 (30%)**
Total suburb count		9	4	4	**17**
Total number of respondents		**228 (71.3%)**	**51 (15.9%)**	**41 (12.8%)**	**320 (100%)**

The household information was required to inform data acceptability and assist with additional assessments of water supply and sanitation service elements, especially ‘Affordability Index’ calculations that require knowledge of household monthly disposable income. Additional household information regarding gender distribution; age of respondents; marital status; relationship of respondent to the family; level of education of respondents; approximate monthly income if any and type of employment, is presented in Table 6.2.

6.3.1.1 Gender of respondents

Table 6.2 shows that more than 68.4% (219) of the respondents were female and 31.6% were male. This distribution was arrived at purposefully because most men were at work during the day and women took care of the household chores. The spouses of the head of family were mainly available to answer the questionnaire followed by the head of families themselves. This means the information collected is likely to be reliable as those directly responsible for running the households were available for the survey.

6.3.1.2 Age and marital status of respondents

Eighty four percent (268) of the respondents were aged above 30 years at the time of the survey. This shows some degree of maturity, hence, it can be implied that most of them understood fully the issues that were discussed. The majority of the respondents (84%) were married and a very small fraction (0.3%) were cohabitating, 8% were single, 7% were widowed and 1% divorced. In a study done in Dzivarasekwa Extension and Msasa Park in Harare by Tanyanyiwa and Nyatsanza, the respondents were all household leaders who included parents and adult informants, which supports the above assertion on maturity of respondents

Table 6.2: Summary of household information for semi-structured household interviews

Gender	Number of respondents	Percent
Males	101	31.6%
Female	219	68.4%
Total	**320**	**100%**

Age group (years)	Age range	18-24	25-30	31-39	40-49	50-59	>60	Total
	No. of respondents	15	34	70	98	97	6	**320**
	Percent	5%	11%	22%	30%	30%	2%	**100%**

Marital status	Single	Married	Widowed	Divorced	Cohabitating
	26	268	22	3	1
	8.1%	83.8%	6.9%	0.9%	0.30%

Relationship of respondent to the household	Head of family	Spouse	Son	Brother	sister	Other	Total
	133	148	14	16	4	5	**320**
	42%	46%	4%	5%	1%	2%	**100%**

Level of Education of respondent	Pre-primary	Primary level	Secondary level	Certificate	Diploma	Bachelor	Postgraduate	Total
No. of respondents	0	12	45	49	75	69	70	**320**
Percent	0%	4%	14%	15%	23%	22%	22%	**100%**

Approximate monthly income	$0 - <$200	$200 - <$400	$400 - <$600	$600 - <$800	$800 -<$1000	$1000-<$1500	>1500$
	48	99	147	13	6	3	4
	15%	31%	46%	4%	2%	1%	1%

Type of employment	Formal	Informal	Unemployment	Total
	258	43	19	**320**
	81%	13%	6%	**100%**

6.3.1.3 Highest academic qualification of respondents

The level of education for participants was explored using seven educational levels as shown in Figure 6.1. The categories were, pre-primary, primary, secondary, certificate, diploma, bachelor and postgraduate. It was important to assess the level of education in order to shed more light on acceptability of the responses provided by the respondents. It is common knowledge that education opens up new ways to life and assist people to find new mechanisms to utilise resources. The education categories that had the lowest frequency were the pre-primary (0%) and Primary with (4%). The category with the highest percentage was the diploma level with 23%. Overall, the majority of the respondents had tertiary education. A survey by the We Pay You Deliver (WPYD) Consortium (2017; 2018) on the status of social services delivery in four cities and a municipal budgeting and financial management survey respectively also considered level of education of respondents. In the 2017 survey, the respondents with no education constituted 2.9% while those with primary education constituted 9.5% and the tertiary education holders constituted 23.2%. In the 2018 survey, respondents with no education background made up 3% of the respondents while those with primary education constituted 7.6% of the sample interviewed. Respondents with tertiary education constituted 27.2% while the majority of the respondents had secondary level education.

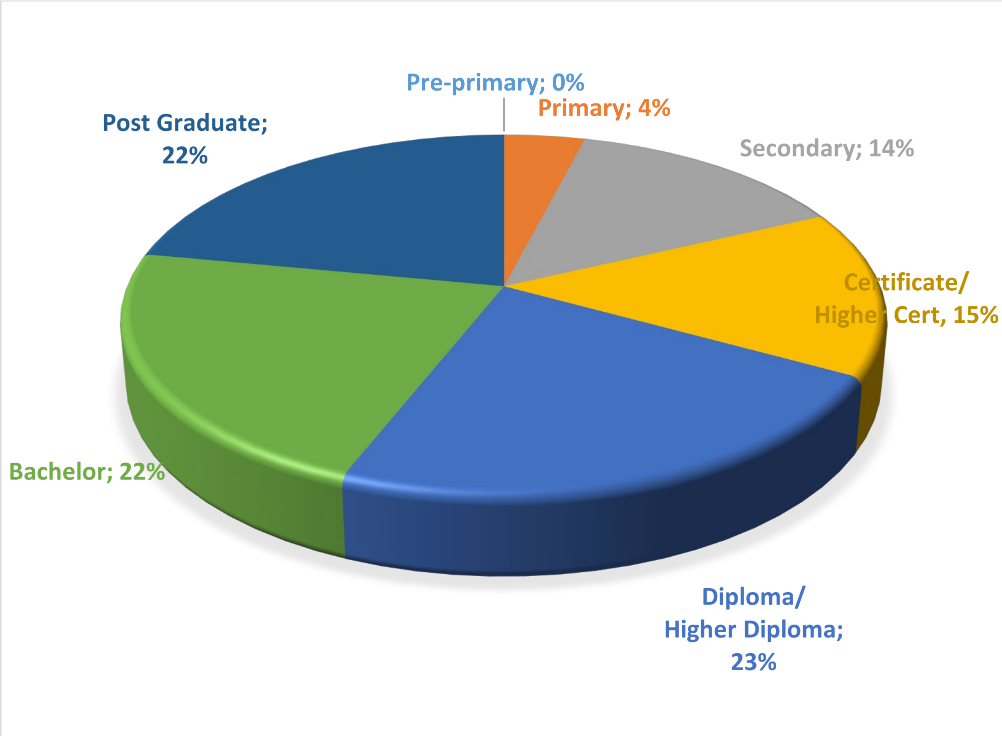


Figure 6.1: Highest academic qualification of respondents

6.3.1.4 Household monthly income

The household monthly income was also a very important indicator in this study. Table 6.1 shows the salary ranges of the respondents in the study units and all the amounts, which were in United States dollars (US$). It is evident from the results that, the modal salary range was in the category of $400-600$ that constituted 46% of the total respondents. However, it is also evident that very few people earned more than 1500US$ which constituted only 1% of the respondents. Respondents with the lowest salary constituted 15% of the population with a frequency of 48 respondents. Ninety-two percent (92%) of the respondents earned less than $600 per month. A study by Morrish (1988) in Calcutta, Rio de Janeiro, Manila, Kinshasa and Lusaka consolidated the position that poverty is closely associated with water and sanitation deprivation. A study by Schuringa (1999) carried out in the slums of Kibera and Nairobi s in Kenya also indicated that some people were not connected to treated council water supply, and that no proper waste disposal facilities were in place owing to the high poverty rate in these low income slums.

6.3.1.5 Occupation of respondent

The results from an analysis of the type of employment for survival of the sampled population show that only 13% of the respondents lived solely on meagre income generated from informal employment with, 81% were formally employed and 6% of the respondents being unemployed.

6.3.2 DATA REGARDING RESPONDENTS INTERVIEWS FROM DIFFERENT INSTITUTIONS

A total of 20 participants took part in the semi-structured interviews from both the purposive and snowball sampling. Table 6.3 summarises the number of participants in the instructional semi-structured interviews.

Table 6.3: Composition of the stakeholders who participated in local authority interviews

Official	Number
Mayor	3
Town Clerk	1
Town Treasurer	2
Town Planner	2
Health officials	3
Government Officials	2

Representatives of a Funding Organization (ROFO)	2
Zimbabwe National Water Authority (ZINWA) Officials	2
Ratepayers Association representatives	3
Total	**20**

6.3.3 AVAILABILITY OF WATER AND SANITATION

6.3.3.1 Drinking water availability results

6.3.3.1.1 Water quantity results

The assessment of availability of drinking water showed that 49% of the respondents in high density suburbs received water supply daily while 51% did not get water all the time. The situation was worse in medium densities suburbs where, 82% of the respondents indicated that they did not get municipal water all the time and 18% indicated that they got running water all the time. The water supply situation in low density suburbs was similar to that of high density suburbs where households got water half of the time from their regular sources.

According to the Committee on Economic, Social and Cultural Rights (CESCR) (2003), water has to be available continuously and in a sufficient quantity to meet the requirements of drinking and personal hygiene, as well as of further personal and domestic uses, such as cooking and food preparation, dish and laundry washing and cleaning. The regularity of the water supply should be sufficient for personal and domestic uses. The analysis of availability included both assessment of sufficient quantities of water and reliability of service provision (Bos et al., 2016). Figure 6.2 shows the household survey responses regarding drinking water availability.

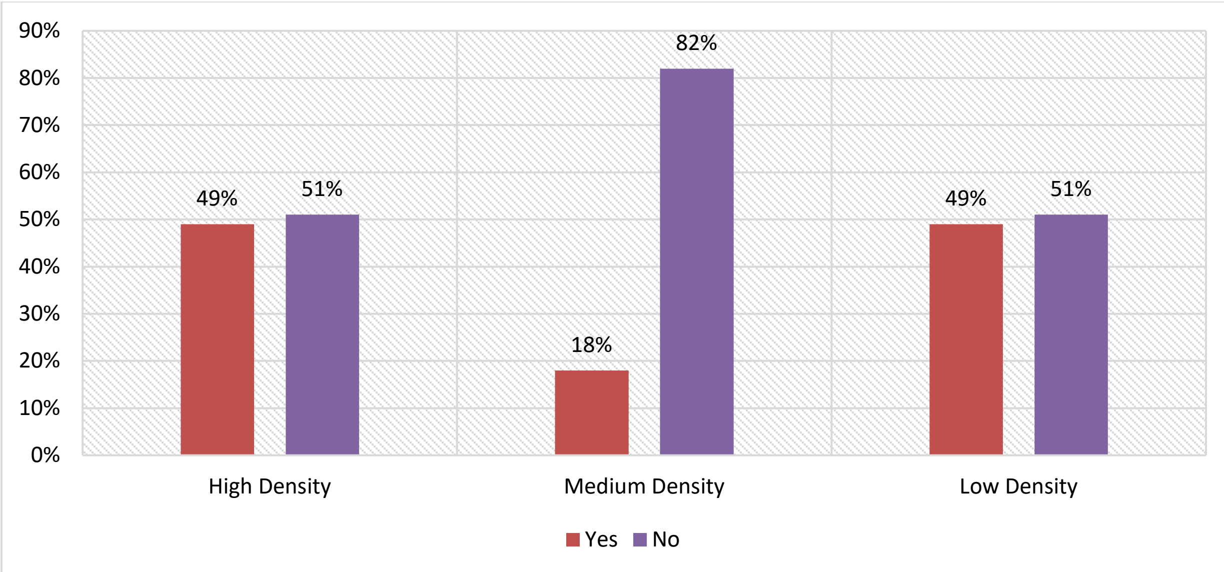


Figure 6.2: Water availability at the regular source of the household

The results on water availability from the respondents were arrived at after a cross tabulation that examined the relationship between residential category and water availability (location and water availability). According to Carter (2014), a cross tabulation allows one to summarise the data in categorical variables and examine it to determine if there are any relationships present. SPSS provides cross tabulation charts that show how many individuals (or cases) are present in each group. A Chi-square test is eventually used to determine whether there is a significant relationship between the two categorical variables of interest (Bhat, 1996; Carter. 2014). The qualitative data on water availability and equity was analysed using descriptive cross tabulation and a Chi-square test for independency to determine if there was a significant relationship between the two categorical variables (water availability and respondent residency category). Results of this cross tabulation are shown in Table 6.4.

Table 6.4: Cross tabulation of water availability perceptions by respondents

			Respondent residency Category (3 categories)			Total
			Low density	Medium density	High density	
Water Availability	Yes	Count	20	21	98	139
		% within Residency	48.8%	41.2%	43.0%	43.4%
	No	Count	21	30	130	181
		% within Residency	51.2%	58.8%	57.0%	56.6%
Total		Count	41	51	228	320
		% within Residency	100.0%	100.0%	100.0%	100.0%

The output table above from SPSS shows the total counts and percentages for each cell (Yes/No). Looking at the "Yes" row at the top of table, which includes all those survey participants who indicated that water was available at the taps, 20 (48.8%) respondents who were from low density residential suburbs answered "Yes", 21 (41.2%) from medium density suburbs and 98 (43.0%) from high density residential areas. Looking at the "No" row at the bottom of the table, which included all those survey participants who indicated that water was not available at the taps, it is clear that 21 (51.2%), 30 (58.8%) and 130 (57.0%) from low, medium and high density suburbs indicated that water was not available at the taps. Although the results show difference in responses, it was necessary to test if it was statistically significant. To determine if there was a statistically significant relationship between water availability and residency category, a chi-squared test was done. The Chi-square for independency results are shown in Table 6.5.

The table shows that the Pearson Chi-square is $X(2) = 0.602$, $p=0.740$, which implies that there was no statistically significant association between residency type and drinking water availability. This means that drinking water availability affected all residential categories (high, medium and low density suburbs) in a similar manner. Thus, no association was found between water availability and residency category.

Table 6.5: The chi-square test table of water availability

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.602[a]	2	.740
Likelihood Ratio	.599	2	.741
N of Valid Cases	320		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.81.

The respondents estimated the amount of water (volume per capita per day) in litres that they required to meet their basic and hygiene needs. The results in Table 6.6 show the recommended volumes from the respondents.

Table 6.6: Recommended water volume (l) per capita (c)/ day (d)

Residential area category	Volume (l/c/d)			
	10- < 14	15- < 24	25- < 49	50+
High	1%	8%	26%	65%
Medium	16%	12%	25%	47%
Low	0	6%	23%	71%

In all residential categories, most households needed more than 50 l/c/d. Seventy one percent (71%) of the households in the low-density suburbs use more than 50 litres of water, followed by those in the high density (65%) suburbs and medium density (47%) suburbs in that order. This data supports findings by JICA (1996) and, Nhapi and Hoko (2004) who report household water consumption in Harare that were as high as 630 l/c/d for low density, 320 l/c/d for medium and 80 l/c/d for high-density residential areas. In addition, an assessment of water adequacy by Tanyanyiwa and Mutungamiri (2011) corroborate this study's results that drinking water supply is not sufficient to meet demand. Similarly, reports by civic organizations in Zimbabwe: the Combined Harare Residents Association (CHRA), the Zimbabwe Coalition on Debt and Development (ZIMCODD), the Harare Residents Trust (HRT) and Transparency International of Zimbabwe (ZIP) in public hearing meeting in 2010 indicated lack of water in some suburbs.

Table 6.6 shows that at least 74 (23%) of the respondents in all three residential categories (high, medium and low) required water quantities between 25 to 49 litres per capita per day, while a small fraction of the community could cope with quantities between 10 and 24 litres. It is essential that service providers talk to people to confirm their priorities. To be on the safe side, water utilities should abide by the already established WHO standard quantities as guidelines in Table 6.7 and Figure 6.3. These quantities have been broken down into categories to increase the accuracy of the estimate, for example not all water will be needed at the house. It may be preferable to provide separate water supplies for bathing, washing or animals, as well as for hospitals, feeding centres and schools. Water for hand washing will be needed near latrines. The WHO (2004) recommends that domestic water supply does not all have to come from the same source, for example, people may be provided with bottled drinking water, but use a stream to wash their clothes in.

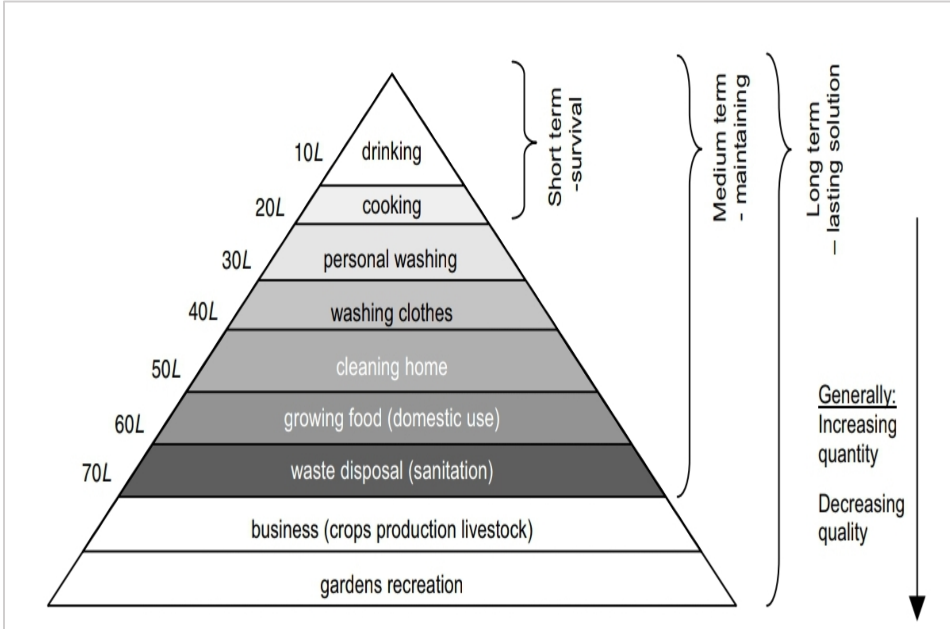


Figure 6.3: Hierarchy of water requirements inspired by Abraham Maslow's hierarchy of needs (WHO, 2004, accessed January 2020)

Various studies have reported on the impending water shortages in the city of Harare and other cities in Zimbabwe. Household water consumption in Harare and Masvingo is too high and may be the main cause of high water demand in these cities. The above-noted consumption pattern mean that water demand surpassed supply to an extent that the pumping capacity of the City of Harare's water supply of 450 mega litres per day could only suffice the needs of 40% of the city's population. The results from semi-structured interviews with the local authorities show that the City of Masvingo's current water treatment plant has a treated water production capacity of 30,000m^3/day (City of Masvingo, 2019). This is not enough to meet the current demand standing at 48.000m^3 and leaving a shortage of 18.000m^3 to meet its current demand. Further illustrations of the extent of the water supply shortages are provided in Appendix F as in the supplementary information. However, despite numerous reports from studies on the impending water supply shortages in the cities of Masvingo and Harare, the water supply problems persist and in some cases, have increased.

It is clear from the results of this study on water quantity that people need water volumes greater than 50 l/c/d to meet their basic needs. The WHO (2004) indicates that water supply is an essential requirement for all people. Furthermore, determining how much water is needed, is one of the first steps towards ensuring the provision of the right quantities to the users. The WHO guidelines stipulate that providing enough water to meet everybody's needs may be difficult in the short-term, hence water can be made available in stages. Moreover, continuous checking, including talking to the various water users especially women, would enable limited resources to be focused effectively.

People use water for a host of activities and some of these are more important than others, for example, having a few litres of water to drink a day is more vital than washing clothes but, people will need to wash if skin diseases are to be prevented and physiological needs met (WHO, 2004). It is well documented that each additional use of safe water has health and other benefits, but with decreasing urgency (Table 6.7).

Table 6.7: Some standard water quantity requirements (WHO, 2004, accessed November 2019)

Standard: All people should have safe access to a sufficient quantity of water for drinking, cooking and personal and domestic hygiene. Public water points should be sufficiently close to shelters to allow use of the minimum water requirement. **Key indicators:** • At least 20 L/c/d is collected. • Flow at each water collection point is at least 0.125 litres per second. • There is at least 1 water point per 250 people.

- The maximum distance from any shelter to the nearest water point is 500 metres one way.

Guidelines:

Individuals:

Minimum “survival” allocation. 7 L/c/d (sustainable for only a few days)

- Drinking 3-4 L/c/d
- Food preparation, clean-up 2-3 L/c/d

Medium term allocation: 15-20 L/c/d (sustainable for a few months)

- Drinking 3-4 L/c/d
- Food preparation, clean-up 2-3 L/c/d
- Personal hygiene 6-7 L/c/d
- Laundry 4-6 L/c/d

Other needs

- Health Centres. 5 litres per Out-Patient; 40-60 litres per In-patient
- Hospital (with laundry facilities). 220-300 litres per bed
- Schools 2 litres per student; (10-15 litres per student if water-flushed toilets).
- Feeding Centres. 20-30 litres per patient
- Camp Administration. (Staff accommodation not included) 5 L/c/d
- Staff accommodation. 30 L/c/d
- Mosques. 5 litres per visitor
- Sanitation (hand-washing, cleaning latrines etc.) depends on technology.

Livestock and agriculture

- Cattle, horses, mules 20-30 litres per head
- Goats, sheep, pigs 10-20 litres per head
- Chickens, 10-20 litres per 100
- Vegetable gardens. 3-6 litres per square metre

Actual values depend on many variables (such as cultural practices and climate) that should be assessed by specialists

The above WHO (2004) guidelines to water supply levels also explicitly define what is regarded as the “expected standard”. The results from the household survey support the assertion by the WHO (2004) that people’s needs are diverse as they include the need to wash sanitary towels or to wash hands and feet before prayer and these may be felt to be more important than other uses.

6.3.3.1.2 Water continuity result

The assessment of water availability also determined water flow continuity. The results below represent the responses of respondents from all residency categories (high, medium and high density suburbs). Figure 6.4 shows that a significant percentage of the respondents (66%) in the high density suburbs indicated that water flow is not continuous, 10 % indicated that water interruptions occurred weekly and 20% other times, which included random interruptions as residents could not identify a pattern of the water interruptions. In medium density suburbs 26% said they do not have water on daily basis, 26% weekly and 50% other times. In the low density suburbs 51% said water is not available daily, 13% weekly and 31% other times.

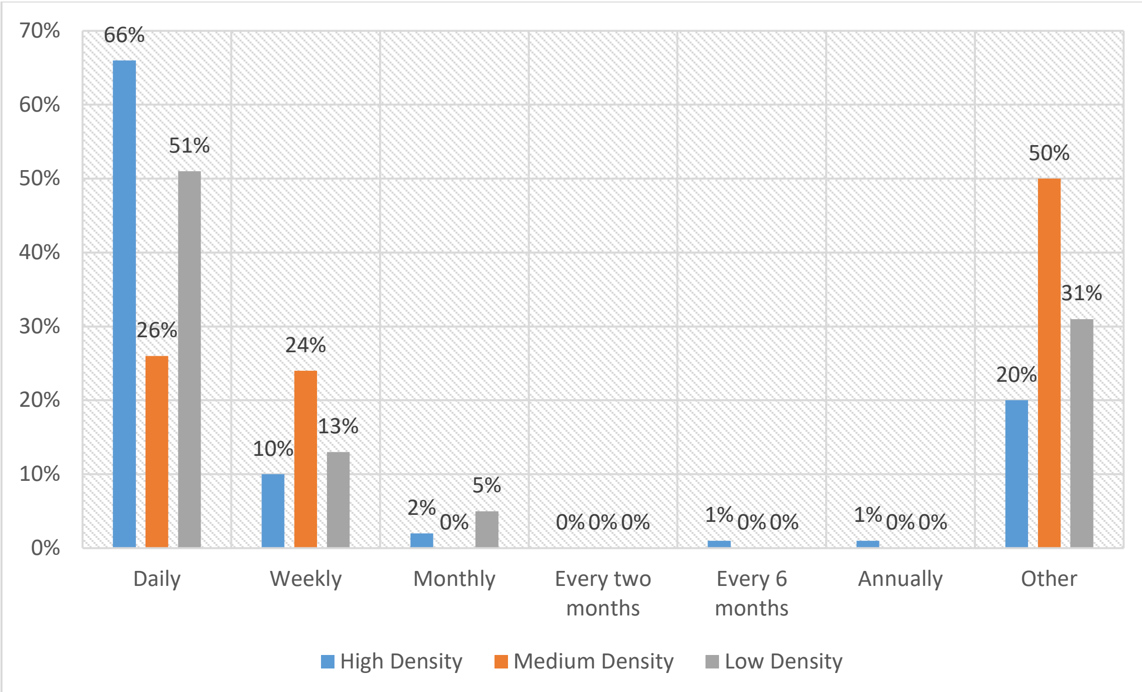


Figure 6.4: Frequency of water unavailability at household level

In very few areas (2% and 5%) in high density and medium density suburbs respectively, water interruptions were very rare occurring monthly, every 6 months and annually. It was noted during the survey that, most of these residential areas that experienced uninterrupted water supplies were geographically positioned in low lying areas and that it was not by design that they were bound to get these uninterrupted services. Generally, the respondents in all the three suburbs have no water almost on daily basis. Water supply is erratic in all the suburbs and its worse in the medium density suburbs.

An assessment of continuity by residency category was done to assess if continuity was influenced by residential area (Figure 6.5). The results show that 175 (77%) out of 228, 45 (88%) out of 51 and 30 (73%) out of 41 respondents in high, medium and low density suburbs did not receive adequate water to meet their basic needs including for hygiene purposes. Only 52 (23%), 6 (12%) and 11 (27%) respondents in high, medium and low density suburbs indicated that they received adequate quantities water that met their basic needs.

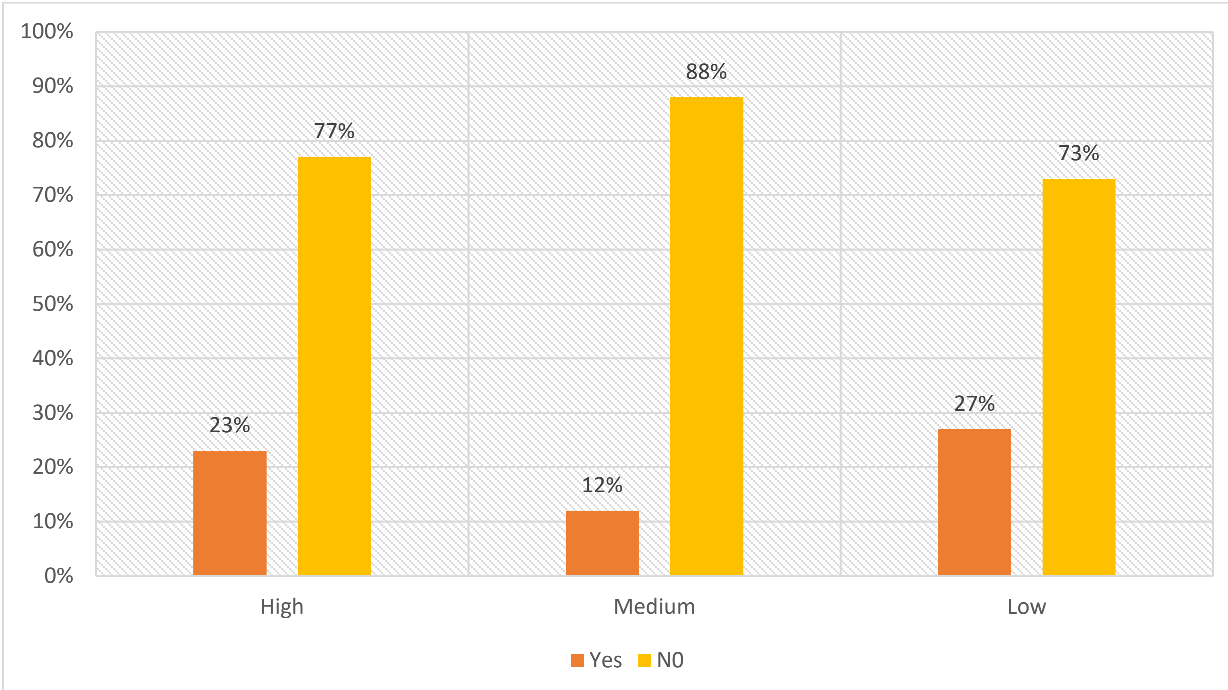


Figure 6.5: Water supply continuity by residential category

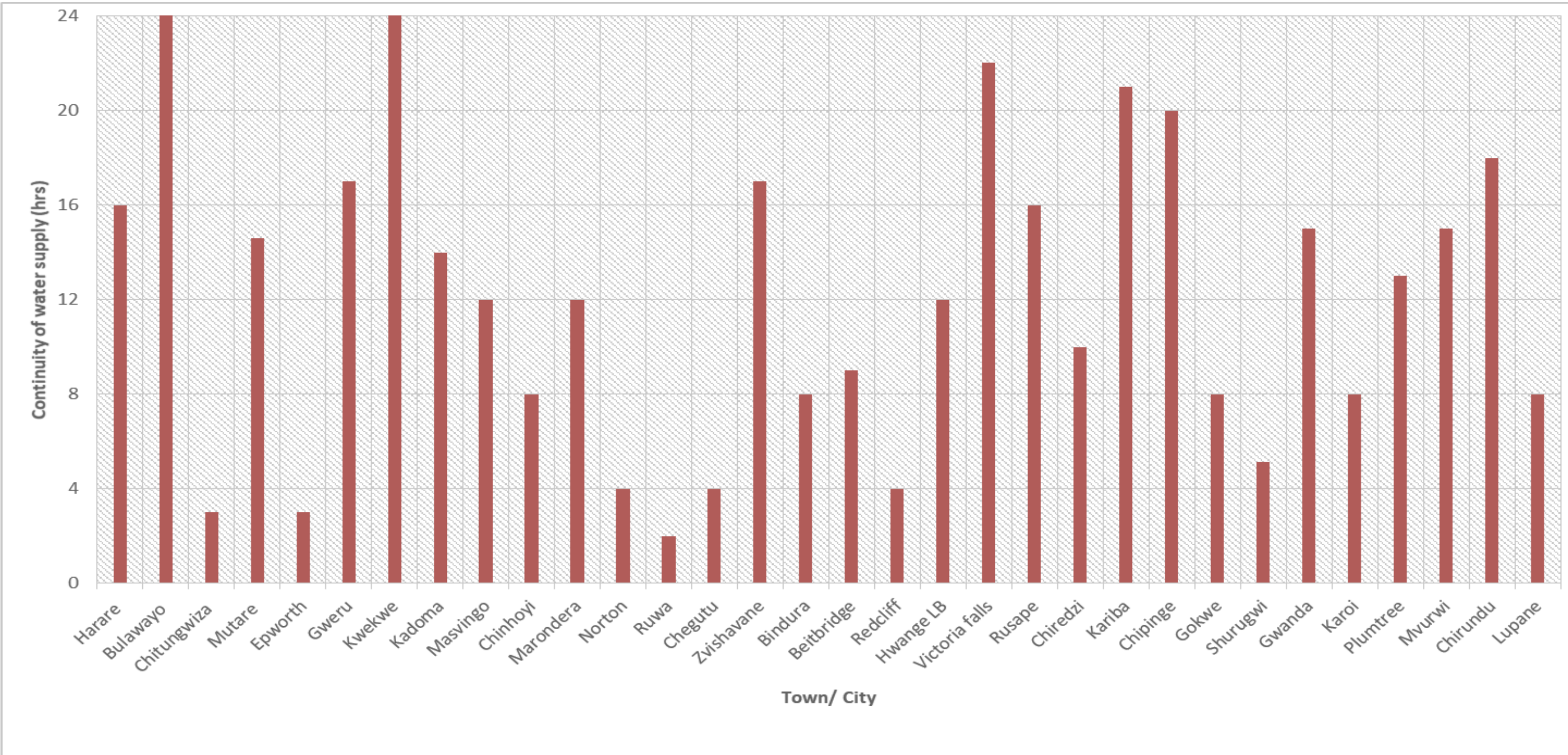
Similarly, the assessment of the time of the day when water cuts were experienced (Table 6.8) showed that in high density suburbs, water-cuts were mainly in the morning (35%) followed by random times (26%) and late afternoon (19%) or early evening. The medium density suburbs experienced water cuts mainly in the mid-morning (37%) followed by early morning (30%) and late morning (19%) in that order. Finally, the low density suburbs experienced water cuts mainly in the late afternoon or early evening (27%) followed by random times (25%) and mid-morning (19%). Therefore, it can be concluded that the water cuts were staggered across the suburbs.

Table 6.8: Time of day when water cuts are experienced

Residential category	Early morning	Mid-morning	Late morning	Afternoon	Late afternoon/early evening	Whole day	Randomly	Total
High	35%	11%	6%	3%	19%	0%	26%	100%
Medium	30%	37%	19%	0%	3%	0%	11%	100%
Low	10%	19%	15%	4%	27%	0%	25%	100%

Previous studies report cases of failure by city councils to maintain a 24 hour water supply service. For example, a study by Hove and Tirimboi (2011) shows that 54% of respondents in a study carried out in the City of Harare had a 24 hour service and 37.6% had less than 24 hour service but with varying duration. It was reported that tap water flow stopped at 5am and resumption varied from 11am up to 2pm or 3am the following day. Hours of service varied greatly from one area to another. Similarly, Ndunguru and Hoko (2016) assessed water flow patterns in four residential areas in Harare in particular the minimum night flow (MNF) in two high-density suburbs of Budiriro and Glen View, and two low-density suburbs of Belvedere and Mabelreign which indicated the MNF, which as per Thornton (2005) usually occurs during the night between 12 and 4 am (see Appendix F).

Similarly, the service level benchmark (SLB) review of 2017 reported on continuity of water supply in the 32 local authorities in Zimbabwe. The results (Figure 6.6) show that the average hours of water supply were below the ZNWP benchmark of 24 hours for most local authorities.



<u>Figure 6.6:</u> Water supply continuity in local authorities in Zimbabwe (SLB, 2018)

Bulawayo and Kwekwe were the only local authorities that reported 24-hour supplies (SLB, 2018). The rest of the 32 local authorities had a very low continuity of water supply. Serious water supply challenges were being experienced in Harare (Chitungwiza, Epworth, Norton, Ruwa), Chegutu, Redcliff and Shurugwi local authorities. The average flow for all the local authorities was 12.3 hours. This situation was contrary to the best practices of 24 hour water flows to customers as stated by the WHO (2000). Water supply discontinuity has an implication of not satisfying the consumers, which might affect their willingness to pay for the service. On a similar note, the “We Pay You Deliver” Consortium (WPYD, 2017) reports on continuity of water supply the city of Harare, Bulawayo, Masvingo and Mutare low hours of continuity of supply (Appendix F). A resident from an affluent suburb south of Harare is cited in The New York Times article titled “*In Zimbabwe, the Water Taps Run Dry and, Worsen a Nightmare*” of 13 July 2019 stating that it was day five since she had done laundry and day five since she had forbidden her children to use the toilet more than once a day. It was reported that the city’s mayor indicated that more than 4.5 million residents of Harare’s greater metropolitan area were getting water only once a week forcing them to wait in queues at communal wells, streams and boreholes (New York Times, 2019).

6.3.3.1.3 Alternative water sources

Further assessments of alternative water source(s) were carried out. The results of this assessment confirmed the inadequacy of water sources contributing to water shortages. In Chapter 5 (Table 1), three major alternative sources of water, including boreholes, taps and bowsers (water trucking), decreased in order of frequency of use during water cut-offs in all the three residential categories. The results showed that water trucking is very uncommon as an alternative source of drinking water during water supply interruptions and most cited reasons for this low frequency included: unavailability of trucks to cater for all suburbs, unavailability of fuel, lack of funds to buy fuel coupons, and in some areas, ed corruption as water bowsers were only servicing certain areas where the officials had some personal interests.

A study by Tanyanyiwa and Mutungamiri (2011) indicates that people living in some communities in Harare where piped water is not available have resorted to the digging of shallow wells, especially in unplanned settlements and slums. The City of Harare and Masvingo City have in recent years witnessed the mushrooming of unsanctioned boreholes and dug wells (Figure 6.8) in residential areas around the city where local municipalities/councils did not have water infrastructure to accommodate these new settlements. The urban local authorities (ULAs) reported the existence of these unsanctioned boreholes and dug wells In the City of Masvingo's Victoria Range and Garikai residential areas, while the city of Harare identified Budiriro, Hatcliffe Extension and Crowborough near Kuwadzana in Harare (Masvingo City Council, 2019). In addition, there is evidence from South Africa water supply studies that dissatisfaction with water supply interruptions could extend to other aspects of service delivery such as water quality (Hemson and Owusu-Amponah, 2006). Thus, the rampant supply discontinuity is likely to have adverse effects on the urban populations in Zimbabwe

6.3.3.1.4 Community coping strategies

The semi-structured interviews also assessed the coping strategies used by the residents to deal with water supply discontinuity. The results are presented in Figure 6.7).

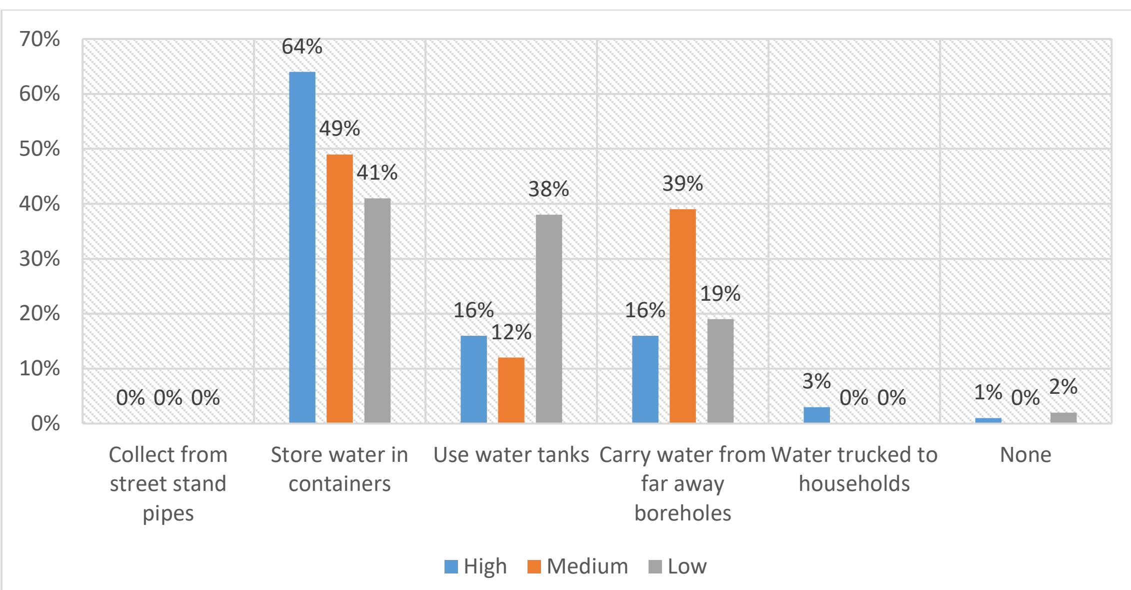
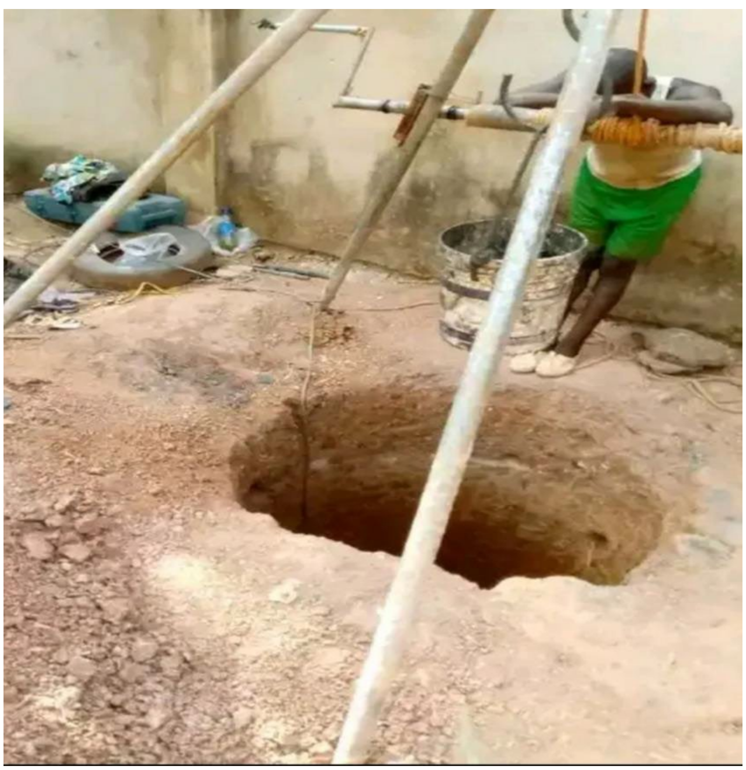


Figure 6.7: Community coping strategies to deal with water cuts

The results indicate that 64% of the respondents in high density suburbs resorted to household water storage in containers, 49% of residents in medium density suburb and 41% in low density suburb stored water in containers in their homes. In the low density suburb, 38% of the residents use water tanks commonly known as Jojo tanks in the communities, while 12% in medium density and 16% in high density suburb also use water tanks. Residents in low density suburbs indicated that they carried water from far away boreholes (38%) probably because they are better off economically and so could use their own cars or other means to ferry water from far away boreholes. In medium density suburbs, 19% indicated that they carried water from far away boreholes while 16% in high density suburbs carried water from far away boreholes. Three percent (3%) in the high density reported that they got water trucked to their homes (water bowsers) while a very small proportion in high density and low density suburbs indicated that they did not have alternative sources of water during flow interruption. In all the suburbs, the main way to deal with water-cuts was storing water in containers followed by carrying water from far away boreholes and use of tanks. However, in high and medium density suburbs, field observations showed that some households have illegally dug up unsanctioned boreholes and wells to cope with the rampant water supply shortages (Figure 6.8).

However, residents who owned these unsanctioned boreholes did not want details about their dug wells to be leaked to city authorities and as part of the research ethics, no traceable links to the owners were captured. Only low and medium-density residential areas can apply to the councils to get permission to sink boreholes in their backyards in accordance with the Water Act of 1998. However, it is illegal to sink boreholes in high-density suburbs in Zimbabwe. The Zimbabwe Coalition on Debt and Development (ZIMCODD, 2013) indicates that water shortages in most urban areas in Zimbabwe have led many people in low density suburbs to resort to drilling boreholes at their housing stands. Most residents in Harare's high density suburbs relied g on UNICEF boreholes which were dug during the cholera era in 2008. Furthermore, other residents went on to dig wells in their backyards to manage the situation (Figure 6.8.b).



a b

<u>Figure 6.8:</u> Residents coping strategies to water shortages (a) Roadside spring in Harare outside Epworth in Harare (New York Times, 13 July 2019, accessed January 2021) and (b) unsanctioned well being dug on the backyard

However, some of the boreholes were dysfunctional due to lack of proper regular maintenance. It has been reported that at least one in every five households in Mabvuku (a high-density suburb in Harare) has a well (ZIMCODD, 2013). Chaminuka and Nyatsanza (2013) corroborate this in their observation that during times of supply discontinuity, residents adopt various coping strategies especially the use of ground water which per Water Act of 1998 is illegal in high-density suburbs.

Field observations showed that many residents in low and medium-density suburbs drilled boreholes without permission from the council. Moreover, some residents walked long distances and queued the whole day to get water from the surrounding farms and low density suburb areas. Secondary sources of data also show that residents resorted to shallow dug wells from which they drew water for various uses (Baietti et al., 2006, Mangizvo and Kapungu, 2010).

Most of the observed wells were a health hazard because they were not protected and as such, runoff after a storm could collect in them (Figure 6.8a). Considering the rampant raw sewage overflows that were observed during field visits, groundwater quality could be of high risk due to high faecal contamination levels in some of the boreholes and wells thus creating a health hazard. On another note, dug wells have a large diameter that expose a large area to the aquifer (Hunt, 2006). Studies have shown that these wells can obtain water from porous materials such as very fine sand, silt, or clay.

The water supply shortages were partly attributed to aging equipment in the water provision system that is dilapidated (Mangizvo and Kapungu, 2010). Studies have shown that the pumping equipment has outlived the efficiency of its design causing huge maintenance costs to be incurred by the city councils to keep them running (Mangizvo and Kapungu, 2010). The obsolete equipment resulted in the water treatment plants producing far less water quantities per day than the current demand r as was reported above. Field observations indicated that the water shortages might be a result of extensive leakages along the main pipe line in the City of Masvingo (Figure 6.9). Chaminuka and Nyatsanza (2013) corroborate to the above assertion in their report that water pipe bursts were frequently experienced in the oldest reticulation mains feeding the residential areas in Harare. Furthermore, the main distribution line supplying water to the city of Harare from the waterworks also experienced serious leakages which contributed approximately 30% of non-revenue water.

Residents also identified that power outages as another major factor that worsened the water shortages. This assertion was confirmed during the study because serious power shortages were experienced and these impacted negatively on water pumping and subsequently the provision of water services in the study area. Through semi-structured interviews with the City Engineers, it was noted that there was no system to detect leakages along the reticulation system. The engineers and town planners were blamed by residents for failing to attend to leakages that resulted in high water bills being passed to consumers to ensure continued viability of utilities. Figure 6.9 shows perennial leakages observed in the city of Masvingo that have turned into swamps. Such a scenario does not reflect the financial resources channelled towards water production. The scenario in Figure 6.9 contributes to serious losses in the form of unaccounted for water. According to Gambe (2011), Harare City Council has been battling with high volumes of non-revenue water which accounts for about 60% of the City’s treated water.

A study by Ndunguru and Hoko (2016) on the estimation of the water losses for a selected water supply zone through leakages shows that a lot of water is lost as non-revenue water (unaccounted for water) (Appendix F). The study used the South African Night Flow Analysis Model (SANFLOW version 2.03), which was developed by the South African Water Research Commission, to determine real losses in a supply zone using the recorded minimum night flows (MNFs) as the major input (McKenzie, 1999). Water leakage was estimated as the system’s excess night flow (ENF) by subtracting the expected minimum night flow (EMNF) from the measured minimum night flow (MNF).

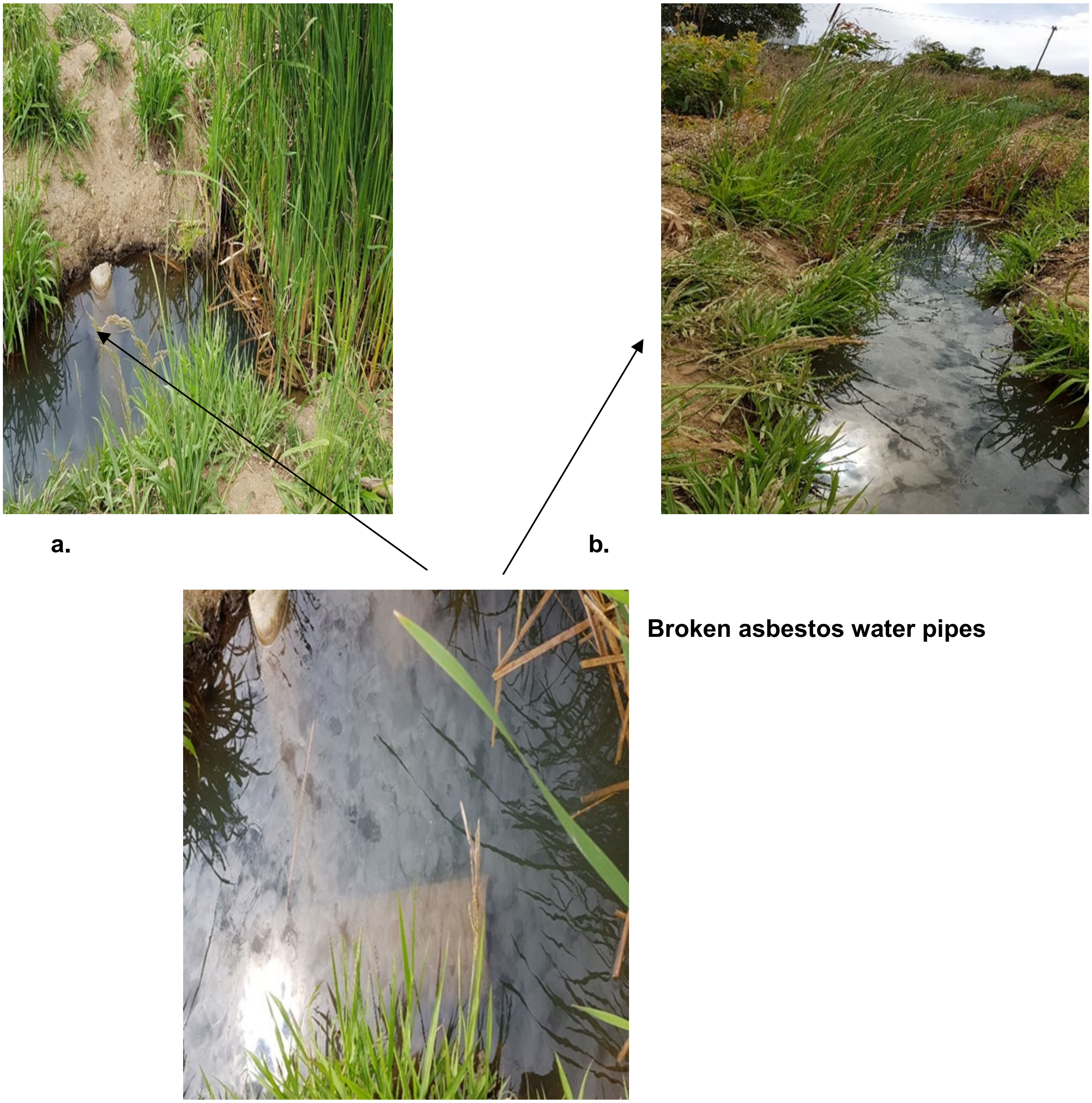


Figure 6.9: Underground water leakage near Church of Christ Hillview, Masvingo: (a) and (b) broken asbestos water pipe lying inside a trench full of leaking water, (c) swamp formed from leaking underground water pipes contributing to non-revenue water

According to McKenzie (1999), the MNF is the lowest flow into the District Metered Area (DMA) over a 24-hour period, which generally occurs between 12 am and 4 am when most consumers are inactive. It is argued that, although customer demand is very low at night, there is still a small amount of flow in the system owing to night-time customer demand for such uses as toilet flushing, washing and for geysers. This flow is termed 'EMNF' (Werner, 2011). In urban situations, it is estimated that about 6% of the population will be active during the minimum night-time flow period (McKenzie 1999). Apart from the MNF data, the SANFLOW model also considers basic infrastructure variables that include burst/leaks pressure exponent; quantity of water used in a cistern (L); background losses from mains (L/km.hr); exceptional use and percent of population that is active during night.

The study found that the leakage in the Budiriro high-density suburb was approximately 26.7% of the water supplied to the area. The Belvedere low-density area had 35.3% leakage, Glen View had 31.2% leakage and Mabelreign 36.5%. Moreover, the study reported that most distribution pipes were 20 years, 40 years, 34 years and 47 years old in Budiriro, Belvedere, Glen View and Mabelreign, respectively. The pipe materials in these areas and in most local authorities around the country including Masvingo City were mainly asbestos cement (AC). According to Ndunguru and Hoko (2016), the contribution of water leakage to water losses in the four selected areas indicated Budiriro water consumption for April 2012 of 268,769 m^3 represented 63.7% of what was supplied (421,992 m3). Belvedere had 71.3%, Glen View 63.4% and Mabelreign 57.1%. This information gives an equivalent total water loss of 36.3% for Budiriro, 28.7% for Belvedere, 36.6% for Glen View and 42.9% for Mabelreign.

A study by Seago et al. (2004) on the benchmarking of water leakage from a reticulation system using data from 27 water supply systems in 19 countries recommended a water leakage benchmark value of 276 L/connection/day as a recommended standard. However, the amount of water leakage in Harare water study areas ranged from 269.0 to 807.2 L/connection/day (Ndunguru and Hoko, 2016). The average for the four areas that were studied was 512 L/connection/day which is way above the above the international benchmark suggested by Seago et al. (2004). Moreover, a similar study on 30 South African water supply systems found an average leakage value of 340 L/connection/day (Seago et al., 2004). Overall, water shortages have been exacerbated by vandalism of water infrastructure, underground water leakages, and illegal water connections to malfunctioning prepaid water meters (Muchoza, 2018). Finally, Taonameso et al (2018) report that there are increased risks of underground contamination during periods of low pressure due to contaminant ingress into the supply distribution pipes. Thus, the leaking water pipes can also contribute to the contamination of water supplied along this distribution line.

When the Zimbabwe National Water Policy (ZNWP) came into force in 2013 its main aim is to improve the security and availability of water to all multipurpose users. The ZNWP stipulates in its policy statements that water required to meet basic human needs, termed 'Primary Water', should be given the first and highest priority in the provision of WSS services by those mandated by the government to provide these services. The above-noted results indicate that generally water is not always available for use from the regular sources in urban areas. The WHO/UNICEF (2019) reported that in many countries water facilities are simply not available in sufficient quantity. People are deprived of essential water quantities to satisfy their basic personal and domestic needs or it arrives only intermittently.

The UNESCO-WWAP (2015) affirms that household access to water supply is critical for a family's health, social dignity and economic development through agriculture and other economic activities. Lack of water supply, sanitation and hygiene (WASH) takes a huge toll on health and well-being and comes at a large financial cost, including a sizable loss of economic activity. Evidence from country wide studies carried out by the Joint Monitoring Programme shows that in many instances, water and sanitation facilities are simply not available in sufficient quantity (WHO/UNICEF, 2019). Thus, people are not getting adequate water to satisfy their basic personal and domestic needs or it arrives only intermittently. Water must be available continuously and in a sufficient quantity to meet the requirements of drinking and personal hygiene, as well as of further personal and domestic uses, such as cooking and food preparation, dish and laundry washing and cleaning (CESCR, 2003).

In conclusion, shortages of water supply in urban areas are common as council authorities fail to meet the 50 l/c/d minimum requirement for consumption purposes. Most urban councils have failed to address these shortages and have resorted to rationing the available supplies, which is a move that has threatened health conditions of urban communities.

6.3.3.2 Sanitation availability results

The availability of sanitation facilities around the household is indicated hereunder (Table 6.9). Almost all the households in the high-density and low-density had sanitation facilities and 82% of those in the medium-density had sanitation facilities around them. A total of 18% and 2% of the households in the medium and high-density suburbs respectively, did not have sanitation facilities around them because they were still under construction or they had water disconnection, which prevented them from using the toilets. The types of sanitation facilities used by residents are as indicated in Table 6.10.

Table 6.9: Sanitation facility availability

Residency category	Yes	No
High Density	98%	2%
Medium Density	82%	18%
Low Density	100%	0%

The results below in Table 6.10 show that there were more water borne/flash toilets (98.1%) than septic tanks and pit latrines across all the residential/suburban categories. Every resident in all the three residential categories has a water borne (flush) toilet and about half of those in the low-density and a significant percentage in the medium and high-density suburbs also had septic tanks.

Table 6.10: Sanitation type cross tabulation data per suburban/residential category

Sanitation type		Residency			Total
		Low density	Medium density	High density	
Septic tank	Count	2	2	0	**4**
	% within Residency	4.8%	4.0%	0.0%	**1.3%**
Water borne/flush	Count	39	50	224	**314**
	% within Residency	95.1%	98.0%	98.2%	**98.1%**
Pit latrine	Count	0	0	2	**2**
	% within Residency	0.0%	0.0%	0.9%	**0.6%**
Bucket system	Count	0	0	0	**0**
	% within Residency	0.0%	0.0%	0.0%	**0.0%**
Total	**Count**	**41**	**51**	**228**	**320**
	% within Residency	**100.0%**	**100.0%**	**100.0%**	**100%**

A Chi-Square test was carried out to assess for any association between the distributions of toilets among the residency categories. The Chi-Square test $X(2)$ was 2.528 and the p-value was 0.283, which implies that there is no statistically significant association between the distribution of toilets among the residency types and waterborne/flash toilets across residency types. The association between sanitation type and residency types was not found, $X(6)=8.570$ with the p-value=0.199 implying that sanitation type does not depend on the residency type. In all three residential categories, the respondents identified waterborne (flush toilet), septic tank and in some situations pit latrines. Thus, the main urban sanitation facilities allowed by policy are waterborne (flush toilet) and septic tank.

Figure 6.10 shows that in all three suburban categories, the respondents identified waterborne (flush toilet), septic tank and in some situations pit latrine. Thus, the main urban sanitation facilities allowed by policy are waterborne (flush toilet) and septic tank. Household survey results from an assessment of alternative sources of sanitation facilities in Chapter 5 shows that more than 30% of the respondents practiced open defaecation since there were no alternative sanitation facilities (Table 5.2). An analysis of alternative sanitation facilities by residency categories showed that most people in high density suburbs practiced open defaecation (Table 6.11).

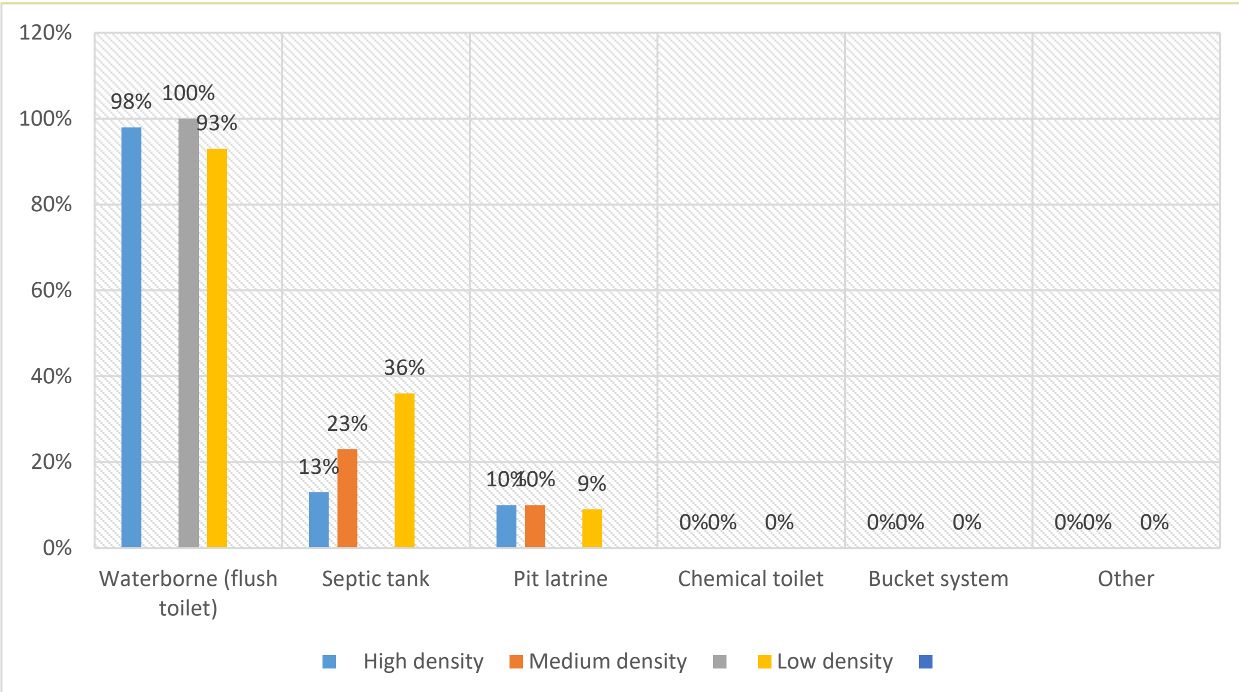


Figure 6.10: The types of sanitation facilities that are permissible in urban areas according the Urban Councils Act

Table 6.11: Alternative sanitation by residential category

Residency category	Alternative sanitation facilities				
	Pit latrine	**Chemical toilet**	**Septic tank**	**Bush**	**Other**
High	7%	0%	0%	44%	49%
Medium	8%	0.09%	0%	35%	56.9%
Low	4%	21.6%	40%	5%	29.4%

The main alternative sanitation facilities in the high and medium-density suburbs are the bush toilet and other ways of disposing human excreta. In the low density suburbs, the alternative sanitation facilities included chemical (21.6%), pit latrines (4%), septic tanks (40%) and other ways of disposing human excreta (29.4%). Open defaecation was not common in the low density suburbs because of the availability of septic tanks and chemical toilets since these households have more space to erect these extra structures unlike in high densities.

The human right to sanitation entitles everyone to sanitation services that provide privacy and ensure dignity, and are physically accessible and affordable, safe, hygienic, secure, socially and culturally acceptable (UN, 2015). In addition, the human rights law requires that there be enough sanitation facilities with associated services to ensure that waiting times are not unreasonably long (de Albuquerque, 2010). In another study, Bos et al. (2016) indicate that safe sanitation facilities must be available to everyone, everywhere: at home, at the workplace and in public places. The results of this study show that capacity (quantity) and continuity should be addressed to address open defaecation during water supply discontinuity.

Consequently, in terms of best practices, the existence of overflows, blockages and other system malfunctioning show low level of sanitation services in the study area. According to Bos et al. (2016), the continuity aspect of sanitation availability means that the collection and treatment should function at all times at an adequate capacity.

6.3.4 DRINKING WATER SAFETY AND ACCEPTABILITY

6.3.4.1 Acceptability

According to Wright et al. (2012) public perceptions of drinking water safety are important because they inform promotion of household water treatment and household choices over drinking water sources in low and middle income countries. The following results are based on an analysis of qualitative data on users' perceptions of water quality. At least 53% of the respondents in all three residential categories indicated that the water quality was good while an average of 19% of respondents in all three residential categories indicated that the water quality was very good (Figure 6.11). In addition, 7% of the water users indicated that water quality was poor while 8% in all residential categories indicated that water quality was very poor. A note can be made in the medium and high-density suburbs where water quality was reportedly very poor.

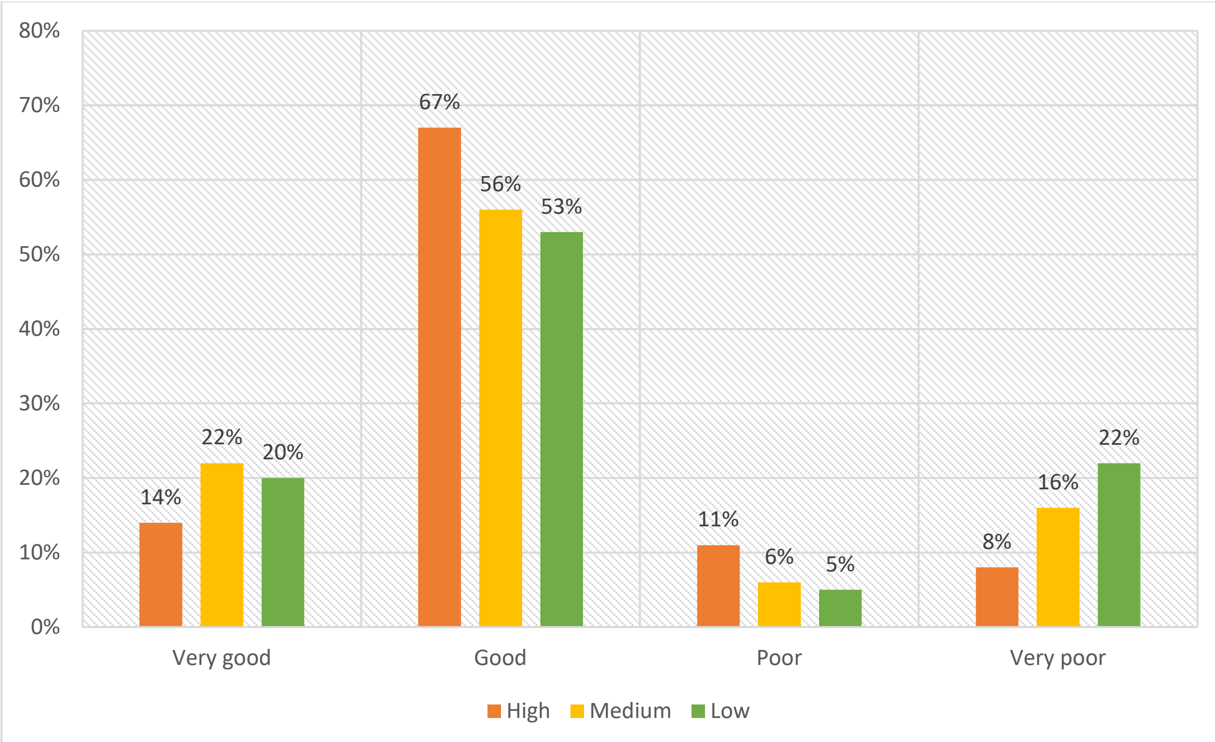


Figure 6.11: Customer water quality perception

The main issue raised by respondents from all three suburbs is the colour of water which had 30%, 22% and 32% of residents in high, medium and low-density suburbs complaining about the colour of water, respectively (Table 6.12), and the possible reasons are explained below.

Table 6.12: Water quality issues raised by residents

Residence category	Water quality issues raised						Total
	colour	smell	taste	Microbial-contamination	Chemical contamination	None	
High	30%	15%	10%	5%	11%	29%	**303**
Medium	22%	6%	9%	3%	6%	54%	**71**
Low	32%	14%	6%	5%	9%	33%	**63**

a b c

<u>Figure 6.12:</u> (a) Water with a milky colour from a tap and, (b) & (c) Bath tabs with brown coloured water coming out in the morning from taps in the City of Masvingo on 26 December 2018 and 28 November 2020, respectively

Respondents indicated that when water flow resumes after some water outages, the first volumes have a brown colour and when left to stand, silt and solid debris settles at the bottom of the containers (Figure 6.12). Smell, chemical contamination and taste were other concerns raised by residents. At least 6% of the residents in all suburbs complained about the water's odour, taste and chemical contamination. Most residents indicated that the smell of the water was like that of mud and sometimes the smell of chlorine and chlorinous taste.

Figure 6.12 (c) reflects a message from the Runyararo South West (KMP Phase 1) WhatsApp group that translate to, "*Please, have a look at the water that was coming out in the morning from our taps here, um, it's the main cause of the stomach aches/diarrhoea that we are experiencing*". The message implies that, there was a general problem of ailments that include diarrhoea and stomach cramps among residents, and that residents suspected that the poor water quality may have contributed to that. Apart from the occasional brown colour, water was reported to be milky/cloudy but gradually became clear on standing. Although milky water that clears on standing does not pause any health hazard as it shows that there is trapped air in it, many users associated this state with health hazards and this reduced its acceptability. At least 3% in all residential categories indicated microbial contamination. A significant percentage (54%) in medium density, 33% in low density and 29% in high density indicated that they did not have issues with the water quality.

A study on residents' water quality perceptions by Hove and Tirimboi (2011) shows that consumers had different water quality perceptions. Hove and Tirimboi (2011) argue that residents' water quality perception varies from place to place with some areas' residents getting used to the taste, odour or colour of the water and hence, not reporting any anomaly with the water quality. However, it is indicated that if a stranger uses the same water, it is very easy to pick up any water quality problems. Similarly, a study by the Combined Harare Residents Association (CHRA) (2009) reported of suspended particles which settled in stored water and rust when water supplies resumed in Harare. Residents further complained that the water would turn green if stored for more than three days. The reports also indicated that residents had to rely on their perception as indicated by WHO (2004) that acceptability is determined by senses if consumers are unable to verify the drinking water safety. The report by CHRA (2009), which used water samples collected from 2007 up to 2009 in Harare, indicated that residents complained that tap water had become greenish whereas ground water samples had settled particles.

Overall, the residents' perceptions on water quality in both empirical and previous studies show that users sometimes perceive the water quality as hazardous. The WhatsApp messages that were shared by residents (Figure 6.12 c) are enough evidence to support this assertion. It is argued that negative perceptions regarding water safety affect water users' behaviour as shown by Nauges and van den Berg's (2006) study on Sri Lankan households that found that a higher perceived contamination risk increased the probability of households boiling or filtering drinking water. Moreover, perceived drinking water safety may influence source choice in situations where households have a choice of several different water sources that include, private boreholes versus municipal water supplies (Nauges and Whittington, 2010) and thereby affecting the financial sustainability of water services through tariff recovery.

The users' possession of alternative water supplies to the municipal water supply affects tariff collections because users cannot pay for services they are not using. Similarly, the Harare City Council (HCC) has experienced a spike in water vending which started in 2009 due to the perceived poor quality of municipal water and resulted in high resistance by residents to pay water bills. Many residents opted for groundwater as they perceived it to be safer than the municipal one.

Consequently, several options for buying water have mushroomed in Harare with some offering large quantity supplies while others sell bottled water. It is reported that many people in low density suburbs rely on bottled drinking water for drinking. This was revealed by the few informally interviewed University of Zimbabwe students who reside in the low density suburb of Mt Pleasant (ZIMCODD, 2013). There is a general belief among these residents that bottled water is safer than water from the HCC. However, the

SLB (2018) reported that water quality improved from 90% to 96.7% during the period 2016 to 2017 and reasons sighted for this improvement include rigorous testing which was done internally and externally.

However, one can still question the reliability of these results because the WHO Regional Office for Africa (WHO Africa) (2019) quoted the then Minister of Health and Child Welfare Dr Obadiah Moyo's statement that, "*We noted with concern that typhoid cases in Harare had been on the increase, with the peak reached in December 2018*". As a result, the Minister indicated that the Ministry decided to introduce the typhoid Typbar-conjugate vaccine in high-risk areas and at the same time promote water provision, sanitation and good hygiene to prevent the further spread of the disease. CHRA (2009) indicates that residents reported that water was unsuitable for drinking due to lack of assurance by the service provider and the Water Regulatory Board, the Ministry of Health. Generally, water quality in the Masvingo City was of commendable quality and the SLB (2018) survey report 100% water quality for Masvingo City Council while Harare City had 87%. This alone shows the water quality supplied by Masvingo City Council is of a better quality than that of Harare City Council (Table 6.13).

The data for quality of water supplied for both the Masvingo and Harare City Councils during the SLB reviews in 2017 had a Reliability Score (RS) of 1, which shows, as per the SLB standard that, the data met all water quality data collection requirements and was reliable. The rise in waterborne diseases cases in Harare that were reported by the WHO Africa (2019) might be partly attributed to the low water quality that was reported by the SLB in 2018. In addition, Hove and Tirimboi (2011) indicate that some areas in Harare, such as Kuwadzana Phase 3, only depended on tap water because of limited alternative sources of water, therefore, they did not have reported cases of typhoid outbreaks. However, residents from areas such as Mabvuku, used underground water sources as alternative sources and yet the underground water has high contamination risk from sewage. Tap water was safe, but the alternative sources of water used during water outages that have become the order of the day contributed to the rise in waterborne diseases as was reported by the WHO Africa (2019).

<u>Table 6.13:</u> Summary of Service Level Benchmarking for water supply in 2017 (SLB, 2018, accessed December 2020)

	Property level coverage of direct water supply		Per Capita Supply of Water		Extent of metering of water connections		Extent of NRW		Continuity of water supply		Quality of water supplied		Efficiency in satisfactory response/ reaction to customer complaints		Efficiency of cost recovery in water supply services		Efficiency in collection of water supply related charges		Maintenance Coverage Ratio	
Benchmarks	**100%**		**lcd**		**100%**		**25%**		**24 hrs**		**100%**		**80%**		**150%**		**75%**		**20%**	
Town/City	**Value in %**	**RS**	**Value in lpcd**	**RS**	**Value in %**	**RS**	**Value in %**	**RS**	**Value in hrs**	**RS**	**Value in %**	**RS**	**Value in %**	**RS**	**Value in %**	**RS**	**Value in %**	**RS**	**Value in %**	**RS**
Beitbridge	65	1	83	1	90	4	45	1	9	2	94	1	90	1	115	1	55	1	0	4
Bindura	85	1	103	1	86	4	34	2	8	4	5	3	34	3	133	3	28	1	3	4
Bulawayo	93	1	174	1	99	1	41	1	24	1	99	4	99	1	111	1	28	2	3	4
Chegutu	94	1	101	4	23	2	44	4	4	4	100	4	93	3	263	3	18	4	0	4
Chinhoyi	73	1	136	1	92	2	55	2	8	2	100	1	91	2	104	2	27	2	0	1
Chipinge	81	1	143	1	100	1	26	2	20	4	100	2	93	1	108	1	52	4	9	4
Chiredzi	103	1	279	1	100	1	61	2	10	4	100	1	74	2	249	2	13	2	3	4
Chirundu	94	1	195	4	100	1	32	4	18	2	91	1	67	4	117	4	72	1	2	4
Chitungwiza	74	1	65	3	100	2	66	2	3	4	87	2	64	2	248	2	57	4	0	4
Epworth	14	4	3	4	100	2	17	4	3	4	278	4	100	1	136	1	29	4	4	4
Gokwe	71	1	79	1	100	1	33	2	8	4	50	4	22	2	161	2	46	1	18	4
Gwanda	74	3	143	3	#DIV/0!	0	35	3	15	0	98	4	82	2	74	2	46	4	1	4
Gweru	96	1	226	1	100	2	32	1	17	4	95	2	70	2	218	2	33	2	2	4
Harare	73	1	511	1	96	1	61	2	16	4	87	1	42	2	90	2	69	1	0	4
Hwange LB	132,97	4	511	4	100	1	33	4	12	4	97	4	0	4	127	4	80	4	0	4
Kadoma	92	1	231	3	100	1	60	3	14	4	96	2	100	2	99	2	66	2	3	4
Kariba	92	1	514	3	100	1	47	2	21	1	98	1	74	2	143	2	51	1	2	4
Karoi	65	4	131	4	0	4	49	4	8	4	93	4	0	4	130	4	50	4	1	4
Kwekwe	100	1	515	1	100	2	64	2	24	1	97	1	94	1	171	1	34	1	3	4
Lupane	31	4	73	4	100	2	32	4	8	4	117	3	0	4	91	4	50	1	4	1
Marondera	81	1	138	1	109	2	65	1	12	3	100	1	86	2	158	2	52	2	2	1
Masvingo	96	1	229	1	99	2	39	1	12	4	100	1	100	3	428	3	43	2	7	4
Mutare	71	4	481	4	100	2	68	4	15	4	100	2	89	2	491	2	61	2	38	4
Mvurwi	66	1	162	1	22671	2	49	2	15	2	58	2	69	5	126	5	100	1	1	1
Norton	65	4	60	4	71	2	58	3	4	4	69	4	60	4	91	4	43	2	2	4
Plumtree	79	3	130	3	100	3	20	4	13	1	112	1	100	2	241	2	23	2	7	1
Redcliff	99	3	213	1	92	2	57	2	4	4	88	3	65	3	67	3	13	4	0	4
Rusape	68	3	243	1	100	2	41	1	16	2	100	1	87	1	284	1	36	1	6	1
Ruwa	82	1	17	1	100	1	30	2	2	4	94	1	18	2	110	2	51	2	4	1
Shurugwi	95	1	139	1	46	1	17	1	5	4	100	4	100	2	108	2	18	2	2	1
Victoria Falls	100	1	341	1	100	2	30	1	22	2	97	1	83	2	99	2	55	2	8	1
Zvishavane	87	3	155	1	77	2	37	1	17	2	100	2	89	2	133	2	17	2	0	4
Average	**81,0**	**1,9**	**203,8**	**2,1**	**817,8**	**1,8**	**43,0**	**2,3**	**12,1**	**3,0**	**96,8**	**2,3**	**69,8**	**2,3**	**163,2**	**2,3**	**44,3**	**2,2**	**4,2**	**3,2**
Std Deviation	**21,5**	**1,3**	**150,9**	**1,3**	**#DIV/0!**	**0,9**	**14,9**	**1,1**	**6,4**	**1,3**	**38,8**	**1,3**	**31,8**	**1,1**	**97,3**	**1,1**	**20,5**	**1,1**	**7,1**	**1,4**

RS – Reliability Score

1. = blue, 2 = green, 3= yellow and 4= red (the smaller the RS, the more reliable the data is)

6.3.4.2 Microbiological quality

The test which is reported below was carried out to detect and quantify *E. coli* as the indicator of faecal contamination in the household source and stored water. The results that follow are on water quality from drinking water samples taken from water sources in the three residential categories in the cities of Masvingo and Harare (Table 6.14).

Table 6.14: Overall water sample health risk assessment results

Risk category	No. of samples	Percent (%)
Low Risk/ Safe	156	80
Intermediate Risk/ Probably safe	18	9
Intermediate Risk/ Possibly safe	1	1
High Risk/ Possibly unsafe	12	6
Very High risk/Unsafe	9	4
Total	**196**	**100**

Eighty percent (80%) of the water samples were low risk and safe for human consumption, 9% had an intermediate or moderate risk and thus unfit for human consumption as per the WHO (2017) standards and the SAZ-560:1997 guidelines for drinking water in Zimbabwe. In addition, one percent (1%) of the samples was of moderate risk or possibly safe while 6% was high risk or possibly unsafe and 4% of the samples were unsafe. It can be concluded, based on a comparison with both the WHO (2017) and SAZ-560:1997 guidelines for drinking water that, 20% of the water samples did not meet the specified guidelines.

Furthermore, an analysis of water samples by sources show that 122 (98.8%) of the tap water samples, 27 (51.9%) of stored tap water samples and 7 (41.2%) of borehole water were of low risk/safe health category of the World Health Organisation's (2017) 4th edition guidelines for drinking water. Six (35.3%) of the borehole water samples, 2 (1.6%) of tap water samples and 10 (19.2% of stored tap water were of intermediate risk/possibly safe while 2 (11.8%) of stored borehole water and 9 (17.3%) of stored tap water was of high risk/possibly unsafe. The results also show 2 (11.8%) of borehole water samples, 1

(33.3%) of stored borehole water samples and 6 (11.5%) of stored tap water samples were of very high risk and unsafe for human use. Overall, 40 (20.4%) of the tested water samples did not meet both the WHO (2017 and the SAZ S560:1997 guidelines for drinking water quality (Table 6.15).

Table 6.15: Domestic Water health risk explanations by Water Source

Sample	Low risk/ Safe	Intermediate risk /Possibly safe	Intermediate risk/ Probably safe	High risk/Possibly unsafe	Very high risk/unsafe	Total
Borehole	7	6	0	2	2	17
Borehole/stored	0	1	0	1	1	3
Tap	122	2	0	0	0	124
Tap/Stored	27	9	1	9	6	52
Total	156	18	1	12	9	196
Percent	**79.6%**	**9.2%**	**0.5%**	**6.1%**	**4.6%**	**100%**

The reported microbiological result for this study show a similar trend with results from a study by Muleya et al. (2019) carried out in Zvishavane, a small town in the south western parts of Zimbabwe, where tap water samples tested for microbiological quality were within recommended limits. Similarly, a systematic review of microbiological contamination between source and point-of-use by Wright et al (2004), also found that approximately half of the studies that were analysed identified significant contamination after collection. The study noted that no instances were reported where microbiological water quality improved significantly after collection. Hence, the decline in microbiological water quality between source and point-of-use measured in terms of faecal and total coliforms is proportionately greater where the source water is largely uncontaminated. According to Chidavaenzi et al (1998), safer household water storage is an appropriate additional intervention to prevent contamination of domestic water after collection from an uncontaminated source.

The SLB (2018) also reports improvement in water quality between 80% and 90% in 2017 for tap water and this corroborates with the observations above. However, the SLB (2018) argues that the high conformity to service delivery best practices in urban councils may be doubted because most of the data provided by the councils and local authorities had very low reliability scores (RS). Only 13 urban local authorities out of 32 had an RS of 1, which supports the above assertion (Table 6.13). The SLB (2018) reported rampant tempering with water quality data by Councils, especially when the data was bad, and that sometimes councils concealed certain documents from the SLB Peer Reviewers. It is argued that the failure to disclose and cooperate with SLB Peer Reviewers is not in conformity with principles of service level benchmarking, because disclosures are an integral requirement for a successful SLB process (SLB, 2018).

The gloomy picture on continuity of water supply, which currently remains at 12 hours on average (SLB, 2018), forces residents to adopt unsustainable coping strategies to meet their daily water per capita volume, including water storage and use of groundwater abstraction. Consequently, various studies have shown that stored water samples were frequently contaminated with *E. coli* (Potgieter et al., 2006; Gundry et al., 2009). Water often becomes contaminated during storage due to poor hygienic practices and studies have shown that unsafe storage of potable water and poor hygiene increases the number of coliform inside storage containers possibly due to microbial regrowth and their ability to survive as biofilm (WHO, 2012; Agensi et al., 2019; Bae et al., 2019; Stauffer, 2020).

Overall, the study results show that the microbiological quality of water at source (especially tap) is high but low at point-of-use as there is a decline after collection. The study results on water quality show that providing safe drinking water to urban communities continues to be a huge challenge for urban local authorities in Zimbabwe and this is likely to continue until councils will be in a position to maintain continuity of water supply.

6.3.4.3 Physico-chemical parameters

The study was mainly concerned with fluoride content in the drinking water supplied by the Masvingo and Harare City Councils. This section discusses fluoride content in detail while drawing from the results section of physico-chemical parameters as per the WHO 2017 and the SAZ S560:1997 guidelines for drinking water quality. The results from an analysis of the physical and chemical parameters of the tested water samples are shown in Table 6.16.

Table 6.16: Physico-chemical parameters of water samples from the study area

Water Source	Statistics	T°C	pH	EC (µs)	TDS (mg/L)	F (mg/L)
Taps	Mean	26.9364	9.1692	145.803	73	1.2
	Std. Deviation	1.72143	0.34456	182.1473	90.41341	0.09063
	Minimum	21.7	7.22	100	49	1.1
	Maximum	31.7	742	1328	658	1.8
Tap stored	Mean	27.3899	7.7701	126.4854	64.4757	1.29155
	Std. Deviation	2.03592	0.43581	99.93251	51.24773	0.09485
	Minimum	23.1	7.06	61	50	1.1
	Maximum	37.6	8.94	1025	526	2.2
Borehole	Mean	24.685	7.337	1168.1	571.4	2.79542
	Std. Deviation	2.66819	0.37473	659.8572	327.4042	1.82949
	Minimum	18.1	6.7	104	52	1
	Maximum	29.8	8.19	2926	1472	7.6
Borehole stored	Mean	25.125	7.435	795.75	397.5	3
	Std. Deviation	1.6358	0.39871	201.8884	100.633	2.64564
	Minimum	23.6	7.04	620	310	1.8
	Maximum	27.4	7.99	997	499	7.2

Table 6.16 shows the descriptive statistics of the water samples by source with respect to water parameters investigated in the study. The results indicate that the tap water had a mean temperature of 26.9°C, with a standard deviation of 1.7, and the minimum recorded temperature at 21.7°C while the maximum was 31.7°C. However, tap stored water indicated a mean temperature of 27.38°C, with a standard deviation of 2.03, a minimum temperature of 23.1°C and maximum of 37.6°C. The statistical results on borehole water tests showed a mean temperature of 24.68°C, with standard deviation of 2.668, and a minimum of 18.1°C as well as a maximum of 29.8°C.

An assessment of total dissolved solids (TDS) and electrical conductivity (EC) showed a maximum TDS value for tap at 658 mg/L while borehole water had TDS of 1474 mg/L. The TDS value for tap water is within the allowable values of the WHO (2017) Drinking-Water Guidelines and the SAZ-56-:1997 which is set at 1000 mg/L. A total of 2 (10%), had TDS values greater than the stipulated limit of 1000 mg/L. All tap water samples had

TDS values lying within recommended TDS limit of 1000 mg/L. Muleya et al. (2019) arrived at similar result with regards to all treated tap water samples that were within the recommended TDS limit and therefore, argue that this implies that most of the contaminants were removed during water treatment. It is further argued that water TDS values lower than 1000 mg/L are usually tolerated by consumers (WHO, 2017). According to the WHO (2017), previous studies on palatability of water in relation to its TDS level was rated as: excellent at less than 300 mg/L, good at values between 300 and 600 mg/L, fair at values between 600 and 900 mg/L, poor at values between 900 and 1200 mg/L and unacceptable at values greater than 1200 mg/L (WHO, 2017).

The WHO (2017) further points out that water with extremely low concentrations of TDS may not be favoured and is usually corrosive to plumbing systems. All the 20 borehole water samples had EC values above 700 µS/cm, the maximum value for borehole EC was 2926 µS/cm. Conductivity measures the ability of water to allow an electric current to flow, which is directly related to the concentration of ions in the water. Unfortunately, 100% of borehole water samples had EC values well above the WHO (2017) and SAZ-560:1997 recommended limit of 700 µS/cm but these were below the maximum allowable limit of 3000 µS/cm by SAZ 560:1997. This maybe a result of mineral leaching because of seasonal changes in underground levels. This also highlights the need to increase water quality monitoring through water safety plans (WSPs) as a preventive approach to safeguard human health.

Overall, it is very important that Local Authorities and the Department of Health diversify water testing to include point-of-use testing instead of only testing at sources in such settings. According to Wright et al. (2004), relying on results of testing at source only may not reflect the quality of water actually consumed in the home. In addition to periodic testing, educating users and residents on the importance of good hygiene and water storage may help reduce episodes of waterborne diseases. The study notes with concern the lack of household water testing and awareness campaigns by local authorities in urban areas, especially given the current setting where water supply is not continuous and almost every resident stores water at one point or the other. Shorter hours of continuous water supply to urban communities will continue to contribute to high morbidity from waterborne diseases without the above heighted interventions. Moreover, the above observation supports the view by Odiyo and Makungo (2012) that, although water quality management strategies based on legal frameworks exist, the inadequacy of technical capacity and finances among others at municipal level constrain efficient implementation.

The assessment of fluoride concentration in drinking water (Table 6.17) showed that 103 (52.6%) of the water samples had a fluoride concentration that lies within the recommended limit. About 53 (27.0%) of the samples had fluoride concentration between 1.6 and 2.0. Four water samples (2.0%) had fluoride concentration between 4.1 and 4.5; while 2 (1%) had fluoride concentration between 6.1 and 6.5 and another 2 (1%) water samples had a fluoride concentration greater than 7 mg/L. High fluoride content was found in water boreholes and given the fact that service continuity is not 24 hours per day, most urban dwellers resort to ground water sources, which increases their risk of fluoride poisoning.

Table 6.17: Fluoride concentration water samples from water sources in the study cases

	Fluoride concentration (mg/L)	**Frequency**	**Percent (%)**
Valid	0-1	1	0.5
	1.1-1.5	103	52.6
	1.6 - 2.0	53	27.0
	2.1 – 2.5	22	11.2
	2.6 – 3.0	9	4.6
	3.1 – 3.5	0	0
	3.6 – 4.0	0	0
	4.1 – 4. 5	4	2.0
	4.6 – 5.0	0	0
	5.1 – 5.5	0	0
	5.6 – 6.0	0	0
	6.1 6.5	2	1
	6.6 – 7.0	0	0
	> 7	2	1
Total		**196**	**100**

According to the WHO (2004), many epidemiological studies of possible adverse effects of the long-term ingestion of fluoride via drinking-water have been carried out. The studies show that fluoride primarily produces effects on skeletal tissues (bones and teeth). It has been reported that high fluoride exposure accounts for the high morbidity in some regions. The minimum concentration of fluoride in drinking water required to produce enamel protection is approximately 0.5 mg/litre. However, it is reported that fluoride concentration may have adverse effects on tooth enamel and give rise to mild dental fluorosis at drinking water concentrations between 0.9 and 1.2 mg/litre, depending on intake. Elevated fluoride intakes can also have more serious effects on skeletal tissues. It has been concluded that there is a clear excess risk of adverse skeletal effects for a total intake of 14mg/day and suggestive evidence of an increased risk of effects on the skeleton at total fluoride intakes above about 6mg/day. The WHO (2004) also stipulates 1.5mg/L (1500 µg/L) as the maximum permissible limit of fluoride in drinking water if there are other daily fluoride intakes from other sources such as food with the highest desirable limit being 1.0mg/l.

The WHO (2017) indicates lack of evidence to suggest that the guideline value of 1.5 mg/l set in 1984 and reaffirmed in 1993 needs to be revised. Concentrations above this value carry an increasing risk of dental fluorosis, and much higher concentrations lead to skeletal fluorosis. The value 1.5 mg/L is considered higher than that recommended for artificial fluoridation of water supplies, which is usually 0.5–1.0 mg/L. The WHO (2017) recommends that it is essential, when setting national standards or local guidelines for fluoride or in evaluating the possible health consequences of exposure to fluoride, to consider the average daily intake of water by the population of interest and the intake of fluoride from other sources such as food and air. It would be appropriate to consider setting a standard or local guideline at a concentration lower than 1.5 mg/L in cases where the intakes are likely to approach, or be greater than, 6 mg/day. Finally, studies by Tobayiwa et al. (1991), and Mamuse and Watkins (2016), in Gokwe, Northwest of Zimbabwe, show that drinking water from boreholes contained up to 11mg/L fluoride concentration, and fluorosis estimated at 62%.

6.3.5 ACCESSIBILITY AND AFFORDABILITY ASSESSMENT RESULTS

6.3.5.1 PHYSICAL ACCESSIBILITY

6.3.5.1.1 Distance to and from water sources

In this study, the distance to and from the water source was considered as a key indicator of access to WSS s by the ratepayers/residents as guided by the normative criteria (Chapter 2). More than 92% of the respondents in high density, 80% in medium and 84% in low density suburbs indicated that they travelled more than 500 metres to collect water from the nearest alternative sources, which are mostly very few municipal water boreholes for the public (Table 6.18). Respondents also indicated that when a water bowser is send to a particular area, the water trucks just park in one area and consumers have to travel to the rationing point regardless of the distance involved.

Table 6.18: Distance travelled to the nearest improved alternative water sources one way

Residency category	**Estimated distance**				
	0-10m	>10 ≤ 50m	>50 ≤ 100m	>100 ≤ 200m	>500m
High density	0%	0%	3%	5%	92%
Medium density	0%	0%	0%	20%	80%
Low density	0%	0%	0%	16%	84%

The number of trips from household to water source is as indicated hereunder (Figure 8.13). Most of the respondents indicated that they carry out ate least three trips from their houses to the water source per day. One trip has the highest frequency and this explains why many people complained about distance to the water source. If the alternative sources were closer, residents could have many trips to the source. The problem that arises is that less quantities of water would be used to meet personal hygiene needs, and washing hands after visiting the toilet would be seen as a luxury and consequently lead to unhygienic practices and outbreaks of diseases (Bos et al., 2016, WHO, 2017).

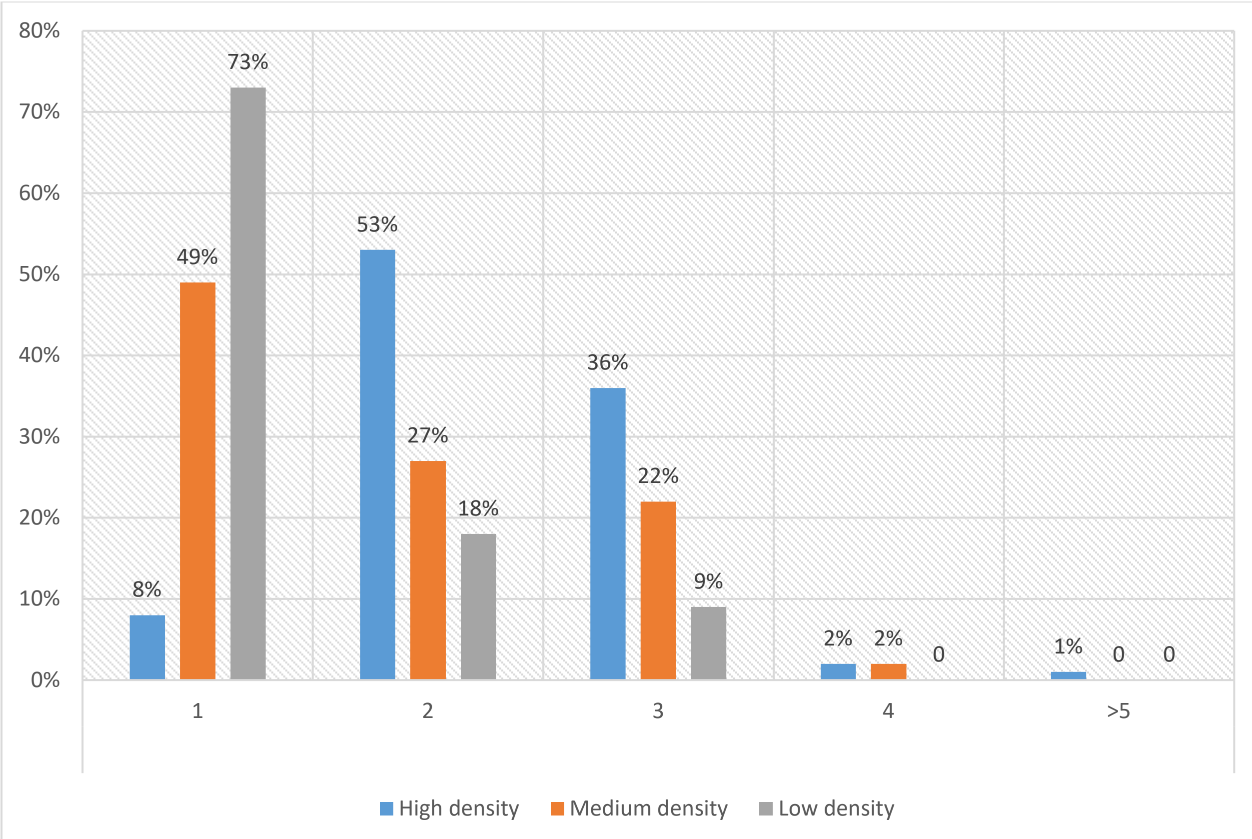


Figure 6.13: Number of trips per day from the household to the water source

6.3.5.1.2 Time of waiting at the water source to get water

The waiting time at the water source to get water is as indicated hereunder (Figure 6.14). Most respondents (> 60%) in all three suburbs waited between 30 and 60 minutes to collect water from a source. The WHO (2017) Drinking Water Guidelines and the SAZ-560:1997 stipulate 30 minutes as the maximum allowable waiting time to collect water. This further supports why residents do fewer trips to the alternative sources.

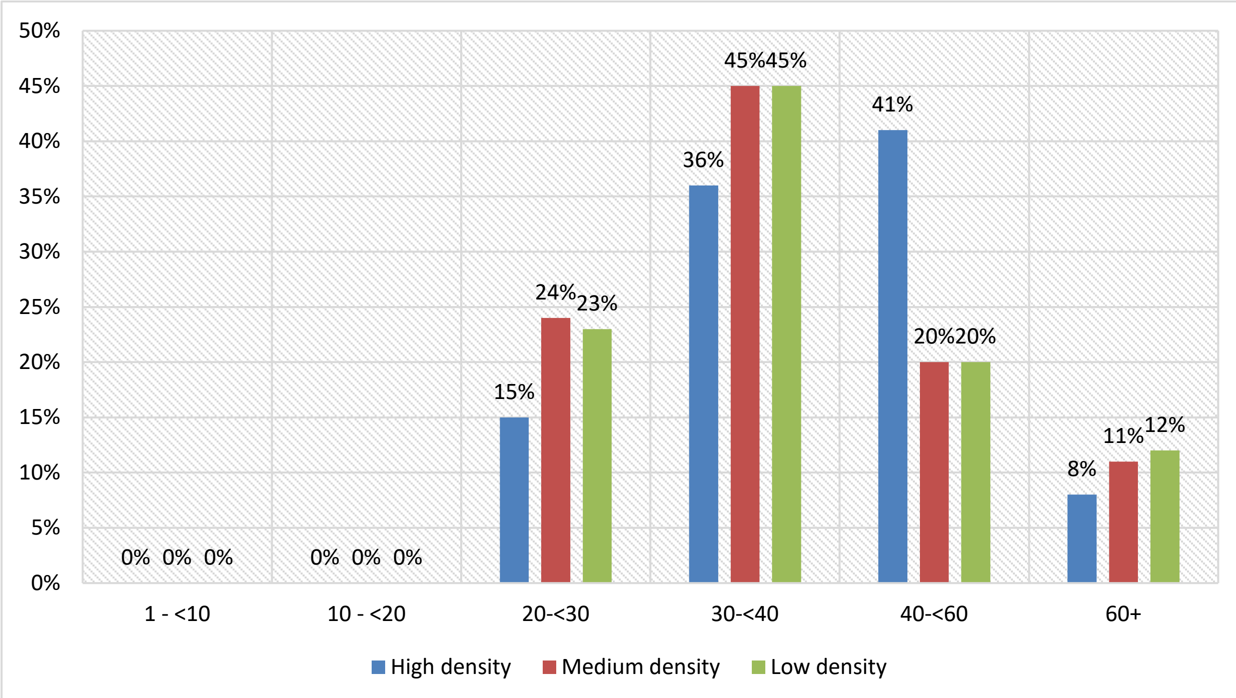


Figure 6.14: Waiting time at the water collection point

The study identified four methods or modes of transport that are used to ferry water from the source to the household (Figure 6.15). A total of 40%, 145 and 11% of respondents in high, medium and low density suburbs, respectively, indicated that they carried their drinking water from the water source to the homestead by hand. A further 40%, 29% and 13% of the respondents in high, medium and low density residential areas, respectively, reported that they carried water on the head in buckets and other water vessels to the household for use. Only 11%, 27% and 31% of the respondents in high, medium and low density residential areas, respectively, used wheel barrows to transport water from the water sources during water supply discontinuity. Finally, a total of 38% of the respondents in low density residential areas used light duty vehicles to ferry drinking water to their households during water supply discontinuity while 18% and 15% of the respondents in medium and high density suburbs, respectively, used light water vehicles to ferry drinking water. The majority of the residents in the first quantile (lowest income group) live in high density residential areas and the results show that unhygienic handling of water was common as most people carried water by hand and on the head, thus increasing the contamination of drinking water through dipping of hands during transportation.

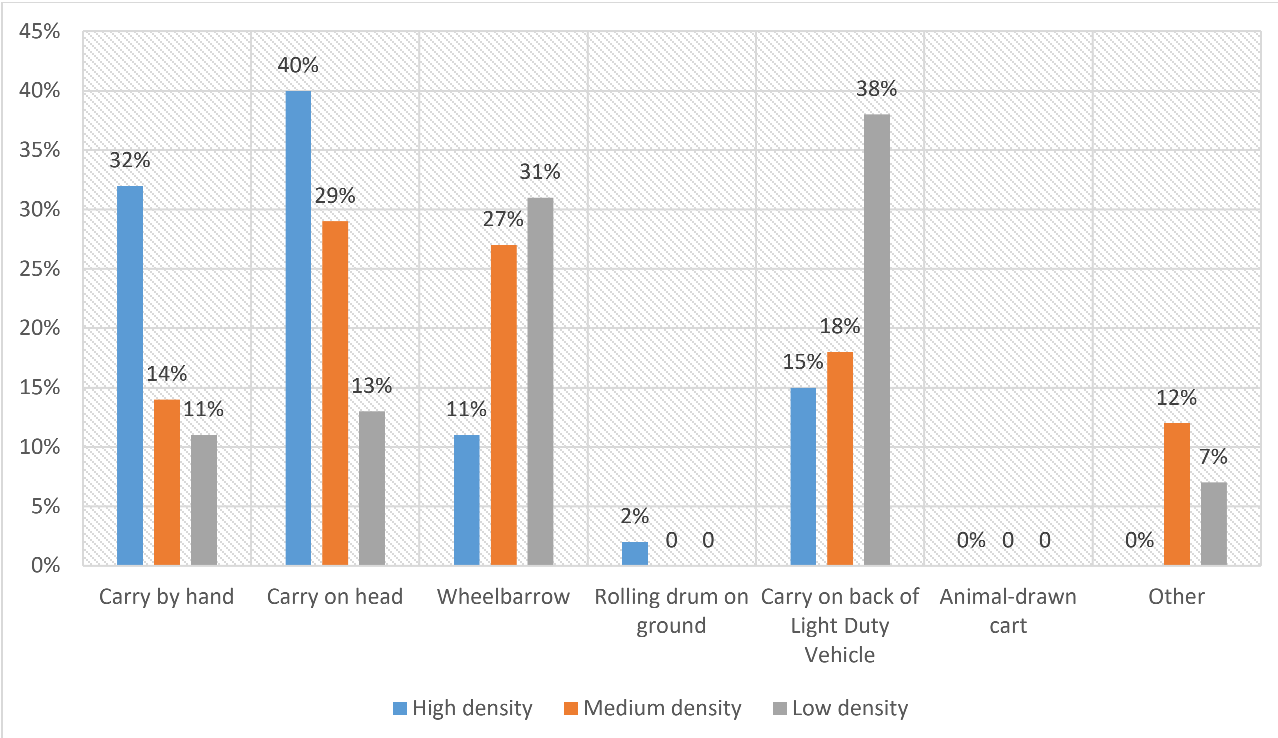


Figure 6.15: The mode of water transportation from source to household

6.3.5.2 ECONOMIC ACCESSIBILITY (AFFORDABILITY) ASSESSMENT RESULTS

6.3.5.2.1 Metering of households

The results in Table 6.19 are based on the assessment of water metering in households. At least 16% of the respondents in all residency categories did not have water meters. The availability of water meters in the households is as indicated hereunder. More than 80% of the respondents had water meters at their homestead. In addition, only 9% of the respondents did not have meters in high density residential areas, while 29% and 11% in medium and low density suburbs, respectively, did not have water meters. Most identified causes for lack of water meters that included disconnections by council after continued failure to pay up water bills, non-functional and never got connected. The SLB (2018) reports the extent of metering of water connections in 20 local authorities in Zimbabwe and the results showed 99% and 96% for Masvingo and Harare, respectively. An analysis of the gathered data indicated that 20 local authorities reported 100% metered connections, however, Chegutu and Shurugwi town councils had low metering connections. According to SLB (2018), the figures showed an improvement in metering of connections, which was commendable. However, the empirical results in Table 6.19 show that the slightly less than 90% in high, medium and low densities.

Table 6.19: Connection of household to a central water meter

Residency category	Yes	No	Frequency
High	91%	9%	222
Medium	81%	29%	51
Low	89%	11%	45

Metering was very high in high-density suburbs with a rate of 91%. However, the frequency of malfunctioning of water meters was very high with some households reported to have replaced the meters for the third time. Most residents attributed the high rate of meter failure to rampant water-cuts and the high turbidity that follows after water restoration whereby the water which will be laden with silt jams the meters. Moreover, at most households, meters exist but are non-functional. According to *The Herald* (a Zimbabwean state-owned daily newspaper) of 16 April 2018, at least 75% of meters in Chitungwiza, a high density residential area in the eastern part of Harare City, were dysfunctional. It was reported that most of these water meters were installed in the 1970s, and the municipality relied on estimates to bill ratepayers (Karengezeka, 2018). Furthermore, Mapetere (2019), notes that 60% of the residents in Masvingo indicated that a lot of domestic water meters were either no longer functional or were not properly functioning.

The Engineering Department also acknowledged that approximately 30% of water meters in the city were no longer properly functioning. A study by Ndunguru and Hoko (2016), also affirms the above in its observation that the Belvedere low density areas in Harare is amongst the areas with a high rate of customers with dysfunctional meters and that monthly water bills for customers with stuck meters were based on estimation of quantities consumed. Furthermore, some of the meters were reported to be more than

15 years of age, which is contrary to the best practices for the reduction of unaccounted for water developed by the World Bank.

Good practices indicate that water meter replacement should be done after every 10–15 years to keep them accurate (Yepes, 1995). In Singapore (World Best Performance), domestic water meters are replaced after every seven years and large meters after every four years (Yepes, 1995). During the household survey, respondents indicated that water meters were very expensive as they were only supplied by a few outlets prescribed by the councils which even promoted monopoly and exploitation of consumers, while the general financial constraints affecting the country, preventing local authorities and consumers from replacing water meters on time.

6.3.5.2.2 Receiving of monthly billing for households

The availability of water bills on monthly basis for each household was assessed through the household survey and through municipality records. The results are shown in Figure 6.16.

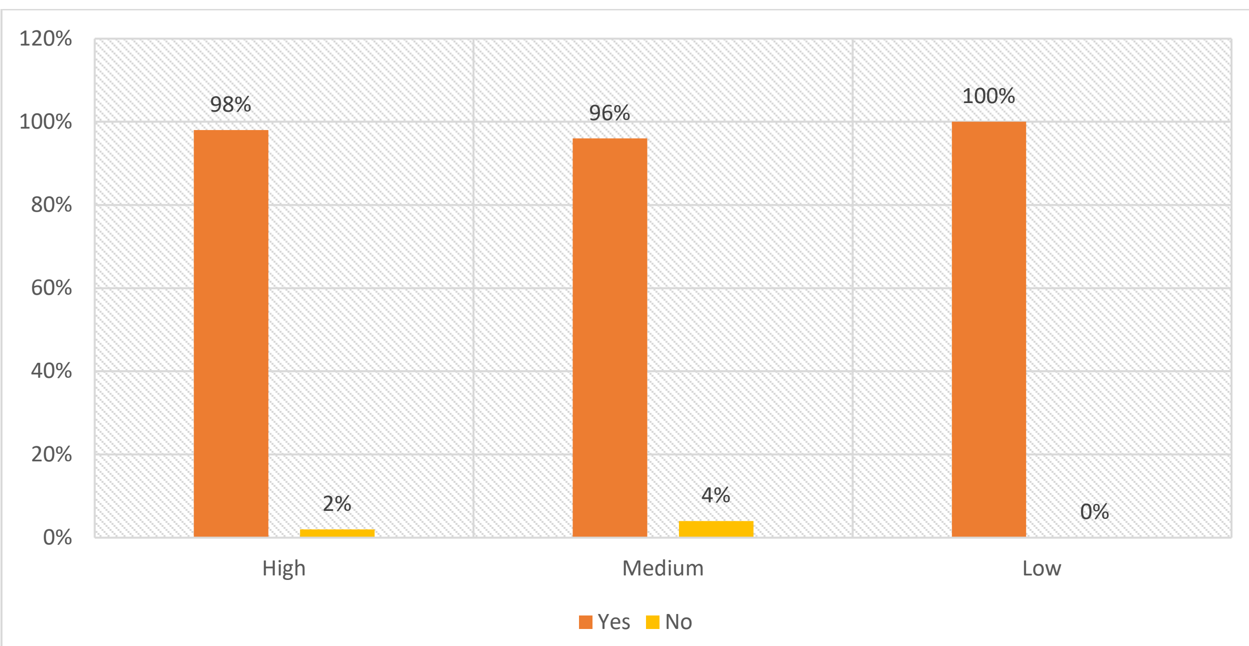


Figure 6.16: Household responses on receipt of monthly bills from service providers

At least 96% of the households in high, medium and high-density residential areas received monthly water bills. These results concur with those from a survey was carried by the We Pay You Deliver (WPYD) Consortium (2018) which showed billing efficiency of 94% in Masvingo and 62% in Harare. The Ministry of Local Government Public Works and National Housing (MLGPWNH) (2017) also reports billing efficiency for five local authorities that consisted of three local authorities with a billing efficiency of more than 90% while that of Harare and Gweru local authorities stood at 62% and 67%, respectively.

6.3.5.2.3 Reliability of water bills received by households

The household survey assessed the residents' knowledge regarding billing of services and including water charges and their current tariff structure. The results shown in Table 6.20 show that 78%, 75% and 67% of respondents in high, medium and low-density suburbs, respectively, disputed the amounts that they were billed and disputed the authenticity of the water volumes that were billed. A total of 22%, 25% and 33% respondents in high, medium and low density suburbs, respectively, indicated that the charges that they received for water bills were a true reflection of usage and water meter readings.

Table 6.20: Reliability of water bills

Residency category	Knowledge of water pricing		No. of respondents
	Yes	No	
High	22%	78%	224
Medium	25%	75%	51
Low	33%	67%	45

The WPYD (2018) identifies mistrust as one key area that contributes to huge unpaid debts in the billing system. Residents in Harare City reported that the prevalence dysfunctional meters in Belvedere meant that the monthly water consumption rates for customers with stuck meters were bases on estimations (Ndunguru and Hoko, 2016). City authorities defended the use of estimation claiming that a significant number of households in this area were difficult to access since some residents denied council meter readers from accessing their premises. The ZNWP indicates that even though water pricing is to be used as a demand management instrument to encourage the efficient use of scarce water resources, water pricing should be based on the quantity of water used by volume to manage demand and encourage conservation. Moreover, water billing must be clear, transparent and based on actual volumetric readings. Whitcomb (2005) also states that, water tariffs should be simple enough that they can be accurately communicated to and understood by water users. Thus, water users who are unaware of how much they are being charged for water use will find it difficult to reduce water use and to save themselves some money.

Furthermore, the income derived from water sales should be expended on costs of providing water, otherwise the 'user pays' principle would collapse together with the services. According to Gambe (2011), revenue collection by local authorities, especially water revenue collection, has generally been very poor with Bindura municipality being owed a total of US$2.33 million in 2009 and the amount rising to US$$4.98 million in 2013 (Zivanai et al., 2013). Furthermore, Harare City Council was owed a total bill of US$250 million in 2013. Analysts such as Zivanai et al. (2013); Ndunguru and Hoko (2016) and Marumahoko et al. (2020) attribute this to the customers' mistrust of the councils which they blame for unreasonable billing even when there is no water flow.

Overall, residents showed mistrust in the current billing system on water. Therefore, this study challenges local authorities to invest in accurate billing systems to reduce debts and improve customers' willingness to pay. The provisions of the ZNWP should be enforced to protect ratepayers from third party exploitation through exorbitant service bills.

6.3.5.2.4 Overview on water pricing

The household survey assessed residents' recommendations regarding water charges and tariffs. The assumption was that, as consumers of water services, ratepayers were more aware of their challenges regarding water pricing and were therefore better poised to inform water pricing recommendations. The results from this consultation are indicated in Figure 6.17.

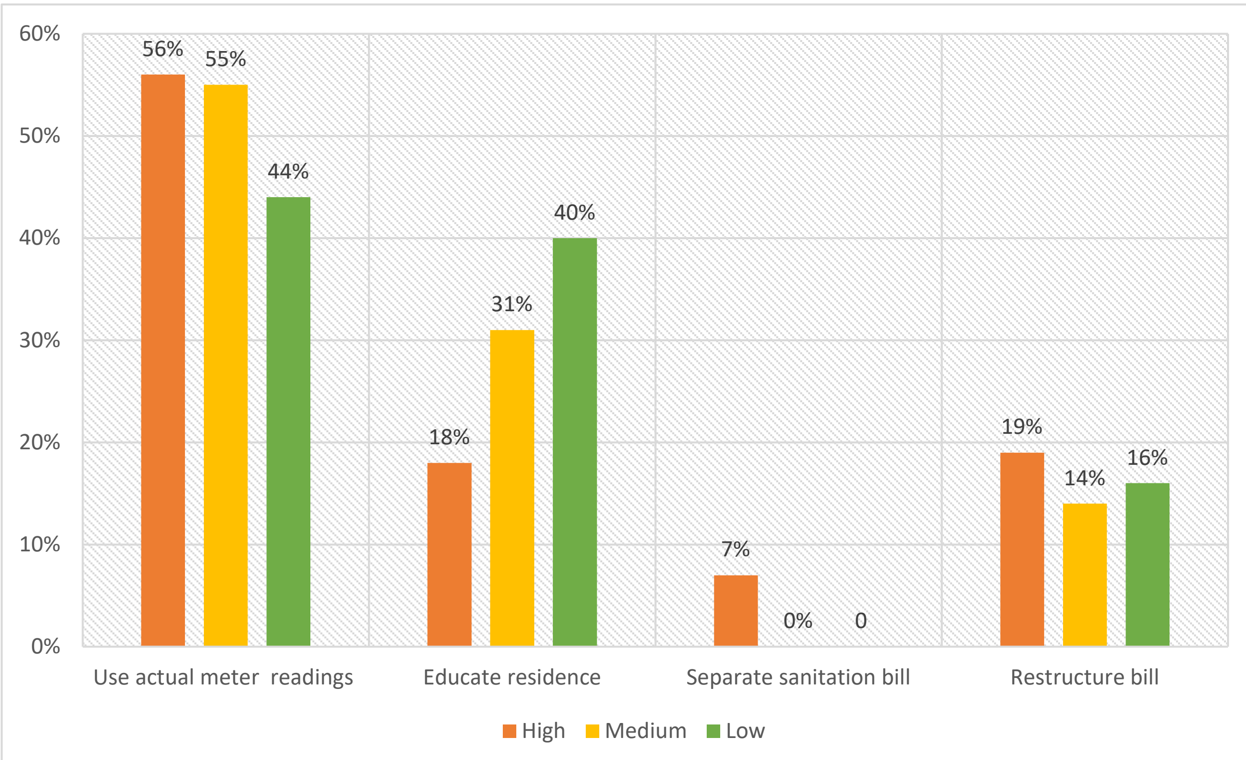


Figure 6.17: Water pricing recommendation

Fifty six percent (56%) of the respondents in high-density suburbs, 55% from medium-density suburbs and 44% from low-density suburbs recommended the use of actual water meter reading by service providers. There was a general mistrust that councils used estimates during the water billing process. The issue to educate ratepayers was second on the recommendations. Residents argued that they could not control their water usage as they did not know how they were billed. One resident was quoted as saying, "*If I know how to read my water meter and know the price I am charged per volume used, I can manage my water usage. I cannot understand my monthly bill, many things are put on it. The problem is, even when you don't get water daily the bill is the same as that of someone getting water more frequent*". The resident in question cited two issues: lack of knowledge on meter reading and water pricing and unreliable water volumes being used in billing.

A survey by the WPYD Consortium (2018), which corroborates the above observation, reported that 72.5% (5114) of respondents did not trust that the water tariffs were fair. Similarly, the Zimbabwe Coalition on Debt and Development (ZIMCODD, 2013) reports that most water users were not happy with water bills due to a gross inaccuracy of the water bills they were receiving. The study identified possible causes such as poor reconciliation at the Harare Water Office before bills are generated and non-functional water meters. It was reported that up to 50% of water meters in Harare were non-functional (Gambe, 2011). Therefore, most service providers resorted to a system of "*averaging*" or use of estimates instead of actual meter reading (Ndunguru and Hoko, 2016). According to the ZIMCODD (2013), the Harare City Council systematically took meter readings in Mabvuku-Tafara a high-density residential in Harare and used the so called "*estimates*" knowing very well that these residents were getting their water from wells as a coping strategy to incessant water shortages.

ZIMCODD (2013) notes further that, the water billing system was reaping off (stealing from) consumers especially those whose water meters were non-functional. The generated water bills were e not based on water usage as a result, the bills were exorbitant to the extent that most water users failed to pay for these bills. It can be argued that the absence of true water meter readings led to the water providers adding an extra charge. The lack of urgency by local authorities to address water meter dysfunctionality can be taken to mean that actual meter readings do not matter in billing since they continue to determine bills on estimations, which in their own nature are always higher than when actual readings are used. This seems to put local authorities at an advantage since actual bills would reveal non-revenue water that cannot be recovered by charging customers.

The above assertion is further confirmed by various studies reporting high levels of non-revenue water (NRW) for the City of Harare that was estimated to be within the range of 35% to 40% of treated water (Ndunguru and Hoko, 2016; SLB, 2018; WPYD Consortium, 2018; Marumahoko et al., 2020)). In some cases, non-revenue water was as high as 60% of treated water (Gambe, 2011). Under a normal set-up, cost recovery means the recovery of all costs that are incurred in the provision of service by the service provider (McDonald, 2001). Since water services are measured using volume to allow for cost recovery through charging short term marginal costs for production, h a fraction of maintenance and long-time operating costs, councils seem to meet their cost recovery targets well regardless of the existence of 40-60% non-revenue water through issuing very high bills to those households with malfunctioning meters. This means using estimates gives the service providers an advantage because the councils do not suffer losses.

The other recommendation to educate consumers on bill interpretation and how bills are calculated is important. Ratepayers can monitor their water usage within their affordable means if they know how to read their meters and the tariff structure. This can help improve bill payment. At least 14% of respondents in all residential areas indicated that they wanted the bill to be restructured for easy interpretation since the current bill structure was not clear especially on refuse charges since refuse collection did not take place in some places and yet residents were still being charged for the service. The results on recommendations support the argument that rates can be complex and confusing even for an informed user (Dziegielewski et al., 2004). As such, water tariffs need to be simple enough so that users can see how they can save money through reduced water use, careful conservation and investment in water saving technology. Gaudin (2006) indicates that less than 20% of water utilities inform water users of the tariff schedule in water bills and goes on to argue that a clear communication and explanation of tariff details results in water use falling by an average of 30%.

Overall, the ZNWP (Principle 6.14: Water Pricing) states that water billing should be clear, transparent and based on actual volumetric readings. Without the knowledge of residents' true consumption levels, it is possible that the water provider is charging a certain percentage more than their consumption. Therefore, the use of estimates to charge consumers is in itself a policy implementation gap.

6.3.5.2.5 Assessment of the ability of households to pay for their water bills

The household survey used bill payment as an item to base the affordability assessment. The researcher understood the limitations of this criterion since bill payment can be affected by factors that include willingness to pay, availability of money, method of payment and physical accessibility of offices for payment. However, the results assist in presenting a general insight on the issues around bill payment and collection efficiency. The results are shown in Figure 6.18.

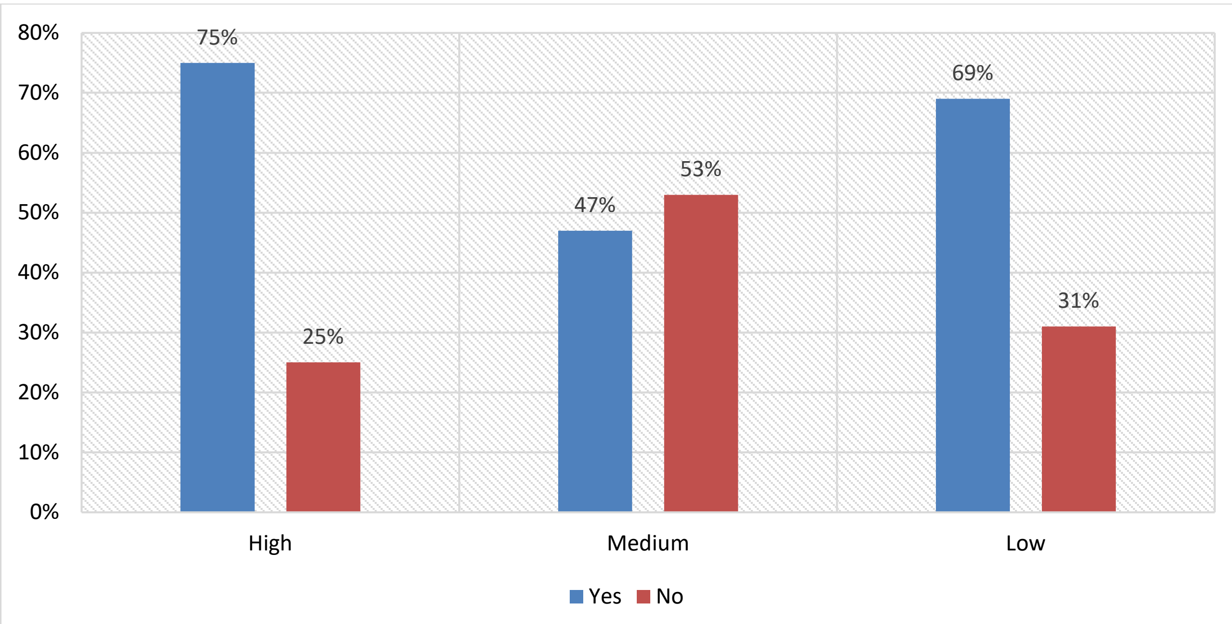


Figure 6.18: Household responses regarding their ability to pay off water bills

The failure rate to pay water bills is highest in the high density suburbs (75%) followed by low density (69%) and medium density (47%) suburbs. The study combined the monthly income data and billing information for the households that participated during the survey to assess affordability. Table 4.21 provides a descriptive summary of the monthly income and average bill. The reported maximum average bill was US$200, with a minimum of US$15, a standard deviation of 20.256 while the median was $35 and the mean was US$39.7. The mean and median were the same at US$200-400$ per month. The standard deviation for monthly income was US$0-200$ as shown in Table 6.21.

Table 6.21: Results from an assessment of monthly water bills including monthly income data

	Approximate monthly household income (US$)	Average bill
N	320	320
Mean	200-400	39.7
Median	200-400	35
Std. Deviation	0-200	20.25691
Minimum	0-200	15
Maximum	1500+	200

An analysis based on g mean household income and mean monthly bill showed that the affordability threshold was between 9.93% and 19.85%. The analysis of the mean monthly bill against the median monthly disposable income still yielded a threshold of 9.93-19.85%. However, a comparison of the mean monthly bill with the maximum monthly disposable income revealed a 2.65% affordability. The affordability threshold of 2.65% for the few wealthier section in the study areas appears to lie within the international recommended threshold of 3-5%. However, the income structure for the residents (Table 6.2) shows that those who earn US$1 500 and above constituted 1% of the study population. About 92% of the study population had an income between US$0-600US$. It can be argued that water is not affordable to most users Zimbabwe's urban areas. Alternatively, a consideration of the minimum monthly income and minimum monthly bill yielded a 7.5%, affordability threshold with the poorest household having an affordability threshold greater than the recommended 3-5%. The affordability threshold was 13.33% when the minimum monthly income and maximum monthly bill were used. In all cases, the affordability threshold was well above the international guidelines of between 3-5%.

Similar findings were reported by Hove and Tirimboi (2011) in a study on Harare's service delivery level. The study noted that the cost per cubic metre (m^3) for various consumptions ranged between US$0.61 and US$2.1. The prices were found to be far higher than the average tariff for the poorest of the developing countries, which is pegged at US$ 0.11 per m^3, while the average global tariff is at US$0.53 per m^3. A consideration of the minimum household consumption of 6m^3 (Table 6.22) implies that some households spent US$12.55, which was equivalent to 2.5 % of Zimbabwe's gross national income (GNI) of US$506.89, on their monthly water bills. This was within Water Operators Partnerships (WOP)'s (2009) recommendations that in Africa, poor households should not pay more than 3% of per capita GNI for 6m3 of water per month, implying that Harare bills were affordable. However, further analysis showed that the minimum typical consumption per month is 15 m^3. It is argued that the amount for 15 m^3 varies between less than US$1 and US$12 per month in most developing countries (Kalulu, 2009), however, for Harare, the cost was $15. 25 and above the average figure as well as that implying that water was not affordable.

Table 6.22: Monthly water bills for varying consumptions (Harare City Council, 2010)

High Density Domestic Consumers	Water Tariff per m^3	Total Monthly Water Bill with Fixed Charges (US$) for	Cost per m^3
Monthly cost for 6 m^3	0.30	6 m^3 =12.55 m^3	2.1
Monthly cost for 15 m^3	0.30	15 m^3 =15.25 m^3	1.02
Monthly cost for 20 m^3	0.30	20 m^3 =16.75 m^3	0.84
Monthly cost for 21 m^3 - 30 m^3	0.40	30 m^3 =20.75 m^3	0.69
Monthly cost for >100 m^3	0.70	>100 m^3 =>61.45 m^3	0.61
Low/Medium Density Domestic Consumers	**Water Tariff per m^3**	**Total Monthly Water Bills without Sewerage Charge/with Sewage Charges**	**Cost per m^3**
Monthly cost for the first 20 m^3	0.40	20 m^3 =18.75 /28.75	0.94/ 1.44
Monthly cost for 21 m^3 - 30 m^3	0.50	30 m^3 =23.75 /33.75	0.79/ 1.13
Monthly cost for >100 m^3	0.80	>100 m^3 =71.55 /81.55	0.71/ 0.81

Hove and Tirimboi (2011), further argue that complaints by residents regarding excessive bills support the view that water services are not affordable. It was noted that some weird consumption figures were registered on bills, a notable example being the Kuwadzana Phase 3 high density suburb's March 2010 bills which had consumptions of around 90 kilolitres, requiring them to pay at least US$40. Here, the liability of unaffordability lay with the Harare Water officials who had failed to take meter readings.

A report on water pricing structure for the City of Masvingo by Mapetere et al. (2019) indicates that domestic users pay US$0.30 per cubic metre within the range of 1 cubic metre to 18 cubic metres of water used without fixed charges. Moreover, users pay US$0.40 for consumption above 19 cubic metres without fixed charges (Table 6.23). However, Mapetere et al (2019) indicate that the increasing block tariff structure used by Masvingo City Council encourages efficient use of water by consumers, especially those in the high-income residential areas who often use more water for swimming pools, car washing, lawn watering and other water uses associated with affluence. Residents of high-income suburbs pay a fixed monthly water charge of US$17compared to US$8.45 in the low-income suburbs. The tariff structure of City of Masvingo is the same as that used by the City of Harare, which implies that the rates are higher than the recommended US$0.11 and US$0.53 for the various consumptions. However, the affordability thresholds of the household survey affirm the argument that water expenses represent a higher proportion of the poor's total consumption expenses than that of average people.

Table 6.23: Water pricing structure for the City of Masvingo (adapted from Mapetere et al., 2019)

Tariff structure	Water prices in various use categories			
	Domestic: low-income	**Domestic: high-income**	**Commercial/ Institutional**	**Industrial**
Water-use bands per sector				
Domestic 1 m^3 – 18 m^3	US$0.30/$m^3$	US$0.30/$m^3$	-	-
19 m^3 and above	US$0.40/$m^3$	US$0.40/$m^3$		
Commercial/Industrial			-	-
1 m^3 – 24 m^3	-	-	US$0.50/$m^3$	US$0.50/$m^3$
25 m^3 and above	-	-	US$0.60/$m^3$	US$0.60/$m^3$
Fixed water charge	US$8.45/month	US$17/month	US$33.89/month	US$52.41/month

An analysis of the mean monthly bill against minimum monthly income stood at 19.85% while for the upper it was 2.65%, which is 7.5 times below the threshold for the poor.

Smets (2009) r indicates that wealthy people have an index 10 times below the index of poor people. Furthermore, this difference causes only poor people to complain of the high price of water but such complaints is not always made because water expenses are a small part of housing expenses (that include rent, heating, electricity, water and telephone). Coalition Eau (2009) corroborate the above assertion by indicating that the affordability threshold in developing countries is much higher and varies from 4 to 12% and that in certain regions of these countries, water is more expensive and the income lower, which results in affordability indices as high as 15%. Smets (2009) also notes that when water prices increase, people who have little means could in principle "*reduce their water consumption*" but this is difficult to achieve because water consumption is related to basic needs that include health, cleanliness, food and beverages.

Similarly, water consumption is weakly dependant on income level and in some cases the water bill is weakly dependant on consumption. Coalition Eau (2009) indicates that for most poor households, drinking water is physically available but economically inaccessible and if safe water is unaffordable, the only alternative is to use unsafe water. Thus, poor people adopted unsafe coping strategies such as using unsafe water (Figure 6.8) and in that way, increasing morbidity from water-related diseases that included dysentery, typhoid, cholera and schistosomiasis. Furthermore, there is an option to forego other essential expenses such as food or health expenses in order to pay for an increase in water charges.

Smets (2009) indicates that in such scenarios, public authorities can lessen the burden of the increase in water price by improving efficiency, providing higher water subsidies for all or by setting up social tariffs or aid targeted on the poor. Unfortunately, Local or Central Government in Zimbabwe does not offer subsidies to cushion water prices for poor households (City of Masvingo, 2019). According to Coalition Eau (2009), water is most certainly unaffordable at national level thus prompting government authorities to take measures to reduce the impact on the most affected groups within the population. Studies worldwide show that in recent years, several countries have officially adopted affordability index figures to adapt their water pricing policies to the population's ability to pay (Smets, 2012; Motsatsi and Gibberd, 2019). It should be noted that the figure chosen by the governments is around 4% (Coalition Eau, 2009). Government practices to make water prices affordable for households include subsidising household water and reducing water taxes; lightening the burden on small consumers (for instance by increasing the price paid by large consumers and nondomestic consumers); supporting programmes that improve economic efficiency in the water sector; and reducing household water consumption levels (reducing wastage).

Moreover, some governments have also introduced social assistance measures (for example increasing housing assistance) aimed at making water more affordable for low-income households. There are other government specific measures that include providing assistance to repair leaks and reduce wasteful use; providing assistance to help users access the different social support systems available and thus be better able to pay their various bills; and creating reduced water tariffs for low-income households (social tariff), which can also be introduced to make water more affordable.

Hutton (2012) indicates that many developing States have adopted policies that seek to promote an affordability index for poor households of 3 - 5% and implement measures to reduce the burden of water expenses for people living in poverty. Regarding France and Mexico, Smets (2009) argues that while spending on WASH services of poor households is generally below that of richer households, the burden of these expenses on poorer households is usually disproportionally higher if expressed as a proportion of household budget. In conformity with this development, Smets (2009) observes that most countries in Latin America have affordability indices above 4% for median households. The use of social tariffs (discounted price plans to vulnerable consumers) has meant that, the affordability ratio for poor households does not exceed 10% and would generally be around 6% for the first decile of income. This would show that many governments in Latin America consider that an affordability ratio for poor households of 6% is acceptable. As already indicated, the UN guidelines indicate that water cost should not exceed 3% of household income. However, the ZNWP is silent on this issue and indicates that water pricing will reflect the full costs of provision of water for all uses (capital and recurrent costs), except for primary water where the price will at least reflect the operation and maintenance costs during the first 5 years (2013 to 2017). From 2018, the tariff structure was supposed to gradually shift towards full cost recovery (MWRDM, 2012).

The ZNWP indicates that water prices should be based on the user pays and polluter pays principles and that this should be socially acceptable to different interest groups in the water sector. The Policy states that subsidies should be targeted to users who are not able to pay the full cost of the service or where national interests would be compromised. The ZNWP uses water pricing as a demand management instrument to encourage efficient use of scarce water resources (MWRDM, 2012). Water pricing is based on the quantity of water used by volume to manage demand and encourage conservation, however, this conflicts with the policy (Principle 6.2:3: Provision of affordability and sustainable WASH services). The conflicting principles start with the removal of blended pricing, which was initially used as a form of cross subsidisation, because it did not comply with the principle of pricing covering the full costs of investments, operation and maintenance. The adoption of blend pricing is now based on catchment or sub-catchment level with the option of scheme specific pricing being explored, where appropriate, after a thorough study of the scenarios and their implications, which leaves the water users exposed to exploitation by service providers in the absence of a service regulator (MWRDM, 2012).

6.3.5.3 WSS SERVICE INFORMATION ACCESSIBILITY

i Service interruption information

The results from an analysis of service information accessibility collected from semi-structured interviews showed that 19% of the residents in low and high density suburbs received written notices about water supply interruption while 10% in medium density received written notices. In all residential areas, the main means of communication about water supply interruption was media announcement, mainly local radio stations (Figure 6.19). Rarely were meetings called to disseminate information about service interruption. At least 20% of the residents indicated that they never received information on service interruption. Most residents (39%) reported that information was circulated through other methods and amongst this was social media or word of mouth/hear say. Residents complained that in most cases, information was received through unofficial communication and through social media with people related or who interacted with council officials tending to get information first and later sharing it through social media and mostly WhatsApp platforms.

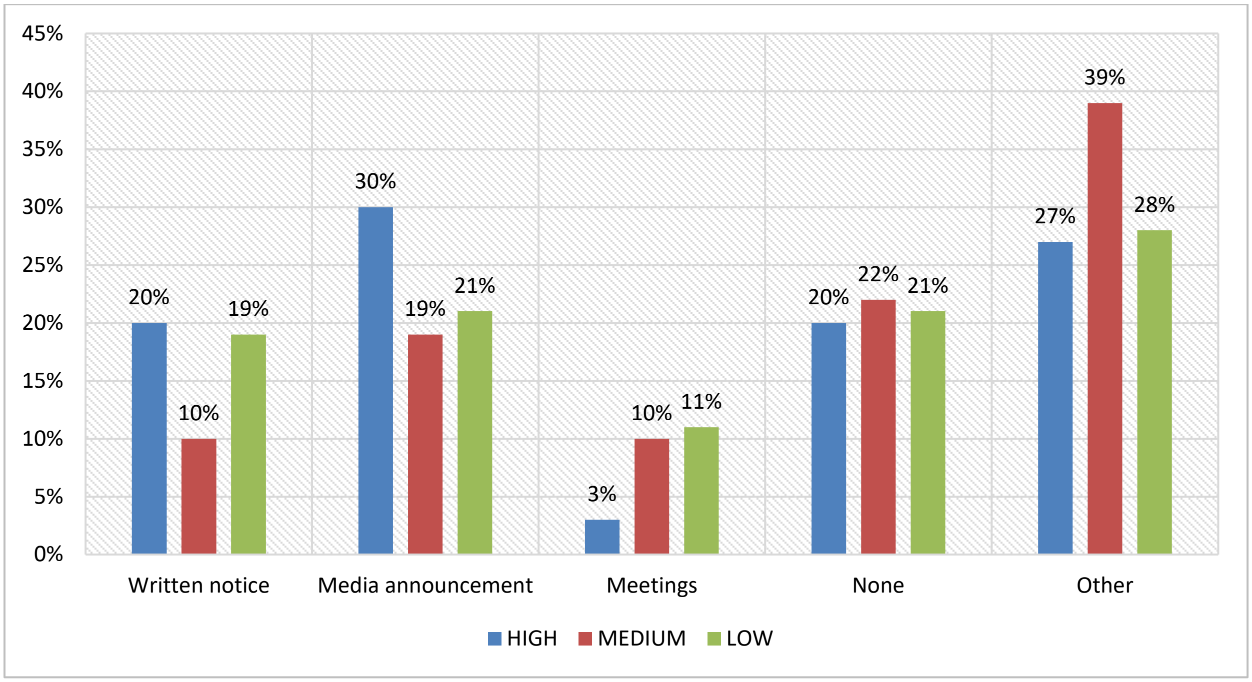


Figure 6.19: Household responses on strategies used by service providers to share information regarding service interruption

The results indicated that information dissemination by local authorities and service providers was poor. However, according to de Albuquerque (2010), in most cases interventions in the water and sanitation sectors are perceived as charity and people get services as passive beneficiaries who hope to gain access but do not have a sense of entitlement. It is the people's right to know where they should turn when access to water and sanitation is non-existent or inadequate, and the service providers should have a high level of transparency. Best practices to WSS services use transparency and accountability as important indicators to consider during monitoring implementation of the human rights to water and sanitation. Information sharing by service providers regarding services is also an indicator of transparency. Furthermore, the sharing of information empowers the users as they are kept abreast of issues that matter to them the most (de Albuquerque, 2010).

ii Information regarding water quality compliance

Most of the respondents in all three residential categories indicated that water quality compliance is either not communicated or is communicated via other ways not specified (Figure 20). An average of 41% of the water users indicated that they did not get information about water quality. At least 31% of the respondents indicated that they only received information through other means with WhatsApp being the most common informal platform for sharing information.

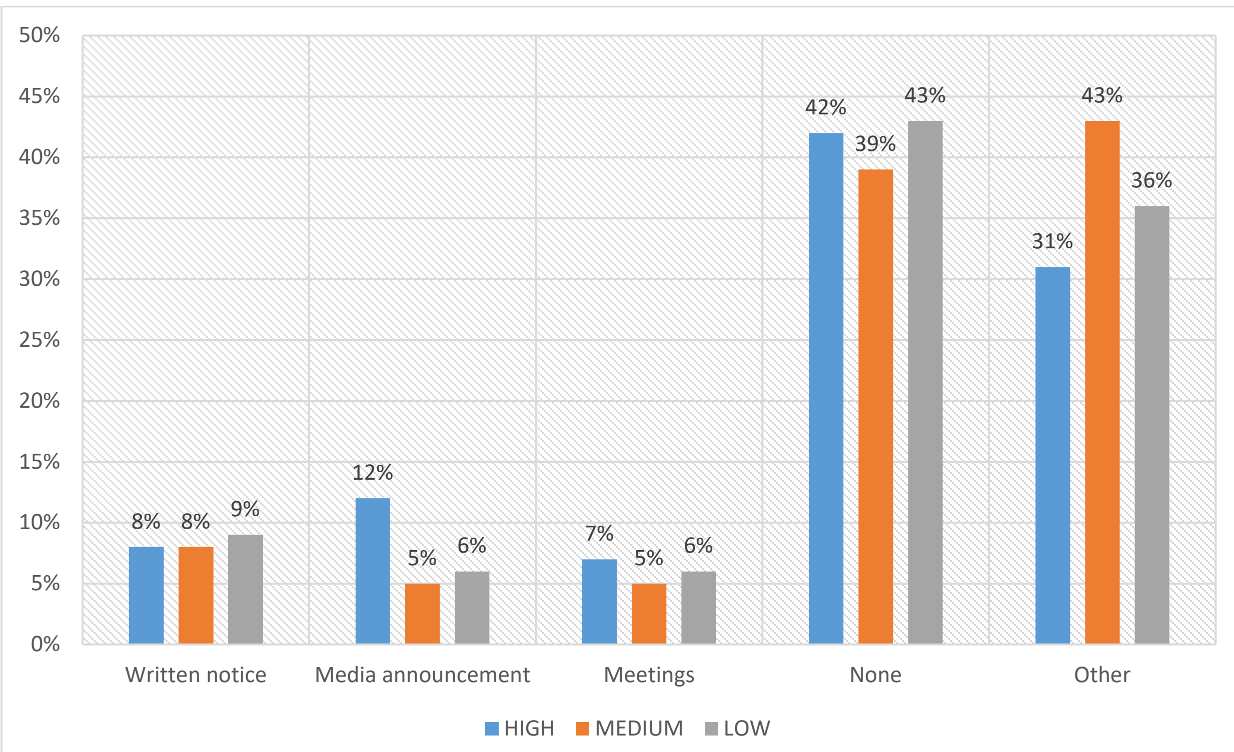


Figure 6.20: Household responses on dissemination of information regarding water quality compliance

However, the information in this social media platform was only received by people who happened to be in the WhatsApp group where the information was shared. The researcher managed to highlight, through discussion forums and meetings, the need to alert consumers if there are any water quality issues. As a result, Masvingo City has started to implement transparency mechanisms to disseminate water quality and service interruption information (Figure 6.21). The information is shared in both print and digital platforms including WhatsApp groups, local media including newspapers and the community Hevoi FM station.

<u>Figure 6.21:</u> Water quality information notice to water users (City of Masvingo, 2021, accessed January 2021)

This is a good development that should be applauded as a step towards the realisation of the human rights to water of acceptable quality in addition to other human rights obligations entrusted to the service providers. Similarly, in South Africa, the government initiated a Blue Drop scheme in 2009, which uses media releases to inform the public about the water quality-related performance of Water Service Providers and Authorities and this is done through various media channels (Department of Water and Sanitation [DWS], 2009).

Unfortunately, the water quality notice above (Figure 6.21) did not indicate if there were any associated dangers of using this discoloured water nor did it t advise the users of the recommended precautionary measures such as boiling, household water treatment and safe storage (HWTS). According to Wright et al. (2012), information is recognised as an intervention that can shape public perceptions of drinking water worldwide. When water quality is poor, the release of water quality information to consumers may help to promote home water treatment (Jalan and Somanathan, 2008), or the use of safer source types, and potentially promote public voice on service providers to improve service quality. Moreover, when water quality is acceptable, releasing water quality information is likely to help reassure consumers and improve customer relations. Dolnicar et al. (2010) indicate that information provision to consumers may change their perceptions on recycled drinking water safety, although there is weaker evidence for households switching sources after being provided with information about arsenic or microbiological water contamination (Lucas et al. 2011).

iii Budget consultative meeting information:

The communication about budget consultative meetings from service providers is indicated in Figure 6.22. Most respondents 37%, 45% and 40% in high, medium and low density suburbs, respectively, indicated that they did not get information about council budget consultative meeting. In addition, 31%, 27% and 30% of the respondents in the high, medium and low density suburbs, respectively, indicated that they got the information through other means. The United Nations General Assembly (UNGA, 2010) asserts that transparency and access to information are crucial element to achieving citizen participation in water management. Multiple channels of information must be used to reach people and provide accessible information and the communication should be provided in local languages. The clause in the ZNWP (Principle 6.15 Accountability for service provision) demands that both the central and local government facilitate processes that enable citizen to raise their views on the regulation of water services or procedural equity and amongst this is the establishment of mechanisms to ensure that ordinary members of society have a role in the regulation and monitoring of services to ensure equitable access to water supply and sanitation (MWRDM, 2012). Lack of transparency and access to information takes away and procedurally excludes citizens from exercising their mandate as required by policy and this constitutes a policy implementation gap.

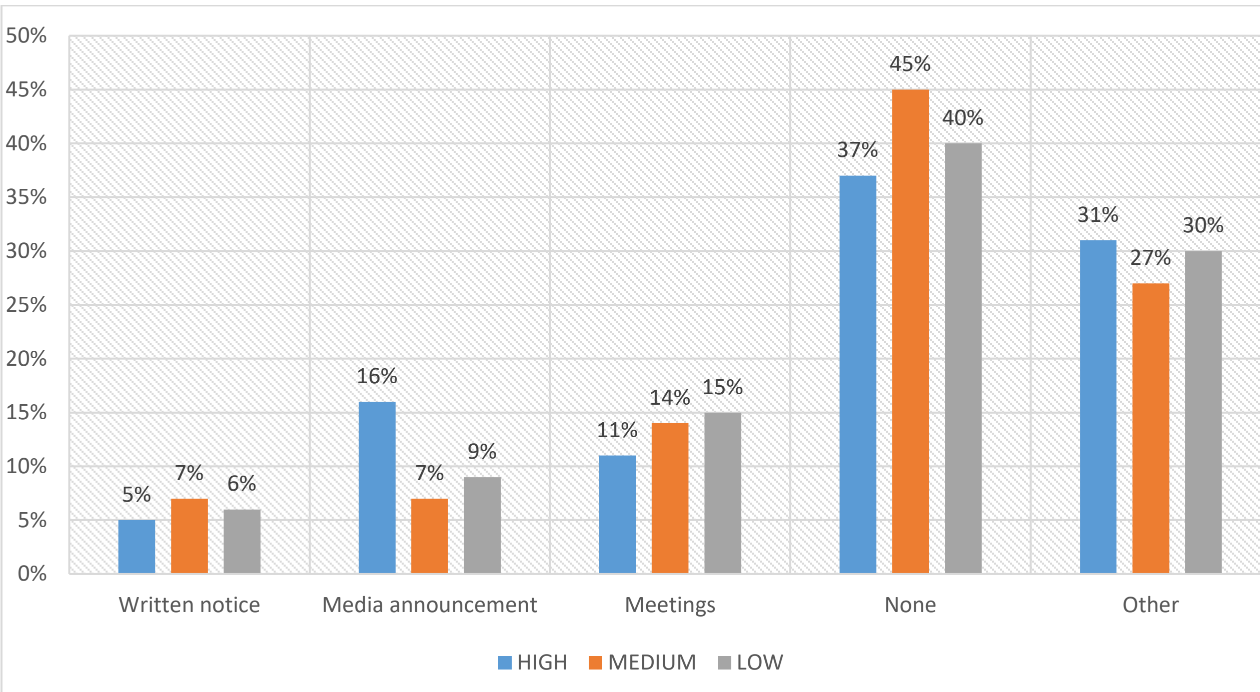
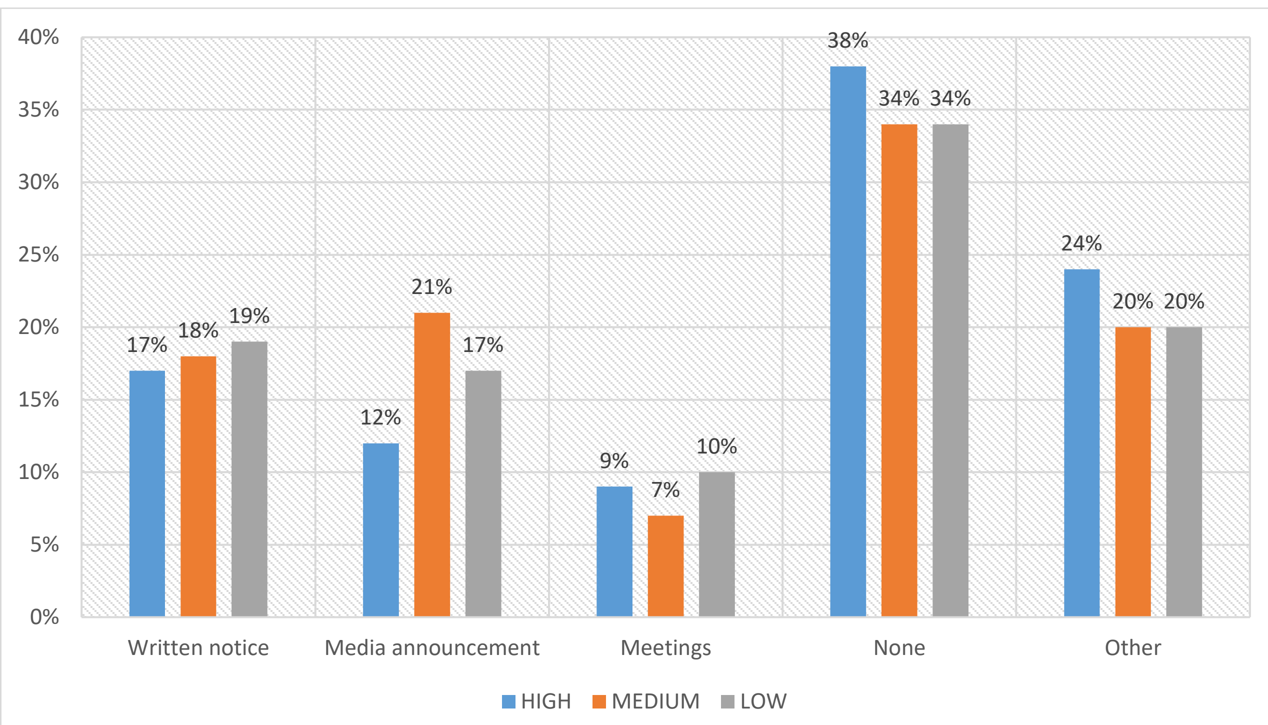


Figure 6.22: Household responses regarding dissemination of information about investment decisions by city councils

iv Information regarding tariff review

The results from an examination of data on information accessibility regarding tariffs showed that 38% of the respondents in high density suburbs and 34% of the respondents in both medium and low density suburbs did not receive any communication on water pricing tariffs (Figure 6.23). Those who received communication mainly received it through other means (unofficial means), followed by written notice and media announcement in that order. Three official means of sharing information were identified and these are, written notices, media announcements and meetings. Transparency through effective dissemination of crucial information on issues that affect water users is still very minimal in the provision of water supply services in Zimbabwe. The Zimbabwe Coalition on Debt and Development (ZIMCODD, 2013) emphasises the need to improve information dissemination by service providers. The WPYD (2017, 2018) notes, d through its surveys on "Citizen-Local Authority Engagement" and "Participation in the 2017 Budgeting Process" that lack of information (42.4%), not being aware of meeting times (31.7%) and not knowing budget issues (19.7%) were the main causes of such non-participation. In addition, the ZNWP stipulates that price reviews or adjustments for services should be done in consultation with water users in order to build confidence, promote transparency and raise the level of willingness of water consumers to pay for services. Sharing of information by local authorities with water users regarding tariff reviews gives water users an opportunity to contribute in the review process and this is regarded as indispensable for service providers' financial viability as more users will be willing to pay their bills.



<u>Figure 6.23:</u> Household responses on dissemination of information regarding water tariffs

6.3.6 ANALYSIS OF EQUITY OF ACCESS TO WATER SERVICES

6.3.6.1 Assessment of equity of access to water services

The results on equity of access to services are indicated in Figure 6.24. At least 80% of the respondents indicated that there was no equity of access to services in high, medium and low density suburbs with the lack of equity of WSS more pronounced in the high density suburbs. The results show that the availability of water in all residential suburbs is not uniform. Residents in Rujeko A and C high-density, areas around Mucheke Taxi Rank and the affluent areas of ZIMRE Park, Rhodene and Eastvale in the City of Masvingo received water supplies on a more frequent rate than most residential area. Rujeko and Mucheke Taxi Rank enjoyed the geographical positioning since the areas are on low gradient. ZIMRE Park, Rhodene and Eastvale shared the same distribution line with the City of Masvingo, hence they received water throughout the day when the central business district is operating.

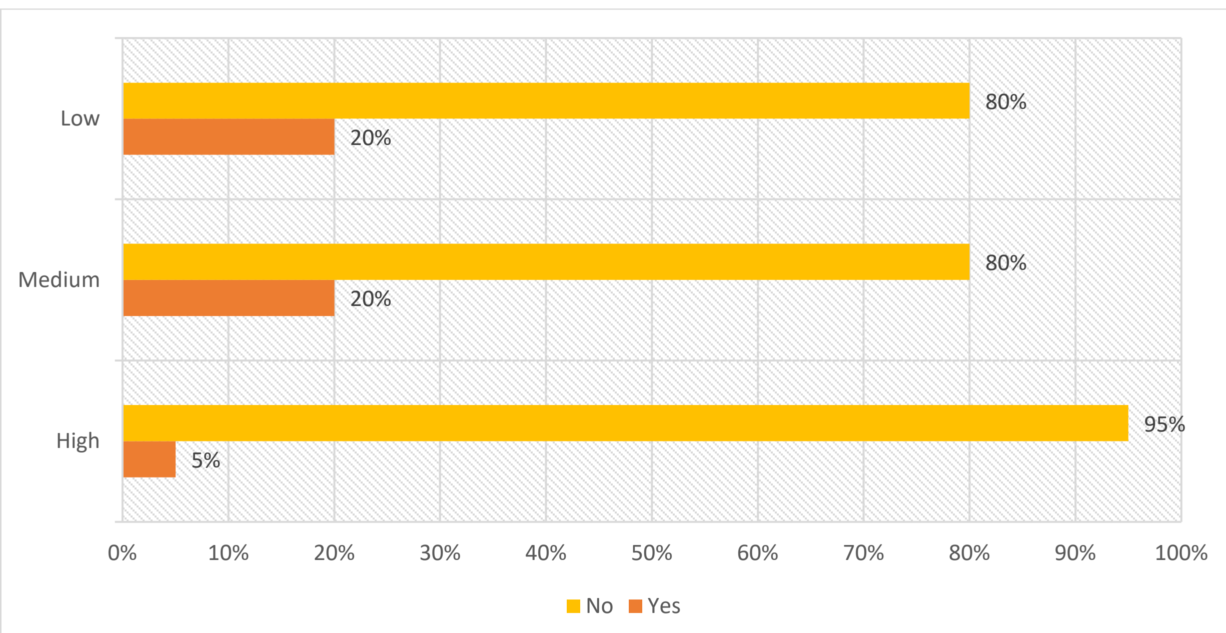


Figure 6.24: Household respondents' perceptions regarding equity of access WSS services

To confirm the results, the ZIMCODD (2013) reports water shortages in Budiriro 4 high density suburb in Harare and underlines that the residents were most affected by water shortages due to high gradient. The report indicates that the residents living around

Budiriro 1 shopping centre were not much affected while households close to Glenview 3 were critically affected since they were the last to receive water when it came with low pressure and their taps were the first to run dry.

6 Assessment of methods used by city councils to collect water rates

The household survey assessed the approaches that are used by the service providers to collect water rates from customers who fail to pay their bills. Figure 6. 25 shows these results of this assessment. It is evident that 37%, 50% and 48% of residents in the high, medium and low density suburbs, respectively, were given a grace period to settle their debts. A further 36%, 27% and 33% of respondents in the high, medium and low density suburbs, respectively, got disconnected after failing to pay up their debts. At least 15% of the respondents from all the residential categories received written notice of debt. The results show that ULAs do not give a blind eye to those who fail to pay up their debts, 0% respondents in all residential categories indicated that there was no action against bill payment defaulters by ULAs.

The above results show that water disconnections take place if one fails to pay up their debts. Mapetere et al. (2019) corroborate the above assertion by indicating that the Masvingo City Council disconnects water supply to users with outstanding bills. In addition, these water users are required to settle their bills and pay a reconnection fee before the reconnection of water supply can be effected. According to ZIMCODD (2013), service providers in Zimbabwe's urban areas use water disconnections as a measure to control the non-payment of water. This measure is still being used by the City of Harare and Masvingo despite protests by most residents that they are billed for services not rendered or water not consumed. The ZIMCODD (2013) indicates that there are National Government directives that prohibit service providers from disconnecting water supplies to residential areas for non-payment. However, water disconnections continue to be carried out in a sharp contradiction of the national government directives. Therefore, the rampant water disconnections in urban communities are ample evidence that not all policy statements are realised in practice.

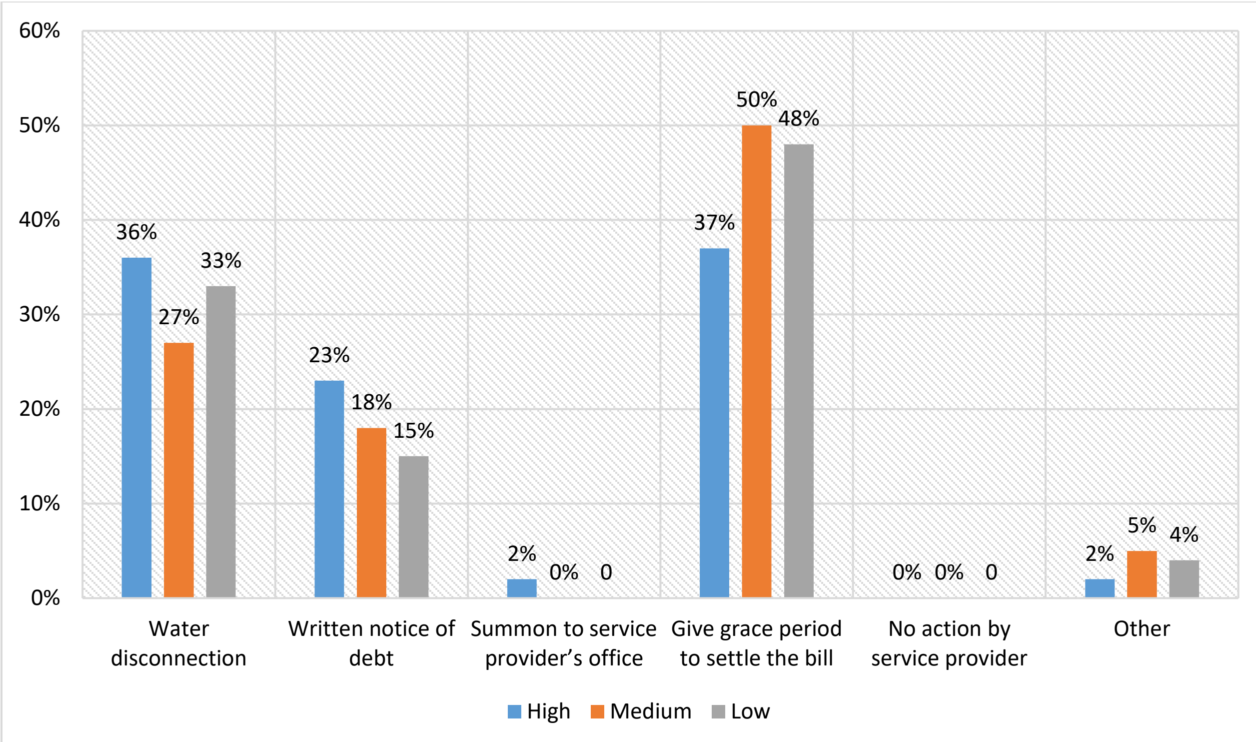


Figure 6.25: Debt collection methods from customers who fail to pay their bills

Disconnected water meter and supply system due to unpaid water rates

Figure 6.26: A disconnected water supply system in Runyararo West high density suburb of the City of Masvingo

The human right to water is continuously being breached and at one household in a high density suburb in the City of Masvingo, the household occupants reported that their water meter was disconnected and taken by the council 3 years ago (Figure 6.26). This may be argued as a form of discrimination given the fact that there are pro-poor policies guiding how service providers should handle such a case.

The only and nearest source of water for the disconnected household was a city council borehole which is about 2km away from the household and to aggravate the situation, this only available source was condemned by the City of Masvingo due to underground contamination from a nearby cemetery which was also confirmed by this study's microbiological assessment. Figure 6.26 shows a few of the technically discriminated urban dwellers (discrimination on economic grounds). It has been there years since the household last received running water from the council due to failure to pay up water bills.

A project by the WPYD Consortium, which consists of the 10 organisations, Danish Church Aid, Combined Harare Residents Association, Harare Residents Trust, Bulawayo Progressive Residents Association, Habakkuk Trust, Women's Institute for Leadership Development, Zimbabwe Women Resource Centre Network, United Mutare Residents and Ratepayers Trust, Masvingo United Residents and Ratepayers Alliance, in 2017 found almost similar results on measures taken by city councils to make water users to pay up their debts. Table 6.24 shows some of the results from their survey.

Table 6.24: Method(s) used by urban local authorities to collect water debts and how customers prevent water disconnections by council officials (WPYD, 2017)

Issue	Responses	Frequency	Percent (%)	n
Disconnected water for non-payment (past 3 months)	**Yes**	2275	32.3	7036
	No	4761	67.7	
Paid council workers to avoid water disconnections	**Yes**	1464	20.9	7010
	No	5546	79.1	

n = Total respondents

The results from the table show that 32.3% of the water users had their water disconnected for non-payment in the 3 months prior to the study and 67% indicated that they were not disconnected. The possible reason for the non-disconnection of others included bribing council workers to avoid disconnections (20.9%) while 79.1% never bribed to avoid disconnections.

The human rights cross-cutting criterion of "*non-discrimination*" states that, everybody should be treated equally and without discrimination. People can be discriminated against because of their colour, sex, language, ethnicity, nationality or other grounds. In the provision of water and sanitation services, discrimination manifests itself, for example, through denying certain groups of people access to sanitation facilities or to water sources (Levin et al., 2009). According to the Human Right Special Rapporteur (de Albuquerque, 2010), in most cases, wealthier households usually draw their water from the tap at home, the poor struggle to fetch the minimum amount of water needed for their families to survive, and many informal settlements are completely unserved by formal water supply and sanitation systems.

The rights to water and sanitation can only be realised through a stronger focus on women, children and the vulnerable and marginalised groups in society, such as the sick or ethnic minorities, as they bear most of the burden of fetching water and living under unhygienic sanitary conditions (de Albuquerque, 2010). Consequently, governments are encouraged to adopt mechanisms that assists in providing services and accelerate access by the very poor and disadvantaged, for example through targeted pro-poor policies and instruments (de Albuquerque, 2010). Even though the variations in access identified in the survey are not deliberate, one would argue that these are not new problems, service providers could have devised methods to find a solution the problem. The perpetual existence of this inequality in access to water services in the urban communities amounts to discrimination.

6.3.6.3 Assessment of pro-poor policies and instruments on the fulfilment of the human right to water

The results from assessment on the provision of free basic water, as stipulated by the ZNWP, show that 70% of the respondents in the high and medium density suburbs were not aware of the provision of the 10 000 litres free lifesaving water per month per household that is stipulated in the ZNWP. A total of 60% of respondents in the low density suburbs knew that they are legally entitled to receive 10m3 of free basic water but were not receiving this allocation (Table 6.25). The results show that most respondents in the low density suburbs had knowledge about the legal obligation of the city councils to provide every household with free basic water but, the majority of residents in the high and medium density suburbs had no such knowledge. These results support the contention by the Masvingo United Residents and Ratepayers Association (MURRA) coordinator, Anoziva Muguti that, the Masvingo City Council refused to disclose this information to residents since the council does not honour this obligation.

The ZNWP, indicates that the administrative difficulty of determining who cannot afford to pay for water because of lack of a coherent social support information system to provide such reliable data means that the option to provide 10 000 litres (10 m^3) per month of free lifesaving water to all, accompanied with a 2 or 3 stage rising block tariff regime should be used. This option permits poorer consumers to manage their consumption so that they stay within an allocation they can afford.

Table 6.25: Residents' knowledge regarding the provision of 10m^3 free lifesaving water per month per household

Residency category	YES	NO	Total
High	27%	73%	**224**
Medium	26%	74%	**51**
Low	60%	40%	**40**

The reality that most people are not aware of the existence of the legal right to 10 000 litres from the ZNWP means that no one can question the city council and they remain unaccountable. Some senior council officials who wanted to remain anonymous indicated that, the provision is on paper and indicated that no service provider can afford that given the economic situation in the country. Service providers consider this provision as only for political expediency and argue that the country cannot afford such a luxury given that the councils are in themselves struggling to meet their minimum mandate due to lack of financial support from the central government and unpaid bills as most residents are struggling financially. However, the silent stance taken by the service providers towards the provision of this lifesaving water has seen most poor households struggling to access water services since they are periodically disconnected from the supply system.

An assessment to check how ULAs make sure that WSS are sustained during supply interruption showed that more than 60% of the respondents in all three suburbs indicated that they did not have the right to water during service outages (Figure 6.27). In most of the cases, service providers do not provide mechanisms to ensure continued access to drinking water services during water service outages. With some service interruptions lasting weeks and in severe cases lasting more than a month in some areas, as was reported in the City of Masvingo between August and October 2018, emergency water supply service mitigation should be in place to ensure the right to water for the residents. Areas on high ground in the City of Masvingo, such as Runyararo West, KMP Phase 1 and 2, Mucheke (A, B, C, D and F) and Clovelly suburbs, went for more than two months with dry water taps. Similar situations were reported in Harare, in 2008 where the high density of Budiriro 1 went for months without water (Makwara & Tavuyanago, 2012; ZIMCODD, 2013).

During this study, total loss of water supply was experienced at least twice per week. Just as in Masvingo, Budiriro 4 in Harare is on high ground and is not spared by severe water shortages. During these periods of service disruptions, the city/town councils have failed to fulfil the obligation to sustain the residents' right to water at least to ensure survival and hygiene. Thus, both the Masvingo and Harare City Councils are failing to meet the 50 litres per day per person minimum requirement for consumption purposes. The results show that the right to water for residents during service interruptions is very limited. In most instances, the city councils and other service providers do not have contingency plans in place to deal with situations where the infrastructure/technology fails and people are left without services. Plans were initiated in Masvingo City Council to erect plastic water tanks (Jojo tanks) and during the survey, these tanks were seen lying on the ground and not being utilised for storing water for emergency situations (Figure 6.28).

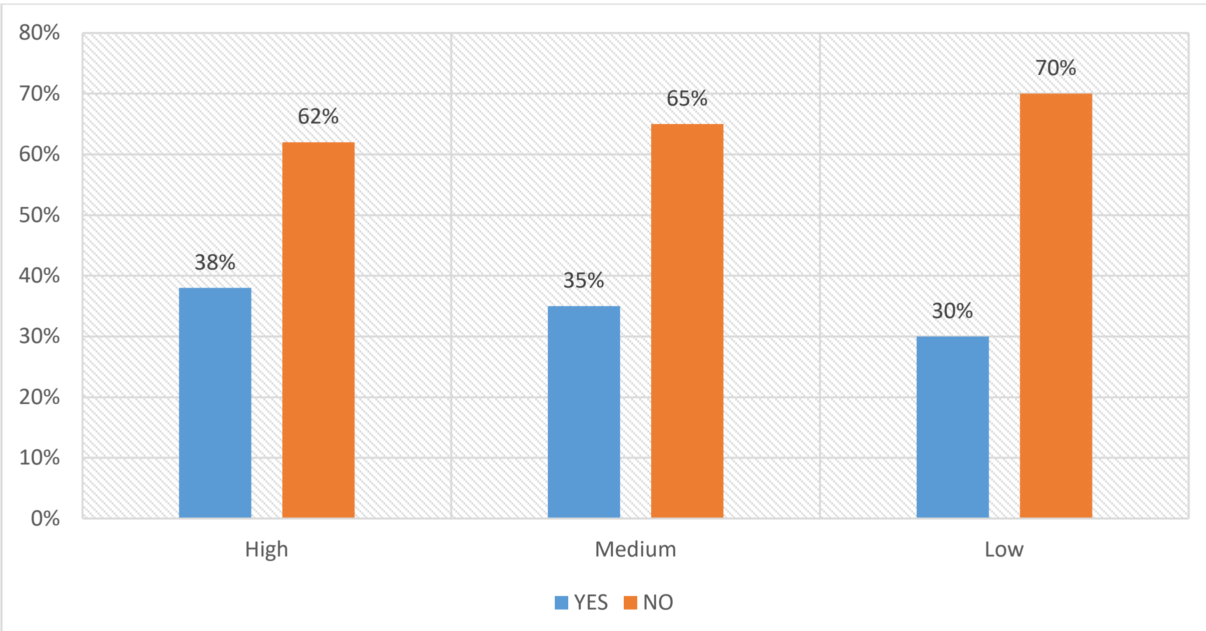


Figure 6.27: Household responses regarding fulfilment of the right to water during service interruption

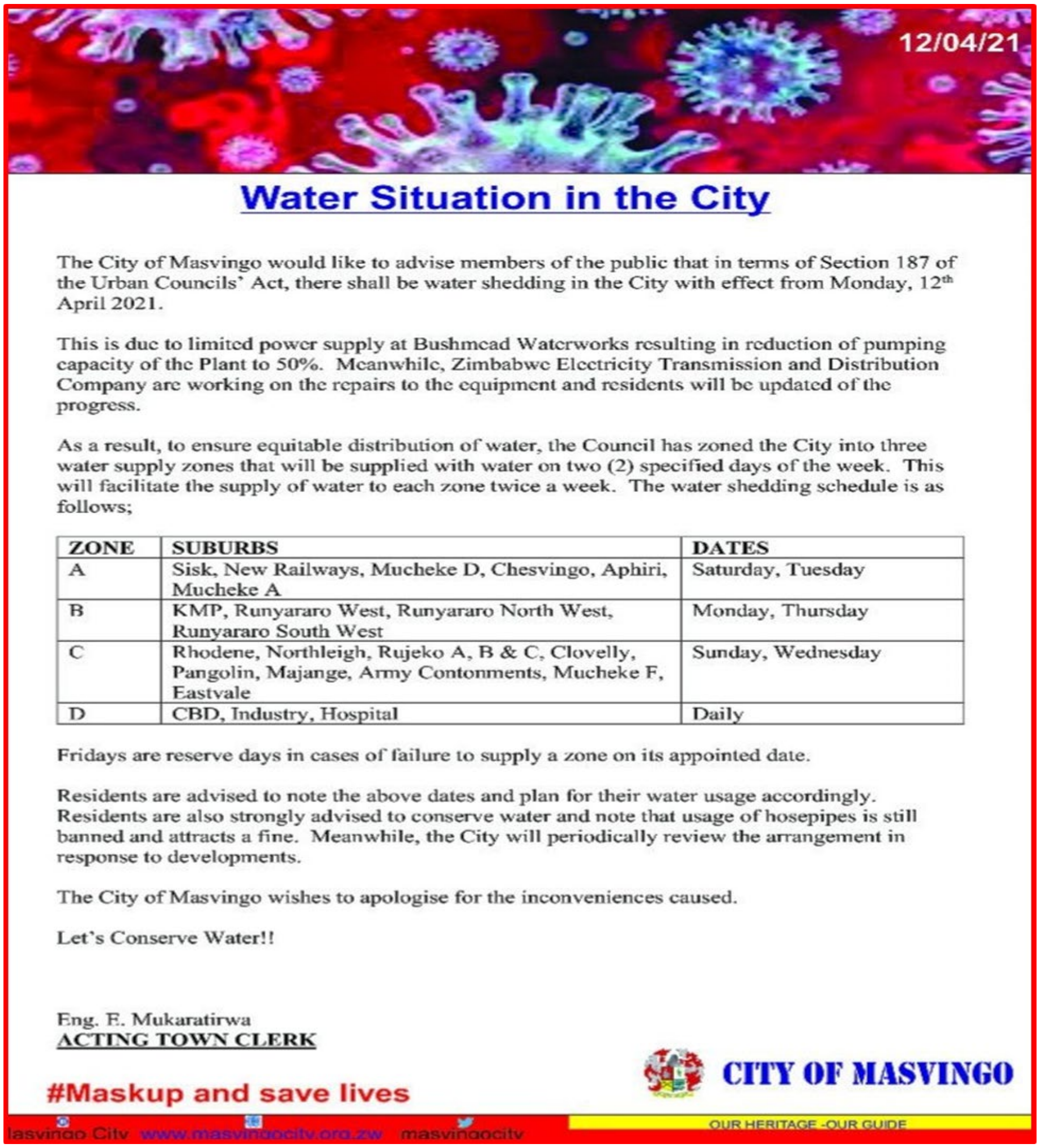
Interviews with the local authorities indicated that most areas known for severe water shortages had water tank installations, however, these tanks were just a white elephant since they just were idle and never served the purpose of storing emergency drinking water for the residents. Some reports showed that these tanks were slowly vanishing and there was lack of accountability. Some local authorities were also surprised to learn that these tanks were never utilised. The slow disappearance of these Jojo tanks was an issue of concern for n many residents who were anticipating relief from the severe water shortages. Some local authorities in the City of Masvingo argued that the right to water was ensured through 31 Council hand pumps (water boreholes). Unfortunately, even if one assumes that all these boreholes are functional at any given time (which is not the case from the field observation), each water borehole could be expected to serve 2835 people. This is way far above the recommended 300 people per one heavy-duty hand pump (WaterAid UK, 2013).

<u>Figure 6.28:</u> A water tank near the Runyararo South West Zimbabwe Republic Police Sub-Base contingency plan for water supply interruption in Masvingo City

In addition, some residential areas, such as the KMP Phase1 (Runyararo South West), Target Kopje and Hillside Extension in the City of Masvingo, did not have a borehole in place to serve these areas. The small numbers of hand pumps, low functionality and contamination (see water quality), suggests that the hand pumps cannot be considered as contingency measures to guarantee city dwellers the right to water during prolonged water outages characterised by dry taps for many days/weeks. During the field surveys, the local authorities did not have a concrete emergency response plan (ERP) to deal with unforeseeable system failures because of pump failure, power outage, pipe bursts, drought, dammed water levels or any other emergency situation that can prompt drinking water supply interruption leading to some areas being prejudiced of their water supply. It was common knowledge to the residents living on high ground that when the reticulation pressure was low, they would never get water supplies. The Urban Councils Act (Chapter 29:15), Section 187 (1) indicates that a local authority may, in cases of emergency, establish by resolution a scheme for rationing or restricted use of water (Urban Councils Act, Chapter 29:15).

However, despite the existence of this provision, the councils are failing to implement an effective water rationing plan. This resulted in some residential areas in Masvingo and Harare s going for weeks without drinking water. A consultative meeting by the Masvingo City Council on the 21st of March 2019 suggested that, to improve fairness of services across all urban areas, there was need for the Council to draft a rationing plan since no such a plan was in place. Since then, the city council has been occasionally implementing water rationing whenever there was a major disruption in the water supply system (Figure 6.29). However, even with these occasional rationing plans being implemented by the Masvingo City Council, residents on high ground still indicated that the rationing facility is not alleviating their water woes since they continued to grapple with acute drinking water shortages and felt that they were being discriminated against by the city councils.

Technology and inadequate planning/ or mismanagement on the part of local authorities could be blamed for the reported crisis on residents living on higher ground regardless of water rationing being implemented. The United States Environmental Protection Agency (EPA, 2011) in its guidelines on planning for an emergency drinking water supply indicates that a water supply system should have an adequate number of operable valves to enable isolation of affected parts of the system and for circumventing sources of pressure loss. In both the Harare and Masvingo Councils, there seem to be pressure losses that continue to reduce water flow to areas on higher ground. On specific days, when the areas the most affected areas are having a turn to receive water, the water reaches a few sections of these suburbs or never reaches them. The assumption here is that all other areas that are not on the rationing schedule are cut-off from the supply system. Hence, questions can be asked why these critical areas continue to experience water supply shortages.



12/04/21

Water Situation in the City

The City of Masvingo would like to advise members of the public that in terms of Section 187 of the Urban Councils' Act, there shall be water shedding in the City with effect from Monday, 12th April 2021.

This is due to limited power supply at Bushmead Waterworks resulting in reduction of pumping capacity of the Plant to 50%. Meanwhile, Zimbabwe Electricity Transmission and Distribution Company are working on the repairs to the equipment and residents will be updated of the progress.

As a result, to ensure equitable distribution of water, the Council has zoned the City into three water supply zones that will be supplied with water on two (2) specified days of the week. This will facilitate the supply of water to each zone twice a week. The water shedding schedule is as follows;

ZONE	SUBURBS	DATES
A	Sisk, New Railways, Mucheke D, Chesvingo, Aphiri, Mucheke A	Saturday, Tuesday
B	KMP, Runyararo West, Runyararo North West, Runyararo South West	Monday, Thursday
C	Rhodene, Northleigh, Rujeko A, B & C, Clovelly, Pangolin, Majange, Army Contonments, Mucheke F, Eastvale	Sunday, Wednesday
D	CBD, Industry, Hospital	Daily

Fridays are reserve days in cases of failure to supply a zone on its appointed date.

Residents are advised to note the above dates and plan for their water usage accordingly. Residents are also strongly advised to conserve water and note that usage of hosepipes is still banned and attracts a fine. Meanwhile, the City will periodically review the arrangement in response to developments.

The City of Masvingo wishes to apologise for the inconveniences caused.

Let's Conserve Water!!

Eng. E. Mukaratirwa
ACTING TOWN CLERK

CITY OF MASVINGO

#Maskup and save lives

OUR HERITAGE -OUR GUIDE

Figure 6.29: Drinking water rationing schedule for Masvingo City residential areas (City of Masvingo, 2021, accessed April 2021)

The EPA (2011) indicates that field surveys are necessary to determine a system's valve requirements. Some residents in areas of Rujeko A, B and C, parts of the Old Railway and Mucheke Taxi Rank residential areas in the City of Masvingo received drinking water almost on a daily basis. This shows that there could be inadequate system valves to isolate these low-lying areas (possible sources of pressure loss) from the supply system so that water supply can reach areas that are on high ground when it would be their turn to receive water during rationing. Supervision of the staff who manage the rationing schedule can also be regarded as inadequate because, some residents from these areas that were receiving water on a day to day basis boasted that they were saved from water cuts because they were lucky to be in an area where some council workers stay. This meant corruption could have been taking place, where council workers could deliberately not close the water valves in those areas to benefit their families.

The water rationing schedule for City of Masvingo (Figure 6.29), shows that the main aim of this schedule is to ensure equitable distribution of the limited water supplies caused by power outage. However, the situation on the ground showed that a certain proportion of the urban dwellers were inadequately served. The EPA (2011) indicates that, it is possible to reduce water outage risks through system redundancy/resilience and repair capabilities. It may also be possible, depending on the extent and scope of the water outage, to compensate for partial system failures by doing the following:

- Have redundant water pipe connections and strategically placed valves which may make it possible to isolate damaged pipes and minimise the area(s) of lost service. For example, New York City and Cleveland in the United States both rely on system redundancy for their emergency water supply plan, while Seattle has means for establishing temporary connections between pressure zones to allow by-passing of certain areas and improve the service provision.
- Have enough operable valves to isolate affected parts of the supply system and circumvent sources of pressure loss.
- Treated water storage may also make it possible to maintain service for a certain time period while treatment plants or other supply systems are being repaired. This is like the Masvingo City Council’s initiative to install Jojo water tanks in areas that area hard hit by water outages. This was a noble idea, however, the implementation of the plan never kicked off as no single area reportedly used the infrastructure and seemly, the plan has been abandoned because the tanks were disappearing from these areas.

- Should have in place emergency equipment, such as generators (in the event of a power outage), fuel, or spare pipes and fittings, to maintain water supply through the existing water system.

Overall, Appendix A presents Article 5 of the Lisbon Charter that clearly spells out the responsibilities of service providers, which include carrying out operations in accordance with the policies set out by governments and acting in strict compliance with legal, contractual and regulatory frameworks that include service delivery, tariff structure, quality of service and quality, quantity and reliability of drinking water, collection and treatment of wastewater, consumer protection and competition, and environmental legislation. The AquaFed (2010), indicate that the Central Government (State) should set up local regulations, to decide a policy, to fix targets and priorities and ensure that these services are delivered effectively to end-users.

Finally, governments are supposed to respect the Right to Water and Sanitation obligations and have the responsibility to protect and fulfil the Right to Water and sanitation (de Albuquerque, 2014). The failure by service providers to honour and fulfil this right, as directed by the ZNWP, is a breach of the ratification that was made by the Zimbabwe Government to ensure the right to water is realised especially by the poor, disadvantaged and marginalised. Household and local authority responses regarding whether the right to water is fulfilled during service interruption are indicated hereunder.

6.3.7 ACCOUNTABILITY AND TRANSPARENCY

6.3.7.1 Household perceptions regarding water pricing

The above assessment of “Economic accessibility/Affordability” discussed the water users’ perceptions on the reliability of the monthly water bills that they receive from the service providers (Table 6.20). The results have shown lack of transparency on the part of the city councils with regards to how monthly bills are calculated. Most respondents complained about the lack of transparency and held the view that service providers do not use the actual water meter readings and instead used estimates to establish the monthly water bills.

According to the ZNWP, Water billing should be clear, transparent and based on actual volumetric readings. Furthermore, the income derived from water sales must be applied to the costs of providing water, otherwise the ‘user pays’ principle collapses together with the services. In line with this guiding principle, the study assessed the availability of centralised water connection in the house as indicated hereunder. Furthermore, *Section 7.4.3* of the ZNWP under the “targets, technical norms and standards of Urban WSS”, stipulates that after five years from the inception of the ZNWP in 2013, the high technical standards, which stipulate that no construction of houses takes place before water connection, would be in full force.

6.3.7.2 The handling of customer grievances or complaints by service providers

The assessment of customer perceptions regarding council officials’ responses towards residents’ complaints regarding water services are presented in Table 6.26. Most respondents (75%) from high and medium density suburbs indicated that there was no transparency between service providers and rate payers, while 81% of responds from the low density suburbs pointed out that they received communication regarding water cuts and causes of water cuts. In high, medium and low-density suburbs, 18.8%, 35.3% and 15.65%, respectively, of the residents received immediate responses from the service providers respectively. Most respondents, 65.6%, 52.9 and 68.8% from high, medium and low-density suburbs, respectively, indicated that service providers delayed responding to user complaints. Furthermore, 15.6%, 11.8% and 15.6% from the high, medium and low-density suburbs, respectively, reported that they never received responses regarding their complaints.

Table 6.26: Household respondents’ perceptions regarding the handling of customer complaints by service providers

Residential area	Transparency		Service provider responsiveness		
	Yes	No	Immediate	Delayed	Never
High	25%	75%	42 (18.8%)	147 (65.6%)	35 (15.6%)
Medium	25%	75%	18 (35.3%)	27 (52.9%)	6 (11.8%)

Low	81%	19%	7 (15.6%)	31 (68.8%)	7 (15.6%)

A close analysis of these findings on community knowledge about factors that cause the water problems drew on policy statements regarding transparency between water authorities/service providers and rate payers/customers. It was noted that service providers' responses were delayed most of the times in all three suburbs. Despite having set the Help Desk, the City of Harare fails to act on reported problems of water shortage. Chaminuka and Nyatsanza (2013) indicate that a social network (Bin-It) had to take an initiative of cleaning the Central Business District (CBD) in Harare, as well as in recording and making calls to the Harare Municipality to report all water leaks through their Help Desk. However, the responses to the water leakages were often slow and treated water, which was meant for the residents, was wasted (Chaminuka and Nyatsanza, 2013). Similar studies have reported that Harare City Council's Water Section's response to burst pipes does not meet the expectations of residents in most residential areas (Chaminuka and Nyatsanza, 2013).

There is too much delay by officials to respond and fix burst water pipes. Consequently, treated water is seen gushing out of burst pipes for days without being attended to. An Urban Councils Association of Zimbabwe (UCAZ)'s Service Level Benchmarking Report (SLB, 2018) assessment of the efficiency in attending to customer complaints by the indicates that local authorities respond to customers' water-related complaints with a response rates of 67% in 2017 as compared to 45% in 2016. The benchmark target for the year was 80%. Conversely, local authorities, such as Bulawayo, Masvingo, Kadoma, Epworth, Shurugwi and Plumtree, reported a 100% response rate to water related complaints, however, the overall assessment points to a gloomy picture of inefficient handling of customer complaints.

According to Water Integrity (WIN) (2010), low responsiveness to customers typically goes hand-in-hand with weak customer relations and complaint management. In the absence of a properly operational complaint management, institutions lose their ability to control risks and manage external relations, because failures, unethical behaviour, or illicit practices by the organisation's staff or partners do not get reported to those responsible. Furthermore, customers are unable to seek redress and lose trust. WIN (2010) identifies the following as red flags when transparency is lacking: long response time of water sector organisation to customer complaints; no monitoring and reporting of customer complaints and the response rate; complaint response rate not integrated into key performance indicators; insufficient resources and/or unclear mandate of the customer relations unit to process, document, and systematically analyse the complaints; customer relations unit not independent, for example from the management or other staff members; low public awareness of the customer relations unit; and inadequate whistle blower protection, such as insufficient anonymity of complaints.

Utilities that lack transparency are characterised by a high number of complaints that must be made before the problem is fixed, customers fixing their problems themselves or hiring someone to do the job, and newspaper articles, letters to the editor and complaints from community groups. Reports by WIN (2010), in Bangladesh also indicate lack of accountability within the water sector institutions because complaint channels are not available, as public officials are protected, and service providers are not accountable to their consumers. There is an example in Kenya where a consumer in Dunga area of Kisumu complained to one Water Action Group (WAG) member that a particular meter reader was soliciting money from consumers supposedly to pay their bills for them and reportedly not recording these payments as paid in the office although the water supply was not disconnected. The lack of accountability instilled fear in the consumer that they did not checking their balance at the Kisumu Water and Sewerage Company Limited (KIWASCO) offices and requested the WAG to do it on his behalf. It was found that the bill had accumulated to KES 40,000 (~USD 400).When the WAG team member raised the matter with KIWASCO, the consumer's water supply was immediately disconnected (WIN, 2010). Later the WAG member received a message from the meter reader through a third party who warned her to stop interfering with their work. A week later supply to the consumer was reconnected without him paying the bill (WIN, 2010). This case raises several concerns, among which is the reality that utility staff receiving complaints do not maintain confidentiality and instead alert the criticised individuals. The WAG member has since filed a complaint with the police. The Overall results of this study indicate inadequate transparency from service providers as complaints take long to be or are never addressed.

6.3.8 RISK ASSESSMENT AND AUDIT OF WATER SAFETY PLANNING

This section focus on the analysis of risks of water contamination from the collection to point of consumption. The data analysed here was collected through household surveys and field observations. The WHO (2017)'s Guidelines for drinking-water quality indicates that, in addition to testing of water quality, verification should include audits of WSPs to demonstrate that the plans have been properly designed, are being implemented correctly and are effective. Factors to consider include the following: all significant hazards and hazardous events have been identified; appropriate control measures have been included; appropriate operational monitoring procedures have been established; appropriate operational limits have been defined; corrective actions have been identified and appropriate verification monitoring procedures have been established.

Analysis and control of risks from collection point to the end tap or point of use is indispensable for guaranteed water safety in communities (Rickert et al., 2014). Just as water policies of other African countries guided by international best practices for water planning and allocation (FAO, 1995), the ZNWP in its policy statements articulates that '*All urban water users should enjoy adequate, continuous, readily accessible, safe, hygienic, sustainable and affordable domestic water and sanitation services provided by accountable, efficient, coordinated, funded and capacitated institutions"* (MWRDM, 2012).

6.3.8.1 Results of assessment of household practices, collection methods and water storage

Container hygiene: The results from an analysis of the washing of vessels before each filling showed that 67% of the household respondents washed their containers before filling in with clean water while 33.4% of respondents indicated that they rarely or seldom washed the containers before filling. This finding explains the heightened household water contamination that was seen during the study with 100% and 48.08% of stored borehole and tap water, respectively, getting contaminated. It can be argued that even more tap water sample could have got contaminated if it were not for high residual chlorine used as a barrier to protect and ensure water safety by the water suppliers. This is so because, borehole water did not have any chlorination and consequently, all the samples tested positive for *E. coli* bacteria.

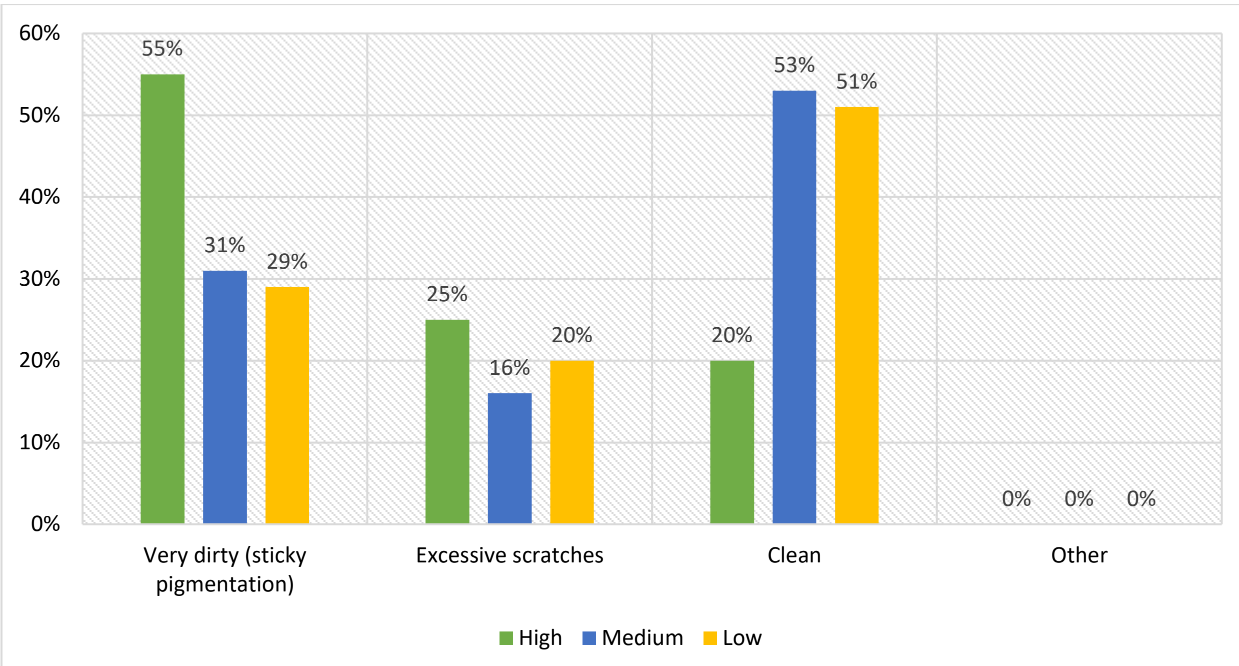
The hygienic condition of the containers were also analysed. The examination of the hygiene-related aspects inside all the containers showed that a total of 405 (42.2%) of the 960 that were sampled were clean (Table 6.27). In addition, 30% of the containers had loose particles. The distribution of container conditions was, 33% of the containers In the high-density suburbs were clean while 53% of those in the medium density and 64% in the low density suburbs were clean.

Table 6.27: Household responses regarding hygiene-related aspects inside the containers

Hygiene aspect	**Frequency**	**Percent**
Biofilm	267	27.8%
Loose particles	288	30.0%
Clean	405	42.2%
Total	960	100%

The above results support the assertion that the burden of water shortages are borne on the marginalised and the poor in society (WHO/UNICEF, 2015, 2017). Most of the poor households are found in high density suburbs characterised by overcrowding and poor hygiene practices and this is aggravated by inadequate sanitation.

Assessments of hygiene-related aspects outside the container showed that 53% of the sampled containers in the medium density were clean outside while 51% of those in the low density suburbs and only 20% in the high-density suburbs were also clean outside. Moreover, 55% of the containers in high density areas were very dirty with sticky pigmentation and 29% of the containers in both medium and low-density suburbs were very dirty. It was also observed that 16% of the containers in all three residency categories had excessive scratches. Generally, the water containers are not clean outside and the situation is worse in the high-density suburbs. These dirt outer surfaces of water vessels can facilitated the contaminants to find their way into the water stored in these containers. These results confirm the microbiological quality results that showed a significant portion of stored water samples getting contaminated are as indicated hereunder (Figure 6.30).



<u>Figure 6.30:</u> Household responses regarding hygiene aspects outer side of water containers

An analysis of the cleaning of the containers shows that 8% and 16% of respondents in high density, and medium and low density suburbs, respectively, washed with disinfectant (Figure 6.31). However, various residents did not use disinfectants when cleaning their water containers before filling with water. It is evident that household hygiene practices constitute a serious hazardous event leading to biological hazards through contamination by faecal coliforms in the homes. Using a disinfectant during cleaning would be an essential control measure with household practices acting as part of the water safety planning to proactively prevent drinking water contamination.

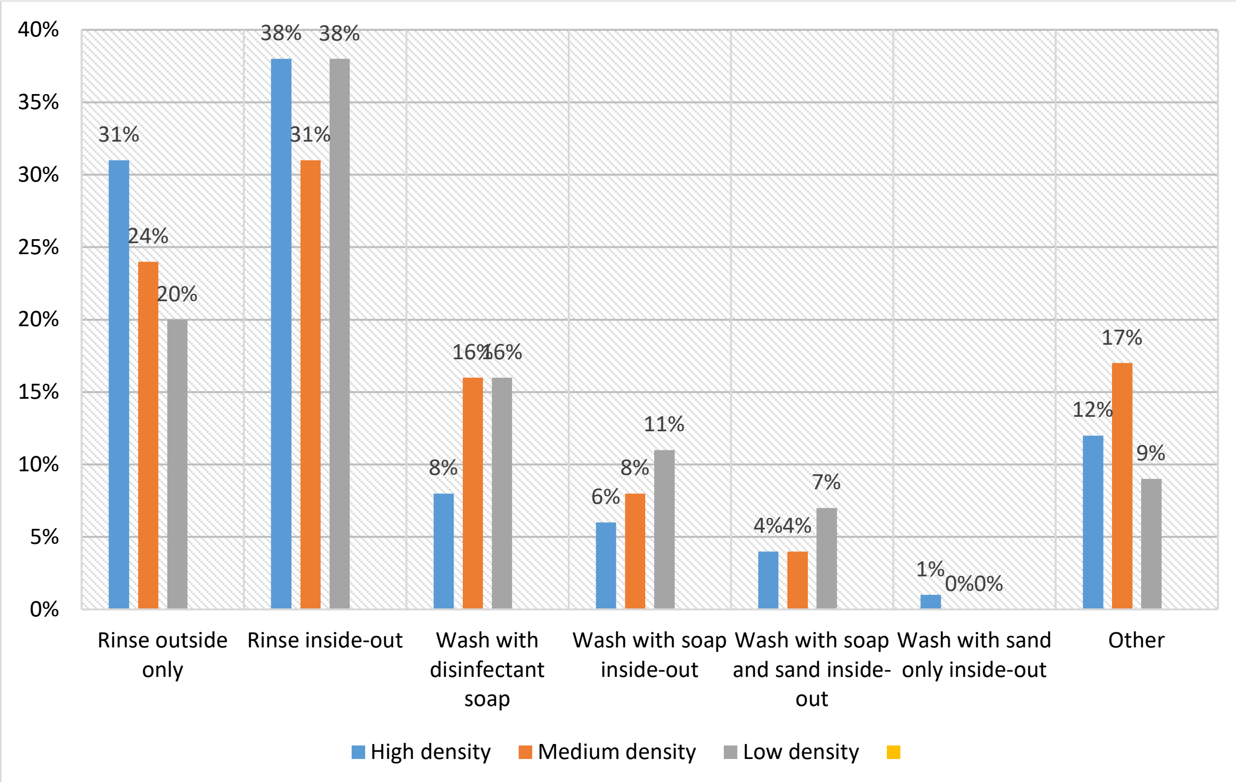
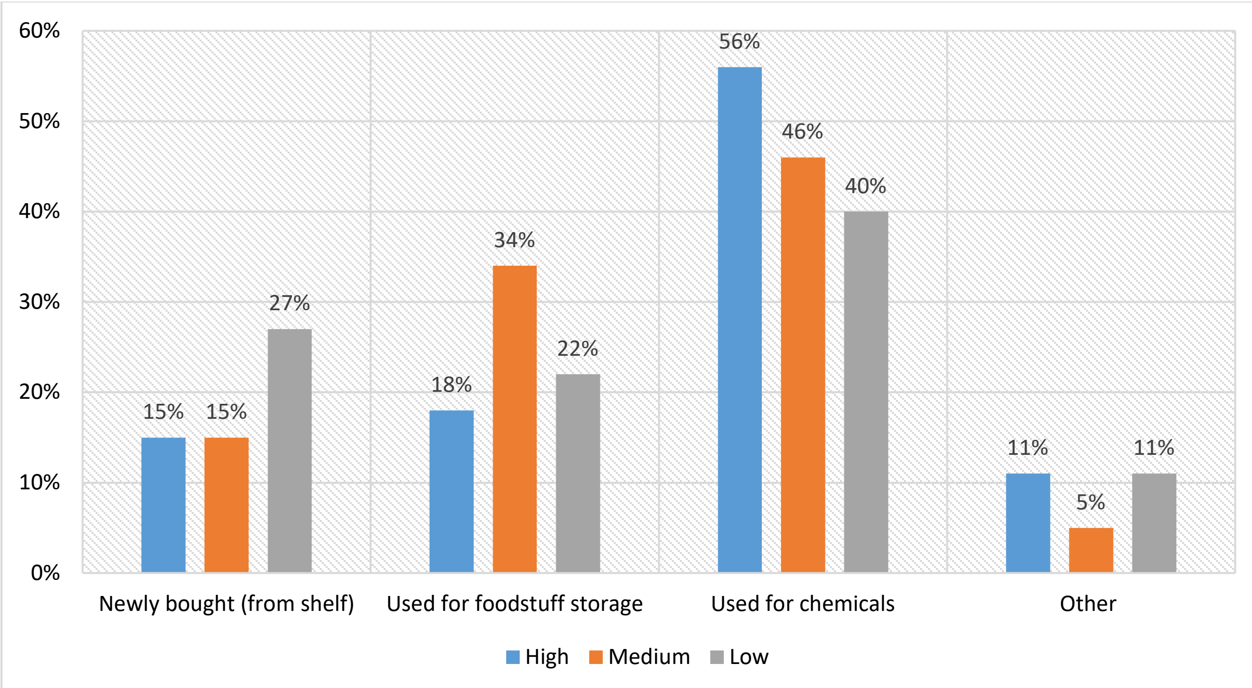


Figure 6.31: Household water vessel cleaning methods and habits

The prior use of containers was also assessed. The results show that most (56%) containers available in the high-density suburbs were previously used to store chemicals while 46% and 40% of those in the medium and low-density suburbs, respectively, were previously used to store chemicals. At least 18% of the containers in all the three residency categories were previously used to store food (food-grade containers). A further 27% percent of containers analysed in the low-density suburbs were newly bought from the shelf and similarly, 15% each in the medium and high-density suburbs were newly bought (Figure 6.32).



<u>Figure 6.32:</u> Previous use of water containers used by households

The above results show a high risk of chemical contamination owing to the use of containers that were previously used to store chemicals. The previous use of water containers can have potential negative consequences to the quality of the water. Apart from the common microbiological contamination, stored drinking water can be contaminated by chemicals that were previously stored in the containers. The CDC (2021), recommends the storage of drinking water in food-grade water storage containers, which do not transfer toxic substances into the water they are holding. In addition, water users are strongly prohibited from using containers that would have previously been used to hold liquid or solid toxic chemicals that include bleach and pesticides (CDC, 2021).

The covering and protection of containers during water storage was assessed. The results showed that 54%, 49% and 60% of containers in high, medium and low density suburbs, respectively, had lids or caps. A total of 39% in high density suburbs and 27% in both medium and low density suburbs did not have covers. A total of 2%, 18% and 13%of the respondents in high, medium and low density suburbs, respectively, used insect repellents to protect their storage containers. A total of 5% and 6% in low and medium density suburbs, respectively, covered containers with cloth (Figure 6.33). Thus, in all the three residential categories, the main methods used to keep insects away from the water include putting lids or caps on containers, followed by covering containers with cloth. The CDC (2021) recommends that water containers have a top that can be closed tightly and made of durable and unbreakable materials and if possible have a narrow a neck or opening for pouring out the water.

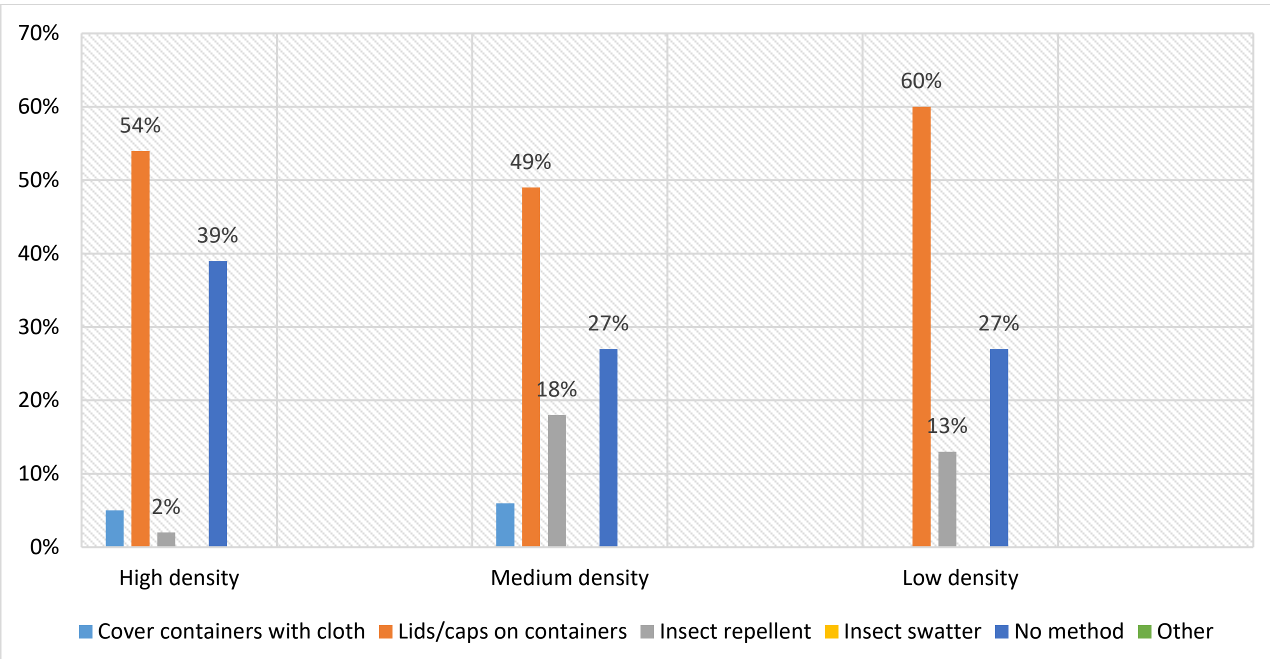


Figure 6.33: Water container covering and ways to keep flies and other contaminant agents away

Higher levels of microbial contamination and decreased microbial quality are associated with storage vessels having wide openings (e.g., buckets and pots), vulnerability to introduction of hands, cups and dippers that can carry faecal contamination, and lack of a narrow opening for dispensing water. It has also been reported that increased storage times, higher levels of airborne particulates (dust storms), higher temperatures and inadequate handwashing, increase chances of microbiological contamination and contribute to increased infectious disease risks (Verweij, 1991; Dunne, 2001; Iroegbu et al., 2000; Luby et al., 2001).

Overall, the conditions and practices of water collection and storage, and the choice of water collection and storage containers or vessels are key factors that determine drinking water safety in the household (WHO, 2012). Numerous studies document inadequate storage conditions and vulnerable water storage containers as factors contributing to increased microbial contamination and decreased microbial quality as compared to improved source waters or water stored in improved containers (Simango et al., 1992; Mudau et al., 2017; WHO, 2021).

There is a growing international call that treated water must be stored properly to prevent re-contamination. Thus, safe storage means keeping treated water away from sources of contamination, and using clean and covered containers. Similarly, when water is taken out of the storage container, effort must be put to prevent cross-contamination. The container should prevent hands, cups and other sources of contamination from touching the water to prevent re-contamination (Centre for Affordable Water and Sanitation Technology [CAWST], 2009). Thus, good hygienic measures include careful storage of household water and regular cleaning of all household water-storage facilities (WHO, 1997).

6.3.8.2 Results of sanitation assessment

The results from an assessment of sanitation show that almost all the households in the high density and low density had sanitation facilities with 82% of those in the medium density having sanitation facilities around them. In addition, 18% and 2% of the households in the medium and high density suburbs, respectively, did not have sanitation facilities around them because they were still under construction or had water disconnection and hence the toilets could not be used. The frequency of cases of blockages is as indicated hereunder. Table 6.28 summarises the intervals at which sewerage spills occurred in the study area. A total of 38 (11.9%) respondents from all residence categories experienced sewerage spills per week with71 (22.2%) experiencing spills monthly while 103 (32.2%) were affected by sewerage spills every two months. A total of 19 (5.9%) respondents reported that sewerage spillages occurring at 6 months intervals while, 3 (0.9%) experienced spills annually and 86 (26.9%) rarely experienced spillages.

Table 6.28: Household responses regarding the frequency of sewerage blockage and spillage

Time	Frequency	Percent
Weekly	38	11.9%
Monthly	71	22.2
Every 2 months	103	32.2%
Every 6 months	19	5.9%
Annually	3	0.9%
Rare/Other	86	26.9%
Total	**320**	**100%**

However, despite this response from most respondents, there were hot spots where sewage spills were perennial. This was captured during on-site visits as reflected in Figure 6.34.

Figure 6.34: Unattended sewage spillages within and around households in the study area in November 2018

Table 6.29 shows that 70 (21.9%) of the respondents reported that the fixing of cases of a spillage occurred on the same day. A further 95 (29.7%) respondents reported that the fixing of sewerage spillage happened in a week's time while 85 (26.6%) indicated that fixing could take almost a month to be done. Similarly 44 (13.8%) respondents indicated that the fixing time could be from a month to 3 months and 26 (8.1%) reported that more than 3 months could elapse before fixing is effected with some spills having remained unattended for almost 12 months. The picture painted here is that sewerage spills are rife and can go for a long time without being attended to (Figure 6.34). Unfortunately, because sewerage spills are not rampant but rather are isolated, the few spills that occur are not given full attention by the city councils and this has negative consequences on water quality and public health.

Table 6.29: Household responses regarding sewerage spillage management and fixing time

Time taken to fix spills	Frequency	Percent
Same day	70	21.9
≤Week	95	29.7
≤Month	85	26.6
> 1 ≤ 3 months	44	13.8
>3 ≤ 12 Months	26	8.1
Total	320	100.0

The state of environmental rehabilitation after sewerage spillage was assessed and at least 79% of respondents from all residence categories reported that they had never witnessed environmental rehabilitation being done after sewerage spills even when the spills had occurred around houses where children would at risk from playing with the contaminated objects or water. Raw sewage is left in the environment without treatment, which renders it harmless to people, the environment and water sources where it flows to. This is against the ZNWP which stipulates that, after environmental pollution, the polluter must rehabilitate the environment (MWRDM, 2012). In cases where respondents indicated the occurrence of rehabilitation, they pointed out that it was done by the City Councils.

The city authorities indicated, during consultation on whose responsibility it is to engage in environmental rehabilitation that, it was the responsibility of the Environmental Management Authority (EMA). Further discussion is made under internal audit and the water institutional framework in Zimbabwe.

The ZNWP stipulates that, it is mandatory that construction and legal occupation of urban houses be preceded by the development of road, water and sewerage services. Most residents in high, medium and low density suburbs 88% for low density, 82% for medium density and 70% for high density indicated that it is not mandatory that construction and legal occupation of urban houses be preceded by the development of road, water and sewage services. These results affirm the results discussed above on availability where some few households did not have sanitation facilities. The ZNWP relaxed the “High Standards” requirement during the first five years from 2013 to 2017 after which this requirement could spring back to full implementation. More regulatory framework is required to follow up on this standard to safeguard public health in urban. Nevertheless, the residents’ views on the implementation of high standards of urban housing services are as indicated hereunder (Figure 6.35).

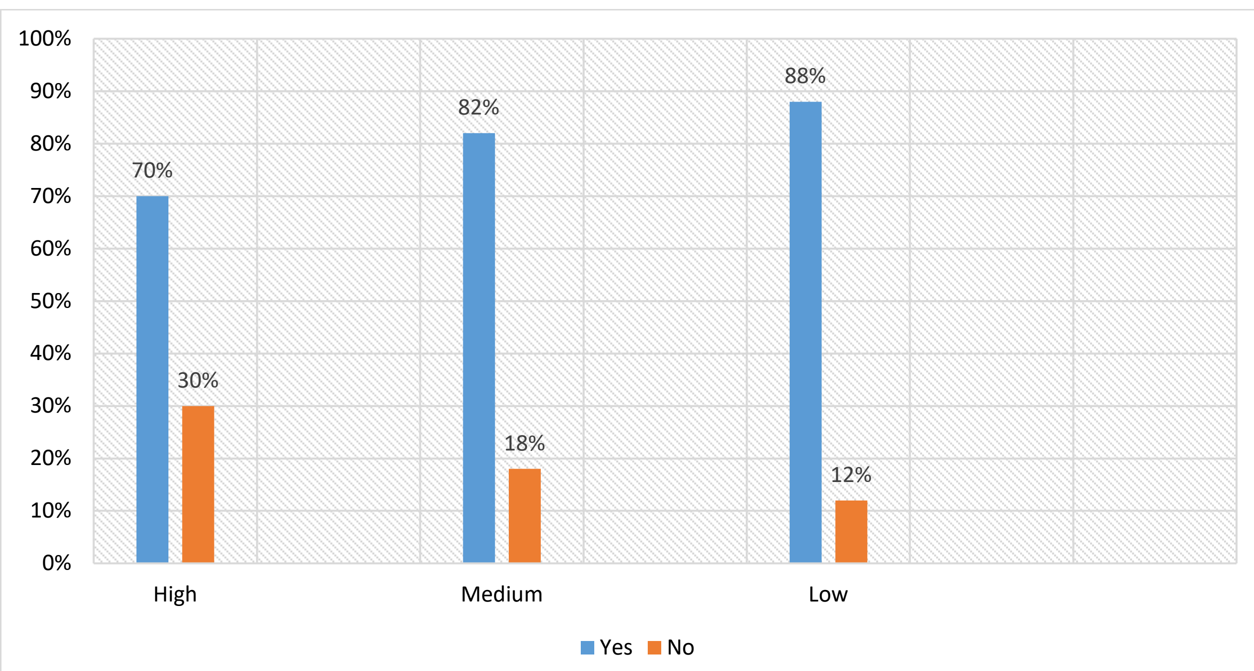


Figure 6.35: Household responses regarding high standards of urban housing services as per policy statements

Open defaecation was rife in high density suburbs, especially in areas with new housing developments, where no alternative sanitation facilities were in place. Open defaecation was aggravated by water flow discontinuity and he resultant non-use of the common waterborne toilets. This can even explain the cholera, diarrhoea and typhoid episodes that are reported in recent years in Zimbabwe's big cities especially in Harare City and Chitungwiza. These diseases can be transmitted through direct or indirect contact with infected faeces. Consequently, environmental interventions for the prevention of diarrheal disease typically include steps to improve the proper disposal of human faeces (sanitation), as well as improving water quality (Clasen, 2006), water quantity and access, and promoting hand washing and other hygiene practices (Curtis and Cairncross, 2003; Ejemot, 2008).

6.3.8.3 Results from an assessment of hazardous events and hazard estimations

The results from an assessment of drinking water infrastructure show severe WSS infrastructure decay. The only improved alternative sources of water in urban areas were boreholes, unfortunately, due to lack of WSP procedures, the risk monitoring of these sources is rare or non-existent as shown by lack of barriers to prevent contamination. Lack of fences to exclude animals within 30 metres of boreholes together with clogged drainage trenches leads to contamination by microbiological agents such as thermos-tolerant coliforms through intrusion (CAWST, 2016; Taonameso et al., 2018). Source protection and sanitary inspections are therefore inadequate. However, if WSP was in place, the ULAs could identify boreholes as major alternative sources and put measures to ensure more boreholes are installed within 500m of residential areas to improve accessibility.

Internal audits with ULAs show no evidence of development and that the adoption of the WSP approach by city councils is severely limited despite calls from the WHO Africa and the Government of Zimbabwe to adopt WSPs (MWRDM, 2012, WHO Africa, 2019). There were no multidisciplinary WSP teams dedicated to drinking water supply system (DWSS) in both city councils, which implies that service providers are reluctant to take up WSP programmes in their respective areas of jurisdiction. The WSP approach starts with the setting up of a multidisciplinary risk management team without which, risk management functions cannot be executed (Bartram et al., 2009, WHO, 2011). The results from internal audits show a lack of data on the monitoring and controlling of water quality by water service authorities in Zimbabwe's urban areas. Limited data availability on water system description has been blamed for the slow development and implementation of WSPs in developing countries (Omar, 2013). The culture of data collection and storage is still a challenge (Omar, 2013). Furthermore, inadequate system knowledge, such as lack of flow diagrams and system maps, has been described as an unfortunate situation because much of the information on the piped networks may not be available as records may have been removed by contractors or colonial powers (Omar, 2013). This observation is not unique to Zimbabwe, a study by Kanyesigye et al. (2019) reports many cases of slow adoption of the WSP approach by African countries.

The assessment of the microbiological quality of drinking water identified a total of 14 hazardous events from the study through literature review, field visits and observations (Table 6.30). A plethora of hazardous events were identified as pausing risks to the quality of water in urban communities in Zimbabwe. The distance travelled to alternative improved water source is more than 1 000m two way. Furthermore, water bowsers, in cases where they were available, delivered water more than 1 000 metres from most of the households. The household survey results show that 82% of the respondents indicated that water was unavailable all the time. The average flow for all urban drinking water suppliers was 12.3 hours (SLB, 2018) and the affordability index is between 7.5% and 13.33%. Drinking water backlogs amounted to 18 000 m^3 in the City of Masvingo against a current demand of 48 000 m^3 (City of Masvingo 2019) and a similar trend is reported in the City of Harare (Ndunguru and Hoko 2016), and thus prompting water rationing.

There was a high proliferation of unsanctioned residential dug wells and boreholes that are unsafe. Residents used unsafe secondary sources as coping strategies to unreliable drinking water supply from the councils. Most urban households have resorted to household water storage. However, 20% of household-stored water contained *E. coli,* 58.8% of borehole water samples (commonly used as the only alternative source of water in urban areas) were unsafe, and 1.6% tap water samples had *E. coli*. Residents used contaminated stored water and contaminated borehole water from certain council and individual boreholes. Most council boreholes were unfenced with the clogged drain trenches exposing them to vermin and contaminants. Furthermore, private boreholes and dug wells were not covered and some were poorly sited.

There were very high public concerns regarding water safety as noted in WhatsApp conversations leading to low acceptability of tap water. Residents complained about discoloured water, Chlorinous taste and odour. Furthermore, groundwater from boreholes does not lather and there is reportedly very high fluoride leaching into some groundwater in certain urban areas (maximum recorded fluoride was 7.6 mg/L). The DWSS lacks non-return valves at consumer meters, which pauses high risks of recontamination of treated water. Household practices show unhygienic handling of taps with dirty hands dipped inside drinking water during collection. There were also cases of water buckets being carried on the head, with hands dipped inside the containers or transported in dirty containers without lids in open dusty air. Finally, water was also stored in dirty containers.

Internal audits also show that water bowsers are used to carry grey water for roadworks and construction. In addition, there are no leak detectors and yet there existed numerous unattended drinking water leakages and low pressure which are sources of contaminant ingress and high non-revenue water. There were reportedly inadequate operations and maintenance (O&M) good practices by council staff evidenced by slow response to water leakages and sewerage spills. It was also reported that some staff would demand tips to attend to reported service faults. There were a lot of unattended sewage spills close to water taps and pipes. There were widespread gold panning activities around the Target Kopje water reservoirs in the City of Masvingo that pause threat to the security at the water reservoirs while low drinking water storage capacity and power outages led to little/no water pumping.

Furthermore, the results from internal audit show lack of data on monitoring and controlling water quality by ULAs. There was limited data on water systems description. There was little or no evidence of WSP development and adoption of WSP approach by city councils despite calls from the WHO Africa and the Government of Zimbabwe to adopt WSPs (MWRDM, 2012, WHO Africa, 2019). This is also true with most African countries (Kanyesigye et al., 2019). There were no multidisciplinary WSP team dedicated to DWSS. The ZNWP was reportedly not specific regarding the adoption of WSPs because it just says "*Water safety plans are encouraged as the most effective means of maintaining a safe supply of drinking water for primary needs*", which leaves room for ULAs to either adopt or not.

Table 6.30: System description and analysis adapted from Peréz-Vida et al. (2013)

Risk analysis protocol	**Risk assessment procedure**	**Hazard event No.**	**Critical limits** (SAZS-560:1997; WHO, 2017; MWRDM, 2012)	**Type of hazard**				
				WQ	**B**	**C**	**P**	**ID**
System description and analysis (WHO 2014; Mudau et al. 2017)	Accessibility	Distance travelled to alternative improved water source is more than 1 000m. Water bowsers where available, deliver water more 1 000m away from some households.	Distance travelled to the source should not exceed 500m one way.	X	X			
	Availability	82% of the respondents indicated that water was unavailable all the time. The average flow for all urban water suppliers was 12.3 hours (SLB 2018) and affordability index lay between 7.5 and 13.33.	50 L/c/d water should be available to each person.	X	X			
		A shortage of 18 000m^3 in Masvingo City to meet current demand (City of Masvingo, 2019) and a similar trend is reported in Harare City (Ndunguru and Hoko, 2016). Water rationing.		X	X			
		Unsanctioned residential dug wells and boreholes which are unsafe. Unsafe secondary sources are used.			X	X	X	

	Portability	20% of stored water in households contained *E. coli*, 58.8% of the borehole water samples were unsafe, and 1.6% tap water samples had *E. coli*. Use of contaminated stored water. Unfenced municipal boreholes with clogged drain trenches and private boreholes and dug wells not covered and poorly sited.	Total coliform counts should not exceed 10/100 mL; *E.coli* should not be found in water (<1/100 mL).		X			
		Public concern and low acceptability of tap water. Discoloured water, Chlorinous taste and odour. Groundwater does not lather. High fluoride leaching into groundwater (maximum recorded fluoride was 7.6 mg/L).	Fluoride concentration should not exceed 1.5mg/L (1500 µg/L).		X	X	X	X
On-site risk assessment (field observation)	Collection point	Lack of non-return valves at consumer meters. Unhygienic handling of taps. Water accessed from dug wells, tanks, private and municipal boreholes. Hands dipped inside drinking water during collection.	Not determined		X	X	X	
	Transportation	Water bowsers also used to carry raw water. Water buckets carried on the head or with hands dipped inside the container. Water transported in dirty containers without lids in open dusty air	Not determined		X	X	X	
	Mains distribution lines	No leak detectors, rampant unattended leakages and low pressure that are sources of contaminant ingress and high unaccounted for water.	Not determined	X	X	X	X	X
		Inadequate O&M good practices by staff. Sewage spills close to water taps and pipes.		X	X	X	X	
	Household storage	11. Water stored in dirty containers. Containers with stored water kept on dusty floors.	Not determined		X			
	Municipal storage	12. Gold panning activities around Target Kopje water reservoirs. Reduced security at reservoirs.	Not determined		X	X		
		13. Low storage capacity. Power outage leading to little/no water pumping.		X				
	Point of use	14. Dirty utensil dipped in storage containers. Dipping hands in drinking water.	Not determined		X			

B: Biological C: Chemical P: Physical WQ: Water Quantity ID: Infrastructural Design

The results from the risk assessment showed lack of WSP control measures. If control measures are incorporated, all identified hazardous present low risk levels (Table 6.31), indicating the necessity for urgent development and implementation of WSPs by ULAs and relevant stakeholders. City councils were blamed for failing to provide safe drinking water and this prompted the proliferation of unsanctioned boreholes and shallow wells in residential areas. The only improved alternative sources of water in urban areas were boreholes. However, the lack of WSP procedures meant that risk monitoring of the borehole sources would be rare or non-existent as shown by lack of barriers to prevent contamination. The water quality results confirmed household survey results relating to consumers' perception of drinking water quality. There was a 72% satisfaction level with tap water, however, consumers were dissatisfied with physico-chemical parameter and the service quality. Residents associated the tap water with the diarrhoea episodes among urban dwellers.

Table 6.31: Semi-quantitative risk estimation for both city councils and water users, adapted from Peréz-Vida et al. (2013)

Hazardous Event No.	**Risk estimation without control measures**		**Control measure**	**Risk estimation with control measures**	
	Consequence	**Risk score**		**Consequence**	**Risk score**
1	Major impact	20	More boreholes installed closer to residential areas to reduce distance to alternative sources. More water bowsers to cover all areas and deliver water closer to households.	Minor impact with no water insufficiency.	4
2	Major impact	20	Improve flow continuity and service hours to 24 hours.	Insignificant or no impact.	2
3	Major impact	25	Have DWSS augmentation: more reservoirs, expand distribution system and treatment plants.	Insignificant or no impact.	2
4	Major impact	25	Health official and local authority should inspect households for unsanctioned boreholes and dug wells and seal them. Local authorities should provide enough volumes of safe water to prevent the use of unimproved sources, including bowsers.	Insignificant or no impact.	2

5	Major impact	25	Disinfect water before use. Health education on good water storage and household hygiene practices; carry out sanitary surveys and fence borehole areas to eliminate animal waste, and drain canals should be clear of debris. Protect water sources by putting barriers such as lids and sealing cracks on borehole aprons.	Insignificant or no impact.	2
6	Major impact	18	Periodic monitoring of ground water for Fluoride leaching, Chlorine residual must be monitored, turbidity and TDS including pH must be monitored to inform corrective measures.	Minor impact: temporary non-compliance of some physical parameters with no health effects. Non-fulfilment of organoleptic characteristics.	6
7	Major impact	16	Non-return valves should be mandatory in all household plumbing and distribution system. Household hygiene campaigns, new containers or those used for food stuff storage should be used to collect water. Provide improved water sources.	Minor impact causing dissatisfaction and health concern.	6
8	Major impact	25	Health education and good operation and maintenance (O&M) practices by water service operators including plumbers and drivers of water trucks.	Minor impact causing dissatisfaction and health concern.	6
9	Major impact	22	Install leak detectors and treat leaks as emergency to avoid unaccounted for water and recontamination of treated water by ingress.	Insignificant or no impact, sufficient water.	3
10	Major impact	25	Promote stuff O&M good practices through in-service training and WSP procedures.	Insignificant or no impact.	3
11	Major impact	25	Health education on good water storage and household hygiene practices.	Minor impact causing dissatisfaction and health concern.	3
12	Major impact	25	Provide national and local bi-laws that protect water infrastructure from any form of vandalism, be it through economic activities such as gold panning. Provide strict security at reservoirs.	Insignificant or no impact.	1
13	Major impact	16	Infrastructure augmentation including installation of right size of water pipes.	Insignificant or no impact.	1
14	Major impact	20	Health education on good water storage and household hygiene practices.	Minor impact causing dissatisfaction and health concern.	6

Despite the lack of evidence on the existence of WSP teams in the City of Harare and City of Masvingo, the information that was collected on systems description and on-site visits as well as household surveys provided enough inputs to apply hazard identification tools. According to Peréz-Vida et al. (2013), absence of DWSS information is a common feature as was reported in WSP experience in Latin America and the Caribbeans.

The results on pumping, storage, infrastructure age and design showed a dearth of infrastructure characterised by low storage and incompatible distribution systems that cause high water losses through leakage and contamination of treated water by ingress of contaminants. Leaks caused pressure loss in the distribution, reduced the quantity of available water leading to intermittent water supply which is a serious risk to communities as it affects water quality (Jayaratne, 2008; Mudau et al., 2017). If pressure in the distribution pipe is low, contaminants from nearby ditches can be drawn into the DW system, this phenomenon was seen during the field visit. Jayaratne (2008) indicates that most waterborne disease outbreaks are the result of contamination in the distribution system. Similar findings were reported by Bartram et al. (2009) in Latin America and the Caribbeans (LAC) where DWSS were characterised by aging infrastructure and leaking distribution pipes leading to as much as 70% unaccounted for water that ended up causing low pressure and failure to meet demand.

Hrudey et al. (2011) and the WHO (2011) indicate that if consumers are not convinced that their water is safe, even if health professionals are satisfied about safety, there is danger that they may look for alternative water supplies that may not be safe as the water they distrust. Already as is reported on Figure 6.12, residents associated tap water with the diarrhoea episodes in the community. The WSP recommends operational monitoring for both the DW suppliers and the consumer (WHO, 2011) key quality parameters including turbidity, heterotrophic bacteria, residual chlorine and pH. Sudden changes in these parameters may cause non-fulfilment of organoleptic characteristics such as taste and colour.

The microbiological results showed that the highest contamination of water takes place at the household after water has been delivered. Stored water now acts as a source of DW in many urban areas in Zimbabwe, which means that the use of WSP can assist in the proactive identification and management of risks to drinking water quality in the household before problems happen (CAWST, 2016). Water safety planning helps households to use a multi-barrier approach to prevent and remove contaminants including safe water storage by regularly monitoring and maintaining any water storage tanks, and using clean containers with lids and tap to store treated water (CAWST, 2016). A further barrier is in the use of clean containers with lids during transportation, and handling water safely every time it is transferred to another container. The national health education and hygiene knowledge program (Participatory Health and Hygiene Education (PHHE) and Community Based Management (CBM) stated in the ZNWP that rural communities should be enrolled as part of WSP in urban areas to facilitate behaviour change and improve hygiene practices.

Overall, the traditional approach of relying on end-product testing as a means to guarantee DW safety is inadequate to secure safe water quality. The use of a comprehensive risk management approaches, such as WSPs, is a very effective means of managing water safety quality risks (Jayaratne, 2008). The most effective way to solve the water supply challenges in Zimbabwe's urban areas, is to develop and implement case specific water safety planning programmes. The proposed generic national WSP approach (WHO Africa, 2019) should be considered as the vehicle to solve urban water woes, Chapter 2 gave a brief explanation of the objectives of a WSP.

6.3.9 COVID-19 and WASH (Water, Sanitation and Hygiene) Synergy

Chapters 4, 5 and 6 have discussed some challenges to the provision of WSS services including hygiene practices that impact quality of these services. The outbreak of the 'severe Acute respiratory syndrome coronavirus 2 (SARS-CoV-2) also called the coronavirus disease 2019 (COVID-19) (WHO, 2021), had a bearing on many countries globally. Zimbabwe was also not spared by the COVID-19 pandemic. As of the 31st of December 2020, Zimbabwe had a cumulative total of 13,625 COVID-19 cases and 360 deaths (UN Office for the Coordination of Humanitarian Affairs [OCHA], 2021). According to Burton et al. (2021), WASH can save lives by preventing deaths from waterborne diseases such as cholera and diarrhea by reducing exposure to human waste, as well as reducing transmission of COVID-19 through handwashing. Functional WASH systems are a first line of defence against COVID-19 and, most waterborne and respiratory infections. Thus, the inadequate WASH systems that were described in this study have an implication on the COVID-19 situation in Zimbabwe. The mortality and morbidity due to COVID-19 in Zimbabwe and other countries that have WASH challenges might not have been as high as is reported. The Sanitation and Hygiene Fund (2020) indicate that the *"decades of under investment in sanitation and hygiene have made this sector the weakest link in our efforts to achieve the [Sustainable Development Goals (SDGs)]".*

According to UNICEF (2020), the provision of adequate WASH is essential to protecting human health during all infectious disease outbreaks, including the COVID-19 outbreak. Thus, ensuring good and consistently applied WASH and waste management practices in communities, homes, schools, marketplaces, and health care facilities will help prevent human-to-human transmission of the COVID-19 virus (UNICEF, 2020). Water supply should be always available to enable frequent and proper handwashing as an important measure to prevent infection with the COVID-19 virus. This puts WASH at the core to enable more frequent and regular handwashing as well as use of proven COVID-19 behavior-change techniques (UNICEF, 2020). The WHO guidance on safe management of WSS services also applies to the COVID-19 outbreak.

The identified shortfalls in the provision of WSS services in urban areas in Zimbabwe might have dire consequences from the COVID-19 pandemic if no effort is made to mitigate the situation. The causes of the inadequate WSS services were identified and discussed. The ULAs in Zimbabwe have made some effort to make some changes to the WASH situation in urban areas when the COVID-19 outbreak was at its peak. The efforts included water trucking to communities that were severely affected by water supply interruption to ensure that safe and adequate running water is available, frequent handwashing and other hygiene practices. There was an improvement in communication between service providers and communities regarding WSS services (Figure 6.21). WASH education was coordinated through non-governmental organisations (NGOs) and local health departments. Residents reported improved WSS services during the COVID-19 outbreaks due to stepped up efforts by both the Government to monitor services provided by the ULAs as well as provision of COVID-19 allowances to workforce in critical services that included council workers and nurses among others. This study identified a close interaction between WASH services and the management of the COVID-19 pandemic. Many co-benefits were realized by safely managing WSS services and applying good hygiene practices.

6.4 CHAPTER SUMMARY

The chapter discussed the risk assessments to the service level on WSS services. The chapter considered various risk assessment procedures and identified 14 hazardous events from the study area through literature review, field visits and observations. The results showed a lack of data on monitoring and controlling water quality by ULAs. There was limited data on water system description. There is little or no evidence of WSP development and adoption of the WSP approach by city councils despite calls from the WHO Africa (2019) and the Government of Zimbabwe to adopt WSPs (MWRDM, 2012, WHO Africa, 2019). This was also true to most African countries (Kanyesigye et al., 2019). There were no multidisciplinary WSP team dedicated to DWSS. The ZNWP was reportedly not specific regarding the adoption of WSPs because it just says "*Water safety plans are encouraged as the most effective means of maintaining a safe supply of drinking water for primary needs*", which leaves room for ULAs to adopt or not.

The chapter noted that the traditional approach of relying on end-product testing to guarantee drinking water safety is inadequate to secure safe water quality. The assessment of this objective indicated that, the most effective way to urban water woes is to develop and implement case specific water safety planning programmes. It was recommended that the proposed generic national WSP approach (WHO Africa, 2019) should be considered as the vehicle to solve urban water shortages.

CHAPTER 7

STUDY OBJECTIVE 4: TO EVALUATE THE EXISTING PARADIGM, INSTITUTIONAL AND ADMINISTRATIVE FRAMEWORK FOR WSS SERVICES IN URBAN AREAS TO INFORM DEVELOPMENT OF A NEW FRAMEWORK

7.1 CHAPTER INTRODUCTION

This chapter starts with a presentation of the existing institutional and administrative framework in the urban water, waste water and sanitation sector in Zimbabwe. The paradigm(s) guiding the management of WSS services in Zimbabwe's urban areas is discussed and the chapter ends with a re-contextualisation of the institutional and administrative framework that can be used to close the identified gaps.

7.2 MATERIALS AND METHODS

The data was obtained from semi-structured interviews with local authorities and document analysis. The data analysis was guided by views postulated by public policy analysts that include Brinkerhoff and Crosby (2002), Hukka and Katko (2003), Pretorius (2003), Castro and Heller (2009), and Jomo et al. (2016).

7.3 RESULTS AND DISCUSSION

7.3.1 INSTITUTIONAL AND ADMINISTRATIVE FRAMEWORK

The schematic presentation of the institutional and administrative framework for urban WSS management in Zimbabwe is shown in Figure 7.1. The institutions (legislation, regulations, policies, protocols, governance arrangements and delegation of responsibility) on how to plan and enact the ZNWP policy were examined. The identified institutions from which the Zimbabwean policies are derived include the human rights laws that also inform the SDGs.

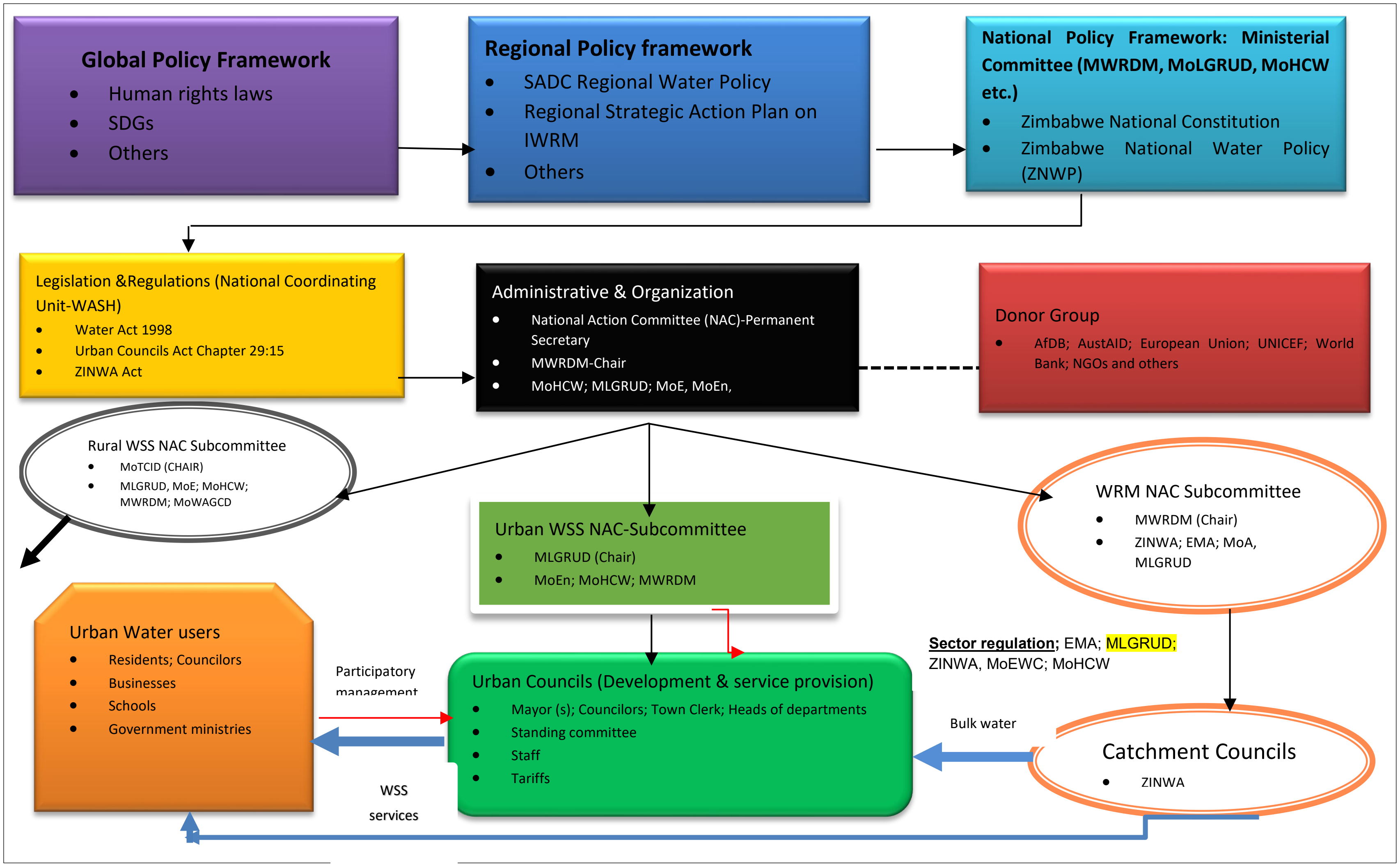


Figure 7.1: The current institutional and administrative framework in WSS management in Zimbabwe (adapted from City of Masvingo, 2019)

Note: Blue arrows show water services either bulk water or treated water/ Red arrows are associated with regulatory functions/Broken line means weak association

The regional institutions from the Southern African Development Community (SADC) Water Policy and the Regional Strategic Action Plan on Integrated Water Resources Management (IWRM) also inform the Zimbabwean policies. Zimbabwe derived its National Constitution and the Zimbabwe National Water Policy from these global and regional policies. Both two institutions form the national policy framework from which legislations and regulations are derived. The legislation and regulatory framework for WSS consists of the Water Act of 1998; the Zimbabwe National Water Authority Act (ZINWA Act) of 1998; the Urban Councils Act (UCA) (Chapter 29:15) and other regulations.

The ZINWA Act and the Urban Councils Act inform the administrative framework in the WSS sector. The ZINWA Act informs the formation of the Zimbabwe Water Authority, a soul body corporate which develops and manages national water resources including dam construction and maintenance. In addition, the Act informs the formation of Catchment Councils under ZINWA. The Water Act also informs the Urban Councils Act which gives local authorities powers to discharge duties that include the including development and management of water resources under their jurisdiction and in particular the provision of potable water and disposal of waste water. All the WSS programmes are informed by these policies and legislations that guide, control and regulate how services should be provided (MWRDM, 2012).

The administrative and organisational framework has, at the apex of water management, the National Action Committee (NAC), which is chaired by the Ministry of Water Resources Development and Management (MWRDM) and consists of membership from the Ministry of Health and Child Care (MoHCW); Ministry of Local Government Rural and Urban Development (MLGRUD); Ministry of Environment (MoE) and the Ministry of Engineering (MoEn). This administrative organ liaises with the donor community to promote its programmes.

The next tier in urban WSS administration is the Urban WSS NAC-Sub-Committee that is still headed by the MWRDM with its membership the same as the NAC. The Urban

Councils ULAs account for their services to this administrative organ. The results of semi-structured interviews with urban local authorities ULAs and representatives from various relevant institutions (Table 6.3) show that at the top of an ULAs is a full Council that is chaired by a ceremonial mayor who is either elected or appointed (City of Masvingo, 2019). The full Council, which consists of all elected councillors, is the policy-making organ of an urban local authority. A full Council is assisted by several committees such as the finance committee, health and housing committee, environmental management committee and audit committee (MURRA, 2019).There are other committees that maybe created to assist in the realisation of the functions of ULAs. The role of committees is to recommend decisions to full Council for resolution. The elected councillors serve five-year terms, which are renewable provided they are re-elected in the next electoral cycle. Urban residents elect councillors to ensure that the public services they need are provided (MURRA, 2019). The councillors are accountable for service delivery and must accept responsibility for such failure. The Council must ensure that such services are provided effectively, efficiently and cost effectively. Similarly, urban residents have a right to demand explanations from their councillors if services are not provided satisfactorily.

There are 4 categories of WSS service providers including city councils, town councils, municipalities and local boards depending on the category of the urban setting. However, all these service providers are accountable to the Minister of Local Government in the Ministry of Local Government, Rural and Urban Development (MLGRUD) as presented below. Following both the literature review and empirical study, the results showed that Zimbabwe's WSS services are managed following the public-sector principles or Local Government Paradigm. There is an administrative component of the urban local authorities under Committees, which is headed by a Town Clerk (Chakaipa, 2010). The Town Clerk is the chief accounting officer whose duties are to implement full Council resolutions and report to council.

The Town Clerk is assisted by the heads of departments that correspond with the committees of council to execute these duties. The heads of departments are responsible for facilitating the realisation of service delivery. Urban residents, ratepayers, government agencies, industries, factories and nongovernmental organisations are also a vital component of the institutions that provide services because they assist in sustaining service provision. However, ULAs pointed out that they are not obliged by law to consult with civil society organisations (CSOs) as they consider them an annoyance during meetings. They indicated that CSOs can create false stories to attract attention from the public and seek relevance, therefore ULAs normally do not engage them during crucial meetings. This assertion was affirmed by MURRA (2019) in their indication that they don't receive notices of council meeting regardless of the fact that they represent a large proportion of urban residents. The ULAs countered this argument by indicating that the resident component comes from councillors who live with the residents in their electoral wards.

Consumers pay rates on property and land; fees charged; penalties and fines; license fees, supplementary charges; plan approval and development fees; lease and sale of land and rental fees, which makes them essential stakeholders for urban service delivery. The role of national government in service delivery at the local level includes inter-governmental fiscal support seeking to facilitate; advice; monitor; oversee; direct; promote; and assist with capacity building through its Ministry of Local Government to account to Parliament. The Ministry of Local Government achieves these roles through its Department of Urban Local Authorities. According to Marumahoko et al. (2020), the Local Government Board, which is a unit of the Department of Urban Councils, is responsible for employing the departmental heads and town clerks of urban local authorities. However, it was argued that this arrangement has shown serious limitations and gaps as government officials use party politics when appointing these departmental heads because appointments are sometimes not based on merit.

There is also another body, the Parliamentary Portfolio Committee on Local Government, Rural and Urban Development that is mandated with the realisation of efficient and effective urban service delivery among other things. The body examines the expenditure, administration and policies of the Ministry of Local Government and other matters falling under their jurisdictions as Parliament may by resolution determine. In recent years, the

Committee has also gone on ‘fact-finding missions’ with the objective of assessing the state of service delivery in urban councils and then submitting a report to parliament. However, this role has been criticised as it is being abused to victimize political opponents by Government (MURRA, 2019).

The Minister of Local Government is accountable to the committee and parliament on matters that include the devolution and provision of service delivery in urban areas. In line with this, Parliament summons the Minister of Local Government to answer questions on government policies on urban service provision and accountability, and the role of urban councils in service delivery. The Urban Councils Association of Zimbabwe (UCAZ), is a voluntary gathering of urban local authorities that are at the frontline of service provision in the cities and towns across the country and bring together the 32 urban councils in Zimbabwe (Chakaipa, 2010). Marumahoko et al. (2020) indicated that although the UCAZ is not provided for in legislation, it has been facilitating efficient and effective service provision through its forums that include the Town Clerks Forum, Engineers Forum Groups, Women in Local Government Forum, Director of Housing and Community Services Forum, the Directors of Finance Forum and the Chamber Secretaries Forum, since 1923.

Residents’ Associations have also become a crucial feature in facilitating urban councils’ accountability in service delivery (Musekiwa and Chatiza, 2015). Just as the UCAZ, the Residents Associations are not provided for in the legislation regulating the activities of urban councils. Residents Associations are regarded as voluntary bodies that represent and advocate for ratepayers within the Local government and were granted a constitutional status in the 2013 Constitution of Zimbabwe (Musekiwa and Chatiza, 2015). However, the study results show that ULAs still isolate civil society organisations (CSO) and ratepayers associations, which indicates that there is partial implementation of the ZNWP provisions. It should be noted that, local authorities did not enjoy constitutional legal standing before the enactment of the 2013 Constitution and got their legal standing from Acts of Parliament which the ruling party could change with a simple majority. However, this changed with enactment of the 2013 Constitution, which elevated the status of local government. Section 5 of the 2013 Constitution of Zimbabwe identifies the tiers of government in Zimbabwe as: the national government; provincial and metropolitan councils and local authorities (Sections 268 and 269 read together with section 267 of the 2013 Constitution of Zimbabwe).

Section 5 (c) of the Constitution stipulates that local governments "*represent and manage the affairs of people in urban areas*" and rural local government '*represents and manage the affairs in rural areas*" (Constitution of Zimbabwe Amendment (No. 20) Act, 2013). Chapter 14, Section 264 (1) of the Constitution gives legal status to local government by advocating for the devolution of power to provincial and metropolitan councils and local authorities that are competent enough to carry out those responsibilities efficiently and effectively. The Preamble to Chapter 14 provides for the democratic participation in government by all citizens and communities of Zimbabwe, '*the participation of local communities in the determination of development priorities within their areas*' and '*devolution of power and responsibilities to lower tiers of government in Zimbabwe'* (Constitution of Zimbabwe Amendment (No. 20) Act, 2013*)*. In addition, Section 264(2) states that the objectives of the devolution of governmental powers and responsibilities are:

- to give powers of local governance to the people and enhance their participation in the exercise of the powers of the State and to promote democratic, effective, transparent, accountable and coherent governance in Zimbabwe;
- to preserve and foster the peace, national unity and indivisibility of Zimbabwe;
- to recognise the right of communities to manage their own affairs and to further their development;
- to ensure equitable sharing of local and national resources; and
- to transfer responsibilities and resources from the national government to establish a sound financial base for each provincial and metropolitan council and local authority.

Earlier discussions on WSS service provision paradigms note that Zimbabwe is amongst the few countries in Africa that are still using the local government or municipal system paradigm to manage water services. In recent years, most African countries have adopted different types of privatisation. Various water professionals argue that the municipal system is liable to constant political interference at the expense of efficiency, effectiveness and transparency in service provision (Nhapi, 2009). It is argued that efficiency is indispensable to the provision of WSS services because poor performance only hurts the poor, as the rich have other coping mechanisms, which leads to an infringement of the poor's human right to these services. Service regulation is a mandatory requirement in the provision of WSS services regardless of whatever form of paradigm is followed. However, regulation is difficult to enforce when municipalities or the government is in charge. Service providers must be accountable to the people they serve and not to political interests (Tom and Munemo, 2015; Nhapi, 2009).

Knowing both the policy and administrative (management paradigm) framework allows the researcher to proffer informed advice on how to close the implementation gaps in WSS service delivery. Chapter 2 highlights the pros and cos of each type of management principle adopted. Observations from the literature review indicate that, decentralisation policies are reportedly on paper even though local governments have the legal obligation to have autonomy in decision-making and management in their areas of jurisdiction. Chapter 4 results indicate incomplete devolution of powers and financial resources to ULAs. There is continued interference from Central Government through the Minister of Local Government. An incomplete devolution disconnects the local from the national aspects of the economy and society, which impedes service delivery by LUAs (Olowu, 2006).

The Urban Councils Act (Chapter 29:15) excludes CSOs in the management process. The inclusive and participatory governance enshrined in the principles of local government paradigm is violated in most ULAs. According to Castro and Heller (2009), the monopoly of local government paradigm in WSS does not mean that the roles of other key players should be overlooked. A continuous regulation of ULAs is indispensable if societal goals and the requirements of sustainable development are to be met in the water and sanitation sector. The ULAs are known for rendering poor services due to financial misappropriation rated at 42.3% including under-spending on WSS services (WPYD

Consortium, 2017). Overall, the results of this section inform the proposed contextual institutional and administrative model in Chapter 8.

7.3.2 EVALUATION OF THE EXISTING FRAMEWORK

The results presented below were generated from an evaluation of data gathered from the empirical study and literature reviews using the public policy approach and the human rights normative and cross-cutting criteria.

7.3.2.1 SUMMARY OF WSS SERVICE LEVEL INDICATORS

7.3.2.1.1 Qualitative gaps

Identified institutional gaps (see 4.2.2) include:

- Central government failure to encourage politically and financially ULAs to implement the ZNWP programmes,
- Vagaries of the political cycle,
- Interference in ULAs' activities and duties by political parties,
- Political instability that leads to economic meltdown and donor apathy,
- Incomplete devolution of powers and responsibilities,
- Lack of regulation,
- City Councils water management strategies that do not protect drinking water supplies,
- Lack of local by-laws to control urban agriculture,
- Inadequate emergency water supply plans ,
- Lack of collaboration by stakeholders responsible for the implementation and enforcement of the ZNWP together with an overlapping of institutional boundaries.

Identified financial (see 4.2.2) gaps include:

- Non-payment of WSS services and unsanctioned boreholes/dug-wells,
- No external nor Central Government financial support for ULAs for WSS infrastructure upgrade,
- Water rates that are too low to cover cost of water production,

- Affordability threshold for WSS services was 7.5% and 13.3% far above the recommended threshold of 3-5%.

Identified social gaps (see 4.2.2) include:

- Lack of clear leadership for water quality protection and WSPs at city council and local government,
- Inadequate practice of democratic culture: debate, consultation and participation of water users or CSOs,
- No active linkages between City Councils and government ministries and agencies (EMA, MoHCW (vertical linkages), nor linkages with ratepayers associations and relevant community organisations (horizontal linkages),
- Lack of community awareness and support regarding HWTS,
- Corruption.

Identified human/technical gaps (see 4.2.2) include:

- Lack of accountability,
- Inadequate or lack of data on drinking water supply systems and lack of data on system descriptions for WSP,
- Inadequate skilled manpower,
- Outdated software for processing water bills and assets or human resources management.

7.3.2.1.2 Quantitative gaps

The identified gaps (5.3.1 and 5.3.2) include:

- Shortages in emergency infrastructure for water supply and sanitation services,
- Infrastructure dearth,
- Inadequate treatment, pumping, storage and distribution infrastructure,
- Urban expansion that is not keeping pace with capital investment in water and sanitation infrastructure.

It has been noted that the existence of quantitative gaps is a result of one or more of the above capacity elements.

7.3.3 THE PROPOSED FRAMEWORK FOR URBAN WSS MANAGEMENT

Some gaps were identified based on the public policy and the human rights normative and cross-cutting criteria analysis of the existing service level and management structure. The main aim of this study was to examine institutional (policy) and the administrative framework for WSS services in Zimbabwean cities to inform development of a new framework. Some of the existing institutional (policy) and administrative framework loopholes that were identified promote third parties opportunistic behaviour that derails the intended policy goals. The lack of emergency plans for unforeseen disaster including disease outbreaks such COVID-19, was identified as serious gap. Emergency response and preparedness in the instance of an epidemic/pandemic, extreme weather is considered a very important element in the proposed framework.

The above-identified gaps can be reduced or eliminated if the proposed institutional and administrative framework shown below is adopted and enforced (Figure 7.2). In Figure 7.2, the thicker the arrow, the stronger the interaction or association is. The red arrows are associated with service regulation, which is a very serious gap that was observed in the old model. The blue arrows show WSS services.

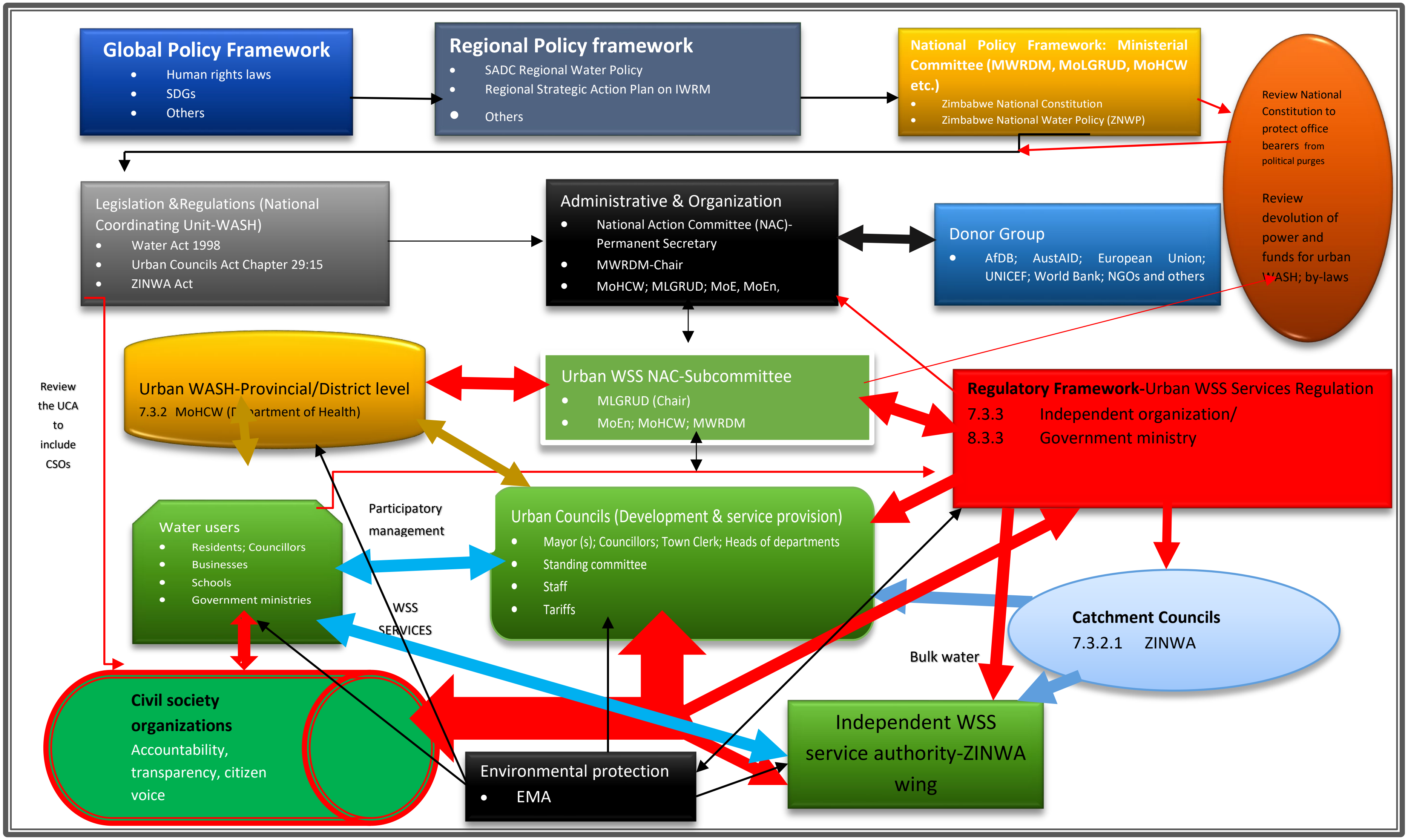


Figure 7.2: The proposed institutional and administrative framework for Zimbabwe's urban WSS services

7.3.3.4 Regulation and duplication of roles

The old institutional and administrative model is so fragmented and has many ministries and organisation such as the h Zimbabwe National Water Authority (ZINWA), regulating themselves. ZINWA is a service provider and a water resources management organisation. The only interaction of the urban WSS sector and the Water Resources Management sector should be at the Catchment Council level, which is a component of ZINWA. In addition, the MLGRUD, being the host (on the driver's city) at the Urban WSS NAC-Subcommittee, should only give direction on what it expects in WSS service delivery. Important organs of this committee, which should work together with the independent regulator who has no conflicting interest in the WSS services, must put in place measures to ensure legislations and regulations are implemented.

7.3.3.5 Civil Society organisations/Citizen voice

In addition to the above, the study results identified a very weak association between WSS service providers and water users. The new model strengthens the link by increasing the citizen voice through recognising the CSOs. The Urban Councils Act (Chapter 29:15) is silent about CSOs and many third part opportunists suppress the citizen voice using this legislation. The new model calls for a review of the UCA to include the role of CSOs at law. The new model also promotes consultations with the independent regulator by all interested stakeholders and encourages participatory management of WSS services. Finally, the elected councillors should cooperate with CSOs with the full Council Committee representing the citizen voice and not a political party's interests which leads to the next point below.

7.3.3.6 National Policy Framework review

The study noted institutional gap as a major gap that constraints the delivery of WSS services. It also noted political meddling and weak lack of political will by the Central Government epitomised by lack of financial support or subsidies towards urban WSS services as further constraints. The new model recommends the amendment of the Constitution of Zimbabwe: Part 5: Tenure of Member of Parliament – Section 129 (1) (k) which states that "*if the Member ceased to belong to a political party of which he or she was a member when elected to Parliament and the political party concerned, by written notice to the Speaker or the President of the Senate, as the case may be, has declared that the Member has ceased to belong to it*." Many constraints to delivery of WSS services are emanating from the national Policy Framework. The voter's rights are taken away and competent officers are removed using certain sections that do not s benefit citizens but individual interests. The Constitution explicitly state, under Section 298 (1) (b)-(f), how national funds must be shared for the development of the country with special provisions being made for marginalised groups and areas. Consequently, the proposed model suggests a review of the allocation of devolution funds based on the WSS infrastructure decay across the country. Long term efforts through legislation can help to improve the infrastructure which is worn out.

The Central Government is encouraged to support (WSS) service providers financially to prepare emergency plans and ensure continuity of service delivery. This could be done through subsidising/providing: water treatment chemicals and spare parts, fuel for pumps and treatment and salary supplements to compensate for the additional work-loads in cases of pandemics like COVID-19.

7.5 Donor apathy

The existing model shows a weak association between various stakeholders in WSS sector and the donor community including NGOs. Donor apathy also requires improvement in the institutional capacity and improved service regulation. Donors are about transparency and accountability and without regulation accountability and transparency cannot be enforced.

8.3.3.5 Environment and source water protection

The proposed model put into consideration the observed environmental pollution levels and urban agriculture. The Environmental Management Agency (EMA) could play a regulatory role in partnership with the WSS regulator for the same cause. The study identified lack of checks on urban environmental pollution from sewage spills and garbage accumulation in the environment.

8.3.3.6 Urban WASH

The study results indicate that there is a lack of urban health and hygiene education. The existing model has a national health education and hygiene knowledge programme called the Participatory Health and Hygiene Education (PHHE) and Community Based Management (CBM) stated in the ZNWP for rural communities. However, inadequate WSS services compel urban residents to engage in household water storage. The proposed model suggests that the same PHHE and Community Based Management (CBM) be enrolled as part of WSP in urban areas to facilitate behaviour change and improve hygiene practices, and that this must be done through the MoHCW's Department of Health.

7.4 THEORETICAL AND PRAGMATIC CONTRIBUTIONS

This section of the thesis demonstrates the uniqueness of this study and the significant contribution it makes to the body of knowledge regarding the gaps in the existing empirical literature. The section concludes with a re-contextualisation of the existing institutional and administrative framework in the urban water, waste water and sanitation sector in Zimbabwe.

7.4.2 SCHEMATIC PRESENTATION OF LITERATURE ON WSS IN ZIMBABWE

The researcher's through systematic literature search for studies in Zimbabwe that reported on the Zimbabwe National Water Policy and its implementation constraints on the delivery of WSS services in urban areas enabled him to identify some gaps in literature. The existing literature on the WSS discourses is summarised in Figure 7.3 and Figure 7.4.

i. **Current study framework on water supply and sanitation in Zimbabwe**

The schematic presentation of the types of studies and approaches that were used in previous studies through literature review show a paucity of studies that incorporated empirical methods or a combination of literature review and empirical methods (Taonameso et al., 2021). There was need to have more empirical or a combination of empirical studies and literature review in the analysis of the gaps between the Zimbabwe National Water Policy and its implementation in urban areas (Figure 7.3). This current study used a combination of both study methods in order to broaden analysis and provide adequate advice on bridging the gaps between policy and its implementation.

ii. **Schematic representation of topics on WSS publications on Zimbabwe**

The results from a review of literature on WSS studies in Zimbabwe that analysed policy in relation to water and sanitation services show that only three studies (5.8%) analysed water policies or legislation in Zimbabwe in relation to shortages in urban water supplies (Figure 7.4). This study makes a significant contribution to the discourse on WSS service delivery in Zimbabwe and the country's readiness for the 2030 Agenda on Sustainable Development Goal Target 6 for universal access to these services by all people regardless of where they live.

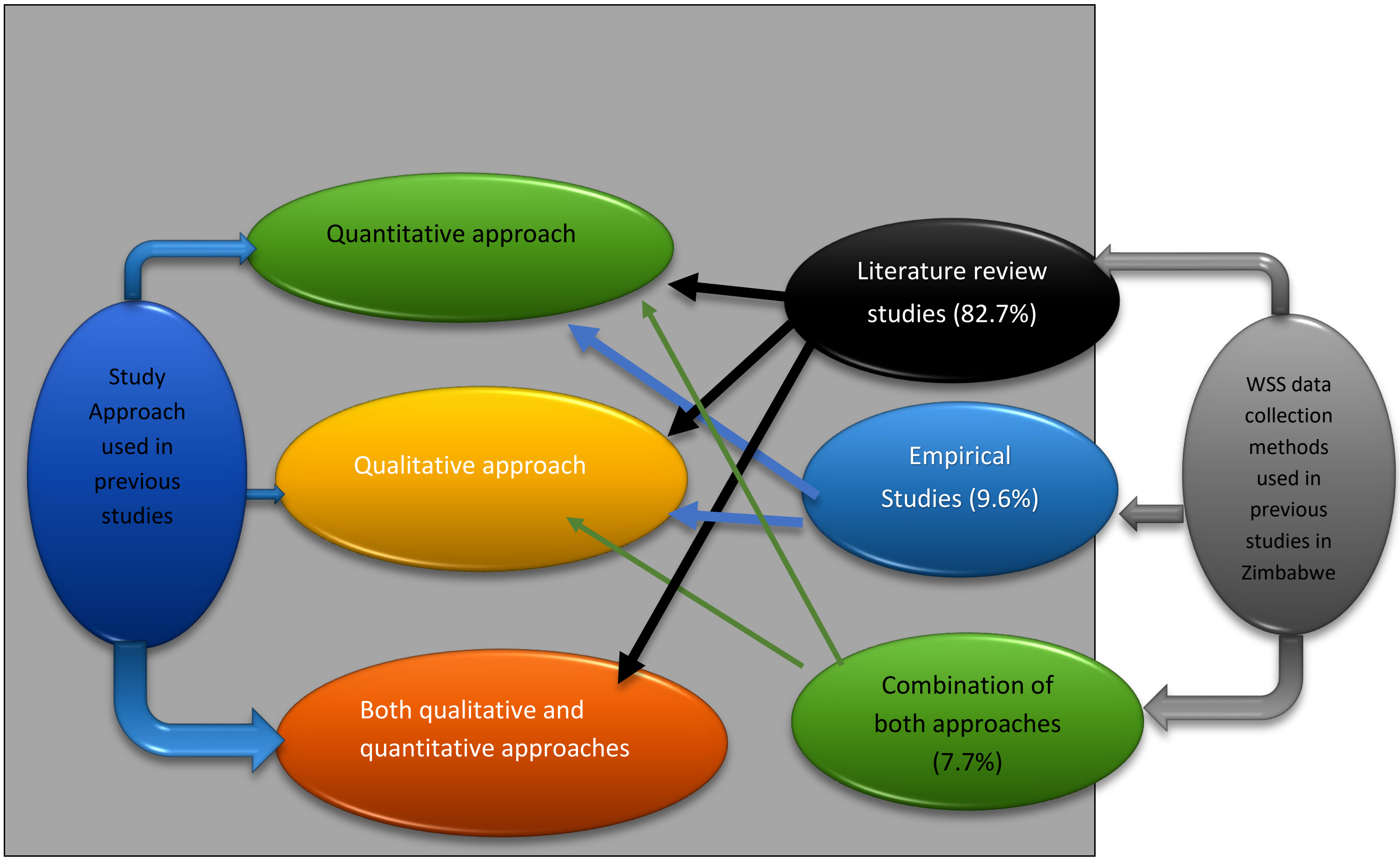


Figure 7.3: Schematic presentation of existing literature on water supply and sanitation in Zimbabwe (adapted from Taonameso et al., 2021)

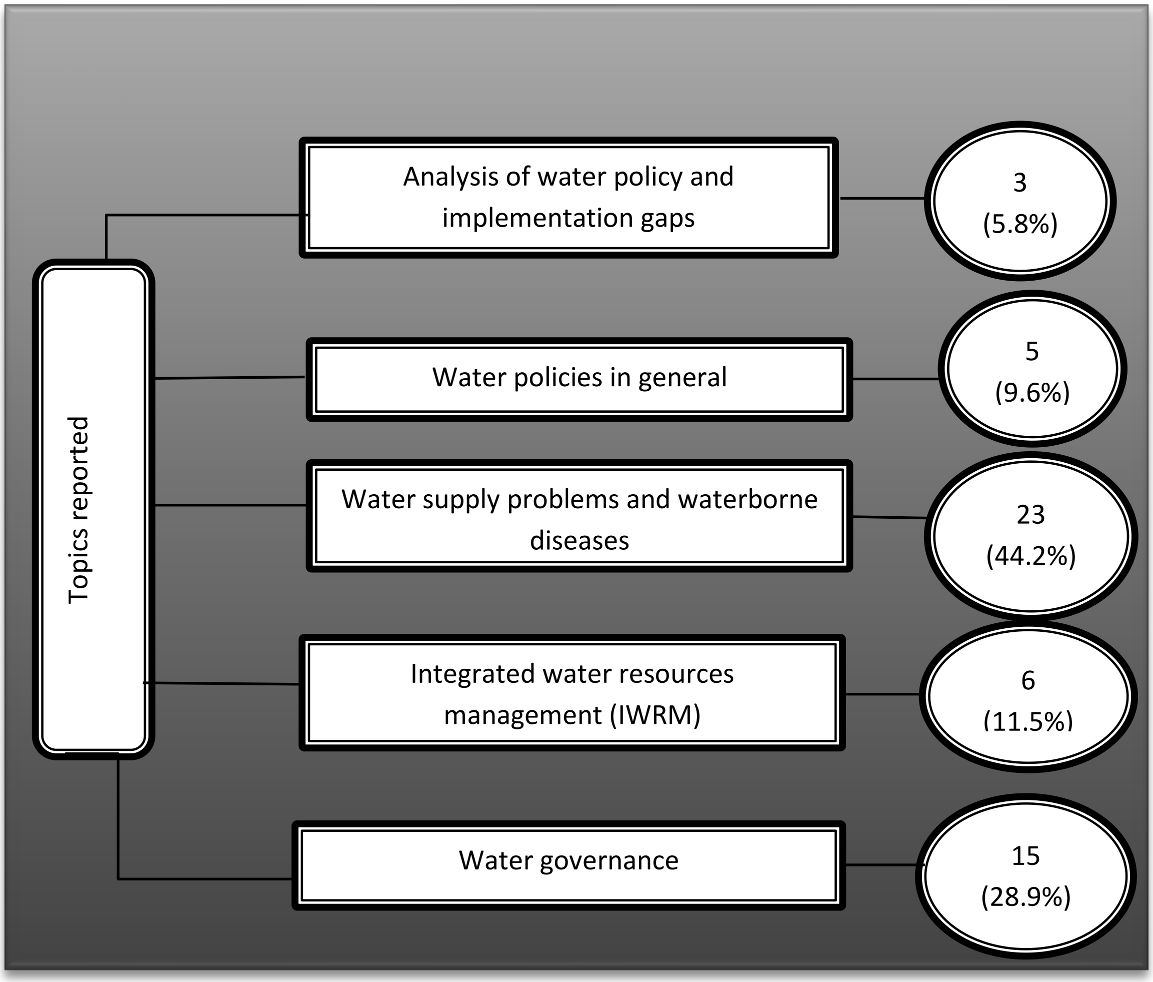


Figure 7.4: Schematic presentation of topics on WSS publications on Zimbabwe (adapted from Taonameso et al., 2021)

This study, which combined qualitative and quantitative approaches and, incorporated both document and empirical data analyses, contributes significantly to the body of knowledge on the ZNWP implementation gaps and provides a new perspective on how to look at the water woes in the Zimbabwe that goes beyond targeting only quantifiable and technical problems of the WSS sector. It is argued that a concerted effort by both technocrats and policy analysts can facilitate the process on how to attain universal access to water supply and sanitation services by 2030 (Taonameso et al., 2021).

7.4.3 DEVELOPMENT OF A RE-CONTEXTUALISED FRAMEWORK FOR URBAN WSS MANAGEMENT

Some gaps were identified based on the public policy and the human rights normative and cross-cutting criteria analysis of the existing service level and management structure. This study developed a new model that could be adopted based on the identified sources of gaps in the existing framework for the management of WSS services in urban areas in Zimbabwe (Figure 7.2).

7.5 CHAPTER SUMMARY

This chapter outlined the existing WSS framework in urban areas and showed how this study used a thorough literature search and empirical study in order to identify the highlighted gaps. The re-conceptualised framework tries to reduce or eliminate the factors that create the identified gaps. There is need to ring fence WSS management from the general water resources management because this situation creates fragmented responsibilities among the important stakeholders in urban water supply and sanitation.

CHAPTER 8
CONCLUSION

8.1 GENERAL INTRODUCTION

This chapter concludes this study. The first section presents an overview of the research, and this is followed by a discussion on the achievement of the research objectives and contribution to knowledge (novelty of the study).

8.2 OVERVIEW OF THE RESEARCH

Access to safe drinking water is indispensable for human health and dignity. Sustainable Development Goal (SDG) 6 calls for the universal access to water, sanitation and hygiene (WASH) services for all people regardless of where they live (UNICEF, 2020). The provision of these services in Zimbabwe's cities and towns is becoming a major challenge epitomised by episodes of waterborne diseases in recent years. The need to re-contextualise the existing approaches to understand urban water conundrums and the re-contextualisation of the existing management framework of water supply and sanitation services in Zimbabwe is a non-negotiable. Therefore, this study examined both technical and policy aspects of WSS services to explain urban water challenges. The study argues that both quantitative and qualitative gaps of the Zimbabwe National Water Policy (ZNWP) and its implementation are important if the urban water woes in Zimbabwe are going to be addressed. The research incorporated a solid empirical study backed by a literature review on the effectiveness of the ZNWP. A management framework on how to reduce and/or eliminate the gaps between the policy and its implementation is proposed to ensure the effectiveness of the policy.

8.3 ACHIEVEMENT OF RESEARCH AIM AND OBJECTIVES

The main aim of this research was to examine the institutional (policy) and administrative framework for water and sanitation services in Zimbabwean cities to inform the development of a new framework. Outlined below is how each of these objectives was achieved.

8.3.1 Research objective 1: To examine causes of urban water conundrums by analysing qualitative gaps between the ZNWP and its implementation using both an empirical and a secondary-based study

This objective has been achieved through an in-depth literature review and analysis of empirical data from Masvingo and Harare City in Chapter 4. Implementation gaps were identified as per Minnes and Vodden's (2017) four capacity elements that affect implementation of policy programmes. The results demonstrated that limited capacity (qualitative elements) including financial, institutional, technical/human and social factor) are the main reason for the observed gaps in the study area. Capacity limitations negatively impacted on the ability of city councils to employ and retain qualified drinking water operators. As a result, there was rampant skilled manpower flight that impacted on the provision of WSS services as directed by the ZNWP. Financial and human resource capacity challenges were also found to impact urban local authorities' (ULAs) capacity to deliver services to urban residents. Finally, the study results also showed that regulation needs to be enforced and that financial capacity is essential to support water policy programmes, the provision of drinking water and recruitment of skilled staff.

8.3.2 Research objective 2: To examine causes of urban water conundrums by analysing quantitative gaps between the ZNWP and its implementation in the provision of water supply services using both an empirical and a secondary-based study

This objective was achieved through in-depth literature review and an analysis of empirical data from Masvingo and Harare City in Chapter 5. A multitude of quantitative factors affecting the implementation of the ZNWP programmes were identified. The negative impact of these factors on the ZNWP implementation could explain causes of urban water woes in Zimbabwe. The identified quantitative gaps from empirical study included shortages in emergency infrastructure for water supply services, infrastructure dearth, and inadequate treatment, pumping, storage and distribution infrastructure, as well as an urban expansion that did not correspond with the ongoing capital investment in water and sanitation infrastructure. The identified quantitative gaps from document analysis included inadequate wastewater treatment plants; rapid urbanisation; expensive technology; obsolete water supply infrastructure; low water storage capacity; increase in urban population and urban agriculture.

8.3.4 Research objective 3: To examine the current service level on water supply and sanitation, risk assessment and audit water safety plans

The objective was achieved through an assessment of WSS service level indicators, risk assessment and water safety plan audit (Chapter 6). The normative criteria for good practices that were assessed include availability, quality/safety, acceptability, accessibility and affordability. The human rights cross-cutting criteria that were assessed include accountability and transparency; participation and empowerment (which incorporates the principles of information accessibility) and non-discrimination.

The results indicated that water was not always available in required quantities in almost all residential categories that were assessed. Tap water was safe for human consumption, but with some acceptability issues. It was also noted that water quality deteriorated with household storage and possible contamination through ingress at points of water pipe leakages while underground water was not safe in more than 50% of the cases. Water was physically and economically not accessible with the physical accessibility worsened by supply discontinuity that lead to some residents traveling long distances to collect water. Finally, sanitation facilities were available but of no use since they required water for flushing and water was not available all the time and thus, forcing people to practice open defaecation.

A total of 14 hazardous events were identified through literature review, field visits and observations. The results showed that ULAs lacked data on the monitoring and controlling of water quality. There was both limited data on water system description and limited or no evidence of WSP development and adoption of WSP approach by city councils despite calls from the WHO Africa (2019) and the Government of Zimbabwe to adopt WSPs (MWRDM, 2012, WHO Africa, 2019). The results of risk assessment showed lack of control measures and when control measures are incorporated, all identified hazardous presented low risk levels. Failure by City councils to provide safe continuous drinking water prompted the proliferation of unsanctioned boreholes and shallow wells in residential areas. Boreholes were the only improved alternative water sources. Unfortunately, the lack of water safety procedures and risk monitoring of these boreholes meant that cities are providing contaminated water.

8.3.4 Research objective 4: To evaluate the existing paradigm, institutional and administrative framework for WSS services in urban areas to inform development of a new management framework

This objective has been achieved following both semi-structured interviews with various stakeholders, and document analysis (Chapter 7). The results showed that the WSS services are managed following the public-sector principles or Local Government Paradigm. The results showed that the management principle follows the subsidiarity principle (devolution) in relation to the functional division between local and central governments and this is in line with the 2013 Constitution of Zimbabwe. The Local Government Paradigm of WSS management holds the view that water supply and sanitation services must be universally available and provided as a public good guaranteed by the state.

Local government is bases on a devolved system. However, this view that the legal mandate of local governments should be at the very centre of decision-making and management activities in relation to WSS has not been fully realised as the system faces challenges because decentralization policies exist only on paper. As already discussed, there is incomplete devolution of powers and financial resources to fund service delivery programmes. The central government continues to influence decisions at local government level through the Minister of Local Government, National Housing and Public

Works. Finally, the duplication of ministerial roles has resulted in local governments facing bad inter-ministerial relations, and a lack of coordination and accountability (Makunde et al., 2018).

There is disconnection between the national and local aspects of the economy and society which constrain local government efforts towards development (Olowu, 2006). The institutional framework (Urban Councils Act [Chapter 29:15]) excludes other key players (Civil society organisations) in the management process. The holistic and prudent inclusive and participatory governance enshrined in the principles of local government paradigm is violated. Castro and Heller (2009) argue that the overwhelming dominance of the public-sector in WSS does not mean that the roles of other stakeholders, such as citizens, water services users and private enterprises should be overlooked. Instead, their responsibilities must be assessed and formulated so that societal goals and the requirements of sustainable development are met in the water and sanitation sector.

In recent years, the urban local authorities have been accused of corruption and spending much on their salaries contrary to the basic aim, which is the non-profit principle. It is argued that any profit or benefits realised thereof, must be channelled towards improving WSS services and creating a better environment, or to open more affordable services (Castro and Heller, 2009). Extra benefits from WSS service charges can also enhance time saving, economic productivity, and the convenience and dignity of individuals and families, such as helping to increase girl child's attendance at school. Overall, the results showed that the local government principles are not fully implemented and abused because of the monopoly associated with WSS services. The situation is aggravated by inadequate service regulation because of duplication of ministerial roles.

8.4 STUDY LIMITATIONS, FUTURE RESEARCH AND RECOMMENDATIONS

This section presents the limitations to the study and future research.

8.4.2 LIMITATIONS

i Resource constraints, including financial and microbiological consumables, limited the number of household interviews conducted and water samples collected for this study. More primary data can be collated through extensive interviews that cater a larger urban population to get a broader picture of the extent of water challenges and their possible causes. More water samples from urban water sources could be collected to determine the extent to which urban local authorities comply with national set limits for water quality.

ii Volatile relationships and infighting within the Harare City Council's top authorities, characterised by the suspension of the City Mayor and other senior managers, constrained the researcher's initial plan to attend stakeholder meetings. The instability and political meddling also constrained sampling efforts because access to residential areas was very restricted. Any request to attend meetings was not granted on suspicion of espionage with city officials being skeptical of any studies in the city because they feared spying and hence opted to bar any studies in the rest of the suburbs. Only five residential areas serviced by the Harare City Council (HCC) participated in the household surveys and most of the data from the HCC came from literature reviews. The disadvantage of secondary data is in that it is difficult to control biases in the data.

iii Participation from municipal government officials was mostly telephonic as they were not available for face-to-face interviews because of their tight schedules.

8.4.3 SUGGESTED FUTURE RESEARCH

i The researcher suggests that a more comprehensive study on ZNWP implementation gaps and solutions in the HCC be carried out using a mixed method approach and in-person interviews, possibly combined with participant observation to provide additional insights regarding community conditions and from observing activities within drinking water supply areas. This would enable researchers to obtain first-hand information on the ZNWP policy implementation in the City of Harare.

ii Further research could also be carried out to determine the extent and ways in which specific capacity factors like finance or human resource contribute to the ZNWP implementation (and implementation gaps) at the provincial level, such as recruiting and retaining qualified drinking water operators.

iii More empirical evidence is required to validate the extent of WSP development and adoption in ULAS. The interviews with council officials required more time for them to gain trust in the researcher to be able to disclose more information regarding WSP adoption.

8.4.4 RECOMMENDATIONS FOR ADDRESSING IMPLEMENTATION GAPS

Recommendations on how to address the implementation gaps in the ZNWP and regulations in Zimbabwe's urban areas are discussed below.

i. Adequate political support

Political interference in council operations was identified in this study as one of the major challenges contributing to the ZNWP policy and regulation implementation gaps in Zimbabwe's urban areas. This is particularly evident in both Masvingo City Council and the Harare City Council where mayors and elected councillors have been recalled or suspended on political grounds (Bulawayo24.com 28 September 2021; HRT, 2021). The National Constitution should be reviewed and the close that gives political parties the right to recall elected councillors and members of parliament amended because this act is being abused for political expediency and undermines the voters' choices. In the end, the voters' rights are taken away using some legislations. The Human rights obligation to the realisation of the right to water and sanitation to "*Respect*" requires that States do not interfere directly or indirectly with the enjoyment of this right. States should refrain from engaging in any practices or activities that deny or limit equal access to adequate water; and arbitrarily interfering with customary or traditional arrangements for water allocation such as interfering with service provision processes (CESCR, 2003; Levin et al., 2009; Meier et al., 2014).

In addition, the obligation to "*Protect*" requires the State to prevent third parties from interfering in any way with the enjoyment of the right (CESCR, 2003; Levin et al., 2009; Meier et al., 2014). Third parties include individuals, groups (such as political parties) and other (governmental) entities such as the Ministry of Local Government. The state's obligation includes effective legislation (Constitution) and other enforcement mechanisms that seek to restrain third parties, for example from charging unaffordable prices for drinking water or interfering with service delivery. It was reported that the HCC was on autopilot due to the suspension of the MDC-A mayor, all done for political patronage at the expense of the ratepayers.

The obligation to "*fulfil"* requires that the State take positive measures to assist individuals and communities to enjoy the right to water by taking targeted steps that include empowering citizens through proper education on household water storage and hygiene, WSP and ways to reduce water wastage (CESCR, 2003; Levin et al., 2009; Murthy, 2013; Meier et al., 2014).

ii Adequate financial support for the ZNWP implementation

Government should subsidise city council projects that are capital intensive. Capital intensive projects, such as drinking water or sanitation infrastructure augmentation or development, because the economic situation has taken away council capacity to invest in these services. Financial challenges for undertaking WSS programmes and regulation implementation were one of the major findings of this study and these should ultimately contribute to the ZNWP policy and regulation implementation gaps in Zimbabwe's urban areas. This is particularly evident in all ULAs that had limited sources of revenue.

Adequate financial support and funding opportunities for ZNWP related activities is key to addressing the existence of implementation gaps. Ensuring the appropriate level of investments from stakeholders (governmental and non-governmental organisations), both financially and from a perspective of human resource capacity, is critical to ensure that WSS policies, regulations and programmes are implemented (WHO, 2011). Limited or no funding implies that activities related to WSP, monitoring, education and public awareness, and communication and the recruitment of qualified staff will be affected and ultimately result in compromises to the safety of drinking water supplies.

Financial viability of the ULAs' programmes towards service delivery is critical, especially over the long-term. Tariffs should be reviewed to cover costs of drinking water production. To allow tariff reviews, ratepayers should be empowered financially to improve WSS affordability. Low income has forced government to restrict tariff reviews in an effort to protect the citizens from already dire economic situation. Funding may be needed through government subsidies specifically for infrastructure development and augmentation, stakeholder awareness, engagement and conflict resolution, and for the inspection of activities and checking of compliance (WHO, 2011).

iii Complete devolution of power to ULAs

City councils should operate independently and empowered to pass resolutions under guided legislation that can be checked by and independent regulatory board. The current set-up allows the minister of Local Government to interfere with council operations at the expense of service delivery. There should be complete devolution of financial resources from Central Government to reduce/eliminate the bureaucratic procedure faced by ULAs in their attempts to secure funds for ZNWP programmes.

iv Need for immediate formation of the Water and Wastewater Services Regulatory Unit (WWSRU) as required by the ZNWP

Lack of regulation in the water sector in Zimbabwe leaves ratepayers vulnerable to discrimination and lack of accountability for the services by ULAs. The WWSRU should regulate the EMA to ensure that it fulfils its statutory obligations to protect the water and land from pollution and degradation by taking sewage spills seriously. Source water protection will not be achieved if councils discharge raw sewage into the environment. The EMA must do its duties without fear or favour and ensure that the environment is rehabilitated after sewage spills. In addition, the Ministry of Health and Child Care's Health Department, EMA and the ULAs should collaborate to limit pollution and thus, ensure public health.

v National Water Supply and Sanitation Services Utility (NWSSU) as required by the ZNWP

There is still a conflict of interest in the ZINWA with regards to drinking water supply services. The study recommends the immediate formation of the NWSSU to allow ZINWA to concentrate on the IWRM obligations.

vi Include urban WASH in the administrative framework of WSS

The Health Department and the ULAs should collaborate in facilitating education and awareness campaigns on household hygiene and household water storage as part of WSP. This recommendation arises from the observation that unreliable water supply forces urban dwellers to resort to household water storage. The study found that household water storage is a serious hazardous event that leads to both microbiological and physical hazards.

vii Communication, education and awareness

The ZNWP implementation gaps can be addressed through education, training and awareness. The WHO (2011) notes that there must be adequate resources dedicated to education and awareness building on the importance of water policy regulations and policies to drinking water safety in order to minimise implementation gaps. Educating the public is crucial to aspects of water policy that include improving stakeholders' understanding of the importance of WSP and can mitigate the impact stakeholders have on access to WSS and protection of public health. The observed limitations in public and municipal awareness of the importance of WSPs and its requirements compels for more education and capacity-building opportunities for decision makers, such as mayors, councillors and council staff, concerning best practices for managing drinking water systems and other stakeholders in water management. Finally, household water treatment and safe storage (HWTS) should be included as part of water safety planning. The study found out that most drinking water contamination occurs during water transportation and storage. Hence, HWTS should be enforced y to reduce the burden of waterborne disease outbreaks such as the reported typhoid cases in Harare residential areas and ultimately safeguard public health (CAWST, 2016).

viii Community involvement and participation

Community involvement and participation in city council policy decisions must also be prioritised (Illsley, 2003). This will enhance implementation success and reduce implementation gaps. Timmer et al. (2007) note that ratepayers play an important role in addressing implementation gaps by participating in the development and enforcement of WSS policy and regulation. Democratic practices, which include debate, consultation and participation of water users or civil societies representing ratepayers, should be encouraged. Information regarding meetings to discuss budgets or tariffs among others should be disseminated on time or shared using means that ensure accessibility by ratepayers from all social strata. In addition, citizen voices must be recognised and as such, the role of ratepayers associations should be legislated in the Urban Councils Act (Chapter 29:15). Accountability by ULAs should also be monitored by a regulator to ensure that ratepayers are protected from third party abuses.

There should be active linkages between city councils, government ministries and agencies that include EMA and MoHCW (vertical linkages), and with ratepayers associations and relevant community organisations (horizontal linkages). It was observed that EMA, the Department of Health and ULAs do not collaborate in dealing with source water pollution, environmental protection and urban WASH. Inadequate drinking water protection at source, during distribution and household storage led to episodes of waterborne diseases in urban areas. Consequently, community awareness and support regarding WSP and household hygiene should be enforced.

ix Enforcement and accountability

The study recommends the formation of an independent regulatory board that will enforce accountability in the public sector. ULAs' projects must be audited. This is because the study findings show a lot of uncompleted projects including a major sewerage augmentation project in Masvingo City and the HCC. Corruption and unaccounted expenditure by council officials is rampant. The literature review also indicated the prevalence of lack of accountability where most city councils refused to disclose information regarding council accounts. The SLB peer reviews must be legislated in the Urban Councils Act and should include independent stakeholders in order to make them to be more effective and eliminate biases. Finally, SLB reviews should assist in supporting better service delivery.

x Emergency response and planning

A plan for emergency responses, which defines roles and responsibilities in case of possible and confirmed supply interruption or confirmed water contamination, should be put in place by all ULAs. The identified public emergency drinking water sources in both city councils included water boreholes and water trucking. The study noted that the existing infrastructure for water and sanitation was in a very bad state and hence, it is not feasible to expect immediate solutions to this infrastructure decay. However, long-term investment in borehole drilling and water trucks can help to lessen the burden of water shortages that are caused by infrastructure decay such as water pipe bursts, leaks and pump failures. In addition, WSP should be enforced to protect water boreholes in cities because most of this infrastructure is unfenced and thus, leaving it vulnerable to contamination. There should also be water bowsers solely dedicated to transport drinking water. The study identified that the same trucks used to transport grey water for construction and roadworks are the same trucks that are used to transport drinking water during supply interruption. The study also recommends investment in system pressure and control valves and, leak detectors. System control valves can help to manage water allocation and distribution to various residential areas and help reduce the problems of pressure loss. Residential areas on higher ground were reportedly not receiving water supplies equally the same as low lying areas, this creates a condition of unequal access to these services. The above-noted devices enable service providers to take full control of the supply system and monitor drinking water system pressure.

8.5 CHAPTER CONCLUSION

This chapter outlined the limitations of the research and suggestions for further research. The chapter also set forth recommendations towards enhancing the elimination or reduction of the gaps between the Zimbabwe National Water Policy (ZNWP) and its Implementation in Zimbabwe's urban areas.

The results of this study were obtained through household and stakeholder semi-structured interviews. The researcher also managed to attend scheduled meetings on WSS service delivery organised by the City of Masvingo. Some data was collected from field observations as the researcher interacted with the respondents, WSS infrastructure (an inductive approach) including and from the researcher's prior theoretical understanding of the phenomenon under study (deductive approach). There were three research questions:

- *Question 1*: What are the quantitative or qualitative gaps between the ZNWP and its implementation based on literature review and empirical evidence to explain the causes of critical potable water shortages in Zimbabwe’s urban areas?
- *Question 2*: Which risk factors exist in the water supply and sanitation sector in urban areas and what is the current service level in urban areas?
- *Question 3*: What policy (institutional) and administrative framework guides urban water supply and sanitation management?

The first question was answered successfully through analysis of data using descriptive and inferential statistics and qualitative data, which was grouped into four themes: institutional capacity, financial capacity, human/technical capacity and Social capacity (Chapter 4.2.1 and 4.2.2). The second question was answered successfully through analysis of water service level based on the WHO (2017) Guidelines for safe Drinking Water Quality 4th Edition (GDWQ) (WHO/IWA, 2016), the ZNWP and the Standards Association of Zimbabwe (SAZ-560:1997) (Chapter 6.3.8). The data to answer question three was obtained from semi-structured interviews with local authorities and document analysis. The data was analysed guided by public policy analysts that included Brinkerhoff and Crosby (2002), Hukka and Katko (2003), Pretorius (2003), Castro and Heller (2009), and Jomo et al. (2016). The short falls of the current framework for WSS management were identified and the study proposed a new institutional and administrative framework to reduce or eliminate the identified gaps (Chapter 7.3.1). Overall, the study results and analysis can proffer possible solutions to the current status of WSS services in Zimbabwe’s urban areas.

VALIDATION OF THE PROPOSED MODEL

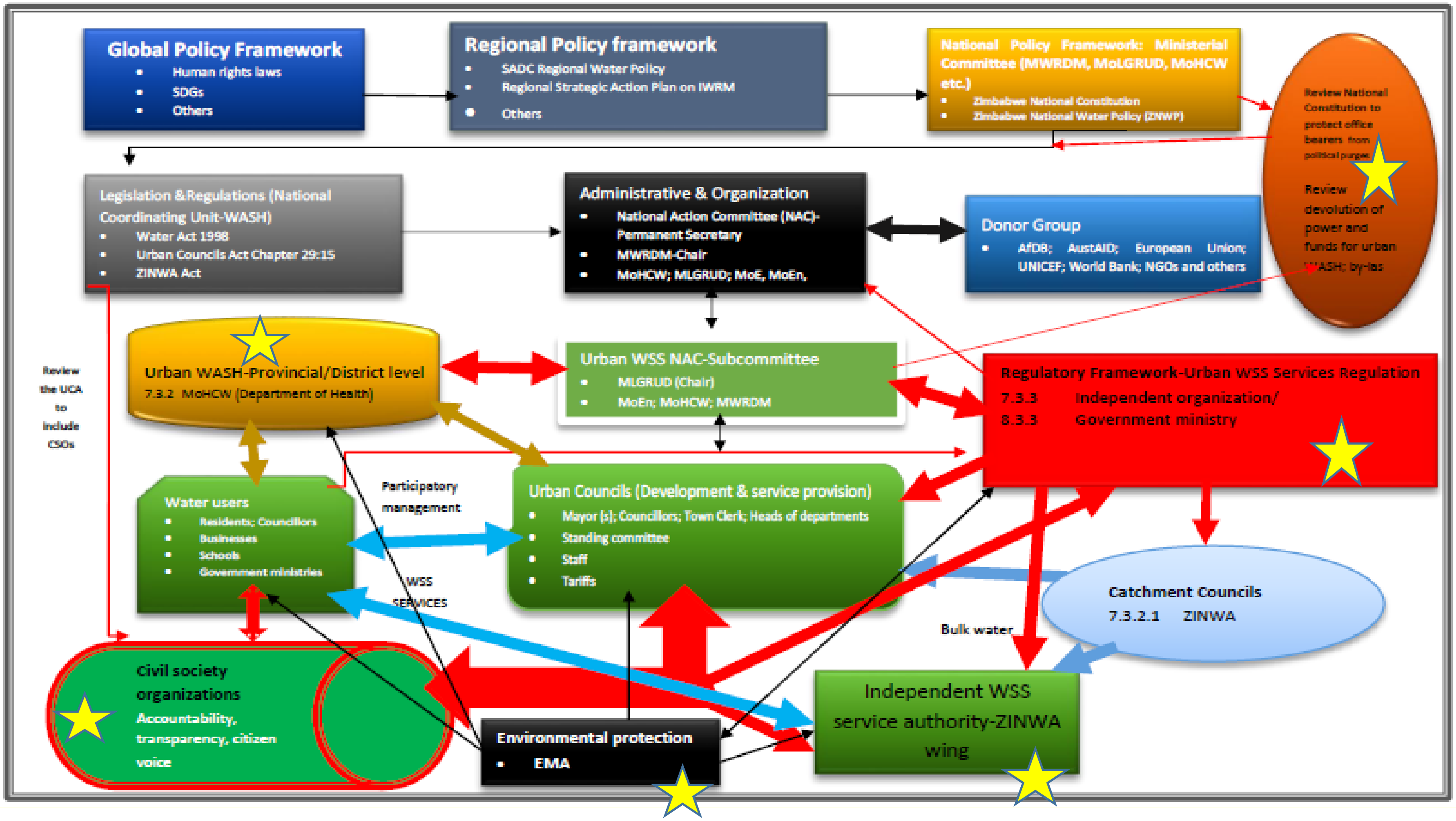


Figure 1: The proposed institutional and administrative framework for Zimbabwe's urban WSS services

MODEL VALIDATION

Model validation is the process of determining whether the model accurately represents the behavior of the system (Kerr and Goethel, 2014). Model validity should be evaluated both conceptually (by determining whether the theory and assumptions underlying the model are justifiable) and operationally (i.e., by determining if model output agrees with observed data) (Kerr and Goethel, 2014). Models can be validated by comparing output to independent field or experimental data sets that align with the simulated scenario.

Operational evaluation of the proposed model involves checking full implementation of the asterisked points on the model. A multi-stakeholder effort is indispensable to full implementation of the model. Critical steps in effective implementation involves the following processes:

1. National Policy and Administrative Framework review (Water governance)

Sustainability of WSS remains a serious challenge including deficient institutional and administrative structures, lack of political will, accountability and lack of stakeholder engagement as part of the problem. For instance, consumers are not included in planning, and there are no established regular review processes.

The first step in implementing the new model requires the researchers tabling before the Urban WSS National Action Committee (NAC) –Subcommittee:

i. The need to review the National Constitution to protect public office bearers from political purges.
ii. Review devolution of power and funds for urban WASH;
iii. Review the Urban Councils Act to include Civil Society Organisations, and
iv. Review by-laws on urban agriculture, sources water and wetland protection
v. Need for an urban WASH under the Ministry of Health and Child-Welfare
vi. Need for an independent service regulator
vii. Implement the WSS Service Authority under ZINWA, and
viii. Review the Environmental Agency (EMA)'s statutory roles in urban areas.

Researchers will consult with the Urban WSS NAC-Subcommittee as the most local administrative organ with powers to take the proposals up to the National Coordinating Unit (NCU)-WASH which has the powers to put this before the Ministerial Committee which has the powers to review the national policies including the National Constitution.

↓

2. Full implementation of the new institution and administrative frameworks

Before validation can commence, the researchers would wish to see adoption and implementation of the identified policy and administrative deficiencies. Transparent, accountable and results-oriented frameworks for action will be needed. In many cases, cost recovery and increased attention on users fees will be encouraged to allow a fair evaluation of the model.

3. Testing the model

The urban local authorities that participated in the study will be expected to fully implement the model under the supervision of an independent regulator with full political support from the Central Government of Zimbabwe.

4. Model Validation

The model will be validated by systematically comparing the model output (WSS service level including drinking water availability (quantity, continuity, acceptability and accessibility (physical and economic) with previous data on WSS services in urban areas. In additional, the model output also include WSS service equity; accountability and transparency. Water safety planning (WSP) evaluation will further allow validation of the new model by providing data on source water protection, household water storage and hygiene practices.

In the meantime, the researchers are trying to arrange meetings with the Urban National Action (NAC)-Subcommittee to share results of the research and negotiate for a discussion on the key proposals regarding the institutional and administrative framework for WSS services in urban areas.

REFERENCES

Abrams, L. (2000). Water Resource Management Policy: Guidelines for the Preparation of a Water Policy Document. Water Policy International. Available at: http://www.africanwater.org/policy_doc_prep.htm (accessed 1 April 2016).

African Development Bank (AfDB) (2010). Zimbabwe Report-Chapter 7: Water Resources Management, Supply and Sanitation. Available at: https://www.afdb.org/fileadmin/uploads/afdb/Documents/GenericDocuments/9.%20Zimbabwe%20Report_Chapter%207.pdf (Accessed 18 December 2016).

African Institute for Development Policy (AFIDEP) (2016). Deficient Water Safety Surveillance in Kenya, Ministry of Health Policy Brief. Government of Kenya. Available at: https://www.afidep.org/publication/deficient-water-safety-surveillance-in-kenya/ (accessed 12 May 2021).

Agensi, A., Tibyangye, J., Tamale, A., Agwu, E. & Amongi, C. (2019). Contamination Potentials of Household Water Handling and Storage Practices in Kirundo Sub-county, Kisoro District, Uganda. *Journal of Environmental and Public Health*. Available at: https://doi.org/10.1155/2019/7932193 (accessed 30 May 2021).

Allafrica.com (27 September 2021). Zimbabwe should hold by-elections, U.S. insist. Available at: https://allafrica.com/stories/202109270252.html (accessed 12 December 2021).

AMCOW **(**2011). Country Status Overview (CSO2): Water Supply and Sanitation in Zimbabwe Turning Finance into Services for 2015 and Beyond, 2011.

AquaFed (2010). The Roles of Governments in Relation to the Different Water Operators with Respect to the Right to Water and Sanitation. Part 2 of the AquaFed's submission to the Independent Expert on the issue of human rights obligations related to access to safe drinking water and sanitation. Available at: http://www.aquafed.org/pages/fr/admin/UserFiles/pdf/2010%20CDA_RTWS_Aquafed-3.pdf. (accessed 12 July 2019).

Bae, S., Lyons, C. & Onstad, N. A. (2019). Culture-dependent and metagenomic approach of household drinking water from the source to point of use in a developing country. Water Res. X. 2, 100026.

Baietti A., Kingdom W. & Ginneken M. V. (2006). Water Supply and Sanitation Working Notes. Note no. 9, Characteristics of Well Performing Public Water Utilities, Washington DC, World Bank.

Bakker, K. (2010). Privatizing water: Governance failure and the world's urban water crisis. Ithaca: Cornell University Press.

Bartram, J., Corrales, L., Davison, A., Deere, D., Drury, D., Gordon, B., Howard, G., Rinehold, A. & Stevens, M. (2009). Water Safety Plan Manual: A Step-by-Step Risk Management for Drinking-Water Suppliers. World Health Organization (WHO): Geneva, Switzerland.

Bhat, M. (1996). Outcome of Rehabilitation Programme: Is there a differential response? *European Psychiatry*, **11** (4), 281 – 295.

Bland, G. (2011). Overcoming a Decade of Crisis: Zimbabwe's Local Authorities in Transition. *Public Administration and Development*, **31** (340-350).

Bogdan, R. C., & Biklen, S. K. (2003). Qualitative Research of Education: An Introductive to Theories and Methods (4th ed.). Boston: Allyn and Bacon.

Bos, R., Alves, D., Latorre, C., Macleod, N., Payen, G., Roaf V. & Rouse M. (2016). Manual on the human rights to safe drinking water and sanitation for practitioners. Available at: https://iwa-network.org/wp-content/uploads/2016/08/Chapter_3_Pages_14_to_35.pdf (accessed 22 December 2020).

Bosshardt, U. (2003). (HACCP) Hazard Analysis and Critical Control Points at the Zurich water supply. Available at: http://www.svgw.ch/fileadmin/resources/svgw/web/Shop-Boutique/download/04_W-Fachinformationen/SVGW_Shop_W15006_e_2003.pdf (accessed on 22 January 2015).

Breach, B. (ed) (2012). Drinking Water Quality Management from Catchment to Consumer. A Practical Guide for Utilities Based on Water Safety Plans. IWA Publishing, London, New York.

Brinkerhoff, D.W. & Crosby, B.L. (2002). Managing policy reform: Concepts and tools for decision makers in developing and transitioning countries. Bloomfield, Kumarian Press Inc.

Brown, J., Hamoudi, A., Jeuland, M. & Turrini, G. (2017). Seeing, believing, and behaving: heterogeneous effects of an information intervention on household water treatment. *Journal of Environmental Economics and Management* **86**, 141–159.

Bulawayo24.com (28 September 2021). Chaos at Harare House.

Burton, J., Patel, D., Landry, G., Anderson, S. M., & Rary, E. (2021). Failure of the "Gold Standard": The Role of a Mixed Methods Research Toolkit and Human-Centered Design in Transformative WASH. *Environmental health insights* **15**, 1–4. Available at: https://doi.org/10.1177/11786302211018391 (accessed 15 February, 2022).

Carter, S.A. (2014), Practical Applications of Statistics in Social Sciences, University of Southampton.

Castro, J. E. & Heller, L. (2009). Water and Sanitation Services: Public Policy and Management. UK, USA, Taylor and Francis publishers.

Centers for disease control and prevention (CDC) (2021). Creating and Storing an Emergency Water Supply. Available at: https://www.cdc.gov/healthywater/emergency/creating-storing-emergency-water-supply.html (accessed 11 June 2021).

Centers for disease control and prevention (CDC) (2009). Health risk appraisals. Available at: https://www.cdc.gov/workplacehealthpromotion/tools-resources/workplace-health/assessment-tools.html (accessed 10 November 2020).

Centers for Disease Control and Prevention (CDC) (2011). A Conceptual Framework to Evaluate the Impacts of Water Safety Plans. Atlanta. Available at: http://www.cdc.gov/nceh/ehs/gwash/publications.htm.

Centre for Affordable Water and Sanitation Technology (CAWST) (2009). An Introduction to Household Water Treatment and Safe Storage. A CAWST Training Manual. Calgary.

Centre for Affordable Water and Sanitation Technology (CAWST) (2016). Technical Brief: Water Safety Plans (WSPs) and Household Water Treatment and Safe Storage (HWTS). CAWST, Calgary, Canada. Available at: www.caw.st/WSPs_HWTS (accessed 2 August 2021).

Centre on Housing Rights and Evictions (COHRE) (2008). The human right to water and sanitation: Legal basis, practical rationale and definition. Available at: www.cohre.org/water (accessed 2 May 2018).

Chakaipa, S. (2010). Local government institutions and elections, in De Visser J, Steytler, N and N Machingauta (eds) Local Government Reform in Zimbabwe: A Policy Dialogue. Bellville: Community Law Centre.

Chaminuka, L. & Nyatsanza, T.D. (2013). Assessment of water shortages and coping mechanisms of Harare residents: A case of Msasa Park and Dzivarasekwa Extension. *IOSR Journal of Agriculture and Veterinary Science* **4** (93), 21-35.

Chatiza, K. (2010). Can local government steer socio-economic transformation in Zimbabwe? Analysing historical trends and gazing into the future. In De Visser, J., Steytler, N. and Machingauta, N. (Eds). Local government reform in Zimbabwe: A policy dialogue. Bellville: Community Law Centre. University of the Western Cape. pp: 1-30.

Chidavaenzi, M.T., Jere, M., Nhandara, C., Chingundury, D. & Bradley, M. (1998). An evaluation of water urns to maintain domestic water quality. 24th WEDC Conference, Islamabad, Pakistan. (ed. J Pickford) WEDC, Loughborough, pp. 249–253.

Chigonda T. (2011). Water supply and sanitation in the new residential areas in new Zimbabwean Towns. *Journal of Sustainable, Development in Africa* **12** (3), 349-362.

Chigudu, D. (2014). Public procurement in Zimbabwe: Issues and challenges. *Journal of Governance and Regulation* **3***(4),* 21-26. Available at: https://doi.org/10.22495/jgr_v3_i4_p2 (accessed 26 November 2020).

Chigudu, D. (2015). “Navigating policy implementation Gaps in Africa: The case of Zimbabwe, Risk governance & control," *Financial markets & institutions* **5** (3), 7-14. Available at: http://dx.doi.org/10.22495/rgcv5i3art1 (accessed 3 August 2019).

Chigwenya, A. (2010). "Decentralization without devolution and its impacts on service delivery: the case of Masvingo municipality in Zimbabwe." *Journal of Sustainable Development in Africa (Volume 12, No.1, 2010)*.

Chikozho, C. (2002). Restructuring the Commons: Water Reforms in Southern Africa in the Context of Global Water Resources Management Paradigm Shifts. Available at: https://www.researchgate.net/publication/42760935. (accessed 21 April, 2017).

Chirenda, T. G., Srinivas, S. C. & Tandlich, R. (2015). Microbial water quality of treated water and raw water sources in the Harare area, Zimbabwe. Available at: https://doi.org/10.4314/wsa.v41i5.12 (accessed 13 April 2018).

City of Harare (1996). Leakage Control and System Rehabilitation Programme within the City of Harare. Department of Works, Harare, Zimbabwe.

City of Masvingo (2019). City Council Offices, Civic Centre, Masvingo, Zimbabwe.

City of Masvingo (2021). Available at: www.masvingocity.org.zw (accessed 12 April 2021).

Clasen, T. Roberts, I. Rabie, T. Schmidt, W. & Cairncross, S. (2006). Interventions to improve water quality for preventing diarrhoea. *Cochrane Database of Systematic Reviews*, (3). DOI: 10.1002/14651858.CD004794.pub2.

Coalition Eau (2009). Is Drinking Water Affordable for All? Available at: www.coalition-eau.org (accessed 12 June 2020).

Cochran, C. & Malone, E. (1995) Public Policy: Perspectives and choices, McGraw-Hill, New York

Combined Harare Residents Association (CHRA) (2009). Harare Water's Inconsistent Billing: A Cause for Concern. Available at: http://www.kubatana.net/html/archive (accessed 10 January 2021).

Combined Harare Residents Association (CHRA) (2021). Harare City Council operates on autopilot. Available at: http://www.chra.co.zw.

Committee on Economic, Social and Cultural Rights (CESCR) (2003). General Comment No.15: The Right to Water (Arts. 11 and 12 of the Covenant), E/C.12/2002/11. Available at: https://www.refworld.org/docid/4538838d11.html (accessed 4 April 2021).

Committee on Economic, Social and Cultural Rights (CESCR) (2010). Implementation of the International Covenant on Economic, Social and Cultural Rights: list of issues to be taken up in connection with the consideration of the combined 2nd and 3rd periodic reports of Cameroon, concerning articles 1 to 15 of the International Covenant on Economic, Social and Cultural Rights (E/C.12/CMR/2-3), 9 December 2010, E/C.12/CMR/Q/2-3. Available at: https://www.refworld.org/docid/52d6542c4.html (accessed 6 October 2020).

Community Water Alliance (2017). Sustainable Access to Available Safe Water: Universal Period Review Zimbabwe. Available at: https://www.ohchr.org/Documents/Issues/Water/ServiceRegulation/NSA/CommunityWaterAlliance.pdf (accessed 24 July 2020).

Conger, J. (1998). Qualitative Research as the Cornerstone Methodology for Understanding Leadership. *The Leadership Quarterly*, 107-121.

Constitution of Zimbabwe Amendment (No. 20) Act, 2013 (Zimbabwe), 22 May 2013. Available at: https://www.refworld.org/docid/51ed090f4.html (accessed 29 November 2021).

Cunliffe, D., Bartram, J., Briand, E., Chartier, Y., Colbourne, J., Drury, D., Lee, J., Schaefer, B. & Surman, S. (2011). *Water safety in buildings*, WHO, Geneva, Switzerland.

Curtis, V. & Cairncross, S. (2003). Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *Lancet Infectious Diseases* **3**(5), 275–81.

Davis, C.K. & McGinn, R.E. (ed) (2001) International Perspectives on Ethical Dilemas in the Water Industry, American Water Works Association, Denver, CO.

Davison, A., Howard, G., Stevens, M., Callan, P., Fewtrell. L., Deere, D. & Bartram, J. (2005). Water Safety Plans. Managing Drinking Water Quality from Catchment to Consumer; Water, Sanitation and Health Protection and the Human Environment World Health Organization: Geneva, Switzerland.

de Albuquerque C. (2010). Report of the independent expert on the issue of human rights obligations related to access to safe drinking water and sanitation. Human Rights Council, Fifteenth session, UN General Assembly.

de Albuquerque, C.& Roaf, V. (2014). Realising the Human Rights to Water and Sanitation: A Handbook by the UN Special Rapporteur. UN Special Rapporteur on the human right to safe drinking water and sanitation, Lisbon.

Delli Prescolli, J., Dooge, J. & Llamas, R. (2004). Water and ethics: Overview in Water and Ethics. United Nations Education Scientific and Cultural Organization (UNESCO), Internal Hydrology Programme and World Commission on the Ethics of Scientific Knowledge and Technology, Paris

De Vellis, R.F. (2003). Scale development: Theory and applications 2nd ed. Thousand Oaks, California: Sage.

De Visser, J. (2008). Subsidiarity in the Constitution: *Local Government Bulletin* **10** (1), 1-2.

Department of Water and Sanitation (DWS) (2009). South African Drinking Water Quality Management Performance. Blue Drop Report 2009 Version 1, Pretoria, South Africa. Available at: http://www.dwa.gov.za/Documents/default.aspx?type=policy (Accessed 30 July 2019).

Dewettinck, T., van Houtte, E., Geenens, D., van Hege, K. & Verstraete, W. (2001). HACCP (Hazard Analysis and Critical Control Points) to guarantee safe water reuse and drinking water production: A case study. *Water Sci. Technol* (43), 31–38.

Dolnicar, S., Hurlimann, A. & Nghiem, L.D. (2010). The effect of information on public acceptance - The case of water from alternative sources. *J. Environ Manage* (91), 1288–1293.

Dube, D. & Swatuk, L. A. (2002). Stakeholder participation in the new water management approach: a case study of the Save catchment, Zimbabwe. *Physics and Chemistry of the Earth* **27**, pp. 867– 874.

Dube, E. & van der Zaag, P. (2002). Analysing water use patterns for water demand management: the case of the city of Masvingo, Zimbabwe.

Dube, E. (2002). Assessing the adequacy of water supply for the City of Masvingo, Zimbabwe: infrastructure, efficiency and consumption patterns. MSc WREM dissertation. University of Zimbabwe, Harare.

Dunne, E.F., Angoran-Benie, H., Kamelan-Tano, A., Sibailly, T.S., Monga, B.B., Kouadio, L., Roels, T.H., Wiktor, S.Z., Lackritz, E.M., Mintz, E.D. & Luby S. (2001). Is drinking water in Abidjan, Cote d'Ivoire, safe for infant formula? *Journal of Acquired Immune Deficiency Syndrome* **28** (4), 393-398.

Dziegielewski, B., Kiefer, J., & Bik, T. (2004). Water Rates and Ratemaking Practices in Community Water Systems in Illinois, Southern Illinois University, ISBN, Carbondale, IL.

Ejemot, R.I., Ehiri, J.E, Meremikwu, M.M. & Critchley, J.A. (2008). Hand washing for preventing diarrhoea. *Cochrane Database of Systematic Reviews* (1). DOI: 10.1002/ 14651858.CD004265.pub2.

Eledi, S.B. (2019). Examining Policy Implementation Gaps in source water protection in Newfoundland and Labrador. Memorial University of Newfoundland.

EPA (2011). Groundwater and Drinking water. United States Environmental Protection Agency: Washington, D.C. Available at: http://water.epa.gov/drink/contaminants/index.cfm (accessed 10 13 July 2021).

European Commission (EC) (2017). Proposal for a Directive of the European Parliament and of the council on the quality of water intended for human consumption. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2017%3A753%3AFIN (Accessed 6 December 2019).

European Union (EU) (2008). Subsidiarity in Europa Glossary, EU, Brussels. Available at: http://europa.eu/scadplus/glossary/subsidiarity_en.htm (accessed 12 February 2019).

EUWATER NETWORK (2005). European Declaration for a New Water Culture, New Water Culture Foundation, Saragossa

Ezenwaji, E.E. & Phil-Eze, P.O. (2014). Water Safety Plan as a Tool for Improved Quality of Municipal Drinking Water in Nigeria. *Journal of Environmental Protection* **5**, 997-1002. Available at: http://dx.doi.org/10.4236/jep.2014.511100 (accessed 8 June 2021)

FAO (1995). Reforming Water Resources Policy – A Guide to Methods, Processes and Practices. FAO irrigation and drainage paper 52. Rome, Italy.

Flores Baquero, O., Gallego Ayala, J., Giné Garriga, R., Jiménez Fdez. de Palencia, A. & Pérez Foguet, A. (2016). The Influence of the Human Rights to Water and Sanitation Normative Content in Measuring the Level of Service. *Soc. Indic. Res.* 1–24. Doi: 10.1007/s11205-016-1374-6.

Folifac, F. A. (2007). National water policies & water services at the extremes: What challenges must be faced in bridging the gap? Learning from the South Africa experience. *African Water Journal,* **1** (1).

Gambe, T. R. (2011), Water Billing and Service Delivery Management in Harare. A Case of Upper Avenues and Msasa Park. MSc thesis, University of Zimbabwe.

Gaudin, S. (2006). Effect of price information on residential water demand. *Applied Economics* **38** (4), 383–393. https://doi.org/10.1080/00036840500397499 (accessed 18 June 2021).

Gelting, R. & Delea, K. & Medlin, E. (2012). A conceptual framework to evaluate the outcomes and impacts of water safety plans. *Journal of Water, Sanitation and Hygiene for Development* **2**, 103. DOI:10.2166/washdev.2012.079.

Giné-Garriga, R., Flores-Baquero, O., Jiménez-Fdez. de Palencia, A. & Pérez-Foguet, A. (2017). Monitoring sanitation and hygiene in the 2030 Agenda for Sustainable Development: A review through the lens of human rights. *Sci. Total Environ*, (580), 1108–1119. Available at: http://dx.doi.org/10.1016/j.scitotenv.2016.12.066. (accessed 11 July 2021).

Gleick, P. H. (1996). Basic Water Requirements for Human Activities: Meeting Basic Needs. *Water International,* **21**, 83-92.

Green, D. (2012). The Importance of Implementation Gaps. People, Spaces, Deliberation. The World Bank. Available at: http://blogs.worldbank.org/publicsphere/ (Accessed January 6, 2017)

Gundry, S.W., Wright, J.A., Conroy, R.M., Du Preez, M., Genthe, B., Moyo, S., Mutisi, C. & Potgieter, N. (2009). Child dysentery in the Limpopo Valley: a cohort study of water, sanitation and hygiene risk factors. *Journal of Water and Health* **7** (2), 259-66. DOI: 10.2166/wh.2009.232.

Gunnarsdottir, M. J., Gardarsson, S. M., & Bartram, J. (2012). Icelandic experience with Water Safety Plans. *Water Science and Technology* **65**(2), 277–288. Available at: https://doi.org/10.2166/wst.2012.801 (accessed 3 May 2021).

Gunnarsdottir, M.J., Gardarsson, S.M., Bartram, J. (2015). Developing a national framework for safe drinking water – case study from Iceland. *Int. J. Hyg. Environ. Health* **218**,196–202.

Gupta, J., Ahlers, R. and Ahmed, L. (2010). The human right to water: moving towards consensus in a fragmented world. *Review of European Community and International Environmental Law* **19** (3), 294 – 305. Available at: http://www.who.int/water_sanitation_health/publications/2011/dwq_guidelines/en/ (accessed 13 July 2021).

Hagg, G. & Emmet, T. (2003). Muddying the elephant's water: Policy and practice in community water supply. *Politeia* **22** (1), 67-92.

Hall, D. & Lobina, E. (2007). International actors and multinational water company strategies in Europe, *1990-2003. Utilities Policy* **15** (2), 64-77. doi: https://doi.org/10.1016/j.jup.2007.02.005

Hamdy, A., Abu-Zeid, M., & Lacirignola, C. (1998). Institutional capacity building for water sector development. *Water International*, **23** (3), 126-133.

Hanrahan, M. & Dosu, B. Jnr. (2017). The Rocky Path to Source Water Protection: A Cross-Case Analysis of Drinking Water Crises in Small Communities in Canada. *Water* **9**, 388.

Harare City Council (HCC) (2010). Water and Sanitation Infrastructure Rehabilitation and Replacement Project Report, Harare, Zimbabwe.

Harare Residents Trust (HRT) (2021). Service Delivery: Harare City Council is on autopilot. Available at: https://kubatana.net/2020/12/30/central-government-should-minimise-interference-in-the-running-of-urban-local-authorities/

Hassan, J. A. (1998). A History of Water in Modern England and Wales, Manchester University Press, Manchester

Hayes, M.T. (2001). The limits of policy change: Incrementalism, worldview and the rule of law. Georgetown: University Press.

Hemson, D. & Owusu-Amponah, K. (2006). South African social attitudes: changing times, diverse voices. In The vexed question: interruptions, cut-offs and water services in South Africa. Edited by Pillay U, Roberts B, Rule SP. Cape Town, South Africa: Human Sciences Research Council Press, 150–175.

Holmes, A.H., Moore, L.S., Sundsfjord, A., Steinbakk, M., Regmi, S. & Karkey, A. (2016). Understanding the mechanisms and drivers of antimicrobial resistance. *Lancet* **387**, 176-187.

Hove, M. & Tirimboi, A. (2011). Assessment of Harare water service delivery. *Journal of Sustainable Development in Africa* **13** (4), 61-84.

Howard, G., Godfrey, S., Tibatemwa, S. & Niwagaba, C. (2007). Water safety plans for piped urban supplies in developing countries: A case study from Kampala, Uganda. *J. Urban Water*, (2), 161–170.

Howlett, M., Ramesh, M. & Wu, X. (2015). Understanding the persistence of policy failures: The role of politics, governance and uncertainty. *Public Policy and Administration,* **30** (3–4), 209–220.

Hrudey, S. E. & Hrudey E. J. (2014). Ensuring Safe Drinking Water – Learning from Frontline Experience with Contamination. American Water Works Association, Denver, CO, USA.

Hrudey, S., Conant, B., Douglas, I., Fawell, J., Gillespie, T., Hill, D., Leiss, W., Rose, J. & Sinclair, M. (2011). Managing uncertainty in the provision of safe drinking water. Water Science & Technology: *Water Supply* **11**, 675. DOI: 10.2166/ws.2011.075.

Hudson, B., Hunter, D.J. & Peckham, S. 2019 Policy failure and the policy-implementation gap: Can policy support programmes help? *Policy Design and Practice* **2** (1), 1–14

Hukka, J.J. & Katko, T.S. (2003). Water privatization revisited: Panacea or pancake’**,** Occasional Paper Series, International Water and Sanitation centre, Delft, the Netherlands.

Hunt, W.F., Jarrett, A.R., Smith, J.T. & Sharkey, L.J. (2006). Evaluating Bio retention Hydrology and Nutrient Removal at Three Field Sites in North Carolina. *J. Irrig. Drain. Eng.* **132** (6), 600.

Hutton, G. (2012). Monitoring “Affordability” of water and sanitation services after 2015: Review of global indicator options.

Illsley, B. M. (2003). Fair participation—a Canadian perspective. *Land Use Policy*, **20** (3), 265-273.

Imonikhe, O. M. & Moodley, K. (2018). The challenge of effective policy implementation in Nigerian urban water utilities. *Water Science & Technology: Water Supply,* **18** (5), 1696–1705.

International Water Association (IWA) (2004). The Bonn charter for safe drinking water. International Water Association. Available at: http://www.iwa-network.org/downloads/1447946928-IWA%20bonn%20charter.pdf (accessed 6 July 2018).

International Water Association (IWA) (2014). An Avoidable Crisis: Water, Sanitation and Hygiene Human Resource Capacity Gaps in Developing Economies. London: IWA Publishing.

International Water Association (IWA) (2015). The Lisbon Charter: Guiding the Public Policy and Regulation of Drinking Water Supply, Sanitation and Wastewater Management Services. Available at: https://iwa-network.org/wp-content/uploads/2015/12/1428790487-Lisbon_Regulators_Charter.pdf (accessed 26 January 2021).

International Water Association (IWA) (2017). Service regulation and human rights to water and sanitation Contribution of the International Water Association (IWA) to the 2017 report of the UN Special Rapporteur on the human rights to safe drinking water and sanitation. Submission on regulation to the UN Special Rapporteur on the HRWS.

International Water Association (IWA) (2018). Water Safety Plan Implementation in Africa, Improving Drinking Water Quality and Safeguarding Public Health through Water Safety Plan Implementation; IWA: London, UK. Available at: https://iwa-network.org/projects/water-safety-plan-implementation-in-africa/ (accessed on 9 March 2019).

Iroegbu, C.U., Ene-Obong, H.N. Uwaegbute, A.C. & Amazigo, U.V. (2000). "Bacteriological quality of weaning food and drinking water given to children of market women in Nigeria: implications for control of diarrhoea." *Journal of Health, Population, and Nutrition* **18** (3), 157-62.

Jack, U., de Souza, P., Kalebaila, N. (2015). Development of emergency response plans for community water systems. *Water SA* (41), 232–237.

Jalan, J. & Somanathan, E. (2008). The importance of being informed: experimental evidence on demand for environmental quality. *Journal of Development Economics* (87), 14–28.

Japan International Cooperation Agency (JICA) (1996). The Study of Water Pollution Control in Upper Manyame River Basin in the Republic of Zimbabwe, Nippon Jogeduido Sekkei Co. Ltd., Nippon Koei Co. Ltd., Ministry of Local Government and Public Construction, Zimbabwe.

Jayaratne, A. (2008). Application of a risk management system to improve drinking water safety. *Journal of Water and Health.* Available at: http://iwaponline.com/jwh/article-pdf/6/4/547/397065/547.pdf (accessed 4 June 2021).

Jomo, K.S., Chowdhury, A., Sharma, K. & Platz, D. (2016). Public-Privat Development: Fit for purpose? Partnerships and the 2030 Agenda for Sustainable, Department of Economic and Social Affairs, DESA Working Paper No. 148.

Jonga, W. (2013). The Minister of Local Government's Intrusions in Urban Councils' Administration. *Public Policy and Administration Review* **1**(1), 26-48.

Juhola, P. (1995). Vesihuoltolaitos yhdyskuntien palveluorganisaationa [Water and Sewage Utility as a Service Enterprise], A5 Licentiate thesis (in Finnish), Tampere University of Technology, Institute of Water and Environmental Engineering, A5, Tampere, Finland.

Kalaba F. (2016) Barriers to policy implementation and implications for Zambia's forest ecosystems. *Forest Policy and Economics* **69**, 40-44.

Kalulu, K. (2009). Assessment of the Performance of a Public Water Utility: A Case Study of Blantyre Water Board in Malawi. University of Zimbabwe, Department of Civil Engineering Unpublished MSc Thesis.

Kanyesigye, C., Marks. S.J., Nakanjako, J., Kansiime, F. & Ferrero, G. (2019). Status of Water Safety Plan Development and Implementation in Uganda. *Int. J. Environ. Res. Public Health* (16), 4096. doi: 10.3390/ijerph16214096.

Karengezeka, Y. (The Herald Correspondent) (2018). 75% of Chitungwiza water meters are dysfunctional. The Herald. Available at: https://www.herald.co.zw/75pc-chitungwiza-water-meters-dysfunctional/ (accessed 28 December 2020).

Kativhu, T., Mazvimavi, D., Tevera, D. & Nhapi, I. (2018). Implementation of Community Based Management (CBM) in Zimbabwe: The dichotomy of theory and practice and its influence on sustainability of rural water supply systems. *Physics and Chemistry of the Earth* **106**, 73-82.

Katko, T. (1992). The Development of Water Supply Associations in Finland and Its Significance for Developing Countries, Discussion Paper services No 8, UNDP and World Bank, Water Supply and Sanitation Programme, New York and Washington. Available at: www.wds.worldbank.org/servlet/main?menuPK=64187510&pagePK=64193027&piPK=64187937&thesitePK=523679&entityID=00000926539

Katko, T. (1994). The need for "Champions" in rural water supply, Waterlines **12** (3), 19-22.

Kerr, L.A. & Goethel, D.R. (2014). Chapter Twenty One - Simulation Modeling as a Tool for Synthesis of Stock Identification Information, Editor(s): Cadrin, S.X., Lisa A. Kerr, L.A. & Mariani, S. (2014). Stock Identification Methods (Second Edition), Academic Press, 501-533, ISBN 9780123970039. Available at: https://doi.org/10.1016/B978-0-12-397003-9.00021-7 (accessed 23 August 2022).

Korzeniewska, E, Korzeniewska, A, Harnisz, M. (2013). Antibiotic resistant Escherichia coli in hospital and municipal sewage and their emission to the environment. *Ecotoxicol Environ Saf* (91), 96–102.

Langford, M., Bartram, J., & Roaf, V. (2014). Revisiting Dignity: The Human Right to Sanitation. In Langford, M. & Russell, A. F. S. (Eds.). The Right to Water: Theory, Practice and Prospects. Cambridge: Cambridge University Press.

Lebel P. & Reed M. (2010). The Capacity of Montreal Lake, Saskatchewan to Provide Safe Drinking Water: Applying a Framework for Analysis. *Canadian Water Resources Journal* **35** (3), 317-338.

Levin, T., Nierenköther, M. & Odenwälder, N. (2009). The Human Right to Water and Sanitation Translating Theory into Practice. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)

Lincoln, Y. S., & Guba, E. G. (2000). Paradigmatic controversies, contradictions, and emerging confluences. In N. K. Denzin, & Y. S. Lincoln (Eds.), The handbook of qualitative research (2nd ed., pp. 1065-1122), Thousand Oaks, CA: Sage Publications.

Louw, S. J. (2003). The ministry of dry taps? The department of water affairs and forestry and the transition to market-based service provision in South Africa. *Politea* **22** (1), 93-118.

Lubout, K.L. (2010). The Role of Water Boards in Water Safety Plan Implementation in South Africa. *Water Practice Technology* **5** (1), wpt2010002. https://doi.org/10.2166/wpt.2010.002 (accessed 7 July 2021).

Luby, S.P., Agboatwalla, M., Raza, A., Sobel, J., Mint, E.D., Baier, K., Hoekstra, R.M., Rahbar, M.H., Hassan, R., Qureshi, S.M. & Gangarosa, E.J. (2001). Microbiologic 64 effectiveness of hand washing with soap in an urban squatter settlement, Karachi, Pakistan. *Epidemiology & Infection* **127**(2), 237-44.

Lucas, P.J., Cabral, C. & Colford, J.M. (2011). Dissemination of drinking water contamination data to consumers: A systematic review of impact on consumer behaviors. PLoS ONE, 6:e2098.

Madaka, E. (2012). The right to water: analysing the legal perspectives of water as a right with specific reference to Zimbabwe. Zimbabwe: Faculty of Law, University of Zimbabwe.

Magoro, M. J. & Brynard, P. A. (2010). Difficulties associated with the implementation of the preferential procurement policy in conjunction with a low-cost housing programme: a South African contextualisation. *Politeia* **29** (3), 4 – 23.

Makunde, G., Chirisa, I., Mazorodze, C., Matamanda, A. & Pfukwa. (2018). Local Governance System and the Urban Service Delivery in Zimbabwe: *Issues, Practices and Scope* (3), 1-13.

Makurira, H. & Viriri, N. (2017). Water Permit Systems, Policy Reforms and Implications for Equity in Zimbabwe, Project Country Report.

Makwara, E. C. & Tavuyanago, B. (2012). Water Woes in Zimbabwe's Urban Areas in the Midst of Plenty: 2000 to Present. *European Journal of Sustainable Development* **1** (2), 151-180.

Mälzer, H.J., Lucas, J., Woltring, D., Hein, A. & Merkel, W. (2007). Einführung eines Technischen Risikomanagements für das Wasserwerk Hemelter Bach der Energie- und Wasserversorgung Rheine GmbH. *gwf Wasser/Abwasser* **148** (11), 786-792.

Mamuse, A., & Watkins, R.T. (2016). High fluoride drinking water in Gokwe, northwest Zimbabwe. *Journal of Water Sanitation and Hygiene for Development* **6**, 55-64.

Mangizvo, V.R. & Kapungu,N. (2010). Urban domestic water crisis in Zimbabwe. *Journal of Sustainable Development in Africa* **12** (2), 254-262.

Manjengwa, J., Matema, C. & Tirivanhu, D. (2016). Understanding urban poverty in two high-density suburbs of Harare, Zimbabwe. *Development Southern Africa* **33** (1), 23-38. DOI: 10.1080/0376835X.2015.1116376 (accessed 23 August 2021).

Manzungu, E., Mudenda-Damba, M., Madyiwa, S., Dzingirayi, V. & Musoni, S. (2016). Bulk water suppliers in the City of Harare – An endogenous form of privatisation of urban domestic water supply in Zimbabwe. *Water Alternatives* **9** (1), 56-80.

Manzungu, H. (2012). Can collective action lead to sustainable outcomes in the provision and management of domestic water in Zimbabwean urban areas? *Journal of Sustainable Development in Africa* **5** (5), 122-135.

Mapetere, K. Chigondai, T. & Chazireni, E. (2019). Water Demand Management Options in Masvingo City, Zimbabwe. European Journal of Social Sciences Studies **4** (1). Available at: https://doi.org/10.5281/zenodo.2545778 (accessed 20 June 2020).

Mapfumo, A. & Madesha, W. M. (2014). Challenges for Urban Water Supply: The case of Masvingo Municipality in Zimbabwe. *International Journal of Environmental Research* **5**, 1-5.

Maphela, B. & Cloete, F. (2020). Johannesburg's implementation of the National Water Act, 1998 in Soweto, South Africa, Development Southern Africa, **37** (4), 535-552. DOI: 10.1080/0376835X.2019.1647834.

Marumahoko, S., Afolabi, O., Sadie, Y. & Nhede, N. T. (2020). Governance and Urban Service Delivery in Zimbabwe. *Strategic Review of Southern Africa* **42** (1), 41-68.

Masvingo United Residents and Ratepayers Alliance MURRA) (2019). Suite 1-9 POSB Building 44 Hughes St Masvingo. Available at: https://murramasvingo.org/ (accessed 2 August 2021).

McDonald, D.A. (2001). Environmental Justice in South Africa Ohio University Press.

McKenzie, R. S. (1999). SANFLOW User Guide: South Africa Water Research Commission, WRC Report No. TT 109/99. Water Research Commission, Pretoria, South Africa.

Meier, B.M., Kayser, G.L., Kestenbaum, J.G., Amjad, U.Q., Dalcanale, F. & Bartram, J. (2014). Translating the Human Right to Water and Sanitation into Public Policy Reform. *Sci Eng Ethics* **20** (4): 833–848. DOI: 10.1007/s11948-013-9504-x.

Melosi, M. V. (2000). The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present (Creating the North American Landscape), John Hopkins University Press, Baltimore.

Ménard, C., Tropp, H. & Jiméne, A. (2017). Addressing the policy-implementation gaps in water services: the key role of meso-institutions. *Water International* **43** (1), 1-2.

Ministry of Local Government, Public Works and Housing (MLGPWNH) (2017). Local Authorities Circular No. 3 of 2017: Annual Budget Preparation 2018 Financial.

Ministry of Water Resources Development and Management (MWRDM) (2012). The Zimbabwe National Water Policy, Harare.

Minnes, S. & Vodden, K. (2017). The Capacity Gap: Understanding Impediments to Sustainable Drinking Water Systems in Rural Newfoundland and Labrador. *Canadian Water Resources Journal / Revue canadienne des ressources hydriques,* **42** (2), 163-178.

Monney, I. & Ocloo, K. (2017). Towards sustainable utilisation of water resources: a comprehensive analysis of Ghana's National Water Policy. *Water Policy* **19**, 377–389.

Morgan, B. (2006). Turning off the tap: urban water service delivery and the social construction of global administrative law. *The European Journal of International Law* **17**(1), 215–246. DOI: https://doi.org/10.1093/ejil/chi161.

Morris, J. C. (2017). Planning for water infrastructure. *Public Works Management & Policy* **22**, 24–30

Morrish, T. (1988). Water Deprivation: Living Below Minimum Standards of Wellbeing. Alolus. London.

Motsatsi, L. L. & Gibberd, J. T. (2019). Household expenditure affordability thresholds for housing, water, energy and transport in South African human settlements. Available at: http://hdl.handle.net/10204/11643 (accessed 21 January 2021).

Muchoza, T. (2018). An assessment of social consequences of using water management devices on the poor households in Harare. The case of Sunningdale high density suburb prepaid water meter project in Harare. Master's Degree thesis, Faculty of Economic and Management Sciences, University of the Western Cape, Bellville.

Mudau L.S., Mukhola S.M. & Hunter P.R. (2017). Systematic risk management approach of household drinking water from the source to point of use. *J. Water Sanit. Hyg. Dev* (7), 290–299.

Muleya, E., Nyomombe, T., Maphosa, N.S. & Matunhu, V. (2019). Assessing Water Quality and its Relationship to Selected Disease Patterns in Zvishavane Town, Zimbabwe. *J. Appl. Sci. Environ. Manage* **23** (11), 2029-2034. DOI: https://dx.doi.org/10.4314/jasem.v23i11.21. Available at: http://ww.bioline.org.br/ja (accessed 12 November, 2020).

Murimoga, R. & Musingafi, M.C.C. (2014). Local Governance and Service Delivery in Zimbabwean Local Authorities: The Case of Harare and Masvingo Urban Municipalities. International Journal of Public Policy and Administration Research, Conscientia Beam **1**(3), 94-107, 09-2014.

Murthy, S. L. (2013). The Human Right(s) to Water and Sanitation: History, Meaning and the Controversy Over-Privatization. Berkeley Journal of International Law **31**(1):89–147. Available at: http:// scholarship.law.berkeley.edu/bjil/vol31/iss1/ (accessed 12 May 2021).

Murungweni, Z. (2011). Zimbabwe National Water Policy. Background Paper on Water Resources Development and Management. Thematic Paper No. 2 – Water Resources, Use, Demand, Planning and Financing submitted to the World Bank Office in Zimbabwe.

Musekiwa, N. & Chatiza, K. (2015). Rise in Resident Associational Life in Response to Service Delivery Decline by Urban Councils in Zimbabwe. *Commonwealth Journal of Local Governance* **16-17**, 120-136.

Musemwa, M. (2010). From 'Sunshine City' to a landscape of disaster: The politics of water, sanitation and disease in Harare, Zimbabwe, 1980-2009. Journal of Developing Societies **26** (2), 165-206.

Musingafi, M. C. C., Chiwanza, K. & Mutsau, S. (2015). Theory and practice in the water sector reforms in Zimbabwe: A comparative study of Harare and Masvingo local authorities. *Public Policy and Administration Research* **5** (10), 132-143.

Muzondi, L. (2014). Urbanization and Service Delivery Planning: Analysis of Water and Sanitation Management Systems in the City of Harare, Zimbabwe. *Mediterranean Journal of Social Sciences* **5** (20), 2905.

Mwanza, D. D. (2010). Roles and institutional arrangements for economic regulation of urban water services in sub-Saharan Africa. Loughborough University. Thesis. Available at: https://hdl.handle.net/2134/19349 (accessed 12 February 2022).

Nadgrodkiewicz, Anna, Nakagaki, Maiko, & Tomicic, Marko, (2012). Improving Public Governance: Closing the Implementation Gap between Law and Practice. Washington, DC: Center for International Private Enterprise and Global Integrity.

Nakagaki, M. (2013). Closing the Implementation Gap. Washington, DC: Center for International Private Enterprise. Economic Reform Feature Service. Available at: https://www.cipe.org/legacy/publication-docs/FS_06-15-2013_MN_Implementation%20Gap_0.pdf (Accessed 5 June 2021).

Nauges, C. & van den Berg, C. (2006). Perception of health risk and averting behavior: An analysis of household water consumption in Southwest Sri Lanka. Toulouse, France: LERNA.

Nauges, C. & Whittington, D. (2010). Estimation of water demand in developing countries: An overview. World Bank Res Obser **25**, 263–294.

Nawab, I. & Nyborg, I. L. P. (2009). Institutional challenges in water supply and sanitation in Pakistan: revealing the gap between national policy and local experience. *Water Policy* **11**, 582–597.

Ndunguru, M.G. & Hoko, Z. (2016). Assessment of water loss in Harare, Zimbabwe. *Journal of Water, Sanitation and Hygiene for Development* **06** (4), 519-533.

Neuman, W.L. (2003) Social Research Methods: Qualitative and Quantitative Approaches. Allyn and Bacon, New York.

New Jersey Department of Environmental Protection (NJDEP) (2011) Safe Drinking Water Act Rules (N.J.A.C. 7.10) Trenton New Jersey Department of Environmental Protection. Available at: nj.gov/dep/rules/rules/njac7_10.pdf (PDF) (accessed 23 July 2021).

New York Times (13 July 2019). In Zimbabwe, the Water Taps Run Dry and, Worsen a Nightmare. Available at: https://crofsblogs.typepad.com/h5n1/2019/07/in-zimbabwe-the-water-taps-run-dry-and-worsen-a-nightmare.html (accessed 23 July 2021).

Nhapi, I. & Hoko, Z. (2004). A cleaner production approach to urban water management: potential for application in Harare,

Nhapi, I. (2009). The water situation in Harare, Zimbabwe: a policy and management problem. *Water Policy (*11), 221-235.

Nicol, A. & Mtisi, S. (2003). The politics of water: a southern African example: Sustainable Livelihoods in Southern Africa Research Paper 20, Institute of Development Studies, Brighton.

Obeta M. C. (2018). Rural water supply in Nigeria: policy gaps and future directions. *Water Policy* **20**, 597–616.

Odafivwotu, O. (2019). Dimensions of Inequality in Urban and Rural Water, Sanitation and Hygiene Services in Sub-Saharan Africa. *European Scientific Journal ESJ*. **15** (8), 144**.**

Available at: URL:http://dx.doi.org/10.19044/esj.2019.v15n8p144 (accessed 1 January 2022).

Odiyo, J.O., Mathoni, M.M. & Makungo, R. (2012). Health Risks and Potential Sources of Contamination of Groundwater Used by Public Schools in Vhuronga 1, Limpopo Province, South Africa. International journal of environmental research and public health. 17. 10.3390/ijerph17186912.

Ogle, M. (1999). Water supply, waste disposal, and the culture of privatism in the mid-nineteenth century American city. Journal of Urban History **25** (3), 3221-347)

Omar Y.Y. (2013). Risk Management for Drinking Water Supplies in Developing Countries: The Influence of Culture on Water Safety Plans. PhD Thesis, Environmental Science and Technology Department, Cranfield University.

Organization for Economic Cooperation and Development (OECD) (2011). Water Governance in OECD countries: A Multi-Level Approach. OECD studies on Water, Paris. Available at: http://www.oecd-ilibrary.org/environment/water-governance-in-oecd-countries_9789264119284-en (accessed 17 May 2019).

Organization for Economic Cooperation and Development (OECD) (2015). OECD Principles on Water Governance. OECD: Paris, France. Available at: www.oecd.org/governance/oecd-principles-on-water-governance.htm (accessed on 9 December 2020).

Organization for Economic Cooperation and Development (OECD) (2016). Water Governance in Cities, Paris. Available at: http://dx.doi.org/10.1787/9789264251090-en (Accessed 12 October 2020).

Olowu, D. (2006), "Decentralisation policies and practices under structural adjustment and democratization in Africa", In Bangura, Y. and Larbi, G. (Ed.). Public Sector Reform in Developing Countries: Capacity Challenges to Improving Services, Palgrave Macmillan, London, pp. 1-294.

Organisation for Economic Co-Operation and Development (OECD) (2008). Annual Report. Available at: https://www.oecd.org/newsroom/40556222.pdf (accessed 18 August 2020).

Pietilä, P. (2006). Role of municipalities in water services, PhD thesis, Tampere University of Technology Publications no. 617, Tampere Finland.

Pérez-Vida C., Amézquita-Marroquin C. & Torres-Lozada P. (2013). Water safety plans: risk assessment for consumers in drinking water supply. *Ingeniera Y Competitividad* **15** (2), 237–251.

Phago, K. (2010). The development of housing policy in South Africa. *Politeia.* **29** (3), 88-106.

Potgieter, N., Mudau, L. S. & Maluleke, F. R. S. (2006). The microbiological quality of private and communal boreholes in the Tshitale-Hlanganani region of the Limpopo Province, South Africa. *Journal of Water Science & Technology* **54** (11–12), 371–377.

Pottie, D. (2003). Housing the nation: The politics of low cost housing policy in South Africa since 1994. *Politeia* **22** (1), 119-143.

Pretorius L. (2003). Six contributions to understanding gaps between policy and implementation: An overview and comments *Politeia* **22** (1), 6-21.

Rawlyk, F.X. & Patrick, R.J. (2013). Capacity needs for source water protection plan implementation: Lessons from the South Saskatchewan River. *Canadian Journal of Urban Research* **22** (1), 20–45.

Reid, M. & Simatele, M.D. (2021). Perspectives on Energy Insecurity and Its Impacts on Urban Livelihoods: Adaptation and Resilience of Women in the Informal Sector. *Frontiers in Sustainable Cities.* **3**, 104. Available at: https://www.frontiersin.org/article/10.3389/frsc.2021.706476 (accessed 4 November 2021).

Rickert, B. Schmoll, O. Rinehold, A. Barrenberg, E. (2014). Water Safety Plan: A Field Guide to Improving Drinking-Water Safety in Small Communities. WHO, Geneva, Switzerland. Available at: http://www.euro.who.int/__data/assets/pdf_file/0004/243787/Water-safety-plan-Eng.pdf?ua=1 (accessed 15 January 2016).

Romano, O. & Akhmouch A. (2019). Water Governance in Cities: Current Trends and Future Challenges. *Water* **11**(3), 500.

Salman, M. A. & Bradlow, D. (2006). Regulatory Frameworks for Water Resources Management: A Comparative Study. Law, Justice, and Development. Washington, DC: World Bank. Available at: https://openknowledge.worldbank.org/handle/10986/7054 (accessed 6 April 2018).

Sanitation & Hygiene Fund (2020). Strengthening the weakest link: the sanitation and hygiene fund investment case. Available at: https://www.shfund.org (accessed 24 February 2022).

Schmoll, O., Castell-Exner, C. & Chorus, I. (2011). From international developments to local practice: Germany's evaluation and dialogue process towards Water Safety Plan implementation. Water Supply **11** (4), 379–387. Available at: https://doi.org/10.2166/ws (accessed 12 May 20121).

Schuringa, M. (1999). Strategic Elements in Water Supply and Sanitation Services in urban low-income areas. Paper presented at the International Symposium. Japan.

Seago, C., Bhagwan, J. & McKenzie, R. (2004). Benchmarking leakage from water reticulation systems in South Africa. *J. Water SA* **30** (5), 25–32.

Service Level Benchmarking Report (SLB, 2018) Service Level Benchmarking Report for Urban Water Supply, Sanitation and Solid Waste Management in Zimbabwe. Peer Review Annual Report 2017.

Setty, K., Kayser, G., Bowling, J., Enault, J., Loret, J. F., Serra, C., Martin-Alonso, J., Mateu, A. & Bartram, J. (2017). Water quality, compliance, and health outcomes among utilities implementing Water Safety Plans in France and Spain. *International Journal of Hygiene and Environmental Health*. **220**. DOI: 10.1016/j.ijheh.2017.02.004.

Signé, L. (2017). Policy Implementation – A synthesis of the Study of Policy Implementation and the Causes of Policy Failure*,* OCP Policy Center. Southern African Development.

Simango, C., Dindiwe, J. & Rukure. G. (1992). Bacterial contamination of food and household stored drinking water in a farmworker community in Zimbabwe. The Central African Journal of Medicine **38**, 143–149.

Smets, H. (2012). Quantifying the affordability standard, in The Human Right to Water: Theory, Practice and Prospects. 2012. Cambridge University Press.

Smets, H., 2009. Access to drinking water at an affordable price in developing countries. Options Méditerranéennes (88).

Smith, W. (2012). “Urban development imagination*.” InternationalJournal of Development* **5** (1), 53-80.

Standards Association of Zimbabwe (SAZ-560) 1997 Standards Association of Zimbabwe. National Standards Body for Zimbabwe.

Stauffer, B. & Spuhler, D. (2020). Safe Storage. Seecon international gmbh. Available at: https://sswm.info/sswm-solutions-bop-markets/affordable-wash-services-and-products/affordable-water-supply/safe-storage (accessed 12 August 2021).

Stephanie, G. (2014). Excel Statistics: Step by Step. CreateSpace Independent Publishing Platform. ISBN-10, 1496102185.

Stiglitz, J.E. (2002). Globalization and its Discontents, Penguin, London

Summerill, C., Smith, J., Webster, J. & Pollard, S. (2010). An international review of the challenges associated with securing 'buy-in' for water safety plans within providers of drinking water supplies. *Journal of Water and Health.*

Swyngedouw, E., Kaïka, M. & Castro, J. E. (2002). Urban water: A political-ecology perspective. *Built Environment* **28**, (2), 124–137.

Tanyanyiwa, V.I & Mutungamiri, I. (2011). Residents Perception on Water and Sanitation Problems in Dzivaresekwa 1 High Density Suburb, Harare. *Journal of Sustainable Development in Africa* **13** (4).

Taonameso, S., Mudau, L.S., Traoré, A.N. & Potgieter, N. (2018). Borehole water: a potential health risk to rural communities in South Africa. *Water Science & Technology Water Supply* **19 (1)**, ws2018030. DOI: 10.2166/ws.2018.030.

Taonameso, S., Mudau, L.S., Traoré, A.N. & Potgieter, N. (2021). Urban water conundrums in Zimbabwe – the role of water policy and its implementation gaps. *Water Supply* Water **00** (0) Available at: http://iwaponline.com/ws/article-pdf/doi/10.2166/ws.2021.386/977971/ws2021386.pdf (accessed 1 January 2022).

TECHNEAU (2008). Identification and description of hazards for water supply systems: A catalogue of today's hazards and possible future hazards, Version 2008. Available at: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.367.2482&rep=rep1&type=pdf (accessed 26 August 2018)

The Herald (16 April 2018). 75 percent Chitungwiza water meters dysfunctional. Available at: https://www.herald.co.zw/75pc-chitungwiza-water-meters-dysfunctional/ (accessed 16 June 2021).

The Herald (22 July 2013). Write off all debts, Government orders councils. Available at: https://www.herald.co.zw/write-off-all-debts-govt-orders-councils/ (accessed 20 January 2021).

The Sphere Project (2004). Humanitarian charter and minimum standards in disaster response. The Sphere Project: Geneva, Switzerland. Available at: http://www.sphereproject.org (26 July 2020).

Thornton, J. (2005). Best Management Practice 3: 'System Water Audits and Leak Detection'. Review and Recommendations for Change. Technical Report, California Urban Water Conservation Council. IWA Publishing, CA.

Timmer, D. K., de Loë R. C. & Kreutzwiser, R. D. (2007). Source Water Protection in the Annapolis Valley, Nova Scotia: Lessons for Building Local Capacity. *Land Use Policy* 2**4**, 187-198.

Tobayiwa, C., Musiyambiri, M., Chironga, L., Mazorodze, O. & Sapahla, S. (1991). Fluoride levels and dental fluorosis in two districts in Zimbabwe. Central African Journal of Medicine. Available at: https://journals.co.za/doi/pdf/10.10520/AJA00089176_283 (accessed 27 August 2021).

Tom, T. & Munemo, E. (2015). Republic of Zimbabwe National Water Policy: A Desk Review of the Gaps between the Policy and its Implementation. *International Journal of Public Policy and Administration Research* **2** (3), 60-72.

UN General Assembly (UNGA) (1980). *Proclamation of the International Drinking Water Supply and Sanitation Decade*, A/RES/35/18. Available at: https://www.refworld.org/docid/3b00f1a93c.html (accessed 26 November 2020)

United Nations (UN) (1992). Rio Declaration on Environment and Development, 14 June 1992 Report of the UN Conference on Environment and Development UN Doc. A/CONF.151/26/Rev.1, vol. 1, annex I. United Nations, New York.

United Nations (UN) (2015). Water for life decade 2005-2015. The human right to water and sanitation. Available at: http://www.un.org/waterforlifedecade/human_right_to_water.shtml (Accessed 13 January 2015).

United Nations Children's Fund (UNICEF) (2020). Snapshot of global and regional urban water, sanitation and hygiene inequalities, UNICEF, New York.

United Nations Children's Fund (UNICEF) (2020). Water, sanitation, hygiene, and waste management for the COVID-19 virus: Interim Guidance. Available at: https://www.who.int/publications/i/item/WHO-2019-nCoV-IPC-WASH-2020.4 (accessed 12 February 2022).

United Nations Development Programme (UNDP). Human Development Report 2006. Beyond Scarcity: Power, poverty and the global water crisis. 2006. Available at: http://hdr.undp.org/hdr2006/ (accessed 8 July 2021).

United Nations Economic Commission for Europe (UNECE) 2019. The Human Rights to Water and Sanitation in Practice: Findings and lessons learned from the work on equitable access to water and sanitation under the Protocol on Water and Health in the pan-European region. ECE/MP/WH/17.

United Nations Economic Programme (UNEP) (2015). Policy and Strategy. Available at: http://www.unep.org/esm/Portals/50159/docs/em_water/UNEP_Water_Policy_and_Strategy_ENG. (Accessed 2 December, 2016).

United Nations Education Scientific and Cultural Organization-World Water Assessment Programme (UNESCO-WWAP) (2006). Water, a Shared Responsibility: The United Nations World Water Report 2, UNESCO and Bergmann Books, New York.

United Nations Education Scientific and Cultural Organization-World Water Assessment Programme [UNESCO] (2009). Water in a Changing World (WWDR-3): the 3rd United Nations World Water Development Report. Available at: http://www.unesco.org/new/en/natural-sciences/environment/water/wwap/wwdr/wwdr3-2009/downloads-wwdr3/ (accessed 7 October 2020).

United Nations Education Scientific and Cultural Organization-World Water Assessment Programme (UNESCO-WWAP, 2015). The United Nations World Water Development Report 2015: Water for a Sustainable World. Paris, UNESCO.

Nations.United Nations Sub-Commission on the Promotion and Protection of Human-Rights (2006). Draft Guidelines for the realisation of the right to drinking water and sanitation, in:

Report of the Special Rapporteur, El Hadji Guissé, 57th Sess., 2005 (UN Doc. E/CN.4/Sub.2/2005/25), adopted in Sub-Commission on the Promotion and Protection of Human Rights (Res. 2006/10), Promotion of the realisation of the right to drinking water and sanitation, 24 August 2006, (UN Doc. A/HRC/Sub.1/58/L11). Available at: http://www2.ohchr.org/english/bodies/subcom/57/aevdoc.htm (accessed 12 July 2020).

United Nations (UN) Millennium Project. (2005). investing in development: A practical plan to achieve the Millennium Development Goals. New York: United

United Nations (UN), Office of the High Commissioner for Human Rights (OHCHR), United Nations Human Settlements Programme (UN-HABITAT), World Health Organization (WHO) (2010). The Right to Water, Fact Sheet No. 35. Available at: http://www.ohchr.org/Documents/Publications/FactSheet35en.pdf (accessed 14 October 2020).

United Nations (UN), Office for the Coordination of Humanitarian Affairs (OCHA) (2021). Zimbabwe Situation Report: Last updated: 31 Dec 2020. https://reports.unocha.org/en/country/zimbabwe/ (accessed 19 Feb 2021).

United Nations Education Scientific and Cultural Organization-World Water Assessment Programme (UNESCO-WWAP) World Water Assessment Programme (2019). The United Nations World Water Development Report 2019: Leaving No One Behind. Paris, UNESCO. (accessed 15 January 2021).

United Nations General Assembly (UNGA) (2010). The human right to water and sanitation-A/RES/64/292. Available at: https://undocs.org/pdf?symbol=en/a/res/64/292 (accessed 18 October 2020).

United Nations Human Rights Council (UNHRC). (2015). *Report of the Special Rapporteur on the human right to safe drinking water and sanitation (On Affordability),* Léo Heller. UN Document A/HRC/30/39, Geneva, Switzerland: Author.

United Nations (UN)-Global Compact (2015). Understanding Water Policy. Available at: http://ceowatermandate.org/policyengagement/understanding-water-policy/ (Accessed 3 December 2016).

Verweij, P.E., van Egmond, M. D.J. Bac, D.J., van der Schroeff, J.G. & Mouton,R.P. (1991). Hygiene, skin infections and types of water supply in Venda, South Africa, *Transactions* *of The Royal Society of Tropical Medicine and Hygiene*, Volume 85, Issue 5, September-October 1991, Pages 681–684. Available at: https://doi.org/10.1016/0035-9203(91)90395-F (accessed 23 August 2021).

Vieira, J.M.P. (2011). A strategic approach for Water Safety Plans implementation in Portugal, IWA Publishing. *J. Water Health* **9**, 107–116.

Wang, H. (2013). Challenges and Opportunities for Source Water Protection Plan Implementation in Saskatchewan: Lessons for Capacity Building, Master's thesis, University of Saskatchewan. Canada.

Water and Sanitation Program (WSP) (2014). WASH Post-2015: proposed targets and indicators for drinking-water, sanitation and hygiene. World Bank Water and Sanitation Program. Available at: http://www.zaragoza.es/ciudad/medioambiente/onu/en/detallePer_Onu?id=883 (accessed 13 March 2021).

Water and Sanitation Program (WSP) (2010). Gender in the water and sanitation program. Available at: http://www.wsp.org/wsp/sites/wsp.org/files/publications/WSP-gender-water-sanitation.pdf (accessed 15 July 2021).

Water Integrity Network (WIN) (2010). Advocacy Guide. Germany. Available at: http://www.waterintegritynetwork.net/wpcontent/uploads/2015/02/WIN_AdvocacyGuide_EN_2010.pdf (accessed 7 December 2019).

Water Operators Partnerships (WOP) (2009). *Africa Utility Performance Assessment,* Final Report. Available at: http://www.wsp.org/UserFiles/file/WOP_Report.pdf (accessed 29 January 2020).

WaterAid UK (2013). Trustee Annual Report and Financial Statements 2012/2013 screen res FINAL.pdf. Available at: http://www.wateraid.org%2Fuk%2F~%2Fmedia%2FPublications%2Fannual-reportsandstrategies%2FTrustees%2520Annual%2520Report%2520and%2520Financial%2520Statements%2520201213%2520screen%2520res%2520FINAL.pdf&ei=ldbEVPegOsPB7AaFuYCACA&usg=AFQjCNEzj2bPH_V9f5HteQWkciekqiFRnA&bvm=bv.84349003,d.ZGU (Accessed 13 May 2019).

Watson, V. (2009). Seeing from the South: refocusing urban planning on the globe's central urban Issue. *Journal of Urban Studies* **46**, 2229-2275.

We Pay You Deliver (WPYD) Consortium (2017). State of Service Delivery Report: Cities at the Crossroads. Volume 1, Harare, Danish Church Aid.

We Pay You Deliver (WPYD) Consortium (2018). Cities in Distress: Municipal Budgeting and Financial Management Survey Report. Harare: Danish Church Aid.

Werner, M. (2011). Accurate measurements of minimum night flows for water loss analysis. In 5th Annual WIOA NSW Water Industry Engineers & Operators Conference. Water Loss Management Program NSW, Exhileracing Events Centre, Newcastle, pp. 31–37.

Whitcomb, J.B. (2005). Florida Water Rates Evaluation of Single Family Homes. Funded and prepared by the Florida Water Management Districts. Available at: www.swfwmd.state.fl.us/documents/reports/water_rate_report.pdf (accessed 5 June 2021).

WHO & IWA (2015). A Practical Guide to Auditing Water Safety Plans. WHO, Geneva, Switzerland; IWA, UK, London. Available at: http://www.who.int/water_sanitation_health/publications/auditing-water-safetyplans/en/ (accessed on 8 September 2018).

WHO & IWA (2016). A practical guide to Auditing water safety plans. World Health Organization, Geneva. Available at: https://www.who.int/publications/i/item/9789241509527 (accessed 9 August 2021).

WHO & IWA (2017). Global status report on water safety plans: a review of proactive risk assessment and risk management practices to ensure the safety of drinking-water. Geneva: World Health Organization. Available at: (http://www.who.int/water_sanitation_health/publications/global-status-report-on-water-safety-plans/en/ (accessed 6 July 2018).

WHO (2000). Tools for Assessing the O&M Status of Water Supply and Sanitation in Developing Countries. World Health. Organization, Geneva, Switzerland.

WHO. (2004). Guidelines for drinking-water quality, 3rd edition. Geneva, Switzerland: World Health Organization. Available at: http://www.who.int/water_sanitation_health/dwq/gdwq3/en/ (accessed 2 June 2017).

WHO (2006). *Guidelines for the Safe Use of Wastewater, Excreta and Greywater*; World Health Organization: Geneva, Switzerland.

WHO (2011). *Guidelines for Drinking-Water Quality*, 4th ed.; World Health Organization (WHO): Geneva, Switzerland.

WHO (2012). Water Safety Planning for Small Community Water Supplies: Step by Step Risk Management Guidelines for Drinking Water Supplies in Small Communities. World Health Organization, Geneva, Switzerland, pp. 1–66. Available at: http://apps.who.int/iris/bitstream/10665/75145/1/9789241548427_eng.pdf (accessed 3 May 2021).

WHO (2014). Water Safety Plans in Eastern Europe, the Caucasus and Central Asia: Summary of a workshop on building capacities for the development of water safety plans 24–25 June 2014, Bishkek, Kyrgyzstan, WHO, Copenhagen, Denmark. Available at: http://www.euro.who.int/en/health-topics/environment-and-health/water-and-sanitation/country-work/water-safety-plans-in-eastern-europe,-the-caucasus-and-central-asia (accessed 19 January 2020).

WHO (2017). Water Safety Plan Review. Approval and Audit; WHO: Geneva, Switzerland. Available at: www.who.int/entity/water_sanitation_health/publications/wsp170805chap14.pdf (accessed on 21 July 2018).

WHO (2019). Weak Systems and Funding Gaps Jeopardize Drinking-Water and Sanitation in the World's Poorest Countries. Available from: https://www.who.int/news/item/28-08-2019-weak-systems-and-funding-gaps-jeopardize-drinking-water-and-sanitation-in-the-world'spoorest-countries (accessed 22 March 2021)

WHO Africa (2019). Africa's first-ever mass typhoid fever vaccination campaign ends in Zimbabwe. Available at: https://www.afro.who.int/news/africas-first-ever-mass-typhoid-fever-vaccination-campaign-ends-zimbabwe (accessed December 2020).

WHO Africa (2019). Planning workshop for water quality monitoring for senior managers held. WHO, Zimbabwe. Available at: https://www.afro.who.int/news/planning-workshop-water-quality-monitoring-senior-managers-held (accessed 7 June 2021).

WHO/UNICEF (2008). Progress on Drinking Water and Sanitation: Special Focus on Sanitation. World Health Organization and United Nations Children's Fund Joint Monitoring Programme for Water Supply and Sanitation (JMP). UNICEF, New York, and WHO, Geneva.

WHO/UNICEF Joint Monitoring Program (2014). Progress on Drinking Water and Sanitation, 2014 Update. Available at: http://www.unicef.org/publications/files/JMP_report_2014_webEng.pdf (Accessed 16 January 2019)

WHO/UNICEF Joint Monitoring Program (2015). Update and MDG assessment. Available at: https://www.wssinfo.org/fileadmin/user_upload/.../JMP-Update-report-2015_English.pdf (Accessed 23 March 2018).

WHO/UNICEF Joint Monitoring Programme (2017). Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines; WHO Press: Geneva, Switzerland; UNICEF Joint Monitoring Programme: New York, NY, USA, 2017; ISBN 9789241512893.

WHO/UNICEF Joint Monitoring Programme (2019) Progress on household drinking water, sanitation and hygiene 2000-2017*:* Special focus on inequalities.
https://www.who.int/water_sanitation_health/publications/jmp-2019-full-report.pdf (accessed 16 September 2019).

Windischhofer, R. (2007). Municipal Enterpreneurialism and Commercialization of the Finnish Water Sector, PhD thesis, University of Tampere, Tampere, Finland.

Wood, P. (2000). Biodiversity and Democracy: Rethinking Society and Nature, University of British Columbia Press, Vancouver, BC.

World Bank. 1998. World Development Report 1998/1999: Knowledge for Development. New York: Oxford University Press. © World Bank. Available at: https://openknowledge.worldbank.org/handle/10986/5981 (accessed 23 June 2021)

The World Bank Development (1998). The political economy of privatization: An Empirical Analysis An empirical analysis of privatization in Argentina

World Health Organization (WHO) (1997). Guidelines for Drinking Water Quality, Volume 3: Surveillance and control of community supplies, 2nd edition, Geneva, Switzerland.

World Health Organization (WHO) (2003). The Right to Water. World Health Organization, World Health Organisation (WHO) (2010). Joint Monitoring Programme for Water Supply and Sanitation. Available at: http://whqlibdoc.who.int/publications/2010/9789241563956_eng_full_text.pdf (accessed 10 June 2013).

World Health Organization (WHO) (2017) . Guidelines for drinking-water quality: fourth edition incorporating first addendum, 4th ed + 1st add. Available at: https://apps.who.int/iris/handle/10665/254637 (accessed 12 January 2020).

Wright, J.A., Yang, H., Rivett, U. & Gundry, S.W. (2012). Public perception of drinking water safety in South Africa 2002–2009: a repeated cross-sectional study. *BMC Public Health*, 12 (556). Available at: http://www.biomedcentral.com/1471-2458/12/556 (accessed 27 September 2020).

Yamane, T. (1967). Statistics: An Introductory Analysis. 2nd Edition, Harper and Row, New York.

Yepes, G. (1995). Best Practices: Reduction unaccounted for water, the job can be done. The World Bank, Washington, DC.

Yin, R. K. (2014). Case study research: Design and methods - applied social research methods, Sage publications Thousand Oaks, CA.

Zimbabwe (1978). Public Health Act (Chapter 15: 09). Harare: Government Printers.

Zimbabwe (1996). Urban Councils Act: Chapter 29:15, Government of Zimbabwe: Harare.

Zimbabwe (1998a). Zimbabwe Water Act: *Chapter 20:24, No.31/98*, Harare, Government Printers.

Zimbabwe (1998b). Zimbabwe National Water Authority Act, Harare, Government Printers.

Zimbabwe (2001). Food and Food Standards Act (Chapter 15: 04). Harare: Government Printers.

Zimbabwe (2002). Environmental Management Act: Chapter 20:27. Act 13/2002, 5/2004 (s. 23), 6/2005 (s. 28). Available at: http://extwprlegs1.fao.org/docs/pdf/zim47834.pdf (accessed 19 August 2021).

Zimbabwe Coalition on Debt and Development (ZIMCODD) (2013). Towards a pro-people framework on water management: An assessment of the political-economy of water service delivery in Harare. ZIMCODD, Harare. Available at: http://www.worldcat.org/oclc/966127702 (accessed 4 January 2021).

Zimbabwe National Statistical Agency (ZimStats) (2013). Population Census, Census 2012: Zimbabwe Main Report. Harare: ZimStats.

Zimbabwe Government (2013). Ministry of Local Government: Directive to Write off Debts, to all Local Authorities. Ministry of Local Government, Harare.

Zimbabwe Electoral Commission (ZEC) (2018). Social media campaign Pre-election and Election Phase. Mahachi Quantum Building, Corner Kaguvi & Jason Moyo, P.O. Box 7782, Harare.

Zimlive.com (30 September 2021). Mafume cleared to return to Town House as Moyo imposes Mutizwa.

Zivanai, O., Onias, M., Nhamo, H., Isaac, M., & Roselyn, M. (2014). An assessment of revenue collection constraints in Zimbabwean local authorities: A case study of Bindura Municipality (2009-2013). *International Journal of Innovative Research and Development* **3** (9), 24–33.

APPENDICES

APPENDIX A: FRAMEWORK FOR IDENTIFYING WSS SERVICE INDICATORS

1.1 THE HUMAN RIGHTS APPROACH

This section of the thesis starts by giving a background of the guiding principles for assessing and monitoring water supply and sanitation services. The study's assessment and monitoring of service level and bests practice is guided by the human right(s) to water and sanitation principles. The international monitoring of drinking water and sanitation has been jointly carried out by WHO and UNICEF through their Joint Monitoring Programme (JMP). As the Millennium Development Goals (MDGs) era ended in 2015, the JMP has proposed a post-2015 framework for integrated monitoring of water and sanitation targets included in the Sustainable Development Goal number 6 (WHO/UNICEF, 2017; Giné-Garriga et al., 2017). A brief discussion of how each element of the proposed water and sanitation targets and the corresponding indicators can be understood from a human rights perspective is indicated below.

According to Giné-Garriga et al (2017), the post-2015 proposal is a step forward towards a monitoring framework where human rights elements related to water and sanitation are effectively promoted. The right to water was first recognised in 2002 with the adoption of General Comment No. 15 by the United Nations (UN) Committee on Economic, Social and Cultural Rights (CESCR, 2003); Levin et al., 2009; Meier et al., 2014). It interprets Articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) to include the right to water as an implicit component of the right to an adequate standard of living and the right to health Levin et al, 2009). In addition, the right to water has been linked with the right to sanitation ever since. However, sanitation was only properly addressed not until 2006, in the guidelines on the realisation of the right to drinking water and sanitation adopted by the UN Sub-Commission on the Promotion and Protection of Human Rights.

The recognition of the human right to safe water and sanitation by the United Nations (UN) General Assembly's resolution 64/292 of July 2010 and the United Nations Human Rights Council's (HRC) resolution 15/9 of October 2010 is thus a step forward in propelling the awareness of the global water and sanitation crisis to new heights (Brown et al., 2017). Murthy (2013) also further asserts that the framing of water and sanitation as a human right can be understood as an affirmation of the fundamental importance of water and sanitation for human dignity, and as a response to global water service trends that have increasingly emphasized efficiency, financial sustainability, and privatization. A comprehensive international legal human rights framework that includes various international treaties and political declarations as well as national constitutions and national legislation has incorporated water and sanitation as an integral component of this framework.

The framework covers the rights to an adequate standard of living, adequate housing, health, education, work, life and physical security, the prohibition of inhuman or degrading treatment, and gender equality and anti-discrimination provisions (Levin et al. (2009). By ratifying these resolutions, UN Member States have accepted their obligations as the duty bearers for the realisation of the rights, therefore they can be held accountable for progress towards their full realisation (Meier et al., 2014; Bos et al., 2016). Governments have three types of obligation including: to respect, protect and fulfil these human rights. Gupta et al. (2010) indicates that human rights to water and sanitation have evolved from an implicit responsibility under the rights to health, development and an adequate standard of living to an explicit obligation, that means State parties are now mandated to observe these human rights to water and sanitation, and they are held accountable for any failures.

Respective States/countries are expected to use maximum available resources to ensure that the right to water and sanitation is “realized progressively” within the International Covenant on Economic, Social and Cultural Rights (ICESCR). Murthy (2013) describes the phrase “realized progressively’ as not giving room for excuses for inaction by Member States, nor that the obligations are nonbinding, instead, the phrase emphasizes the importance of considering how governments allocate their budgets over time towards the realization of these rights.

According to Bos et al. (2016), the term “progressive realization” refers to the principle that States/countries, as the duty bearers, are required to act to the best of their abilities and capacity to maximise progress towards a situation where their entire population enjoys human rights without inequalities or discrimination. The concept of progressive realization and non-discrimination can be used as a tool to monitor governments’ expenditure over time and to assess whether the obligations to expend maximum available resources to realize the rights in a non-discriminatory way are being met (Murthy, 2013). This assertion therefore implies that the human rights to water and sanitation may promote accountability and embolden civil society to monitor the government’s progress. The human right framework of access to water and sanitation compliments good governance and anti-corruption efforts seeking to ensure that resources are being used efficiently, fairly and transparently (Murthy, 2013).

In addition, the right water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses (CESCR, 2003). According to Murthy et al. (2013), the ICESCR General Comment No.15 (Arts. 11 and 12 of the covenant) describes the normative content of the human right to water in two related ways:

i Paragraph 2 states that the right to water and sanitation “*entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses.*”

ii In paragraph 12, it describes the content of the right as requiring:

a. Availability,

b. Quality, and

c. Accessibility.

Accessibility is then further divided into four sub-categories:

- physical accessibility,
- economic accessibility,
- non-discrimination, and
- information accessibility.

The United Nations Special Rapporteur (Catarina de Albuquerque) developed two sets of criteria from the General Comment No.15 that could be used to evaluate whether a practice was “good” from the standpoint of realizing the human right to water and sanitation. The first set are described as the “normative content” of the human right to water and sanitation and consists of:

i. Availability,

ii. Quality/safety/potability,

iii. Acceptability,

iv. Accessibility and,

v. Affordability

The second set of criteria are described as “cross-cutting” criteria because they are applicable to all human rights including:

- non-discrimination,
- participation (which incorporates the concept of information accessibility described in General Comment 15),
- accountability,
- impact and,
- sustainability.

The CESCR (2003) indicate that the human right to water contains both freedoms and entitlements. Freedoms include the right to maintain access to existing water supplies necessary for the right to water and such as the right to be free from any interference for example be free from disconnections or contamination of water supplies. Conversely, entitlements include the right to a system of water supply and management that provides quality opportunity for people to enjoy the right to water. The cross-cutting criteria contain both substantive (basic) and procedural rights, and they are conceptually consistent with the principles of the human rights-based approach to development. General Comment 15 articulates normative standards, but does not specify actual quantities of water. Murthy (2013) indicates that even though paragraph two states that "*An adequate amount of safe water is necessary to prevent death from dehydration, to reduce the risk of water-related disease and to provide for consumption, cooking, personal and domestic hygienic requirements*," the exact amounts are supposed to be determined at the national and subnational levels.

Thus, both General Comment No.15 and "good practices" refer to guiding principles, such as the World Health Organization's minimum daily water requirements, which describe twenty litres per capita daily (20 lpcd) as basic access; 50 lpcd as intermediate access; and 100-200 lpcd as optimal access. Thus, domestic incorporation of the right to water and sanitation, with specific parameters, is now one of the primary public policy challenges.
According to Levin et al (2009), the human right to water and sanitation is based on three pillars:

- the State's general obligations,
- three general human rights principles and,
- five criteria specific to water and sanitation.

These are based on the International Covenant on Economic, Social and Cultural Rights (ICESCR) and its interpretation by the Committee on Social, Economic and Cultural

Rights (CESCR), monitoring implementation of and compliance with these treaties. A full discussion of these three important pillars is given below.

1.1.1 HUMAN RIGHTS OBLIGATIONS

Levin et al. (2009) and Murthy (2013) indicate that States assumed several obligations by ratifying human rights treaties. The obligations are thus classified in three categories:

i. the respect of human rights,
ii. protection and
iii. fulfilment of the human rights.

1.1.1.1 The obligation to respect

This requires that the State does not interfere directly or indirectly with the enjoyment of the right (CESCR, 2003; Levin et al., 2009; Murthy, 2013; Meier et al., 2014). They indicate that this obligation includes, inter alia*,* refraining from engaging in any practice or activity that denies or limits equal access to adequate water; arbitrarily interfering with customary or traditional arrangements for water allocation; unlawfully diminishing or polluting water, for example through waste from State-owned facilities or through use and testing of weapons; and limiting access to, or destroying, water services and infrastructure as a punitive measure, for example, during armed conflicts in violation of international humanitarian law.

1.1.1.2 The obligation to protect

This obligation requires the State to prevent third parties from interfering in any way with the enjoyment of the right (CESCR, 2003; Levin et al., 2009; Meier et al., 2014). Third parties include individuals, groups, businesses and other (governmental) entities. There the state's obligation includes effective legislation and other enforcement mechanisms to restrain third parties, for example from charging unaffordable prices for drinking water, polluting water resources and inequitably extracting from water resources, including natural sources, wells and other water distribution systems. Where water services (such as piped water networks, water tankers, access to rivers and wells) are operated or controlled by third parties, States parties must prevent them from compromising equal, affordable, and physical access to sufficient, safe and acceptable water. To prevent such abuses an effective regulatory system must be established, in conformity with the Covenant and this General Comment, which includes independent monitoring, genuine public participation and imposition of penalties for non-compliance. In this study, the existence of regulatory systems is used as one of the indicators of best practices in the provision of these services.

1.1.1.3 The obligation to fulfil

The obligation to "*fulfil*" can be disaggregated into the obligations to facilitate, promote and provide (CESCR, 2003; Levin et al., 2009; Murthy, 2013; Meier et al., 2014). The obligation to facilitate requires the State to take positive measures to assist individuals and communities to enjoy the right. To fulfil this, the State is required to take targeted steps, for example to ensure its citizens are empowered through proper education on hygienic use of water, source water protection and ways to reduce water wastage (Levin et al., 2009). The obligation to fulfil requires States parties to adopt the necessary measures directed towards the full realization of the right to water. The obligation includes, inter alia, according sufficient recognition of this right within the national political and legal systems, preferably by way of legislative implementation; adopting a national water strategy and plan of action to realize this right; ensuring that water is affordable for everyone; and facilitating improved and sustainable access to water, particularly in rural and deprived urban areas (CESCR, 2003; Levin et al., 2009; Murthy, 2013; Meier, 2014). States parties are also obliged to fulfil (provide) the right when individuals or a group are unable, for reasons beyond their control, to realize that right themselves by the means at their disposal, especially the impoverished and marginalized (CESCR, 2003). Thus when one is analysing national water policies, these three obligations are crucial indicators of best practices.

1.1.2 THE HUMAN RIGHTS NORMATIVE CRITERIA

The normative criteria for determining good practices are based on the normative content of the human rights to sanitation and water. The Committee on Economic, Social and Cultural Rights described the content of the right to water in its general comment 15 (2002), and the independent expert (Catarina Albuquerque), in her report on human rights obligations related to sanitation (A/HRC/12/24), described the normative content of the right to sanitation. The normative criteria for good practices are: availability, quality/safety, acceptability, accessibility and affordability. Levin et al. (2009) further indicate that these criteria give guidance for water sector practitioners by setting a general framework for reforms, but at the same time leaving room for solutions specific to a national or local, urban or rural context.

1.1.2.1 Availability of water and sanitation

Availability of water and sanitation differ in the aspects of each service. The Human Rights Council identifies sanitation as an explicit right on its own. The aspects of each services are discussed independently below.

1.1.2.1.1 Water availability

Evidence from country wide studies by the Joint Monitoring Programme shows that in many instances, water and sanitation facilities are simply not available in sufficient quantity (WHO/UNICEF, 2019). People are not getting adequate water to satisfy their basic personal and domestic needs or it arrives only intermittently. Water should be available continuously and in a sufficient quantity to meet the requirements of drinking and personal hygiene, as well as of further personal and domestic uses, such as cooking and food preparation, dish and laundry washing and cleaning (CESCR, 2003). According to CESCR (2003), “continuous” means that the regularity of the water supply is sufficient for personal and domestic uses. Bos et al. (2016) affirms the above assertion as they indicate that safe and clean water must be available for household use, in public buildings and at the workplace. Moreover, as a criterion, availability refers to both sufficient quantities of water and reliability of service provision (Bos et al., 2016).

Associated with reliability is '*continuity*', not just for the current but also for future generations. This raises important operational considerations, which were discussed above under the principle of sustainability, including system robustness and resilience. However, neither continuity nor exact quantity required can be determined in the abstract, since individual requirements for water consumption vary, for instance due to climatic conditions, level of physical activity and personal health conditions. Thus, it is not possible to set precise amounts that apply at a global level. However, supply needs to be continuous enough to allow for the collection of sufficient amounts to satisfy all needs, without compromising the quality of water (CESCR, 2003). Regarding the necessary quantity, estimates and international recommendations can provide broad guidance for assessing whether the availability criterion is being met.

As an example, WHO (2003) indicate that all domestic needs can be met with an estimated volume of about 100 litres per capita per day. Moreover, The Sphere Project (2004) indicates that an absolute minimum amount in the context of disaster response is set at 15 litres per capita per day. However, it is argued that such an amount raises health concerns, as it is insufficient to meet hygiene requirements, and must not be understood to correspond to the full realization of the right to water. The Sphere Project (2004), indicates that once personal and domestic needs have been met, adequate quantities of water should be available to secure livelihoods and ensure food security.

The quantity of water available for each person should correspond to World Health Organization (WHO) guidelines (Gleick, 1996; WHO, 2003). Levin et al (2009) corroborate the above assertion by indicating that World Health Organization (WHO) stipulates that access to drinking water means receiving at least 20 litres per person per day, although not all requirements can be met with this amount. Instead, the WHO considers 50-100 litres per capita per day (l/c/d) as the amount necessary to meet most hygiene and consumption needs. Moreover, the 7.5 or 15 l/c/d that is mentioned by the WHO (2003) and The Sphere Project (2004) respectively, is regarded as the minimum for survival needs under most conditions (United Nations Development Programme [UNDP, 2006]; Levin et al, 2009). Bos et al. (2016) also affirm the above assertion that water should be available in sufficient quantity for household use such as drinking and personal hygiene, and for cooking, food preparation, dish and laundry washing, and cleaning, however, the human rights framework does not provide a global, absolute value to define “sufficient quantity”, as this depends on contextual factors.

An indication for a range of values may be derived from a study by the World Health Organization (WHO, 2003), which presents quantities based on levels of service and linked to levels of public health concern (Table A1). They also emphasized the need to ensure that wastage of water and pollution of the environment are avoided to guarantee long-term availability of water, and protect the rights of present and future generations.

Table A1: Requirements for water service levels to promote health (l/c/d) (WHO, 2003)

Service level	Access measure	Needs met	Level of health concern
No access (quantity collected often below 5 l/p/d).	More than 1000 metres or 30 minutes collection time.	Consumption—cannot be assured. Hygiene—not possible unless practised at source.	Very high
Basic access (average quantity unlikely to exceed 20 l/p/d)	Between 100 and 1000 metres or 5–30 minutes total collection time.	Consumption—should be assured. Hygiene—handwashing and basic food hygiene possible, laundry/bathing difficult to be assured unless carried out at source.	High
Intermediate access (average quantity about 50 l/p/d).	Water delivered through one tap on-plot (or within 100 metres or 5 minutes collection time).	Consumption—assured. Hygiene—all basic personal and food hygiene assured; laundry and bathing should also be assured.	Low (provided absence of Contamination is rigorously assessed)
Optimal access (average	Water supplied through multiple taps continuously.	Consumption—all needs met. Hygiene—all needs should be met.	Very low

quantity 100 l/p/d).			

Table A1 shows that recommended quantities depend on level of service, optimal access is the most desired level and the average quantity per capita per day is 100 litres. Moreover, the water should be supplied through multiple taps continuously. This level of service meets all consumption needs including hygiene. The WHO guideline standards may not be immediately achievable in many developing countries. This assertion affirms what was discussed above that the human right to water is to be progressively realized. States may take a stepwise approach, adapting the WHO guidelines to their national context. The UN, Office of the High Commissioner for Human Rights (OHCHR), UN-Habitat, WHO (The Right to Water, Fact Sheet No, 35. 2010) made reference to a judgement by the South African Constitutional Court (Case CCT 39/09, 2009 ZACC 28) which concluded that it is not appropriate for a court to define a quantity for what should constitute 'sufficient water', because this is a matter best addressed in the first place by the government.

1.1.2.1.2 Sanitation availability

Regarding sanitation, in a few small countries, 673 people were still practising open defecation in 2017 because sanitation facilities are not available to them (WHO/UNICEF, 2019). This normative criterion aims to respond to this reality. The human right to sanitation entitles everyone to sanitation services that provide privacy and ensure dignity, and that are physically accessible and affordable, safe, hygienic, secure, socially and culturally acceptable (UN, 2015). The rights law requires that there be enough sanitation facilities with associated services to ensure that waiting times are not unreasonably long (de Albuquerque, 2010). Bos et al. (2016) indicate that safe sanitation facilities must be available to everyone, everywhere: at home, at the workplace and in public places. Both capacity and continuity should be addressed by this criterion and regardless of the type of facility (public, shared or private), sanitation systems should be designed to minimum standards that ensure their functioning is sufficient under normal operating conditions (Bos et al., 2016).

Consequently, best practices should ensure realistic safeguards that prevent overflows, blockages and other system malfunctioning as part of the design (de Albuquerque, 2014). Recommendations are that for new infrastructure, extreme weather conditions, including those resulting from climate change, need to be taken into consideration, especially in those areas inhabited by the poor, the vulnerable and those who are discriminated against (Bos et al., 2016). Operators have an obligation to starts with the evacuation of waste to disposal sites or to treatment plants, which may be central or decentralised in the case of private or shared facilities. Public authorities and regulators should establish a framework of enforceable measures that ensure safe sanitation facilities are available:

- in public places in sufficient numbers, addressing the specific needs of men, women and children, the elderly and the disabled;
- to serve those without a permanent dwelling, such as homeless people or nomadic communities;
- in institutional facilities (such as schools, hospitals, health and detention centres) in sufficient numbers, addressing the specific needs of men, women and children, the elderly and the disabled, and for detained people (such as prisoners, refugees and asylum-seekers).

According to Bos et al. (2016), the continuity aspect of availability means the collection and treatment should function at all times at an adequate capacity. Furthermore, a well-established and clearly communicated schedule of periodic emptying of septic tanks should be used, and in public sanitation facilities and facilities in institutions acceptable hygienic conditions should be maintained always. However, de Albuquerque (2010); Flores et al. (2016) and Giné-Garriga et al (2017) indicate that defining a minimum number of toilets for a given population is not feasible since this may not consider the particularities of a given community and the special needs of each one of its members. For instance, women, persons with disabilities, children and others may have sanitation requirements (A/HRC/12/24, para. 75). Furthermore, the United Nations, Office of the High Commissioner for Human Rights (OHCHR), United Nations Human Settlements Programme (UN-HABITAT) and WHO (2010) stipulate that the right to sanitation demands that facilities be available for use always, day or night, along with associated services such as sewerage or safe faecal sludge management.

The right to sanitation further demands protection from excreta, not only single individuals, but also the people in their vicinity must therefore have access to hygienic toilets, use them and have arrangements to ensure that excreta and waste-water are safely stored and treated (de Albuquerque, 2010; UN, 2015; Flores et al., 2016; Giné-Garriga et al., 2017). This specific sanitation principle is used in reporting in this research as an indicator of good practice. Taking into account this understanding of availability, de Albuquerque (2010) indicates that a wide range of practices might qualify as good from a human rights perspective, and these might involve laws and policies that prioritize water for basic personal and domestic uses such as: exempting such water uses from licensing requirements, ensuring the minimum “lifeline” amount of water for personal and domestic uses, providing technologies to improve water continuity, promoting community-led sanitation or building latrines in communities which have none. According to de Albuquerque (2010), such practices relate to the availability of services, but will most likely simultaneously intersect with other criteria mentioned under both normative and cross-cutting criteria.

i ***Water and sanitation quality/Safety***

The WHO/UNICEF (2019) estimates indicate that 701 million people still did not use improved water sources in 2017, the number of people relying on water of poor quality is unfortunately estimated to be much higher (WHO/UNICEF, 2010). The WHO (2006) issued guidelines on drinking water quality that require water to be free from substances hazardous to human health. Water must be of such a quality that it does not pose a threat to human health (WHO, 2017). The transmission of waterborne diseases via contaminated water must be avoided. Safe drinking water is water that “*does not* *represent any significant risk to health over a lifetime of consumption, including different sensitivities that may occur between life stages*" (WHO, 2006). The maximum limits provided in the guidelines for a wide range of potentially harmful substances can serve as a reference point (WHO, 2017). The State may adopt these standards or create regional or national standards for implementation; in either case, it must ensure that such standards prevent hazards to human health (Levin et al., 2009).

UN Member States are therefore obliged to establish and enforce water quality monitoring guidelines for all water utilities. Moreover, since water quality is affected by human behaviour, governments are also mandated to take appropriate awareness-raising measures on the hygienic use of water and the protection of water sources (Levin et al., 2009). To fulfil the human rights criteria, water must be of acceptable quality (Levin et al., 2009). Special Rapporteur on the human rights to water and sanitation, sustainability and non-retrogression, 2013 (A/HRC/24/44) and a human rights report by de Albuquerque (2010), indicate that water contamination from pollution, natural geological phenomena such as arsenic in groundwater, inadequate sanitation, and improper handling and household storage have devastating effect on people's health and their capacity to attend school, work, or even to participate in society.

The content of the human right to sanitation lacked clarity to many people for a long time and of late, efforts have been devoted to clarifying its scope (Centre on Housing Rights and Evictions [COHRE], 2008; Langford et al., 2014; United Nations General Assembly [UNGA], 2010). To this note, the independent expert on human rights (de Albuquerque) states in her report that "*sanitation can be defined as a system for the collection, transport, treatment and disposal or reuse of human excreta and associated hygiene*" (Giné-Garriga et al., 2016). The UN General Assembly (2010) also indicates that "*States must ensure without discrimination that everyone has physical and economic access to sanitation, in all spheres of life, which is safe, hygienic, secure, socially and culturally acceptable, provides privacy and ensures dignity*". Sanitation facilities must be hygienically and technically safe to use, moreover, to ensure good hygiene, access to water for cleansing and handwashing at critical times is essential (UN, 2015; WHO, 2017).

Holmes et al. (2016) further indicate that lack of safe sanitation systems contributes to the emergence and spread of antimicrobial resistance by increasing the risk of infectious diseases and thereby use of antibiotics to tackle preventable infections. Limited management of faecal waste including antimicrobial residues from communities and health care settings can also contribute to emergence of resistant pathogenic strains (Verweij, 1991; Korzeniewska et al., 2013). The lack of access to safe and hygienic sanitation raises serious public health concerns (WHO, 2017). Hence, this normative criterion of quality/safety aims to address these problems, and WHO (2017) indicate that sanitation of acceptable quality means having safe and adequate facilities to protect public health and the environment. This assertion is supported by de Albuquerque (2014) who indicates that sanitation facilities must be safe to use and must effectively prevent human, animal and insect contact with human excreta, to ensure safety and to protect the health of users and the community. Therefore, a toilet facility must be hygienic and easy to clean, solidly built, prevent human, animal and insect contact with excreta, and ensure privacy. Moreover, the excreta must be safely deposited and treated in ways that avoid pollution and public health risks (WHO, 2017). Thus, the design of facilities should take into account the needs of women and children, as well as people with disabilities and the elderly (WHO, 2017). Manual emptying of pit latrines is not allowed, furthermore, facilities must ensure access to safe water and soap for hand-washing (de Albuquerque, 2010).

Overall, de Albuquerque (2010) indicates that good practices related to safety and quality of water and sanitation may be directed at different aspects, as the dimensions of this criterion are quite diverse including but are not limited to: laws and systems in place for monitoring and testing water quality, systems of ecological sanitation, innovative methods for emptying latrines in complicated environments such as slums, low cost sanitation solutions which hygienically separate excreta from human and animal contact, purification, filtration or other low cost solutions for rendering water potable, or hygienic household storage methods.

1.1.2.2 Acceptability of water and sanitation

Acceptability has important implications for dignity and privacy, which are themselves human rights principles that cross-cut international human rights law and are especially relevant to the human right to sanitation and associated hygiene (de Albuquerque, 2014). Acceptability aspects differ depending on whether you are looking at provision of water or sanitation. This aspects are defined separately below.

i) Water acceptability aspects: Taste, odour and appearance

The acceptability of any water and sanitation services provided is crucial: water and sanitation facilities will not be used if they fail to meet the social or cultural standards of the people they are meant to serve (de Albuquerque, 2014). Acceptability (which includes appearance, taste and odour) is a highly variable concept, depending on perceptions related to local ecology, culture, education and experience (Bos et al., 2016). WHO (2017) indicate that water should be free of tastes and odours that would be objectionable to most consumers. Pursuant to this, acceptability therefore encourages people to use safe water sources and colour, odour and taste of water should be acceptable to the users (Levin et al., 2009; de Albuquerque, 2010; de Albuquerque, 2014; WHO, 2017). Consumers rely principally upon their senses to assess the quality of drinking-water (WHO, 2017).

The microbiological, chemical and physical constituents of water may affect the appearance, odour or taste of the water, and the consumer will evaluate the quality and acceptability of the water based on these criteria (WHO, 2017). Although these constituents may have no direct health effects, water that is highly turbid, is highly coloured or has an objectionable taste or odour hence, may be regarded by consumers as unsafe and rejected. In extreme cases, consumers may avoid aesthetically unacceptable but otherwise safe drinking-water in favour of more pleasant but potentially unsafe sources (WHO, 2017). WHO water quality guideline to water indicate the need to be aware of consumer perceptions and to consider both health related guideline values and aesthetic criteria when assessing drinking-water supplies and developing regulations and standards (WHO, 2017). Changes in the normal appearance, taste or odour of a drinking-water supply may signal changes in the quality of the raw water source or deficiencies in the treatment process and should be investigated. WHO guidelines indicate that water must be of an acceptable odour, taste and colour to meet all personal and domestic uses (WHO, 2017). The water facility itself must be acceptable for the intended use, especially for personal hygiene (CESCR, 2003).

ii) Sanitation acceptability aspects

Sanitation perspectives differ from the water ones because in many cultures there are great sensitivities surrounding toilet use (United Nations Sub-Commission on the Promotion and Protection of Human Rights (2006); COHRE et al. (2008); de Albuquerque (2010). Personal sanitation is a highly sensitive issue across regions and cultures, hence, if facilities and sources are not acceptable maybe due to their position, then people will not use them (Murthy, 2013). Thus, acceptability is an equally important criterion. Many cultures and religions require that anal and genital areas be washed after toilet use. Hence the technology for sanitation also needs to fit in with the given cultural context. According to de Albuquerque (2010), good practices related to the acceptability of drinking water and sanitation will inevitably involve a high degree of consultation with users to fully understand their definitions of “acceptable”.

In her report, de Albuquerque (2010) further indicates that, definitions of sanitation “acceptability” might involve aspects like: to the design or location of a sanitation facility, or the placement of a water point or the actual water source. Cultural prescriptions may also apply to conditions for use of these facilities. Considering this, proper consultation with and awareness-raising among concerned groups is vital to foster understanding of the linkages with other aspects of the rights to water and to sanitation. Several practices exist that are unacceptable from a human rights perspective including manual scavenging (the manual emptying of pit latrines, which is associated with specific scheduled castes in the Indian subcontinent) and the taboos attached to women and girls during menstruation. It is imperative that States ensure that these practices are eliminated by putting in place measures including changes to the physical infrastructure, coordinated political leadership, awareness raising and legal and policy change. Overall, the Human Rights Council (HRC) resolution A/HRC/12/24, para. 80 indicates that the concept of a human right to water and sanitation is an important vehicle for communities around the world to raise attention to perceived inequities and injustice in access to a vital natural resource and to services that have significant public health implications (Murthy, 2013).

1.1.2.3 Accessibility of water and sanitation

The human rights to water and sanitation oblige all UN Member States to consider all aspects of access to services, including increasing the number of people with access to at least minimum services, improvement in levels of services, and explicitly targeting poor, marginalised and disadvantaged people (Committee on Economic, Social and Cultural Rights [CESCR, 2010]; UN, 2015). de Albuquerque (2010) argues that even where water and sanitation are generally available, most of the time they are inaccessible because of several reasons. Worldwide, water points are often very far away from human dwellings, hence people, especially girls and women, spend greater of their day walking to collect water for their daily needs (de Albuquerque, 2010). People are vulnerable to attach while using such services, when using sanitation facilities at night. All practices that meet the accessibility criterion would strive to overcome these issues. The independent expert has stated that "*sanitation facilities must be physically accessible for everyone within, or in the immediate vicinity of, each household, health or educational institution, public institutions and places, and the workplace*" (A/HRC/12/24, para. 75). The same is true for water facilities. Again, aspects of accessibility depend on whether you are referring to water or sanitation. These aspects for each are described below.

i) Water accessibility

Accessibility implies the distance or time to a reliable water supply (from the house, but also from the workplace, school or other public places) and whether the services can be accessed by, for example, people with disabilities (Bos et al., 2016). According to CESCR (2003), water and water facilities and services have to be accessible to everyone without discrimination, within the jurisdiction of the State party. Human rights perspective, indicate stipulate that water supply must be accessible within, or in the immediate vicinity of, each household, educational institution, workplace and public place (Levin et al (2009). Water, and adequate water facilities and services, must be within safe physical reach for all sections of the population (CESCR, 2003). The water source should be in a secure place, considering the needs of the most vulnerable groups using it (Levin et al (2009). Threats to the security of women collecting water must be prevented Sufficient, safe and acceptable water must be accessible within, or in the immediate vicinity, of each household, educational institution and workplace (CESCRC, 2003). Furthermore, where this is impossible, a source must be provided close enough to allow people to collect sufficient water, at least the essential minimum of 20 litres of water (Levin et al., 2009; de Albuquerque, 2010). According to WHO (2017), the time required to collect the basic quantity (20 litres/capita/day) should normally not exceed 30 minutes (walking both ways, including waiting times), and the overall distance should be less than 1000 metres.

ii) Sanitation accessibility

According to the Human Rights Special Rapporteur (de Albuquerque, 2014), the design of sanitation facilities must be in such a way that users can physically access them. For example, the toilets must be easy to use by older persons, children and persons with disabilities, and the location must also be within reach and accessible to all always. The time and distance taken to reach a sanitation facility determines whether they will use the sanitation facilities or resort to defecating in the open (de Albuquerque, 2014). The Organisation for Economic Co-operation and Development (OECD, 2008) indicates that like water supply, the human right to sanitation implies that a sanitation facility is also accessible within, or in the immediate vicinity of, each household, educational institution, workplace and public place. Furthermore, people must be able to use sanitation facilities safely at night. This can be facilitated through lighted paths, provision of flashlights, or other measures (Levin et al., 2009). The risk of attack from animals or people, for women and children, and especially girls, must be considered when choosing how to construct and where to locate the service to avoid such threats. Regular maintenance and cleaning (such as emptying the pits) are essential to ensure the sustainability of sanitation facilities and continued access. The Human Rights Special Rapporteur therefore indicates that good practices with a focus on accessibility may include specially designed facilities for people with needs, including such features as ramps or handrails for people with disabilities or mobilization of community groups to ensure safety in around sanitation facilities, among many others.

1.1.2.4 Affordability of water and sanitation

According to Hutton (2012), the General Comment does not provide any quantitative metric in determining what is affordable. The Committee does, however, state that *“Any payment for water services has to be based on the principle of equity, ensuring that these services, whether privately or publicly provided, are affordable for all, including socially disadvantaged groups. Equity demands that poorer households should not be disproportionately burdened with water expenses as compared to richer households.”* Moreover, affordability has been variously described and measured and ‘affordable’ is a relative term, and in general refers to how much a good or service costs in relation to available spending power. The core aim is to ensure that:

- the price faced by consumers does not strongly affect the quantity demanded such that households would choose not to consume the service, or to demand below the minimum recommended quantity of the service, without another mechanism in place for guaranteeing lower cost access to the service for certain deserving groups; and/or
- the price paid does not place the household into debt or lead it to reduce consumption of other essential services, such as minimum levels of nutrition, health care, or education for children (Hutton, 2012).

There are two important consequences of ‘unaffordable’ water, sanitation and hygiene (WASH) services: (1) households will either pay too much for them hence, reduce other essential expenditure, or (2) they will cut back their WASH consumption, with other negative consequences such as adverse health consequences.

Smets (2012) proposes that economic affordability should be described by an ‘affordability index’ comparing the monthly water and sanitation bill of a household to its disposable income. The above definition of affordability given by Hutton (2012) is thus, in line with the CESCR statement in General Comment No. 4 on the Right to Adequate Housing: “*Steps should be taken by States parties to ensure that the percentage of housing-related costs is, in general, commensurate with income levels*”. According to the UNDP (2006), in many places, the poorest pay the most for water and sanitation services and their situation is aggravated by the fact that not being connected to the public network for water and sanitation services, they are left with no other choice than to buy water from informal private vendors, who can charge 10 to 20 times more than public utilities. People may find networked services unaffordable, even if it is possible to connect.

Due to the essentiality of water and sanitation to survival, people may spend the extra money to acquire access, but often this comes at the expense of the enjoyment of other human rights. The affordability criterion therefore addresses this problem. Sanitation and water facilities and services must be available for use at a price that is affordable to all people. The provision of services includes construction, maintenance of facilities, treatment of water, and disposal of faecal matter. According to de Albuquerque (2010) paying for these services must not limit people’s capacity to acquire other basic goods and services guaranteed by human rights, such as food, housing, health services and education. However, affordability does not necessarily require services to be provided free of charge. The State has an obligation to find solutions for ensuring that those who are unable to pay for these services, for reasons beyond their control, continue to gain access to sanitation or water.

The former Special Rapporteur on human rights (Catarina de Albuquerque) indicated that caution must be exercised and due process guaranteed in cases of disconnection from the water supply due to a user's inability to pay (de Albuquerque, 2010). Measures must be in place to ensure that such users are not deprived of access to safe water to meet their most basic personal and domestic needs, including sanitation needs when relying on water-borne sanitation. She advised that with respect to affordability, good practice examples might relate to, inter alia, the inclusion of sanitation and water services in social safety nets, microcredit programmes or revolving funds to help people afford the connection cost to the network, tariff structures with built-in cross-subsidies, policies regarding disconnections, or initiatives to monitor and regulate the price of water and sanitation.

However, Bos et al (2016) decry the lack of an absolute yardstick for affordability of water, sanitation and hygiene (WASH) services, even though some development agencies apply a threshold in a range of 3–5% of household income, which has its origin in World Bank practice. Further, Bos et al (2016) argue that such a global yardstick is debatable from a human rights perspective as it ignores income inequalities and contextual differences in purchasing power. However, Hutton (2012) indicates that the European Commission in both its Green and White books on services of general interest has expressed itself in favour of a definition of affordability based on the cost of services and the disposable income of the household. An OECD report for Egypt defined an affordable WSS tariff as a tariff that allows a "normal household" to pay for the consumption of a "basic amount of water and sanitation services" without the WSS bill exceeding a pre-determined share of the household's income (United Nations Human Rights Council [UNHRC, 2015]).

Using the above inference, it implies that water and sanitation services are affordable if the combined monthly water and sanitation expenditure of the average household divided by the monthly disposable income of the average household is less than the defined threshold (percent). Real world practice, mainly from developed countries, also focuses on comparing expenditure with household income (UNHRC, 2015). For example, in

Portugal the water and wastewater bill should never be more than 2% of income (consuming 120 m^3 per family per year or the equivalent of roughly 120 litres per capita per day). According to Hutton (2012), the real-world practice, mainly from developed countries, also focuses on comparing expenditure with household income. For example, in Portugal the water and wastewater bill should never be more than 2 per cent of income (consuming 120 m^3 per family per year or the equivalent of roughly 120 litres per capita per day) income (or total expenditure) spent on water and sanitation services.

The actual percentage selected varies from country-to-country, and between organizations. Pursuant to this, Smets (2009) states that "*By large, State practice supports the choice of an affordability index of 3 to 4 per cent of disposable income of poor households in industrialised countries*." Hutton (2012) indicates that many developing States have adopted policies to promote an affordability index for poor households of 3 to 5 per cent and implement measures to reduce the burden of water expenses for people living in poverty (Table A2). Regarding France and Mexico, Smets (2009) argues that while spending on WASH services of poor households is generally below that of richer households, the burden of these expenses on poorer households is usually disproportionally higher if expressed as a proportion of household budget. In conformity with this development, Smets (2009) makes the following observations about developing regions: in Latin America, most countries have affordability indices above 4 per cent for median households. However, because of social tariffs (discounted price plans to vulnerable consumers), the affordability ratio for poor households does not exceed 10% and would generally be around 6% for the first decile of income. This would show that many governments in that region consider that an affordability ratio for poor households of 6 per cent is acceptable.

Conversely, in Africa, the affordability index for median households is around 2.8% and for poor households connected to public water supply it can easily reach 7.5%. Much higher values of the index have been observed in slums with water supplied by water vendors. In Morocco, the target ratio of 3% for water supply and sanitation of poor households is considered appropriate, and in slums, the ratio is 5%. However, Coalition Eau (2009) indicates that there are no internationally recognised standards set to define the level at which water prices become unaffordable. Coalition Eau (2009); Hutton (2012) and, Motsatsi and Gibberd (2019) indicate that international agencies have set their own affordability thresholds:

i World Bank: the Africa Infrastructure Country Diagnostic, a World Bank project, cites 5% as a widely used affordability threshold for expenditure on utility services (power and water)
ii UNESCO-WWAP (2019) indicates that the water cost should not exceed 3% of household income.
iii OECD and European Commission: 4%
iv African Development Bank: 5%
v United Nations Development Programme (UNDP): 3%
vi Asian Develop men t Bank: 5%

At national level, water is most certainly unaffordable when the public authorities decide to take measures to reduce the impact on the most affected groups within the population. In Europe, some public authorities reacted when the affordability index exceeded 3%, but others show no concern (Coalition Eau, 2009). In developing countries, the index can even be higher before action could be taken by the authorities to address the situation. However, during recent years, several countries have officially adopted affordability index figures to adapt their water pricing policies to the population's ability to pay. It should be noted that the figure chosen by the governments is around 4% (Coalition Eau, 2009).

Table A2: Official objectives of national governments regarding water affordability: 2 to 6% of the household budget (Coalition Eau, 2009)

Country	Affordability threshold (% of household income)
Lithuania	2%
Northern Ireland	3%
Argentina	3%
Venezuela	3%

Chile	3%
United States	4%
Indonesia	4%
Kenya	5%
Mongolia	6%

Recommended Government Practices to ensure water affordability for households include:

- Subsidise household water and reduce water taxes,
- Lighten the burden on small consumers (for instance by increasing the price paid by large consumers and nondomestic consumers),
- Support programmes to improve economic efficiency in the water sector and to reduce household water consumption levels (reducing wastage).

Some governments have also taken social assistance measures (for example increasing housing assistance) and specific measures to make water more affordable for low-income households such as:

- Providing assistance to repair leaks and reduce wasteful use,
- Providing assistance to help users access the different social support systems available and thus be better able to pay their various bills, including water,
- Creating reduced tariffs for water for low-income households (social tariff) and/or provide targeted aid to the same effect.

According to Smets (2009), number of developing States have adopted policies to promote an affordability index for poor households of 3 to 5% and implement measures to reduce the burden of water expenses for poor people. One way to facilitate access to water would be to provide a set quota of free water or low-priced water per household or per person. Other approaches involve offering only low-income groups a reduced tariff or assistance to help them pay their water bills up to a certain volume. However, Coalition Eau (2009) indicate that for this to work, prior identification of beneficiaries is required and there should be an initial strategy identified on how the cost will be recovered. They argue that, identification of beneficiaries is easier in countries that already have an established social benefit system. Such measures have been taken by more than 50 national governments, at least 14 of which are industrialised countries and amongst these countries there are Africa countries including: South Africa, Kenya, Gabon, Morocco, and Tunisia (Coalition Eau, 2009; Smets, 2009).

The Coalition Eau (2009) and Smets (2009) further indicate that the cost of social measures varies per the number of beneficiaries and evidence from different countries shows that, this cost is usually very low. For instance, if 15% of the population gets assistance for around 30% of the average bill, the assistance provided to the poorest represents 4.5% of the total cost of water (Coalition Eau, 2009). They further argue that in most cases, the number of people who need such kind of assistance is usually very small therefore it is less costly to fund. Moreover, setting up social measures does not necessarily mean increasing the price of water for domestic users since assistance for the poorest can be funded by eliminating unnecessary advantages for certain “protected” individuals or institutions (unpaid bills, preferential tariffs, and privileges). Other measures cited include increasing the proportion of cross-subsidies, to reduce water taxes and even to finance social measures with the price reduction obtained when re-negotiating delegated services contracts in cases where utilities are operated by private entities. Some example can be drawn from South Africa where a free quota of 6 000 litres per month (200 litres/day) is attributed to all households even though the Johannesburg court has deemed this quota insufficient. According to Coalition Eau, 2009), approximately 45% of the population in Soweto pays nothing and 55% pays €5/month for water. Furthermore, the impoverished populations receive an additional quota of 4 000 litres/ month.

Table A3: Social tariff and targeted aid for low income households (Coalition Eau, 2009, accessed January 2021)

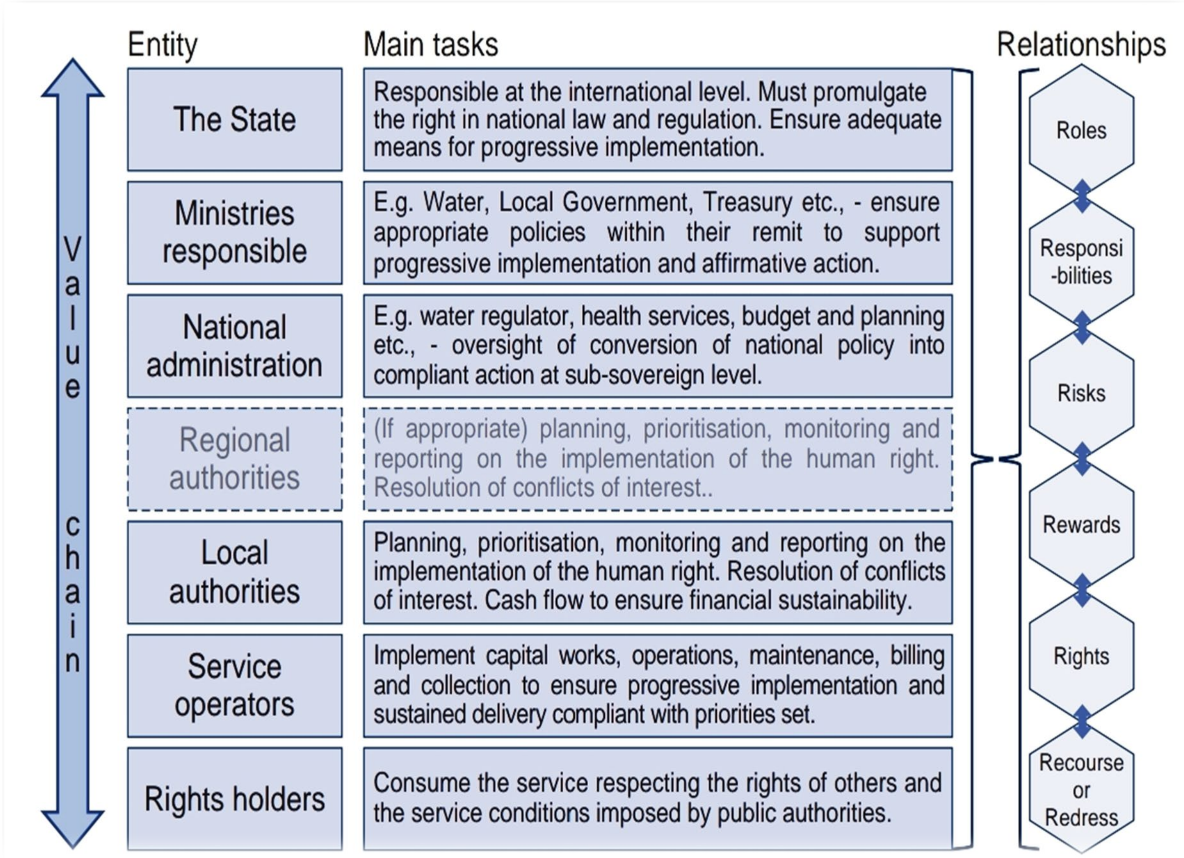
WHO PAYS?	HOW?	
	TARIFF REDUCTION	**DIRECT INDIVIDUAL AID**
USERS	United Kingdom Australia	South Africa Belgium (Walloon Region)
USERS AND TAX PAYERS	Colombie Panama	France (housing solidarity fund) Mexico
TAX PAYERS	Poland Chile	Estonia Lithuania

Overall, the above discussion shows that improving access to affordable water requires paying attention to the affordability index and taking measures to reduce it such as differentiated pricing, targeted aid programmes, cross-subsidy systems, etc. It was noted that many developing countries have implemented such measures and those countries which do little on affordability are likely to impose a high burden of water expenses on the most deprived people. Everyone will agree that in the framework of economic and social rights, drinking water should be available to all at an affordable price, either as a political objective or as a legal obligation (Smets, 2009).

1.1.2.5.2 Stakeholders for the progressive realization of the human rights to safe drinking water and sanitation

According to the International Water Association (IWA, 2015), contributions from all stakeholders, playing their role effectively and efficiently is indispensable for satisfactory delivery of drinking water, sanitation and wastewater management services. This assertion is affirmed by the Human Rights Rapporteurs de Albuquerque (2010) and IWA, 2017 who indicate that many actors are relevant to ensure the realization of the human rights to safe drinking water and sanitation (HRWS) for all and thus for identifying good practices in that context. It might not be easy to provide an exhaustive list of all relevant actors, however, below is an illustration of the ways that different actors may be engaged in good practices. The different actors who can participate in institutional arrangements for best practice include but are not limited to, States (including local governments), regulators, public and private water and sanitation providers, civil society organizations, development cooperation agencies, intergovernmental organizations, and education, training and research institutions, as well as individuals and communities (de Albuquerque, 2010; IWA, 2017; Bos et al., 2016).

Furthermore, realizing the rights to water and sanitation requires a wide number of different practices, and goes beyond service provision to include other types of interventions, such as legislation, policy formulation, institution building, awareness-raising, training, advocacy and litigation (de Albuquerque, 2010). Figure 1 summarises the tasks and relationships of the actors involved.



<u>Figure A1</u>: The value chain for realising the HRWS (Bos et al., 2016, accessed March 2020)

All these actors are relevant in best practice to enable realization of the HRWS, the discussed in detail in the following sections:

1.1.2.5.2.1 States

According to AquaFed (2010), the role of a State is to set up local regulations, to decide a policy, to fix targets and priorities and to ensure that these services are delivered effectively to end-users. States are supposed to respect the Right to Water and Sanitation obligations, furthermore, states have the responsibility to protect and fulfil the Right to Water and sanitation (de Albuquerque, 2014). The role the State is a very important part of that Zimbabwe water issues. It is the responsibility of the Central Government of Zimbabwe to formulate water policies and support water policy programs. The role of central government in WSS policy support is very important in ensuring that WSS services in Zimbabwe are efficiently provided as dictated by world, regional and national targets. It is the responsibility of the Central Government of Zimbabwe to ensure that a conducive environment prevails for the enjoyment of the rights to WSS services. The Central Government of Zimbabwe is therefore a crucial player in solving the Zimbabwe water issues by providing necessary legislative and policy measures to govern the WSS sector including the regulation of service providers and government ministries that are directly involved in the provision of these services.

Case studies of good practices in the realization of the rights to water and sanitation from many countries exist. These practices can range from direct service provision, establishing a regulatory framework and ensuring the existence of responsive accountability mechanisms, to engaging in awareness-raising activities and putting social policies in place to protect people living in poverty (de Albuquerque, 2014; Bos et al., 2016). The adoption of national action plans by States for the realization of the rights to water and sanitation such as "*Equitable Access Action Plan*" among others, with benchmarking and monitoring processes built in, are all good examples of best practices in the progressive realization of these rights (Bos et al., 2016, United Nations Economic Commission on Europe (UNECE, 2019). Frequently, responsibility for water and sanitation services lies at the local or municipal level (de Albuquerque, 2010). This implies that local authorities (Local Government) or municipalities have human rights obligations to ensure the enjoyment of the rights to sanitation and water for all within their jurisdiction.

At the local level, tailored solutions can often be devised to respond to the specific needs of the communities in question (de Albuquerque, 2010; Bos et al., 2016). For example, local and municipal authorities can, among other things, take specific measures to extend access to unserved communities, to ensure participation of marginalized groups, to raise awareness of the public health, environmental and other aspects related to water and sanitation, and to establish local-level accountability mechanisms to respond to potential problems and resolve disputes efficiently (de Albuquerque, 2014).

1.1.2.5.2.2 Regulatory bodies

The IWA (2015) indicates that international documents including the UN '*International guidelines on access to basic services for all*' and the International Organization for Standardization (ISO) standards 24510, 24511 and 24512 have defined the respective roles of different stakeholders but, they did not provide a detailed description of the roles of regulatory authorities. The public policy (water and sanitation policy) and regulatory frameworks are derived from the HRWS principles. In 2014, a Forum jointly organized in Lisbon (Portugal) by IWA and the Portuguese Water and Waste Services Regulation Authority (ERSAR brought together water services; public health and environmental regulators to deliberate on the role of regulation, its status and future trends on water services provision; including the different interactions between regulatory bodies across sectors (IWA, 2015). The Forum recommended the IWA to develop, formulate and establish a Charter that lays out the basic principles for good public policy and effective regulation of drinking water supply, sanitation and wastewater management services, declaring the respective rights, duties and responsibilities of the governments and public administration, regulatory authorities, service providers and users. This led to the establishment of a Charter for guiding the Public Policy and Regulation of services (The Lisbon Charter).

The IWA Lisbon Charter gives guidance on the formulation of national and local public policies, the creation of associated regulatory frameworks for the services, and good practice for the implementation of such policies and regulations (IWA, 2015). The IWA (2015) indicate that to achieve its purpose, the provisions of the Charter rely on the following fundamental elements:

- The IWA Lisbon Charter is anchored on the fact that the reliable supply of safe, affordable, acceptable and accessible drinking water and sanitation, and the sustainable and safe management of wastewater are fundamental to the health of communities and to their sustainable socio-economic development,

- Governments must ensure their people's basic needs are met, in compliance with their international commitments to pursue development goals (including the Sustainable Development Goals); and that they are the duty bearers for the process of progressive realisation of the human rights to safe drinking water and sanitation, with the obligation to respect, protect and fulfil these human rights, banishing inequality and discrimination towards the achievement of universal access,
- Governments are the main local public authority responsible for policy making, however, they may not be the only entity implementing all actions required to achieve universal access to safe drinking water and sanitation, and to attain an acceptable level of wastewater management. However, governments as the human rights duty bearers are obliged to promote good public policy and effective regulation to meet their international commitments as well as the commitments to their own people.

According to Bos et al (2016), the IWA Lisbon Charter provides principles for good public policy and effective regulation of the services. These principles are linked to rights, obligations and good practices for each group of stakeholders (governments and public administration, regulatory authorities, service providers and users) and for the community of water and sanitation practitioners at large. Guidance for each stakeholder group is provided to optimize their responsibilities collectively and individually in the formulation and implementation of public policy and regulation.

Definitions linked to the Lisbon Charter

a. Regulation or Regulations

The term is used to refer to the rules that emanate from governments and public administration and are enforceable by regulatory authorities or regulators that is 'regulations'. Further regulation/regulations refer to the act of applying and enforcing standards, criteria, rules or requirements, which have been legally or contractually adopted 'to regulate' (IWA, 2015). Baldwin et al., 1998 define a regulatory framework (regulation) as "*the promulgation of an authoritative set of rules, accompanied by some* *mechanism, typically a public agency, for monitoring and promoting compliance with these rules*".

b. Stakeholders in service regulation

The Lisbon Charter identifies drinking water, sanitation and wastewater professionals and practitioners, policy and decision makers with responsibilities for the these services, public administration, regulatory authorities, managers of public or private service providers, the community of practice working in water management and beneficiaries of the Services as the stakeholders (IWA, 2015). The Lisbon Charter groups them into four distinctive roles:

i. *governments and public administration*;

Government is the political system that includes politicians, and exercises executive authority that direct how a country/state is governed, including relevant authorities and responsible bodies. Public administration is the administrative system that includes public officials and daily implements government policy (IWA, 2015).

ii. regulatory authorities;

IWA (2015) defines a regulator as a public authority mandated to apply and enforce standards, criteria or rules which have been politically, legally or contractually adopted by exercising autonomous authority over the water, sanitation and wastewater services, in a supervisory capacity.

iii. service providers;

Suppliers of services to the consumers, regardless of them being public or private are regarded as service providers/utilities. Water and sanitation service providers are also well placed to share good practices in realizing the rights to water and sanitation (de Albuquerque, 2010). Moreover, service providers can play an important role in many aspects, including extending the water and sanitation networks to unserved or underserved areas, providing services, including delivery of water by tanker trucks at affordable prices to communities that are not connected to the network, and by developing low-cost technologies for ensuring that more people fully enjoy these rights (de Albuquerque, 2014). Moreover, they can also promote public participation in discussions on how the enjoyment of the rights to water and sanitation can be improved. Service providers can be crucial partners for Government as it devises strategies for the progressive realization of the rights to sanitation and water since they have expertise in water and sanitation.

iv. *Users.*

These are the final recipients of the drinking water supply, sanitation and wastewater management services.

Other important stakeholders in the realization of human rights to water

a) Private sector

Besides their role in service provision, private actors are active in many areas related to the rights to water and to sanitation. The private sector includes companies and business, and they can contribute by including the respect and realization of the rights to water and sanitation in their core business operations and decision-making processes (de Albuquerque, 2010, 2014). For example, they ensure consultation with, and accountability to, local communities so as to guarantee that the company's water use does not jeopardize the safe water available to the community (de Albuquerque, 2010, 2014).

b) Civil society

This is a diverse category including local community organizations, faith based groups, NGOs focused on water and sanitation in the context of development, NGOs focused on human rights, including the rights to water and sanitation, NGOs focused on the environment, and lobby groups, among others (de Albuquerque, 2010, 2014). The areas of intervention and the contributions of these organizations can vary widely including operating as service providers, monitoring service provision, or engaging in training or capacity-building on technical issues such as how to build water and sanitation facilities, or policy issues (such as how to lobby Government representatives on these issues). According to Human Rights Special Rapporteur, civil society organizations may engage in campaigning and act as pressure groups to effect change at the local, national and international levels (de Albuquerque, 2010, 2014). They may also conduct research on a wide variety of topics related to the human rights to water and sanitation, which can inform future action in these sectors.

c) National human rights institutions

A national human rights institution (NHRI) is a "*body which is established by a Government under the constitution, or by law or decree, the functions of which are specifically defined in terms of the promotion and protection of human rights*" (UN, 1993, 1995). In the water and sanitation sector, NHRIs can play a role in reviewing government action, such as legislation, policies and programmes, to ensure that it is consistent with human rights. Furthermore, they can monitor compliance with relevant laws, policies and programmes including investigating complaints by users and provide adequate redress (de Albuquerque, 2010).

d) Development agencies

These are development agencies, which implement a donor country's bilateral development cooperation and assistance, they are also have a positive contribution to make. Development agencies are frequently part of the Government structure (de Albuquerque, 2010). Since development agencies represent States which have undertaken specific human rights commitments, donor countries are equally obliged to respect, protect and promote human rights in their activities, including through their official development assistance (de Albuquerque, 2010). Moreover, agencies which explicitly adopt a human rights-based approach to their water and sanitation interventions may have experience to share. Development agencies can promote the rights to sanitation and water in numerous ways including for instance, financial assistance can help build sanitation and water infrastructures, while technical assistance can support the receiving country in institution-building, transfer of technology, and know-how for sustainable operation and maintenance of the infrastructure. These agencies can support participatory processes in their projects (de Albuquerque, 2010). Furthermore, they can also give essential advice in establishing regulatory frameworks and accountability mechanisms that respect human rights norms. Moreover, they can build the capacity of civil society to monitor compliance with human rights, including the rights to water and to sanitation.

e) Intergovernmental organizations

Intergovernmental organizations include international organizations such as the United Nations, its specialized agencies, funds and programmes, and the World Bank and International Monetary Fund, as well as regional organizations such as the regional development banks (de Albuquerque, 2010). Organizations of the United Nations are obliged to promote and encourage respect for human rights, as provided for in the Charter of the United Nations. Moreover, since intergovernmental organizations are composed of States, one can argue that they automatically acquire the human rights obligations to which their States have ratified. Many intergovernmental organizations are active in the water and sanitation sector, and have an important contribution towards the recognition and realization of the human rights to water and sanitation, within their organizations and in collaboration with their external partners (de Albuquerque, 2010). Typical roles include for instance supporting the capacities of national water and sanitation institutions through technical cooperation, carrying out and disseminating research on water and sanitation technologies and advocating for improved water and sanitation policies on the national level (de Albuquerque, 2010). Furthermore, they can also identify marginalized and excluded groups and work with the Government to ensure that these are not left behind in extending access to safe drinking water and sanitation. Intergovernmental organizations are also engaged in important standard-setting and monitoring activities.

f) Education, training and research institutions

Education, training and research institutions such as schools, universities and institutes can play important roles to realize the human rights to water and sanitation. For schools, this includes teaching young people about fundamental issues such as their human rights, the links between sanitation and water contamination, and understanding that water is a precious resource. Training institutes can equip people with the skills needed for working in the sector, for instance with technical or managerial competences. Research institutions also play important roles in finding locally adapted solutions to the challenges in accessing water and sanitation.

g) Individuals and communities

Individuals and communities frequently know their own needs and priorities best; with knowledge of their rights, they can play an enhanced role in improving their access to water and sanitation. They can also monitor service provision, propose appropriate policies to government, and advocate for their implementation. Furthermore, encouraging the responsible use of water and sanitation facilities and spreading knowledge of good hygiene practices, as well as assisting vulnerable and marginalized individuals and households within the community can be ways for communities and individuals to promote the human rights to water and sanitation.

1.1.3 CROSS-CUTTING CRITERIA

According to de Albuquerque (2010), non-discrimination, participation and accountability are defining attributes of human rights, with a combined effect of empowering the powerless, the marginalized and the excluded. In this regard, the UN Special Rapporteur on Human Rights (de Albuquerque) indicates that these three criteria are natural for the identification of good practices from a human rights perspective. They are also reflected in the human rights based approach to development, which is a guiding framework for interventions to ensure access to water and sanitation (de Albuquerque, 2010). In considering further criteria, and through discussions with water and sanitation practitioners, impact and sustainability were added as they were considered equally essential in the human rights context.

According to the independent expert (de Albuquerque) for a service to be considered as good practice, it needs to meet all the five crosscutting criteria to some degree, and at the very least, the practice must not undermine or contradict these (Levin et al., 2009; de Albuquerque, 2010). A substantial effort to extend access to water to the whole population in each area, but which perpetuates prohibited forms of discrimination by providing separate taps for the majority population and for a marginalized or excluded group, while meeting the criterion of accessibility, cannot be considered a good practice from a human rights perspective (de Albuquerque, 2010). These criteria are explained in more detail below, including their relevance from a human rights perspective and examples of the types of good practices which might relate to them.

1.1.3.1 Non-discrimination

Everybody is entitled to be treated equally and without discrimination. In many countries, some people are discriminated against because of their colour, sex, language, ethnicity, nationality or other grounds. The human rights principle of non-discrimination prohibits any distinction, exclusion, restriction or preference based on any ground (such as race, gender, religion, political or other opinion, national or social origin, property, or any other such status). In the provision of water and sanitation services, discrimination manifests itself, for example, in restricted or denied access to sanitation facilities or to water sources for certain groups of people (Levin et al., 2009). In most instances, wealthier households usually draw their water from the tap at home, the poor struggle to fetch the minimum amount of water needed for their families to survive, and many informal settlements are completely unserved by formal water supply and sanitation systems (de Albuquerque, 2010). They are neglected by policymakers and service providers alike.

According to Levin et al. (2009), non-discrimination is at the heart of human rights law, with non-discrimination provisions in most human rights treaties and declarations. In article 2 of both the International Covenant on Economic, Social and Cultural Rights and the International Covenant Civil and Political Rights, discrimination in the enjoyment of the rights contained in the respective treaties based on "*race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status*" is prohibited (CESCR, 2003). It's important to note that discrimination is often not explicit, but only evident in the de facto impact of seemingly neutral policies. For instance, a given water and sanitation policy might require users to present documents, such as a birth certificate, property title or a building permit, in order to be connected to the network. Levin et al. (2009), indicate that at first view this requirement appears neutral however, in examining the specific situation in a country, one may realize that members of a particular minority group have very low rates of birth registration, or lack formal ownership over the land on which they live. Therefore this policy will have a de facto discriminatory impact on this minority group because it will not be able to connect to the water and sewage networks.

In order to address existing discrimination, positive measures and targeted action may be required, for example it is imperative from the human right principles for policies to focus on the people who are the most marginalized and vulnerable to exclusion and discrimination (de Albuquerque 2010; Levin et al., 2009). Thus, good practices linked to eliminating discrimination will be aimed at addressing the situation of vulnerable groups and the discriminatory practices which perpetuate their exclusion from these services. A good example of such practices might focus on innovative ways to ensure the provision of these services to remote rural areas or slums where people lack legal title to the land they live on or a policy that guarantees that no forced evictions will be carried out, or partnerships with non-governmental organizations (NGOs) as intermediaries to extend services to discriminated groups Levin et al., 2009).

Realizing the right to water and sanitation also requires a stronger focus on women, children as well as vulnerable and marginalised groups in society, for example the sick or ethnic minorities, as they bear most of the burden of fetching water and living under unhygienic sanitary conditions (de Albuquerque, 2010). To comply with the right to water and sanitation, governments need to adopt a strategy for providing services and accelerating access by the very poor and the disadvantaged, for example through targeted pro-poor policies and instruments (de Albuquerque, 2010) and, this study uses aspect as a key indicator of good practice.

1.1.3.2 Participation and empowerment

In many cases, implementation of water and sanitation programmes takes place without sufficient participation of the beneficiaries, which can compromise the effectiveness of a project and lead to implementation failure. For instance, if new water points are to be built in a community, and the beneficiaries do not actively participate in this process, the intervention may not meet people's needs. If only some people participate, and others are not represented in the process, in the end the water points might benefit only a certain part of the community (de Albuquerque, 2010). It is argued that while participation is important as a preventive measure and as a way of ensuring sustainable change, it is also important as a human rights consideration (CESCR, 2003; de Albuquerque, 2010). Participation is a central requirement in the human rights framework and indivisible from the realization of all other human rights. Ensuring meaningful participation requires full respect for the freedoms of expression, assembly and association, and for the right to information (de Albuquerque, 2010).

The right to participate is most clearly reflected in article 25 of the International Covenant on Civil and Political Rights, which provides for the right to participate in public affairs (CESCR, 2003; de Albuquerque, 2010). It is argued that General Comment No. 25 (1996) on the right to participate in public affairs, voting rights and the right of equal access to public service, the Human Rights Committee interprets article 25, explaining that citizens may participate directly, or indirectly through freely chosen representatives, in the conduct of public affairs, which is considered to cover "all aspects of public administration, and the formulation and implementation of policy at international, national, regional and local levels" (para. 5). The importance of participation from a human rights perspective has been repeatedly reinforced through other conventions and treaties detailing the rights of people.

The Declaration on the Right to Development of 1986 calls on States to "encourage popular participation in all spheres as an important factor in development and in the full realization of all human rights". According to the UN Special Rapporteur on Human Rights, participation must be active, free and meaningful and thus needs to go beyond mere consultation and provision of information (Levin et al., 2009). Participation requires a genuine opportunity to express demands and concerns and influence decisions moreover, it is crucial for all concerned individuals, groups and communities to be able to take part or be represented in participatory processes (de Albuquerque, 2010). The Special Rapporteur on Human Right indicates that more emphasis should be placed to make sure that women are included, failing to do so may undermine a project.

An example of the importance of participation of all concerned groups was given where one project's aim was to bring water points closer to a village and hence included consultation with the village council, and on that basis, water points were established close to most of the homes (de Albuquerque, 2010). However, it was later realized that most women continued to go the further distance to the river, instead of using the new water points. After investigation, it was revealed that there were no women on the village council, and that their input would have been crucial because they were the ones who collected the water. The subsequent investigation with the women showed that the women would have preferred the water points to be located closer to their homes than the old water point, but further away than the new ones, in order for them to preserve the social dimension of collecting water together, while preserving their privacy away from men. These findings corroborate the assertion that consultations involving these services should ensure involvement of women.

Transparency and access to information are crucial elements in order to ensure effective and meaningful participation. A wide range of channels of information dissemination have to be used, as must communication in local languages in order to reach people and actually provide accessible information. According to de Albuquerque (2010), capacity development and training may be required, because only when people understand existing legislation and policies can they judge whether their rights are adequately protected. Levin et al. (2009) affirm this assertion by indicating that participation empowers people and enables them to articulate their rights. They further indicate that meaningful participation in the water sector requires access to relevant information, such as water quality data and tariffs as a pre-requisite. Moreover, decision-making processes should be open to participation at different levels and within formalised structures. In the case of excluded or marginalised people, however, capacities often need to be strengthened before people can fully exercise their right and it is the governments' obligation to ensure this (Levin et al., 2009). Thus, empowering the poor might require awareness-raising campaigns and capacity building.

1.1.3.3 Accountability and transparency

According to de Albuquerque (2010), in most cases interventions in the water and sanitation sectors are perceived as charity and people get services as passive beneficiaries who hope to gain access but do not have a sense of entitlement. She argues that often roles and responsibilities are not clearly defined and people do not know where they should turn when access to water and sanitation is non-existent or inadequate. Thus, without accountability, human rights guarantees may not be realized since obligations cannot be enforced. From a human rights law perspective, accountability is a defining attribute and thus a fundamental element for identifying good practices from a human rights perspective (Levin et al., 2009; de Albuquerque, 2010). They argue that clear lines of accountability assist responsible parties to know their obligations, and help individuals to claim their rights. Moreover, judicial mechanisms of accountability, such as courts and tribunals, are an indispensable part of accountability.

While the State bears the primary obligations to ensure enjoyment of human rights, other actors such as donors, intergovernmental organizations, water service providers, private actors and civil society organizations also have responsibilities regarding the rights to water and sanitation, which must also be accompanied by accountability mechanisms de Albuquerque, 2010). Moreover, state-based and non-State-based mechanisms can perform a variety of functions, including monitoring; receiving and responding to complaints; and providing remedies and/or redress where human rights violations have occurred. Water and sanitation are frequently provided by local governments or of specific ministries within the Government therefore, administrative mechanisms must be established at those levels to ensure accountability. An effective option is to establish regulatory bodies within these specific ministries to enforce accountability. These regulatory bodies should be able to receive and respond to complaints from water and sanitation users and to carry out human rights impact assessments de Albuquerque, 2010).

The UN Special Rapporteur further indicates that water and sanitation service providers should also establish grievance mechanisms at the level of the operator so as to respond to the complaints and concerns of users. She even proposed the seeking services of informal justice systems, such as traditional or indigenous systems of justice in the context of water and sanitation. In addition, accountability mechanisms at the political level can be established through parliamentary review committees or similar structures. Levin et al. (2009) indicate that transparency ensures the overall integrity of the water sector, not least by preventing corruption. Moreover, it also helps people to hold sector institutions which fail to comply with sector rules and regulations accountable for their actions. They further argue that for effective accountability, those affected must be entitled to legal redress before a court or other adjudicator hence they emphasize the need to strengthen the capacities of legislative institutions at communal, regional or national level and the judiciary to create greater opportunity for redress.

According to de Albuquerque (2010), social mobilization, media reporting, campaigning and lobbying, and social activism all promote accountability, and the proper functioning of these mechanisms is dependent upon the enjoyment of the rights to freedom of expression, of the press, of assembly, of association, and of access to information, as well as the rights to participate in public affairs and vote, among others. Levin et al. (2009) affirm this assertion by indicating that strengthening the capacity of civil society organisations or community-based organisations (CBOs), along with the media, which might be required to act as a watchdog, for example against corruption is indispensable for accountability mechanisms to be effective. Accountability will usually depend on the availability of a variety of different mechanisms, which can be used in parallel or subsequent to each other. Good practices in the area of accountability may take different forms for example ensuring that easily accessible mechanisms are available to users, located for instance at the level of the service provider, to respond to user complaints, commonly used are suggestion boxes and complaints desks. States can also include instruments that clearly outline the roles and responsibilities of the different actors involved and that are easily available and transparent to users (de Albuquerque, 2010). Interventions aimed at institutional strengthening and fighting corruption would also link to criterion of accountability.

1.1.3.4 Impact

It is argued that guaranteeing human rights requires more than mere rhetoric and that these rights must be operationalized, and as such, good practices from a human rights perspective should positively contribute to the realization of the human rights to water and sanitation (de Albuquerque, 2010). As asserted by the former Human Rights Rapporteur above, the “impact” criterion is essential for assuring meaningful interventions which can effect an improvement in peoples’ lives. In the water and sanitation sectors, as in other areas of development, well-meaning but ineffective interventions sometimes occur. An example of this was reported by de Albuquerque (2010) where she gave a scenario where latrines will be provided to communities without essential awareness-raising activities aimed at ensuring that people understand the importance of using safe sanitation, and then she indicated that such an intervention will inevitably fail since the community members will see no reason for changing their entrenched habits of open defecation.

Experience by human right experts has shown that participation of concerned communities is vital for ensuring impact, as is learning lessons from past experiences (de Albuquerque, 2010). As such, accountability also must be factored into the impact criterion, since accountability mechanisms are important means for feedback on practices which require improvements.

1.1.3.5 Sustainability

This is the last cross-cutting criterion and sustainability is particularly relevant to issues concerning water and sanitation, as it relates to the longer term positive and negative impacts of a practice. Water networks or other sources of water delivery may be built, but in the absence of corresponding capacity-building to maintain such infrastructure, the ongoing needs of the community in question will not be met (de Albuquerque, 2010). Maintenance cost of water and sanitation facilities are a frequent cause of discontinued use for example, communities may be unable to pay for repairs to the system or to empty septic tanks. Moreover, over-reliance on groundwater can result in the depletion of groundwater levels, which has serious implications for the wider environment. The criterion of sustainability therefore ensures that these considerations are considered.

The General Assembly resolution 42/187 defines sustainable development as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs*". The CESCR (2003) also affirms that the realization of the right to water requires "*ensuring that there is sufficient and safe water for present and future generations*" and this similarly applies to sanitation. According to the CESCR General Comment No. 3, unsustainable interventions may eventually result in unjustifiable retrogression in the progressive realization of the rights, amounting to violations of these rights (CESCR (2003).

Sustainability also implies that the practice in question does not negatively impact on other human rights including: economic, social and environmental rights (de Albuquerque, 2010). According to the United Nations Development Programme (UNDP, 2006), environmental sustainability means that water quality and availability have to be ensured in a way that respects and supports the larger environment. To ensure continued access to safe and sufficient water, water contamination and over-extraction must be avoided. Thus, any good practices would, for example, aim to map existing groundwater availability and current use patterns and avoid over-abstraction of groundwater by industrial or agricultural users so as to ensure that sufficient water resources are available for personal and domestic uses.

Similarly, good practices in sanitation services should contribute to environmental sanitation, for example by ensuring that human excreta do not leak into groundwater (de Albuquerque, 2010). Economic sustainability requires, among other things that, in addition to the initial investment, the costs of ongoing operation, management and investment must be taken into consideration from the planning phase onwards to ensure the continued functioning of the system. User fees are the sources of this income since human right to water and sanitation do not prohibit charging user fees. Crucial in the former UN Special Rapporteur on human rights if the fact that the achievement of economic sustainability must consider the equity aspects of ensuring that the poorest segments of the population may still afford these services (de Albuquerque, 2010). Aspects like the availability of skilled labour and affordable spare parts for operation and maintenance are equally important.

Capacity building of local communities, or of the local private sector, to maintain facilities after a project initiated by development agencies or civil society organizations is terminated is also an important component of good practices in water and sanitation services. Service providers with the guidance of Central or Local Government can also include tariff structures which ensure that those who can afford it contribute to the sustainability of the system, and that those who cannot afford it receive assistance from the State through subsidies or other means available. According United Nations Educational, Scientific and Cultural Organization, World Water Assessment Programme (UNESCO-WWAP, 2009), social sustainability touches on issues of social equity and acceptance. Participation by all concerned individuals, communities and groups is crucial to guaranteeing that interventions enhance community ownership and thus contribute to achieving sustainability (UNESCO-WWAP, 2009). Good practices could include participatory processes from the outset, and use the input from these in the design of interventions to ensure that they will endure.

1.1.4 THE FRAMEWORK FOR WATER AND SANITATION REGULATION

Regulation covers the areas of water quality, pricing, and service standards, hence, regulators can contribute immensely to the realization of the human rights to sanitation and water, for instance, through setting and monitoring water quality standards (de Albuquerque, 2010, Bos et al., 2016). Moreover, regulators play an important role in tariff setting, aiming to achieve a delicate balance between affordability and economic sustainability. According to Bos et al. (2016), national and local governments can establish regulations within the national legal context. In addition, regulators interpret the laws and regulations in practical terms and enforce their implementation through monitoring, reporting and enforcement.

1.1.4.1 Principles of public policy and regulation

The Lisbon Charter (Article 1) recognizes the following fundamental principles for good public policy and effective regulation of the Services:

i Effective water supply, sanitation and wastewater management make a positive contribution to sustainable development

The services mentioned above are essential to public health, general welfare and a decent standard of living as such, they are considered essential for development of contemporary societies. Consequently, they must address the three pillars of sustainability (social, economic and environmental) by collectively safeguarding the population, economic activities and the environment.

ii The provision of services should enshrine accountability and transparency

The services must fulfil a set of public administration obligations including: ensuring universal access; having clear standards and norms in terms of quantity, quality, reliability and continuity; using 'users come first' principles by adopting proactive, preventative, and risk-based management; ensuring access to information which is reliable for all stakeholders; establishing structural and operational efficiency; managing protection of assets with integrity and due regard to affordability and intergenerational costs; maintaining a fair balance between affordability of the services and cost recovery to ensure operational sustainability; and adopting rules of good practice, such as those stated in the IWA Lisbon Charter including the IWA Bonn Charter which addresses sanitation regulation.

iii The economics of service provision should be framed by long-term infrastructure investments and cost recovery instruments

The services (water supply, sanitation and wastewater management) incorporate a set of heterogeneous products and aspects within the context of the water cycle. According to IWA (2015), these services have the potential to achieve long term economic and social benefits as their assets are designed to be able to cope with peak situations and to face emergency events. High unitary costs are involved, there is a significant fixed capital cost component involved in the provision of these services. Thus, the recovery of the invested capital requires a long timeframe and a low elasticity between price and demand. IWA (2015) indicates that cost recovery instruments, that include user charges, external transfers and fiscal subsidies, should put into account the total costs of the services, that is, financial costs (operation and maintenance, funding of new infrastructure), environmental costs and resource costs. The degree of contribution of different sources of funds (tariffs, transfers and taxes) should be determined with the maximum degree of transparency.

iv Service provision should consider the financial, social and environmental aspects of all water resources

The services are inextricably linked to water resources, which constitute the raw material for drinking water and the destination for wastewater. Water resources are therefore regarded as the beginning and the end of all water cycles, regardless of scale (IWA, 2015).

v Effective service provision relies upon the collective actions of interdependent stakeholders

The responsibilities of many stakeholders should, collectively, ensure that the stipulated obligations towards the delivery of these services are met in an equitable and non-discriminatory way (IWA, 2015).

1.1.4.2 Roles and Responsibilities of stakeholders in regulation of services

The IWA Lisbon Charter of 2014, Article three gives guidelines on the responsibilities of Governments and public administration.

i. Responsibilities of governments and public administration

Governments and the public administration participate at central, regional and local levels to ensure reliability of the services, in acceptable quality and affordable prices as part of their obligations as duty bearers to the realization of the rights to these services. As initially stated when the role of states was discussed, governments must ensure the formulation and implementation of appropriate public policies for the provision of these services to the population, including the creation, application and monitoring of norms, standards and best practice (de Albuquerque, 2010; IWA, 2015; IWA, 2017). The public policies are also expected to contribute to the international development goals and respect for internationally recognized human rights to safe drinking water and sanitation (de Albuquerque, 2010, IWA, 2015). The Lisbon Charter stipulates in Articles 3 that the formulation and implementation of relevant public policies for the provision of the services to the population involves:

- Adopting strategic plans for the sector, at a national or regional level and in the medium term, which embodies the vision of governments and society (para, 1);

- Establishing and strengthening the legal framework for provision of the Services and ensure that all regulations are applied equitably to all stakeholders, whether they are public, private, mixed or associative (para, 2);
- Defining the governance models of the Services whether public or private, central, regional or local, according to each country context (para, 3);
- Creating and guaranteeing an effective institutional framework with clear allocation of responsibilities and accountabilities amongst the various entities involved in the provision and management of these services, as an essential basis for optimal sector performance (para, 4);
- Designing regulatory frameworks as a tool for national, regional and local governments to analyze and enforce legislation, norms, standards and best practice in infrastructure and service delivery, guaranteeing and protecting the autonomy of the regulatory authority (para, 5);
- Defining the objectives and capacities of the different bodies having regulatory roles at national, regional or local levels in the fields of health protection, environmental protection, economic regulation, implementation of human rights, and other issues seeking harmonization (para, 6);
- Overseeing and evaluating the legal and regulatory frameworks for the provision and management of the services including the functioning of the respective institutional frameworks to enable innovation and good governance (para, 7);
- Defining goals and setting realistic, measurable targets and standards to improve the availability, access, quality, reliability and affordability of the Services (para, 8);
- Ensuring provision of mechanisms to access reliable information on the services, both to support the definition of public policies and business strategies and to ensure greater transparency in their provision (para, 9);
- Ensuring equality and non-discrimination in access to the services and, if necessary, prioritizing their provision to marginalized user groups (para, 10);
- Establishing a fiscal framework for the services that promotes economic incentives for the long-term conservation and protection of water resources, to

reduce emission pressures to the environment and sustain infrastructure investments (para, 11);

- Promoting tariff policies that foster gradual cost recovery to promote economic sustainability and guarantee reinvestment; periodically adapting tariff policies to the economic capacity of the population and guaranteeing service delivery to cover the most economically disadvantaged (para, 12);
- Providing and efficiently managing the available financial resources, from public budgets or from cooperation and development support funds (para, 13);
- Improving the structural efficiency of the services, with an optimised territorial organisation and promotion of utilities' operational efficiency (para, 14);
- Developing the economy in the water sector, strengthening its capacity in national and possibly international markets by creating jobs and wealth (para, 15);
- Promoting awareness and participation of users regarding the services to ensure greater and more fruitful civic participation (para, 16);
- Supporting the development of human resource capacity in terms of numbers of and balance between qualified professional and technical staff, and a favourable organisational structure in which they can perform essential functions that ensure the good quality of the Services (para, 17);
- Providing the means and defining the responsibilities for the resolution of any conflicts of interest between parties that may arise from any of the above (para, 18) and,
- Promoting research in areas related to the services, promoting indigenous knowledge (para, 19).

ii. Responsibilities of regulatory authorities

Articles 4 of the Lisbon Charter gives guidelines on the responsibilities of regulatory authorities. IWA (2015) and the Human Rights Special Rapporteur (IWA, 2017) indicate that the actions of regulatory authorities should be based on principles of competence, professionalism, impartiality, accountability and transparency. Regardless of whatever way they can be organized to best meet local and national needs, regulators must ensure the implementation of models which promote an integrated approach including, regulating both the sector and each service provider individually, and identifying the optimal conditions for all segments of the population and service delivery models (IWA, 2017). An integrated regulatory approach for the services should be defined depending on the context, including the following activities:

- Ensuring that all stages, from design and tendering processes, contracting, service management, contract amendment and termination, are carried out in strict compliance with legislation and with any pre-existing contract, such as in the case of delegation or concession of the Services to third parties (para, 1);
- Supervising tariff schemes to ensure they are fair, sustainable and fit for purpose; promoting efficiency and affordability of prices together with a level of cost recovery that meets the requirements for economic and financial sustainability; enabling service providers to adequately perform operations and maintenance, considering infrastructure, environmental and resource costs (para, 2);
- Overseeing and promoting the provision of quality services to users, ensuring compliance with standards, norms and best practices for the benefit of public health and the environment (para, 3);
- Addressing the link between service providers and users, to ensure protection of consumer rights, safeguard the right to submit complaints and due process, and improve the quality of the relationship between service providers and users (para, 4);
- Helping to clarify the operating rules of the sector, based on regulations, which are essential for the proper delivery of the services (para, 5);
- Contributing to fair and open competition between service providers to facilitate faster implementation of innovative solutions and technical progress; in this way, promoting efficiency and quality of the services while minimizing the effects of their monopolistic nature (para, 6);
- Collecting, analyzing and disseminating accurate information on the implementation of the public policy of the sector and on the performance of

service providers; enabling a culture of transparency, providing reliable, concise, credible information that can be easily interpreted by all, covering all operators, regardless of the management system adopted for service provision (para, 7);

- Promoting research to expedite innovation, building on local knowledge and the development of human resources with suitable technical and professional training, fit to carry out essential functions, thus ensuring increased autonomy of the services (para, 8) and,
- Providing incentives for improvement of the services, enforcing appropriate and proportionate sanctions in case of non-compliance with established regulations for the services, following due process rules (para, 9).

iii. Responsibilities of the service providers

Article five of the Lisbon Charter gives guidelines on the responsibilities of service providers as they are the key stakeholders in the water sector (IWA, 2015; IWA, 2017). Regardless of them being public or private, service providers should effectively and efficiently ensure the equitable, universal supply of the services, as an essential contribution to the wellbeing of the society (IWA, 2015). Regardless of their organisational structure and management model, service providers should:

- Operate in accordance with the policies set out by governments and act in strict compliance with legal, contractual and regulatory frameworks, particularly for service delivery, tariff structure, quality of service and quality, quantity and reliability of drinking water, collection and treatment of wastewater, consumer protection and competition, and environmental legislation;
- Improve operational efficiency, adopting organisational framework that suits the local context, particularly in relation to staff management, the gathering and sharing of information, administrative routines, financial resources, planning, accounts, budget and quality assurance;
- Contribute to improving the structural efficiency of the services using economies of scale, scope and process through integrated management of the systems on

a technically and economically appropriate scale with proven benefits in terms of reduced unitary costs;

- Implement the pricing policies and the procedures for recovery of water charges that are defined by the responsible public authorities, informing them on potential difficulties with cost recovery, particularly with the most disadvantaged users;
- Contribute to human resources capacity development and innovation in service delivery through cooperation with other bodies, as essential factors to ensure overall quality of service provision;
- Verify the integrity of their processes by appropriate monitoring, reporting and auditing, keeping track of information and conducting suitable and auditable accounting, in accordance with the requirements of the regulatory authority in particular. This includes providing reliable information to support the design of appropriate public policies and business strategies, as well as to evaluate the service that is provided to society and,
- Aspire to operating '*beyond compliance*' through the development of activities that contribute to the conservation of resources by minimizing waste and recovering by-products, including energy and nutrient recovery from wastewater and sludge (IWA, 2015; IWA, 2017).

iv. Responsibilities of the users

Article four of the Lisbon Charter gives guidelines on responsibilities of Users as the key stakeholders and final beneficiaries of these services. Users have the following rights and duties:

- Effectively exercise their rights, especially regarding physical and economic access to the services and information about their quality; actively participating in decisions, if possible and assuming their corresponding obligations;
- Make appropriate use of the services, preventing and avoiding behaviours that may adversely impact other users, public health or the environment, such as contamination of water sources and the reduction in quality and/or reliability of water supply and,

- Strive to ensure the efficient use of water resources, making appropriate use of and preventing damage to water facilities and individual systems for the provision of the services; following established procedures and regulations, including the use of appropriate materials and necessary equipment.

1.1.4.3 Principles of effective regulatory frameworks

Article seven gives principles of effective regulatory frameworks. International guidance, best available science and local circumstances should be followed when drafting, reviewing and updating regulatory frameworks to ensure a robust and appropriate instrument to regulate the services, in consultation with civil society, service providers and industry (IWA, 2015; IWA, 2017). Key considerations for development of regulatory frameworks include:

- Regulation should be viewed as a part of public policies on the services. Although regulation is only one component of provision of these services amongst many, it plays a crucial role, in so far as it has responsibility for the control and promotion of most of the other components;
- Ensure that all contributors to delivery chain of services have clear objectives and means of action, deliver achievements that satisfy these objectives and act in an efficient manner;
- Assure an integrated regulatory approach for the Services, including both a regulation of the sector and the regulation of each service provider individually;
- Ensure an adequate level of institutional, functional and financial independence of the regulatory authorities; guarantee the stability and autonomy of these bodies, including freedom of decision making within their legally defined remit, subject to judicial review;
- Acknowledge that regulators constitute an essential element of good governance, reflecting the needs of our times, and providing a clear separation between technical and managerial dimensions on one hand and political decision making on the other;
- Establish the necessary mechanisms to ensure accountability and public scrutiny of regulatory authorities, particularly regarding transparency of their actions;

- Establish the necessary mechanisms to ensure accountability and public scrutiny of regulatory authorities, particularly regarding transparency of their actions;
- Recognise that regulation is a key instrument in the very constitution of a competitive market for the Services;
- Recognise that regulation promotes a culture of adhering to standards, norms and good practice that is resilient to external pressures and more rational, objective and evidence-based and,
- Optimizing the contribution of regulation to the modernisation of public administration and to the economy can be achieved by greater consistency in service provision, by further harmonisation, by the elimination of obstructions and by increasing the confidence of economic agents and users in the objectives and practice of regulation (IWA, 2015).

According to Bos et al. (2016), the regulatory framework for drinking water supply, sanitation and wastewater management services is a combination of standards, criteria, good practice, rules and requirements that have to be respected by service providers, and of institutions that apply and enforce them (Lisbon Charter). As defined by the IWA Lisbon Charter above, regulations are established by the executive branch of government at central and local levels to create, limit or constrain a right, create or limit a duty, or allocate a responsibility. Regulation can take many forms; for instance, drinking water regulation sets quality standards and norms, and good practice rules for those mandated to supply drinking water as a "*common good*" service. A regulatory framework is a set of government-decreed rules within the broader legislative framework Bos et al., 2016).

Regulations are a powerful tool available to governments in the promotion of the human rights to safe drinking water and sanitation because they are means to create, limit or constrain rights. Bos et al. (2016) indicate that in most cases, regulations are not always used to their maximum potential or to the best advantage of all stakeholders. Some challenges that were identified by national experts and regulators on drinking water supply and sanitation include:

- regulations tend to be developed from an engineering and operational perspective, neglecting the public health perspective such as the application of authority for public health surveillance and associated responses;
- Regulations may be non-existent, incomplete and/or outdated even in some high-income countries;
- in the current integrated ("from source to tap") risk assessment and management approach to ensure water quality there may be no link between regulations for old-style drinking water supply, and regulations for the environmental safeguarding of water sources; and,
- the regulatory framework for drinking water quality may lack clarity regarding jurisdiction, legal mandates and authority, including gaps and overlaps (Bos et al., 2016).

Guidelines suggest that regulatory frameworks be constructed in such a way that they support all State obligations with respect to HRWS implementation. As such, standards, criteria, rules or requirements that need to be obliged to by service operators must be compliant with all HRWS criteria and principles and contribute to their progressive realisation (Bos et al., 2016). Bos et al. (2016) argue that the fact that requirements are adopted for specific purposes without explicit mention of HRWS criteria or principles, however, this does not mean that they do not respect these HRWS criteria and principles. Many existing regulations contribute to the progressive realisation of the HRWS, but this needs to be verified rule by rule and this is the responsibility of Government and its regulatory bodies. Moreover, regulatory bodies should assess to ensure their own activities are compliant with all HRWS criteria and principles. An example of such review is presented below. This relates to the regulatory framework of drinking water quality (WHO, 2011).

Bos et al. (2016) further indicate that many countries have a regulatory framework and a corresponding regulator for drinking water quality. However, the functions of drinking water regulation in some countries are embedded in the functions of an economic regulator, who also covers drinking water tariffs. Moreover, in some regions (Latin America and Europe) drinking water regulators are organised in regional associations. The WHO Drinking Water Quality Guidelines stipulate that regulation of drinking water quality at the point-of-use (end-user tap) alone is inadequate and inefficient for a robust protection of public health (WHO, 2011). Instead, multiple elements from source to end-users, including oversight and management, are key determinants of drinking water quality and their coordinated management plays an important role in protecting public health (Bos et al., 2016). Consequently, the following elements of drinking water quality management should be covered by regulations to safeguard public health:

i. Protection of Public Health

- Consideration of, and reference to, the WHO Stockholm Framework (WHO, 2006) and WHO Guidelines for Drinking Water Quality (WHO, 2011);
- Adequacy of supply (that is quality, availability, accessibility, affordability, acceptability and reliability), including drinking water quality standards and,
- Surveillance for potential waterborne disease episodes to identify, those responsible for collecting and sharing information and responding to such events.

ii. Source Water Protection

- Source water protection, including pollution prevention (land use zoning and policies), protection zones of springs, protection of wellheads, application of codes of practice, and watershed management and,
- Water abstraction and use, such as permits allowing for the withdrawal of water from surface and groundwater sources, protection from over withdrawal and associated tariffs (Bos et al., 2016; Eledi, 2019).

iii. Infrastructure for WSS services

- Materials and fittings, including treatment chemicals, materials that encounter water from the point of collection to the point of distribution, water meters and water treatment devices used in households;

- Commissioning and decommissioning of wells, boreholes, water treatment facilities and another infrastructure and,
- Design and construction of water treatment facilities and plumbing systems, including environmental impact assessments.

iv. Water treatment and delivery

- Minimum treatment standards, including identifying allowable concentrations of substances and setting performance targets, based on assessment of source water quality and processes and practices used to treat the water;
- Operation and maintenance (O&M) of drinking water supplies to confirm that the whole chain of supply is operating properly and that relevant water quality standards are met;
- Occupational health and safety programmes to protect workers from occupational hazards, such as handling and using chemicals and working in confined spaces and,
- Standards for delivering non-piped water, including bulk transportation and storage.

v. System assessment and enforcement

- Confirmation and operational monitoring, for example testing of finished water quality by authorised laboratories to confirm compliance with water quality targets;
- Creation of a fundamental performance indicators system linked to benchmarking;
- Surveys of, for instance, drinking water supplies and installations, to identify hazards and assess risks, as part of the water safety plan (WSP) audits (WHO/IWA, 2015);
- Consumer satisfaction: feedback from water users whether drinking water is safe, acceptable, physically accessible in sufficient quantities and affordable, and the service is reliable and,

- Enforcement powers, including authority to act and penalise non-compliance with regulations.

vi. Operation and management procedures

- Training, protocols of practice and, where appropriate, certification of operators, inspectors, engineers, laboratories, plumbers and other relevant stakeholders;
- Emergency planning and response which, at least, defines roles and responsibilities in case of possible and confirmed water contamination and waterborne illness events;
- Education and health promotion, for instance for water supply managers and operators, and households and other water supply users on the treatment and storage of drinking water and,
- Record keeping and information sharing.

1.1.4.4 Types of regulators in water and sanitation

1.1.4.4.1 Economic regulators

These are concerned with finance and tariff setting, consequently, they influence the planning function of the provision of these services. Moreover, economic regulators should ensure that tariffs are affordable, while the required investments can be financed, and that adequate provision is made for maintenance of systems to ensure sustainability and avoid relapse (Bos et al., 2016).

1.1.4.4.2 Drinking water quality regulators

Water quality regulators are normally part of economic regulatory body, but more commonly are part of the ministries of health. They advise governments on appropriate short-term and permanent standards, promote water and sanitation safety plans and ensure that effective monitoring is in place Bos et al., 2016). Moreover, water quality regulators are essential in reporting drinking water quality and in the investigation of incidents. However, Bos et al (2016) indicate that water quality regulator surveillance in mostly limited to urban areas in developing countries.

1.1.4.4.3 Environmental or specific wastewater regulators

These monitor discharges to waterways and are important in reducing the impact of waste on the quality of drinking water sources and the environment (Bos et al., 2016).

However, Bos et al. (2016) further indicate that in some countries like Portugal, regulators also have a capacity building role. The role of regulators goes beyond that of mere policing. They can help with strengthening the evidence base through targeted studies that can help the design and adjustment of norms and standards. For example, studies by the Bolivian regulator led to the introduction of the “tarifa justa”, a tariff system that considers affordability and capacity to pay. The information collected by regulators can also feed back into the legislative system to support the evolution of policies and laws (Bos et al., 2016). Furthermore, the regulator in Kenya reviews consumer profiles together with the water utility, and decides whether an increase in tariffs is feasible, how bill collection can be made more efficient and where water kiosks can fill the gap for those who are not connected to the distribution network and can only pay in small instalments on a day-to-day basis. Bos et al. (2016) argue that any special tariff to accommodate the affordability question should ensure that full cost recovery, essential for sustainability, is addressed effectively.

The 2002 Water Act of Kenya has bestowed the regulatory body WASREB with a list of responsibilities that include the following:

i. to set and verify minimum service levels for adequate service quality;
ii. to set tariffs for affordability and financial sustainability;
iii. to institutionalise consumer engagement through citizen volunteer groups for a strengthened consumer voice;
iv. to establish corporate governance standards in operator enterprise that foster efficiency and professionalism; to provide guidance on utility clustering for the commercial viability of services; and,

v. to carry out performance monitoring and public reporting for transparency and for the accountability of the various actors in service provision.

Irrespective of these responsibilities, WASREB has further increased its efforts in monitoring, to ensure that the information that it collects reflects the access situation on the ground, allows improved targeting of efforts to extend services or increase service levels in underserved areas, and to intensify public reporting on progress in realising the rights (Bos et al. (2016).

Development of reliable measurable indicators is essential to support monitoring and surveillance. According to Bos et al (2016) indicates that for decades, indicators have been developed and measured, mostly this was stimulated by the need to monitor the drinking water and sanitation target during the period of the Millennium Development Goals (2000–2015) and is now expected to accelerate and intensify in response to the HRWS and to the efforts towards the Sustainable Development Goals (2015–2030). When mutual trust is prevailing, regulators must be able to sanction operators who fail to meet the norms and standards, however, they should also be open to the capacity development needs of operators and support them in efforts to improve performance.

It is expected that regulators provide guidance on assessing and managing resource needs incurred by legislation and regulation. In the case of financial resources, this means working to ensure that budget appropriations accompany new laws, that there continues to be support for regulatory functions, and that cost recovery is strengthened with a view to better asset management (Bos et al., 2016). The regulator engagement in human resource analysis, addressing gaps and oversupplies in operators' human resource base, and the identification of new human resource needs is also crucial in the case of human resources. The recent IWA analysis of human resources gaps in drinking water, sanitation and hygiene provides evidence of the needs in terms of education, training and staff deployment to support efforts towards universal coverage (IWA, 2014).

The holistic review of water utilities' structures and operations, by regulators must ensure the human rights perspectives are addressed throughout, in assessing performance, efficiency, governance and the quality of services delivered. According to Bos et al. (2016), this is particularly important with respect to types of governance where members of the senior management or board members are political appointees who don't have specific professional qualifications in drinking water and sanitation service provision. Examples of regulations to be inspected include the following categories:

i. Quantity

The minimum amount of safe water to be accessible (1) at home, (2) at the work place, (3) in public buildings (schools, hospitals, prisons), (4) when the public service is disrupted (power shortage, burst pipes, flooded installations) and (5) in case of water scarcity (drought, disaster).

ii. Availability

For beneficiaries of public water networks, the minimum number of hours a day during which water should be running from the tap (this may differ between households and collective standpipes). Guidelines can also be found by referring to HRWS guidelines and the WHO.

iii. Quality

The parameters of water required for potable water for public consumption (number and conditions of water quality tests). The measures should cope with public water supply that is unsafe (for example boiling alerts). Precautionary actions if one of these parameters is not satisfactory (for example excess of fluoride, salt, arsenic).

iv. Affordability

The regulator should set appropriate, contextual definitions for "affordable" and "unaffordable". Define conditions under which individuals or households are entitled to apply for a subsidy to make their water supply affordable to them (Bos et al., 2016).

v. Access

When a water mains bursts or electric power is interrupted, consequently the public water supply is also interrupted. These incidents may last days or even weeks. Regulators must consider the following during monitoring and surveillance:

- What alternative service is guaranteed?
- Is the safety of the water that is distributed/sold by water tankers guaranteed, and/or are arrangements in place for the delivery of bottled water?

Furthermore, where a public water or wastewater piped network goes through an inhabited area, individuals should know if they have the right to be connected to this network (and under what conditions). In urban settlements, the maximum distance between a household and the closest source of safe water should be determined. In isolated unserved areas, the regulator should define the conditions for individuals to get water from a neighbouring community. According to Bos et al. (2016), the strengthening of regulations for sanitation and wastewater management should follow these same HRWS criteria-related categories. Finally, water utilities and regulatory bodies can strengthen their commitment and that of their staff to the realisation of the HRWS by adopting a collectively agreed code of practice, such as the IWA Bonn Charter for Safe Drinking Water which shall be discussed later.

APPENDIX B: ETHICS APPROVAL LETTER

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Mr S Taonameso

Student No:
11634561

PROJECT TITLE: **The analysis of the public policy, institutional framework and management of water supply and sanitation (WSS) services in Zimbabwe's urban areas: A Comparative development of sustainable water supply and sanitation services.**

PROJECT NO: SMNS/17/MBY/26/2001

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Prof N Potgieter	University of Venda	Promoter
Dr L.S. Mudau	TUT	Co - Promoter
Prof AN. Traore	University of Venda	Co - Promoter
Mr S Taonameso	University of Venda	Investigator – Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: January 2018
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: ....
Name of the Chairperson of the Committee: Senior Prof. G.E. Ekosse

UNIVERSITY OF VENDA
DIRECTOR
RESEARCH AND INNOVATION
2018 -01- 24
Private Bag X5050
Thohoyandou 0950

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950, LIMPOPO PROVINCE, SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9060
"A quality driven financially sustainable, rural-based Comprehensive University"

APPENDIX C: APPROVAL LETTER TO CONDUCT RESEARCH IN URBAN LOCAL COUNCIL

City Of Masvingo

+263 39 262431/4
Fax No + 263 39 262257

townclerkdept@masvingocity.gov.zw

Chamber Secretary's Office
City Council Offices
Civic Centre
Masvingo
Zimbabwe

All Communications Should Be
Addressed to
THE TOWN CLERK
P O Box 17
MASVINGO

Our Ref MM/cc/research

19 October 2018

Mr Solomon Taonameso
Hse. 28506
Target Kopje Extension
Masvingo

Dear Sir

RE: PERMISSION TO CARRY OUT RESEARCH ON THE ANALYSIS OF THE PUBLIC POLICY INSTITUTIONAL FRAMEWORK AND MANAGEMENT OF WATER SUPPLY AND SANITATION (WSS) SERVICES IN ZIMBABWES URBAN AREAS :A COMPARATIVE DEVELOPMENT OF SUSTAINABLE WATER SUPPLY AND SANITATION SERVICES: A CASE STUDY OF CITY OF MASVINGO

Reference is made to your letter dated **16 October 2018** requesting permission to undertake an academic research on **"the analysis of the public policy institutional framework and management of water supply and sanitation (wss) services in Zimbabwe's urban areas :a comparative development of sustainable water supply and sanitation services"** in partial fulfilment of your PhD in Microbiology.

I am pleased to inform you that Masvingo City Council has granted you the permission to undertake your research. However your research findings shall not be for publication and ***you are also required to present a copy of your final project to the Town Clerk.***

May I take this opportunity to thank you for the interest you have shown in our organization and wish you well in your research.

Yours faithfully

pp

V. Shonhai
ACTING CHAMBER SECRETARY

CHAMBER SECRETARY
CITY OF MASVINGO
19 OCT 2018
P.O. BOX 17, MASVINGO
TEL: (039) 262431 - 4
FAX: (039) 262257

Cc: file

APPENDIX D: HOUSEHOLD SURVEY QUESTION GUIDE

University of Venda

Appendix 2: Household survey

Doctor of Philosophy (PhD) programme in Microbiology (Urban Water Supply and Sanitation Management), Department of Microbiology University of Venda, South Africa.

PhD Thesis Topic: The analysis of the policy (institutional) and administrative framework for water supply and sanitation (WSS) services in Zimbabwe's urban areas: A comparative development of sustainable water supply and sanitation services.

Key Note: All information provided will be treated as strictly confidential and for academic purposes only **Questionnaire for households**.

Date of survey: ________________________

Area Service Provider Name _____________________________

Household details

Suburb Name __________________________

Suburb Category: ☐ Low ☐ Medium ☐ high density

Household Number (HHN): ____________________

Head of Household:

☐ Father ☐ Mother ☐ Child headed ☐ Other (specify)_______________

Section A: Demography data

Question 1: Respondent level

1.1. Description of gender. Female ☐ Male ☐ 1.2. What is your date of birth? __________________ 1.3. What is your marital status? 1.4. What is your relationship to the head of the household? 1.5. What is your highest qualification?

1.3. Single	Married	Widowed	Divorced	Live-in Partner

1.4. What is your relationship to the head of household? Tick (√)

Head of the household	
Spouse	
Son	
Daughter	
Brother	
Sister	
Other (specify)__________________________	

1.5. Highest qualification

Pre-primary	
Primary	
Secondary	
Certificate/Higher certificate	
Diploma/Higher diploma	
Bachelor	
Postgraduate degree	
Other (specify) _______________________	

Question 2: Household income and migration

2.1. Do you have any means of income? (Use legend provided)
2.2. What type of employment are the HH members involved with? (Use legend provided)
2.3. Which sector of employment are the HH members involved with?
2.4. How much money does each contributor in the household receive every month? (Use legend provided)

2.1. Earn income (EI)	Yes	No
Code	1	2

2.2. Type of employment (TE)	Formally Employed/Self-employed: If person works for a salary or shares in profits of a registered firm.	Informal activity: Person involved in informal activities for 3 days or more for food/ accommodation.	Unemployed: Those who can work, want to work, but cannot find work.	pensioners, sick or disabled grant
Code	1	2	3	4

2.3. Which sector of employment (ES)	Code
Agriculture	1
Mining, quarrying	2
Manufacturing	3
Electricity, water, gas	4
Construction	5
Government	6
Higher Education	7
Wholesale, retail, trade, catering	8
Transport, storage, communication	9
Financing, insurance, real estate	10

Community, social or personal services	11
Informal activity	12
Other (specify)	13

2.4. Approx. monthly hh member income (MI)	0- 200$	200-400$	400-600$	600 – 800$	800 -1000$	1000-1500$	$1500+
Legend	1	2	3	4	5	6	7

Section B:

Water Availability

Question 3: The following questions relate to water services provisions as per policy statements.

3.1 Who your water service provider?
3.2 Is water always available at your regular source?
3.3 If **not**, how often is water not available at your sources?
3.4 What alternative source(s) are available during water cut-offs?
3.5 How many litres does the household use per day?
3.6 How do you make sure this volume of water is met during times of interruptions?
3.7 If water is unavailable daily, at what time of day is it unavailable?
3.8 How urgently are water-cut problems addressed by the service providers?
3.9 Do you always get enough water for all your basic needs every day?
3.10 If not, a) what do authorities say are the causes of this problem, and b) Have you tried to raise a complaint about the problem? C) If **yes**, what was the response?
3.11 Did you occupy your house when water was connected?
3.12 a) Do you have a centralized water connection in the house and, b) do you have a water meter?
3.13 Do you receive your water bills on monthly basis?
3.14 What is your average monthly bill?
3.15 Do you understand water pricing by your supplier?
3.16 If **not,** what do you think should to be done to address this problem?
3.17 Have you ever failed to pay your bills?
3.18 If **yes,** explain the action that was taken by your service provider (Council/Municipality)
3.19 Are there any incentives to customers who keep their bills up to date?
3.20 Is the quality of service and access to water services the same to all areas?
3.21 Do you get information about a) water quality standards, b) water pricing, c) investment decisions in water and, d) service interruptions from the service providers? If **yes**, how is the communication done?
3.22 a)What is your opinion about drinking water quality?, b) If **not** satisfied**,** give details.
3.23 Does the service provider leave few water points with running water during periods of supply interruptions?
3.24 Are you allowed by the service provider to use your drinking water for gardening?
3.25 If **not,** do you have a separate tap of raw water for gardening?
3.26

3.1 Service provider ________________________

3.2 Water Availability			
Yes		No	

3.3 How often not available	Daily	Weekly	Monthly	Every 2 months	Every 6 months	Annually	Other
Tick							

3.4 Alternative sources	Tick
River	
Tap	
Borehole	
Spring	
Well/Canal	
Other	

3.5 Recommended volume per capita/day (L) :Tick (√)	10-15	15-25	25-40	50+

3.6 Ways to deal with water-cuts	Tick
Collect from street stand pipes	
Store water in containers	
Use water tanks	
Carry water form far away boreholes	
Water trucked to households	
Other	

3.7 Time of day	Early morning	Mid-morning	Late morning	Afternoon	Late afternoon/early evening	Whole day	Randomly

3.8 Fixing time	Same day	Week	Month	> Month	> 3 Months	> 6 Months	Year	Other
Tick								

3.9 water adequacy			
Yes		No	

3.10a Causes of water-cuts	Tick
Burst pipes	
Power outage	
Pump problem	
Low water level in the dam	
Low storage capacity	
Unknown	
Other (specify) ___________________	

3.10b Transparency of service			
Yes		No	

3.10c Service provider responsiveness

1.________________________________
2. ________________________________
3. ________________________________

3.11 Service standard			
Yes		No	

3.12b Water meter			
Yes		No	

3.13.13 Billing			
Yes		No	

3.12a Service standard			
Yes		No	

3.14 Average monthly bill $___________

3.15 Water pricing knowledge			
Yes		No	

3.16 water pricing recommendations
1.______________________________ 2. ______________________________ 3. ______________________________

3.13.17 Billing payment			
Yes		No	

3.18 Finance collection from customers	Tick
Supply cut-off	
Written notice of debt	
Summon to service provider's office	
Give grace period to settle the bill	
No action by service provider	
Other________________________________	

3.19 Customer incentive			
Yes		No	

3.20 Equity of access to services			
Yes		No	

3.21 Transparency and democratization of services	Service interruption	Compliance with water quality standards	Investment decisions	Water pricing and tariffs
	☐Written notice ☐Media announcement ☐Meetings ☐None ☐Other __________ _________________	☐Written notice ☐Media announcement ☐Meetings ☐ None ☐ Other_________ _________________	☐ Written notice ☐ Media announcement ☐ Meetings ☐ None ☐ Other_________ _________________	☐ Written notice ☐ Media announcement ☐ Meetings ☐ None ☐ Other _______ _______________

3.22a Customer water quality perception	Tick
Very good	
Good	
Poor	
Very poor	
Other (specify)____________________ __________________________________	

3.22b water quality issues raised	Tick
colour	
smell	
taste	
Microbiological contamination	
Chemical contamination	
Other (specify)____________________	

3.23 The right to water during service interruption			
Yes		No	

3.24 Primary water definition			
Yes		No	

3.25 Raw water for other basic needs			
Yes		No	

Question 4.0: Water accessibility

4.1 How far do you think the source is from your house (in paces)?
4.2 How many trips do you travel per day from the household to the water source?
4.3 How long do you wait at the source to collect water?
4.4 How do you carry water in containers from source to home?

4.1 Distance in Paces	0-10m	>10≤50m	>50≤100m	>100≤200m	>200m
Code	1	2	3	4	5

4.2 Number of trips: ____

4.3 Waiting time: ____

4.4 Transport	Carry by hand	Carry on head	Wheelbarrow	Rolling drum on ground	Carry on back of LDV	Animal-drawn cart	Other
Tick							

Question 5: Container hygiene and storage

5.1 Do you wash the vessel before each filling?
5.2 Describe the container hygiene inside. (Use legend provided)
5.3 Describe the container hygiene outside. (Use legend provided)
5.4 How do you clean your containers? (Use legend provided)
5.5 What was the prior use of the container? (Use legend provided)

5.2 Hygiene-related aspects (inside)	Code
Biofilm	1
Loose particles	2
Clean	3

5.3 Hygiene-related aspects (outside)	Code
Very dirty (sticky pigmentation)	1
Excessive scratches	2
Clean	3

5.4 Cleaning methods	Rinse outside only	Rinse inside-out	Wash with disinfectant soap	Wash with soap inside-out	Wash with soap and sand inside-out	Wash with sand only inside-out	Other
Code	1	2	3	4	5	6	7

5.5 Prior use	Rank
Newly bought (from shelf)	1
Used for foodstuff storage	2
Used for chemicals	3
Other	4

Specify other:____

5.5. What was the container used for?

Chemicals	Food	soaps

Other (specify);____

5.6 Where did you get the container that you are using?

____

Question 6: Storage conditions

6.1 Are the storage containers stored inside or outside the dwelling? (Tick)

6.2 Describe the areas where the water is stored. (Use legend provided)

5.1	Yes		No		
			5.2 Container hygiene inside	5.3 Container Hygiene outside	5.4 Cleaning method
Plastic screw top (open)					
Plastic screw top (closed)					
Plastic wide mouth (open)					
Plastic wide mouth (closed)					

6.3 How do you scoop water from the water container?

6.4 How long do you store water?

6.5 How much water do you drink per day?

6.6 What do you do to keep insects (flies cockroaches) away from the water containers?

15.1			
Inside		Outside	

6.2 ____
6.3 ____
6.4 ____
6.5 ____
6.6 ____

<u>**Section C:**</u> <u>**Sanitation Services**</u>

6.0 Sanitation Accessibility as per policy statements of adequate, continuous, accessible, sustainable, safe and affordable sanitation services.

7.1. Do you have any sanitation facilities around?
7.2. If yes, what type of sanitation facility do you use?
7.3. Who provides sanitation services?
7.4. Does the type of sanitation facility depend on residential status (whether low, medium and high density)?
7.5. What types of urban sanitation facilities are allowed by the policy?
7.6. How frequent are cases of sewerage blockage?
7.7. How urgently are sewer system blockage problems addressed by the service providers?
7.8. Is the environment rehabilitated/ sanitized after sewerage spillage? If yes, who does it?
7.9 Are all households having the “**high standards of urban housing services**” that is, it is mandatory that construction and legal occupation of urban houses be preceded by development of road, water and sewerage services?

7.10. If **not**, what alternative options are in place?
7.11 Do you get a separate bill for sewerage services?
7.12 Do you know how much money you are charged for sewerage services?

7.1 Toilet facility			
Yes		No	

7.2 sanitation type	Water borne(Flush)	Septic tank	Pit latrine	Bucket system	Chemical toilet	Other

Tick						

7.3 Sanitation service provider____

74 Sanitation facility depends on residential status			
Yes		No	

7.5 Permitted urban sanitation options. Tick (√)	Waterborne (flush toilet)	Septic tank	Pit latrine	Chemical toilet	Bucket system	Other
High density						
Medium density						
Low density						

7.6 How often are sewerage spillages	Daily	Weekly	Monthly	Every 2 months	Every 6 months	Annually	Other
Tick							

7.7 Fixing time	Same day	Week	Month	> Month	> 3 Months	> 6 Months	Year	Other
Tick								

7.8 Environmental rehabilitation			
Yes		No	

Rehabilitation done by ________________

7.9 sanitation service standards by policy			
Yes		No	

7.10 Alternative sources	Tick
Pit latrine	
Chemical toilet	
Septic tank	
Bush	
Other	

7.11 Do you get sanitation bill			
Yes		No	

7.12 Sanitation pricing			
Yes		No	

<u>Section D</u>: <u>Citizen Participation</u>

7.1 Do you have urban residents associations that represent residents' voices during decision-making meetings?

7.2 If **not,** do service providers consult users before they make decision regarding issues like tariffs, budget, investment decisions, tax and other issues that affects citizens/customers?

7.3 If **ye**s, how do they do the consultation process and who chairs the process?

7.4 Do you think citizen/customer participation during decision-making process by service providers may be helpful improve service provision?

7.5 If **yes,** explain

7.6 Are there provisions or channels in place to raise citizen/customer concerns on issues like compliance with water quality, tariffs, taxation etc?

7.7 If **yes,** give details

7.8 How is gender equality observed in decision-making process?

8.1 Customer representation			
Yes		No	

8.2 Stakeholder/customers consultation in decision-making	Tick
Tariff review	
Budget	
Investment decision	
Tax and levies	
Other	

8.3 Transparency and democratization of services	Tariffs review	Investment decisions and budgeting	Taxes and levies	Customer grievances
	☐Formal letters ☐Media ☐Meetings ☐ Annual reviews ☐ None ☐Other __________ _________________	☐Formal letters ☐Media ☐Meetings ☐ Annual reviews ☐ None ☐ Other_________ _________________	☐ Formal letters ☐ Media ☐ Meetings ☐ Annual reviews ☐ None ☐ Other_________ _________________	☐Formal letters ☐ Media ☐ Meetings ☐ Annual reviews ☐ None ☐ Other _______ _______________

8.3 Who chairs? ____

8.4 View on citizen participation			
Yes		No	

8.5 Why citizen participation (Principle of subsidiarity)	Tick
Decisions taken at local level are more likely to be more efficient and relevant	
Services will be demand-driven and not supply-driven (quality of service improves)	
Customers stipulate what kind of service they want depending on their income	
Improves revenue collection as customers are part of the set goals	
Other (specify) ____ ____ ____	

7.6 Stakeholder Communication			
Yes		No	

8.7 Communication channels	Tick
Individual telephonic call	
Individual written note	
Individual office visit	
Through Residents Associations	
Other (Specify) ______________________________ ______________________________ ______________________________	

APPENDIX E: INSTITUTIONAL INTERVIEW QUESTION GUIDE

University of Venda

Doctor of Philosophy (PhD) programme in Microbiology (Water Supply and Sanitation Management), Department of Microbiology University of Venda, South Africa.

PhD Thesis Topic: The analysis of the policy (institutional) and administrative framework for water supply and sanitation (WSS) services in Zimbabwe's urban areas: A comparative development of sustainable water supply and sanitation services.

Key Note: All information provided will be treated as strictly confidential and for academic purposes only.
Questionnaire for urban local authorities and/service providers.
Institution Name ____

Respondent category

C/TC	C/TT	C/TP	C/THO	GO	ROFO	ZO

C/TC: City/Town Clerk

C/TT: City/Town Treasurer

C/TP: City/Town Planner

C/THO: City/Town Health Official

GO: Government Official

ROFA: Representative of a Funding Organization

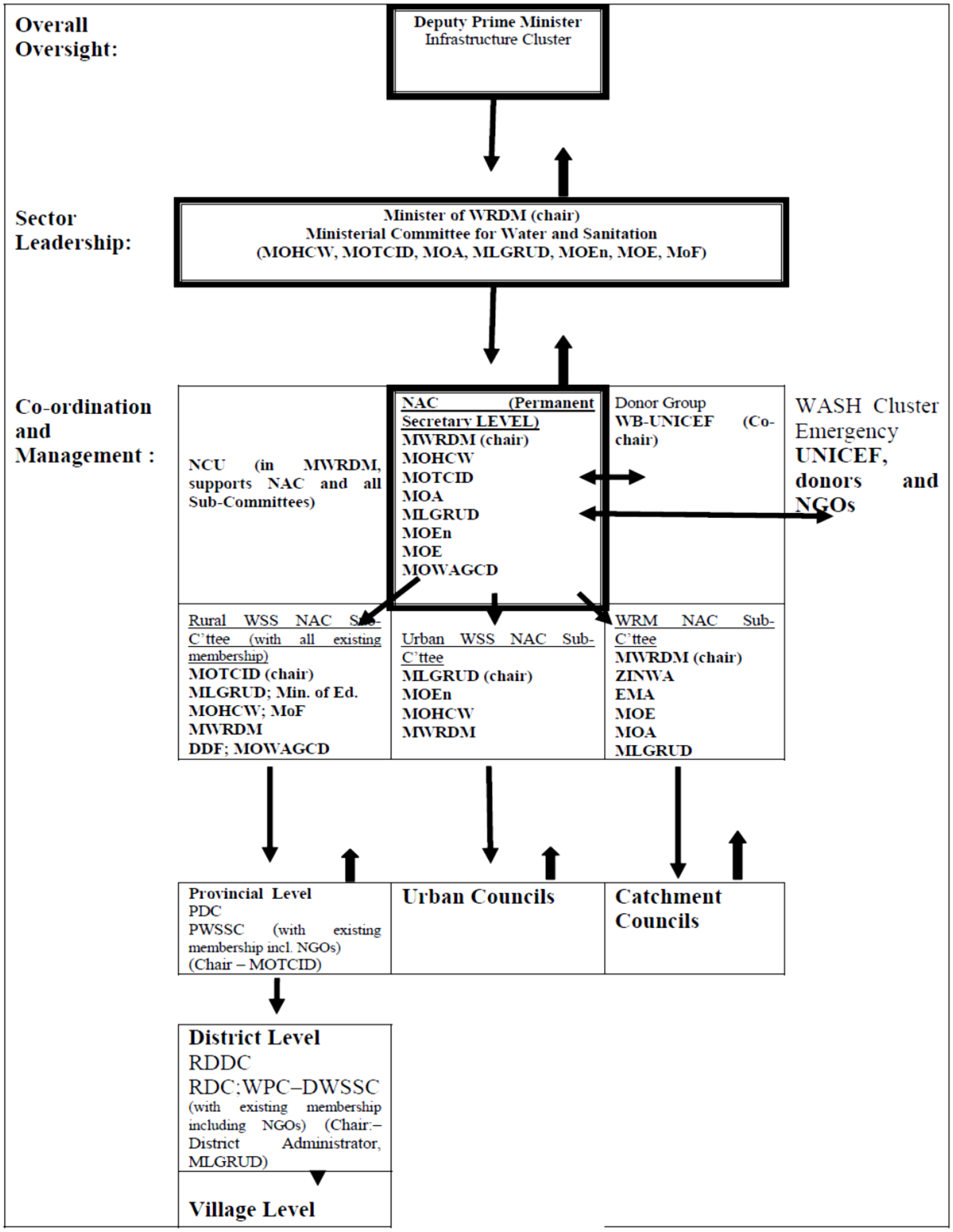
ZO: ZINWA Official

Section 1: Institutions/Political decisions/policies.

A. Institutional Framework

1.1. **A National water policy should be conceived and implemented within the framework of an interdisciplinary national economic, social and environmental policy. Refer to the institutional framework in figure 1 below.**

Figure 1: Water and Sanitation Coordination Structure in Zimbabwe (Ministry of Water Resources Development and Management (MWRDM, 2010).



Acronyms for your guide

AFDB	**African Development Bank**
AUSAID	Australian Government Aid Agency
DDF	District Development Fund

DWSSC	District Water Supply and Sanitation Sub-Committee
EMA	Environmental Agency
EU	European Union
GTZ	German Technical Assistance
MoLGRUD	Ministry of Local Government Rural and Urban Development
MoA	Ministry of Agriculture
MoEn	Ministry of Environment and Natural Resources
MoF	Ministry of Finance
MoHCW	Ministry of Health and Child Welfare
MoTCID	Ministry of Transport Communication and Infrastructure Development
MoWAGCD	Ministry of Women's Affairs Gender and community Development
MoWRDM	Ministry of Water Resources Development and Management
NAC	National Action Committee
NCU	National Coordination Unity
NGO	Non-Governmental Organization
PDC	Provincial Development Committee
PWSSC	Provincial Water Supply and Sanitation Sub-Committee
RDDC	Rural District Development Committee
RDC	Rural District Council
WPC	Water Point Committee
WSS	Water Supply and Sanitation
ZINWA	Zimbabwe National Water Authority

1.2. What is the role(s) of the Deputy Prime Minister (Infrastructure Cluster)

1.3. What is the role(s) of the Minister (MWRDM)?

1.4. What are the main duties of the National Action Committee (NAC)?

1.5. How are NAC members nominated?

1.6. What is the membership composition of the National Coordination Unity (NCU)?

1.7. How does the work of the NCU compliment with the NAC's roles?

1.8. What is the relation between NAC and the Donor Group's role as a co-chair?

1.9. Is the WASH Cluster a permanent institution? Yes ☐ No ☐

1.10. What are the main duties of the WASH Cluster?---

1.11. How the members of the Urban WSS NAC Sub-committee elected?

1.12. What are the main duties of the Urban WSS NAC Sub-Committee?

1.13. How do the duties of the Water Resources Management (WRM) NAC Sub-Committee compliment to those of the Urban WSS NAC Sub-Committee?

1.14. Do Urban WSS NAC Sub-Committees and WRM NAC Sub-Committees have provincial offices? Yes ☐ No ☐

1.15. Is ZINWA only part WRM NAC Sub-Committee? Yes ☐ No ☐

1.16. If **not**, explain at what level it renders its duties: **management and coordination, WSS service provider**.

1.17. Is the newly formed National Water Supply Services Unity (**NWSSU**) under ZINWA now providing services? Yes ☐ No ☐

1.18. Elaborate your response to 1.17 above.

1.19. To whom do Urban Councils account for their statutory responsibilities?

1.20. What communication protocol exists between the Urban WSS NAC Sub-Committee and the Urban Councils?

--Was the proposed independent regulator, the Water and Wastewater Services Regulatory Unity (WWSRU) under MWRDM formed? Yes ☐ No ☐

1.21. If **yes**, is the WWSRU now operational? Yes ☐ No ☐

1.22. Is the Urban Council both the Water Service Authority and Water Service Provider? Yes ☐ No ☐

1.23. If **no,** specify

1.24. Are there any private institutions involved in the provision of urban WSS services? Yes ☐ No ☐

1.25. **Catchment Councils are a sub-section of ZINWA and they render services through the Sub-Catchment Councils.** What are the statutory duties of the Catchment and Sub-Catchment Councils in the National Water Policy?

1.26. How are the duties of the Catchment Council/Sub-Catchment Council influenced by the WRM NAC Sub-Committee?

1.27.1 **The above institutional Framework does not show community institutions in the WSS issues**. Are there any community or civil institutions whose statutory duties are catered for in the National Water Policy? Yes ☐ No ☐

1.27.2 If **yes**, name them

1.27.3 If **not**, how are societal goals determined during policy agenda-setting?

--How are the community concerns and grievances catered for in the policy?

Policy Statements and Principles of the National Water Policy

The Zimbabwe National Water Policy and the Zimbabwe Water Act have policy statements and principles such as efficient water supply, quality potable water, water-rights-based access, equity in access, sustainability, user pays, polluter pays, environment, economic feasibility, subsidiarity (catchment approach) and empowerment (MWRDM, 2012, Murungweni, 2011). The questions in this section focus on these policy statements and principles.

1.28 What are the intended beneficiaries of the National Water Policy?

1.29 On what basis are the beneficiaries of the National Water Policy identified?

1.30 How are the needs of the urban communities catered for during policy formulation?

1.31 Does the National Water Policy empower all urban dwellers? Yes ☐ No ☐

1.32 Explain your response to 1.28 above?

1.33 In which way does the policy reduce inequalities in access to WSS services among urban dwellers?

1.34 Does the policy address issues of water quality? Yes ☐ No ☐

1.35 If **yes**, are service providers meeting this policy provision? Explain.

1.36 Is there any policy provision for the transfer of valuable knowledge from experienced workers to the juniors? Yes ☐ No ☐

1.37 If yes, give the policy statement or principle that addresses the need for knowledge management in WSS and water resources management.

What are the policy provisions on water pollution?

1.38 What are the policy provisions on water pricing?

-- Is there a provision in the Water Policy for service providers to make a "reasonable return/profit from the services they provide to the users? Yes ☐ No ☐

1.39 If **yes,** what are the stipulated uses of the 'return' capital in the policy?

<u>Section 2:</u> <u>Water Policy implementation</u>

Organizations/players

2.0 The following ministries and/ government departments are part of the Urban WSS NAC Sub-Committee: Ministry of Health and Child Welfare (MoHCW), Ministry of Local Government Rural and Urban Development (MoLGRUD), Ministry of Environment (MoEn) and the Ministry of Water Resources Development and Management (MWRDM).

2.1 How is the work of these ministries coordinated at this level as an Urban WSS NAC Sub-Committee? --------------------------
----

2.2 To whom do these institutions account in this Urban WSS Sub-Committee?

2.3 What are the statutory duties of these institutions the National Water Policy?

i). Ministry of Health and Child Welfare (MOHCW)

----

ii). Department of Water Resources (DWR)

----

iii). Department of Environmental Health (DEH)

----

iv). At which level of management is the National Environmental Council (NEC)?

- ☐ Sector leadership
- ☐ NAC
- ☐ Urban WSS NAC Sub-Committee
- ☐ WRM NAC Sub-Committee
- ☐ None of the above

v). How do the statutory roles of Environmental Management Agency (EMA) compliment with those of NEC? ----------------------------
----

vi. To whom does EMA account for its statutory duties? ---

vii). Which of the water resources statutory roles below are executed by Zimbabwe National Water Authority (ZINWA):

- ☐ Planning
- ☐ Development
- ☐ Management
- ☐ Managing water permitting
- ☐ Gives water permits
- ☐ Water service provider

Other (specify) ____

vii). What are the roles of Catchment Councils?

----

viii). What are the roles of Sub-Catchment Councils?

----

viii). Are there statutory roles of consumer and /civil institutions in urban WSS management?

----

ix). Is the role of customer and/civil institutions enforced at all levels of the National Water Policy implementation? Yes ☐ No ☐

x) Is there a Water Safety Planning (WSP) Team? Yes ☐ No ☐

xi) If Yes:

a) When was WSP adopted by your institution?

b) Give examples of duties that they that they execute as part of Water safety planning

____

____

Section 3: **Policy Monitoring and Regulation**

Water Pricing and licenses to supply water services

3.1. Who sets urban water tariffs? ____

3.2. What is the current water tariff? __________

3.3. Is the water tariff the same across all users: domestic consumers, industry and business? Yes ☐ No ☐

3.4. If **yes,** specify ____

3.5. Who reviews water tariffs? ____

3.6. Do tariffs cover costs incurred? Yes ☐ No ☐

3.7. Is there any funding from central government towards annual investment and cost incurred in providing water and sanitation services? Yes ☐ No ☐

3.8. Is there any subsidy for primary water (water required to meet basic human needs: washing, bathing, small gardening and reasonable livestock)? Yes ☐ No ☐

3.9. If **yes,** give the source. ☐Other users
☐Public funds
☐External funding (eg NGOs, World Bank etc)

3.10. Is the free lifesaving water (**10m^3 per month per household**) policy instrument being applied in urban areas? Yes ☐ No ☐

3.11. If **yes**, does it apply to everyone regardless of social status (disadvantage/advantaged)? Yes ☐ No ☐

Specify____

3.12. If **not,** the National Water Policy recognizes the RIGHT to 'Primary Water' by all Zimbabweans. Then cases where people cannot afford to pay, how is their wellbeing guaranteed?

3.13. Who regulates water allocation and management?

3.14. Who regulates water contracts or permits between urban water services authorities and water service providers?____

3.15. Q27. Are there any private companies that are contracted as service regulators? Yes ☐ No ☐

If **yes,** give some detail ---

Q28. Is there a water and wastewater services regulatory unity in the Ministry of Local Government, Rural and Urban Development (MLGRUD)? Yes ☐ No ☐

Q29. Who regulates activities of municipalities and other service providers? ___________________

Q30. How often is regulation done? ☐Quarterly ☐ Yearly ☐2 year cycle ☐ 3 year cycle ☐rarely
☐Never

<u>Section 4</u>: <u>Policy service provision and production of Water supply and sanitation services</u>

4.1. Who are the urban WSS service providers? _______________________________

4.2. How do City/ Town Councils and municipalities get goods and services for the day-to-day running of the water and sanitation utilities?

4.3. How do urban Councils and municipalities get goods and services for the day-to-day running of the water and sanitation utilities?

4.4. Are there any private companies that are contracted as urban WSS service providers? Yes ☐ No ☐

4.5. If **yes,** give some detail ____

4.6. 4.6. Are there some water service authorities that are also service providers? Yes ☐ No ☐

4.7. If **yes**, give details ____

<u>Water Availability</u>

4.8.0 The following questions relate to water services provisions as per policy statements.

4.8.1 Is water always available at urban residents' regular source?

4.8.2 If **not**, how often is water not available at residents' sources?

4.8.3 What are some of the sources of unaccounted for water? How do you reduce risks of unaccounted for water?

4.8.4 What alternative source(s) are available during water cut-offs?

4.8.5 Does the Water policy have a recommended basic daily volume of water per capita?

4.8.6 If **yes**, state (a) the volume and (b) how the service providers make sure this volume is met during times of interruptions?

4.8.7 If water is unavailable daily, at what time of day is it unavailable to residents?

4.8.8 How urgently are water-cut problems addressed by the service providers?

4.8.9 How old is the water infrastructure:

i. treatment plants

ii. Distribution system?

4.8.10 Is supply and demand at par?

4.8.11 If not, what are the causes of the backlog. What is the magnitude of the backlog in terms of households that need connection to the service and what intervention is in place to address the problem?

4.8.12 Are all households having the "**high standards of urban housing services**" that is, it is mandatory that construction and legal occupation of urban houses be preceded by development of road, water and sewerage services? If **not**, what alternative options are in place?

4.8.13 Are there any incentives to customers who keep their bills up to date?

4.8.14 Is the quality of service and access to water services the same to all the different income groups?

4.8.15 How do water service providers ensure transparency to customers in relation to:

i. Compliance with water quality standards?

ii. Water pricing?

iii. Investment decisions?

iv. Service interruptions?

4.8.16. What are customer's perceptions on water quality? If not satisfied, what are the sighted problems?

4.8.17 Are capital costs of providing primary water subsidized?

4.8.18 If **not,** how is the low income group of customers catered for in the Water policy?

4.8.1 Water Availability			
Yes		No	

4.8.2 How often not available	Daily	Weekly	Monthly	Every 2 months	Every 6 months	Annually	Other
Tick							

4.8.3 sources of unaccounted for water	Tick
Burst pipes	
Loose valves	
Worm out valves	
Illegal connections	
Leaking pipes	
Other:	

4.8.4 Ways to monitor unaccounted for water
1.
2.
3.
4.

4.8.5 Alternative sources	Tick
River	
Tap	

Borehole	
Spring	
Well/Canal	
Other	

4.8.6 Volume per Capita			
Yes		No	

4.8.7a Recommended volume per capita/day (L) :Tick (√)	10-15	15-25	25-40	50+

4.8.7b Action to meet the recommended Volume/capita	Tick
Few water points left with running water in each locality	
Water trucking	
Municipal boreholes	
Other: _________________	
________________________	
None	

4.8.8 water adequacy			
Yes		No	

4.8.9 Time of day	Early morning	Mid-morning	Late morning	Afternoon	Late afternoon/early evening	Whole day	Randomly

4.8.10 Fixing time	Same day	Week	Month	> Month	> 3 Months	> 6 Months	Year	Other
Tick								

4.8.11 Infrastructure age Tick (√)	Age(year)	Treatment plant	Distribution system	Pump(s)
	0-10			
	10-20			
	20-30			
	30+			

4.8.112 water adequacy	Backlog No. of households	Causes of backlog	Intervention
	Area No. ------- -------------- - --------------------- --------------------- --------------------- ---------------------	1. ______ 2. ______ 3. ______ 4. ______ 5. ______	1.______ 2.______ 3.______ 4.______ 5.______

4.8.13 service standard			
Yes		No	

4.8.14 Equity of access to services			
Yes		No	

4.8.15 Transparency and democratization of services	Service interruption	Compliance with water quality standards	Investment decisions	Water pricing and tariffs
	1.______ 2.______ 3.______ 4______	1.______ 2.______ 3.______ 4______	1.______ 2.______ 3.______ 4______	1.______ 2.______ 3.______ 4______

4.8.16 Customer water quality perception	Tick
Very good	
Good	
Poor	
Very poor	
Other (specify)______ ______ ______	

4.8.17 water quality issues raised	Tick
colour	
smell	
taste	
microbiological	
Chemical	

Other (specify)____________________	

4.8.18 Subsidization of costs			
Yes		No	

4.8.19 Ways to guarantee the 'Right' to water	Tick
Free lifesaving water	
Subsidized cost	
Cheap water across all different user groups	
Other (specify)______________________________ ____	
None	

Sanitation Services

5.0 Sanitation Accessibility as per policy statements of adequate, continuous, accessible, sustainable, safe and affordable sanitation services.

5.1 Are all households connected to a sewerage system?

5.2 If not, what are the causes of the backlog. What is the magnitude of the backlog in terms of households that need connection to the service and what intervention is in place to address the problem?

5.3 a What types of sanitation facilities are available?

5.3b Does the type of sanitation facility depend on residential status (whether low, medium and high density)?

5.4 What types of urban sanitation facilities are allowed by the policy?

5.5 How urgently are sewer system blockage problems addressed by the service providers?

5.6 How old is the sanitation infrastructure:

i. treatment plants

ii. distribution system?

5.7 How often are cases of raw sewerage spillage into the environment?

5.8 a How are sewerage spillage problems addressed?

5.8b Is the environment rehabilitated? If yes, by who?

5.9a Are all households having the "**high standards of urban housing services**" that is, it is mandatory that construction and legal occupation of urban houses be preceded by development of road, water and sewerage services?

5.9b If **not**, what alternative options are in place?

5.1 Toilet facility			
Yes		No	

	Backlog No. of households	Causes of backlog	Intervention
5.2 sanitation availability	Area No. ------------- ------------- --------- ----------------- ----- --------------------- - --------------- ------- --------------- ------- ----	1. ______ 2. ______ 3. ______ 4. ______ 5. ______	1.______ 2.______ 3.______ 4.______ 5.______

5.3a sanitation type	Water borne(Flush)	Septic tank	Pit latrine	Bucket system	Chemical toilet	Other
Tick						

5.3b Sanitation facility depends on residential status			
Yes		No	

5.4 Permitted urban sanitation options. Tick (√)	Waterborne (flush toilet)	Septic tank	Pit latrine	Chemical toilet	Bucket system	Other
High density						
Medium density						
Low density						

5.5 Fixing time	Same day	Week	Month	> Month	> 3 Months	> 6 Months	Year	Other
Tick								

5.6 Infrastructure age Tick (√)	Age(year)	Treatment plant	Distribution system	Pump(s)
	0-10			
	10-20			
	20-30			
	30+			

5.7 How often are sewerage spillages	Daily	Weekly	Monthly	Every 2 months	Every 6 months	Annually	Other
Tick							

5.8a Action to prevent sewerage spillage	Tick

Frequent surveillance	
Budgeting to replace old sewerage infrastructure	
Upgrading existing infrastructure	
Other: ________________	
None	

Rehabilitation done by______________________

5.8b Environmental rehabilitation		
Yes		No

5.9a Toilet facility			
Yes		No	

5.9b Alternative sources	Tick
Pit latrine	
Chemical toilet	
Septic tank	
Bush	
Other	

APPENDIX F: SUPPLEMENTARY INFORMATION

1. WATER AND SANITATION: PREVIOUS STUDIES SUMMARY

The information presented in this supplementary sheet summarizes some previous studies on water availability in Zimbabwean cities. A study by Tanyanyiwa and Mutungamiri (2011) on residents' perception on water and sanitation problems in Dzivarasekwa 1 found that only 10% of the respondents confirmed that they were getting enough water (Figure F1). However, 42% indicated that they were getting less than enough water, 39% claimed the situation varied because at times water was enough and at other times it was not and 8% was not sure.

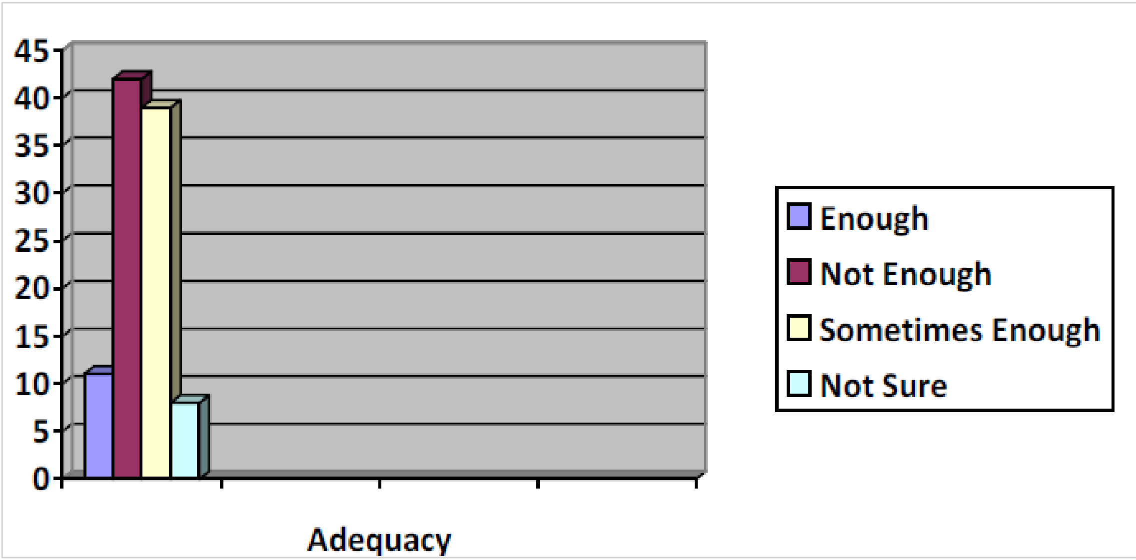


Figure F1: Adequacy of water supply in Dzivaresekwa 1 (Tanyanyiwa and Mutungamiri, 2011, accessed March 2020)

Similarly, Nhapi (2009) reported on the impending crisis in the provision of water supply services to Harare city. Figure F2 (b) was an extrapolation of the then prevailing situation regarding water abstraction and treatment. The information shown in Figure F2 (b) shows that the full capacity of the Morton Jaffray Waterworks was going to be reached in 2008 whilst that for Prince Edward waterworks would be reached in 2012, assuming constant growth of demand. Harare's water demand was estimated at 750,000m^3/day (AfDB, 2010), which was more than Harare was abstracting. A total of 544,000m^3/day was being abstracted and after subtracting process losses in the treatment plant, only 486,000m^3/day was produced.

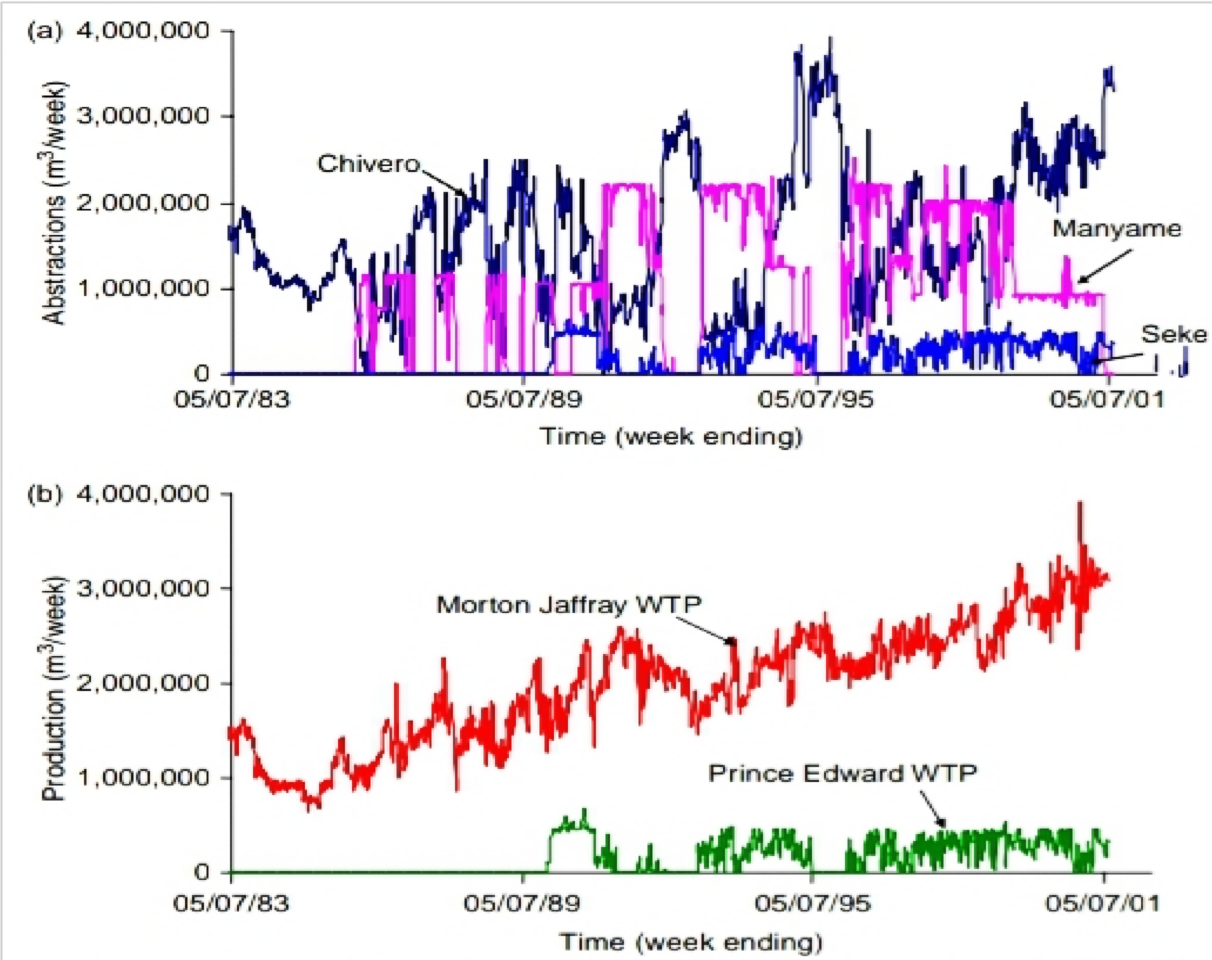


Figure F2: Weekly water supply patterns for the Harare metropolitan area: (a) raw water abstractions from Chivero, Manyame and Seke dams and (b) potable water production from Morton Jaffray and Prince Edward waterworks (Dube and van der Zaag, 2002, accessed November 2020)

After an estimated 30% loss in the distribution/reticulation system (City of Harare, 1996), 340,000m^3/day was potentially going to available for use. When the prevailing demand was factored, in which was pegged at 750,000m^3/day, the situation meant that there were going to be frequent water supply disruptions to many areas, a situation that raised political instability in the city and resulted in two mayors being dismissed within a space of four years. Similarly, Manzungu et al. (2016) indicated that Harare's water infrastructure was never upgraded or augmented since 1994 despite the increase in the city's population from 200,000 in 1980 to over two million in 2015, and in light of plans to construct three new dams.

The repercussions of the lack of upgrades to the city's water infrastructure, (which also services the neighbouring towns of Chitungwiza, Norton, Ruwa and Epworth), including the failure to construct three dams; Kunzvi and Musami (with capacities of 250 and 450 mega litres/day, respectively) to supply Harare, and Muda to supply Chitungwiza (Manzungu et al., 2016), and failure to reduce the pollution of Lake Chivero, began to be felt in the early 2000s. Furthermore, this was aggravated by operational problems such as rampant power cuts and high water treatment costs caused by widespread pollution of water bodies (Nhapi, 2009).

Similarly, in the city of Masvingo, reports by Dube and van der Zaag (2002) showed an increase in water use through the years, from 2.4 Mm^3/annum in 1977 to 6.8 Mm^3/annum in 2001 (Figure F3). Figure F3 shows the pattern of water supply for the city of Masvingo from 1977 to 2000.

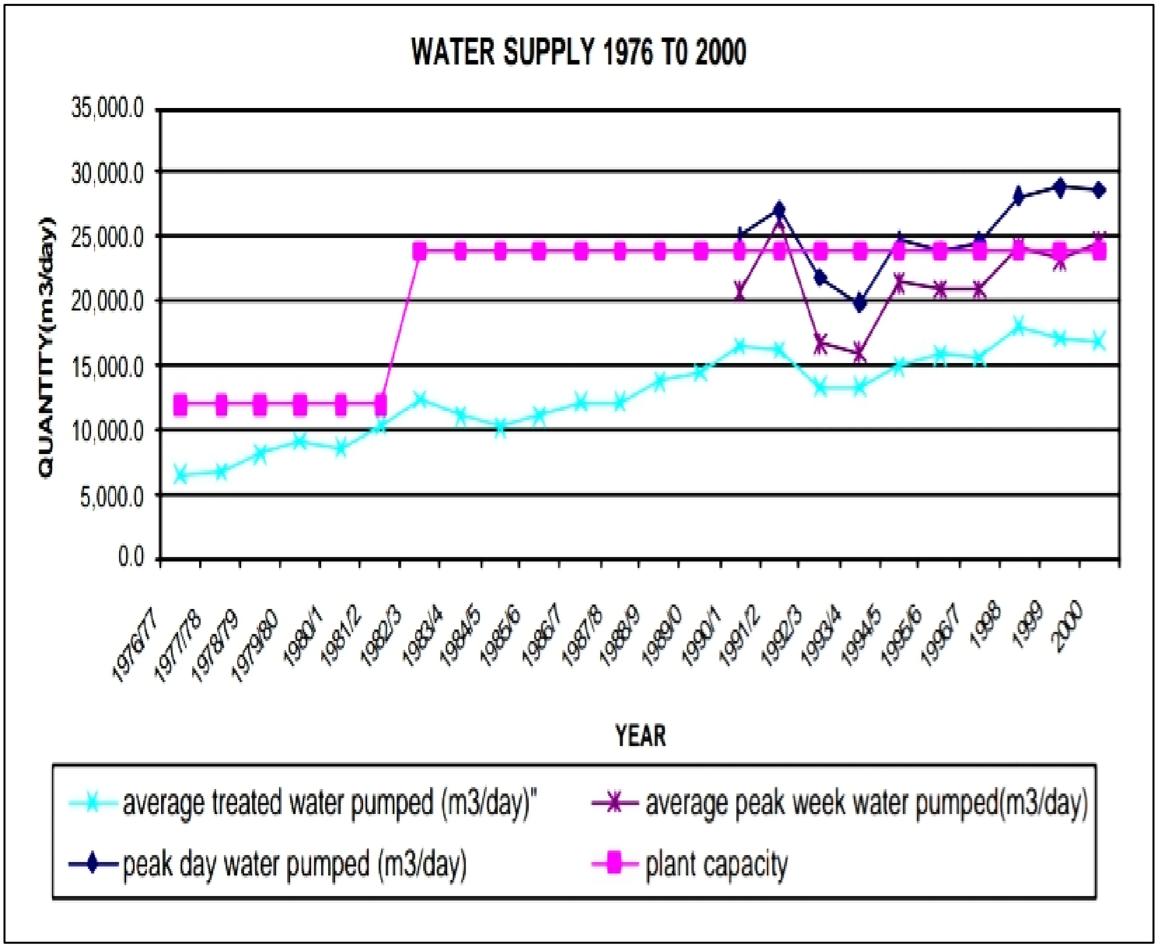


Figure F3: Pattern of water supply for the city of Masvingo from 1977 to 2000 (Dube and van der Zaag, 2002, accessed March 2020)

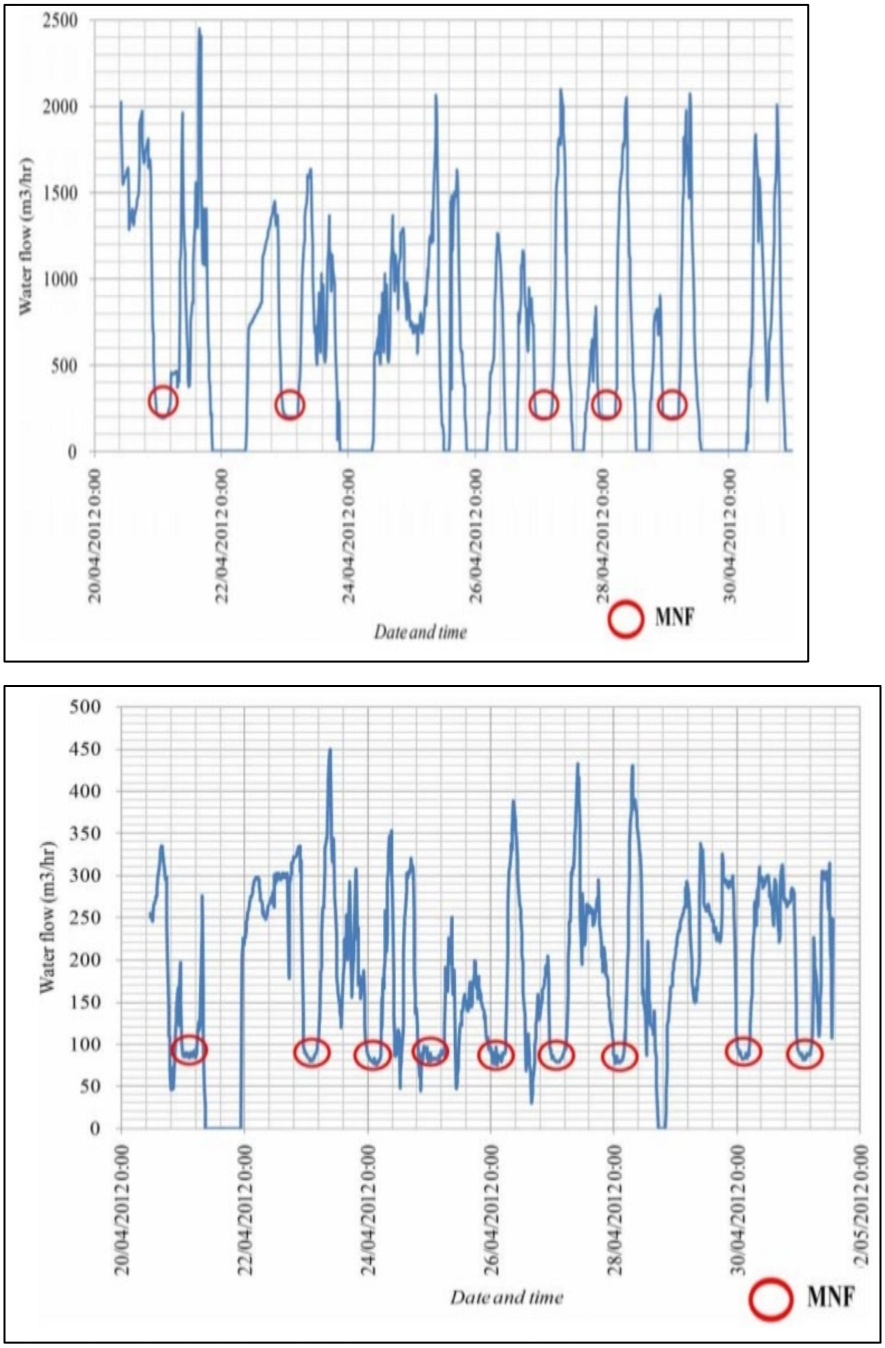
On a similar note, Chirenda et al. (2015) affirm the above assertion that water is not enough by indicating that the provision of adequate amounts of safe water for domestic purposes has become difficult for most municipalities that are mandated to do so in Zimbabwe. Manzungu et al. (2016) reported that suburbs on higher ground, such as Mabvuku suffered the most and went for over 5 years without water. Musemwa (2010) also decries poor governance as a major factor contributing to the problems. Reporting on the same theme, the African Development Bank Group (AfDB) (2010) assessed the supply capacity and demand in towns and cities around Zimbabwe and the results support the findings that water demand far exceeds the supply capacity (Table F1).

Table F1: Water supply capacity and demand in some parts of Zimbabwe (AfDB, 2010)

City	Population	Water supply		Demand (m^3/day)
		Installed capacity (m^3/day)	Actual (m^3)	
Harare	2500 000	704 000	645 000	1200 000
Chitungwiza	1000 000	-	-	-
Mutare	300 000	65 000	54 000	75 000
Kwekwe	120 000	90 000	45 000	36 000
Chegutu	120 000	12 000	8 000	36 000
Masvingo	110 000	30 000	23 000	48 000
Total	4150 000	901 000	775 000	1395 000

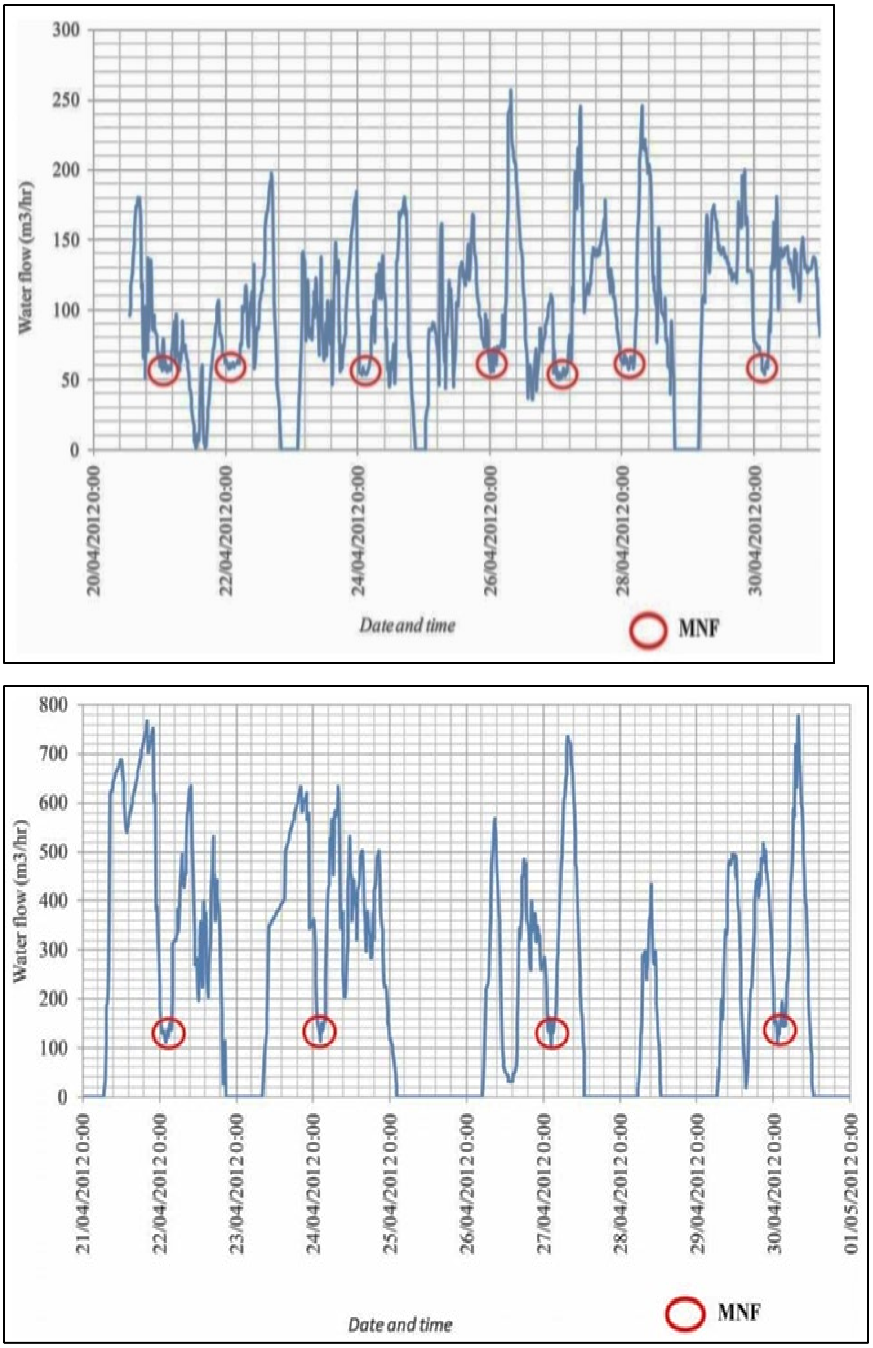
Another study by Ndunguru and Hoko (2016) further supports the assertion that water supply is not continuous and that people don't get enough water. The study involved analysis of minimum night flow (MNF) shown in Figure F3 (a) for Budiriro, indicate the MNF, which per Thornton (2005) usually occurs during the night between 12 and 4 am, was ranging from 193 to 199 m^3/hr during the entire logging period. The average flow was 586 m^3/hr during the logging period. Figure F3 (b) shows the results of the inflow pattern to the Belvedere low density water supply area. The MNF was ranging from 74 to 83 m^3/hr during the entire logging period. The average flow was calculated to be 181.1 m^3/hr during the logging period. The results show 2 days where the area had a period of water-cuts that were possibly due to either a major pipe burst or power cuts that the City of Harare was experiencing during the period of study.

Figure 4 (a) shows that the MNF from Epsilon Reservoir to Mabelreign varied from 56.1 to 59.2 m^3/hr with an average flow into the area of 95.3 m^3/hr. MNF results from feeder 1 for Glen View high density area (Figure F4 [b]) shows MNF values ranging from 104.7 to 113.3 m^3/hr during the entire logging period with the average flow calculated to be 203.0 m^3/hr.



a b

Figure F4: Water supply flow (minimum night flow [MNF]) pattern for the period of 20 April to 1 May 2012 from feeder 1. (a). Budiriro high density area and (b). Belvedere low density (Ndunguru and Hoko, 2016, accessed February 2020)



---------- a **b**

<u>Figure F5</u>: Minimum night flow (MNF) pattern for the period of 20 April to 1 May 2012 from feeder 1. (a) Mabelreign low density area and (b) Glen View high density (Ndunguru and Hoko, 2016, accessed February 2020)

A study by the “We Pay You Deliver” Consortium (WPYD, 2017) reporting on availability of running water per week at household level in four cities of Zimbabwe (Harare, Bulawayo, Masvingo and Mutare) found that only 54.9% of the residents indicated that they received drinking water from the municipality 7 days a week, 26% got water four days per week, 14.8% got water 3 days and below and 4.3% never got access to water (Table F2).

Table F2: Availability of water per week at household level (WPYD, 2017)

Issue	Responses	Frequency	Percent (%)	N
Running water per week	7 days	3861	54.9	7036
	4 days	1830	26	
	3 days & below	1044	14.8	
	Never	303	4.3	