BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF SUSTAINABLE DEVELOPMENT

TOPIC: THE EFFECTIVENESS OF RPWS IN ZIMBABWE, FOCUSING ON THE MHANGAMI AR INVESTIGATES EA WARD 9, SHURUGWI DISTRICT.

BY

MUNYARADZI RUKATO

(B213613B)

SUPERVISOR DOC SAMUKANG

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APPROVAL FORM

This research project aligns with Bindura University's presentation standards and has submitted for review to ensure adherence to departmental guidelines.

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SUPERVISOR'S SIGNATURE **DATE**

DECLARATION

I, Munyaradzi Rukato, affirm that this study is my personal writing. Any content derived from external sources has been properly acknowledged.

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STUDENT'S SIGNATURE DATE SIGNED

DEDICATION

I am eternally appreciative to my esteemed parents, Hlanga Trymore Rukato and Winnie Mudzwembiri, whose solid love, sacrifices and encouragement have been the bedrock of my journey. Their steadfast belief in me has provided the strength and resilience needed to navigate challenges and pursue this landmark. Earnest appreciation to Mr Samukange, for tireless dedication and insightful guidance have shaped the depth and rigor of this dissertation. His commitment to excellence has been a driving force in my academic growth.

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ABSTRACT

Clean water and safe remains a pressing challenge to rural societies in Zimbabwe. This study accessed effectiveness of Rural Piped Water Schemes in Mhangami area of Shurugwi District. The primary objectives were to identify factors influencing RPWS performance, explore the link between community perceptions and sustainability, investigate strategies to enhance RPWS functionality and water quality and evaluate their impact on health and livelihoods. A mixed methods approach was employed involving questionnaires completed by 37 employees and in-depth interviews with 5 senior managers. Findings reviewed that RPWS faced technical inefficiencies due to inadequate maintenance, poor water quality and limited training. Despite general positive community perceptions, engagement in management was minimal. The scheme significantly improved health outcomes reflected in a 40% reduction in water borne diseases but had a limited effect on improving livelihoods. The study recommends targeted operator training, routine maintenance schedules, deeper community involvement, integration with livelihood programs and robust monitoring systems to improve RPWS sustainability and effectiveness.

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LIST OF ACRONYMS

IPCC	Intergovernmental Panel on Climate Change
NGOS	non-governmental organisations
RPWS	Rural Piped Water Schemes
RWSSP	Rural Water Supply and Sanitation Program
SPSS	Statistical Package for Social Sciences
TRDC	Tongogara Rural District Council
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organisation
ZINWA	Zimbabwe National Water Authority

Chapter 1

1.1 Introduction

In many parts of rural Zimbabwe, obtaining safe drinking water remains a significant challenge. This ongoing issue not only threatens public health but also affect local progress (UNICEF, 2020). The introduction of RPWS aims to address this gap, promising more accessible and consistence water delivery (Mukuru, 2020). Yet researchers have noticed persistent obstacles such as breakdowns in infrastructure, questions about water quality and limited community input that undermines the success of these schemes (Chimbo, 2019, Mhlanga ,2022). This study enters on Mhangami ward 9 in Shurugwi District to critically examine how effective RPWS are in practise.

1.2 Background

The right to safe water for consumption is deeply tied with health, dignity and progress, a principle recognised by the United Nations (2010). Yet for a majority of rural households in Zimbabwe, accessing clean water remains a daily struggle. Around 63% still depend on unsafe water sources, placing them to a greater risk of diseases and limiting opportunities for growth (World Bank, 2020).

To change this RPWS were introduced designed to deliver treated water through piping networks directly to villages (Mukuru, 2020). Despite their potential these systems are fraught with challenges such as inconsistent service, lack of maintenance, substandard water quality and low community involvement all threaten their reliability and long-term use (Chimbo, 2019) and (Mhlanga, 2022). Add to this the impacts of climate stress, financial strain and institutional gaps and situation becomes even more complex (UNDP, 2019).

The roots of Zimbabwean water access challenges stretch far back. Before colonisation rural populations relied mostly in natural water sources like streams and hand dug wells which were not protected (Moyo,2015). Colonial authorities developed piped systems but these mainly served cities and white owned commercial farms (Rutheford, 2001). After independence, government initiative expanded water projects to rural zones

through bodies like the Department of Water Resources established in 1980 (Government of Zimbabwe, 1980).

Despite these efforts, safe rural water remains elusive. A 2019 government survey found that nearly half of rural households still draw water from rivers, lakes or shallow wells with only a minority using unprotected boreholes or piped systems (Ministry of Health and Child Care, 2019. In Mhangami Ward 9 this study focuses conditions reflect these national trends, with most residents using exposed water sources. This reality sets the contexts for investigating whether RPWS in the area are truly meeting their goal.

1.3 Problem Statement

While considering development has been placed to improve access to clean water in rural Zimbabwe, many piped schemes are still falling short. The majority of rural residents roughly 63% continue to live without access to protected water sources (World Bank, 2020). Common issues include infrastructure breakdowns, delays in repair due to missing parts and inconsistent system upkeep (Mhlanga, 2022). Water safety is another concern with reports of microbial contamination and chemical pollutants making their way into supplies (Water Aid, 2020). On top of this when communities are not actively involved in decision making or system maintenance, long term sustainability suffers (Chimbo, 2019).

As these challenges were not enough, climate change results in prolonged droughts to flash flooding disrupts water availability even further (IPCC, 2014). In Mhangami ward 9 residents still rely heavily on rivers, surface pools and uncovered wells for their daily use (District Development Plan, 2018). Although broad studies on RPWS exists, there is a lack of research that zeroes in on the everyday realities in local settings like this one. This study steps in seal the gap.

1.4 Purpose of the study

Central aim of the investigation is to evaluate how well RPWS are working in the Mhangami area of Shurugwi District. It seeks to unpack what factors are driving success or failure and how these systems are impacting daily life and health outcomes in the community.

1.5 Research Objectives

1. To investigate the main challenges and enablers affecting RPWS in Mhangami.
2. To explore how local residents view and involvement influence the sustainability of these systems.
3. To identify practical measures for enhancing water quality and the smooth operation of RPWS.
4. To assess how the introduction of piped water has affected both health and livelihoods in the area.

1.6 Research Questions

1. What conditions or factors influence how well RPWS operate in Mhangami?
2. In what way do residents attitude and participation affect the longevity of these schemes?
3. What can be done to improve water quality and reduce system breakdowns in the area?
4. How has access to piped water impacted the wellbeing and daily lives of the local population.

1.7 Significance of the study to

The Researcher

This exploration offers valuable opportunity to deepen my understanding of water resource management in rural context. It strengthens my skills in field work, analysis and policy engagement paving the way for future roles in academia, research institutions or development work. Ultimately the study aligns with my personal drive to contribute to better water systems for underserved communities while advancing my in-development research.

To Bindura University of Science Education

This study adds to the university portfolio of applied research and strengthens its role in environmental health, water governance and sustainable development. It provides material to enrich teaching in environmental science and public health programmes and supports curriculum design grounded in real world challenges. Furthermore, it enhances the university outreach efforts by offering insights that can be shared with rural communities and policy stakeholders.

The study to policy makers:

This study equips decision makers with evidence driven recommendations for improving piped water delivery systems in rural areas. By highlighting the social technical and institutional elements that affect scheme performance, it can inform adjustments to national water policies. The findings can also help in designing locally relevant, sustainable models that support Zimbabwe's developmental goals and contributes towards United Nations Sustainable Development Goals.

1.8 Assumption of the study

1. RPWS offer a practical solution for improving access to clean water in rural Zimbabwe.
2. the sustainability of these systems is closely tied to the active participation of local communities.
3. interviews and survey respond will provide truthful and consistence information.
4.the insights gathered from Mhangami ward 9 are likely applicable to other similar rural settings within Zimbabwe.

1.9 Delimitation s of the Study

1. Geographical scope: The exploration centres on Mhangami area, Shurugwi District, Zimbabwe, limiting generalisation to other regions.
2. Population scope: The study targets community members, local authorities, and water officials, excluding other stakeholders.
3. Time frame: Data collection occurs during a single period, neglecting seasonal variations.
4. Methodological scope: The study employs quantitative and qualitative methods, omitting experimental or longitudinal designs.
5. Language: Data collection is conducted in English and Shona, potentially excluding non-proficient community members.
6. Sample size: The study's sample size is limited, potentially affecting statistical power.
7. Study duration: The study's duration constraints may limit in-depth exploration of certain issues

1.10 Limitations of the Study

1. Sampling bias: Non-probability sampling may lead to selection bias.

2. Geographical focus: Findings may not generalise to other regions beyond Mhangami area, Shurugwi District.
3. Cross-sectional design: Causality and longitudinal effects cannot be established due to the study's single-time data collection.
4. Social desirability bias: Participants may deliver socially acceptable responses, potentially masking true perceptions and experiences.

1.11 Chapter Summary

The first chapter has drawn the research focus, providing a clear background on the rural water situation in Zimbabwe and narrowing in on Mhangami ward 9. It framed the problem established the research's drive and objectives and laid out key questions it aims to answer. By highlighting its relevancy, scope and limitations, this chapter sets a solid foundation for deeper investigation in the chapters that follow. The study seeks to assess not just whether RPWS are working, but why they are or are not and what can be done to improve their performance in real world rural conditions.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter gives appropriate scholarly works concerning RPWS in Zimbabwe, narrowing the lens on their performance in underserved rural settings such as Mhangami in Shurugwi District. It draws on both empirical data and established studies to contextualised the research and identify key themes. The focus is on framework used to support these systems, the practical steps taken to ensure their sustainability and existing knowledge gaps all with the goal of building a robust foundation for the current study.

2.2 Overview of RPWS

Rural Piped Water Schemes (RPWS), typically managed by local communities or governmental bodies, aim to bring piped water infrastructure to rural populations. These schemes rolled out in Zimbabwe in the 1980s as a strategy to expand access to water which is safe for drinking, diseases, boost rural development through irrigation and livestock support.

Examples include the Mvurwi RPWS in Mazowe District which increase clean water access from 40% to 80% (Hoko and Hurtle, 2016) and the Chivi RPWS in Masvingo Province which reached over 10 000 beneficiaries (ZINWA, 2018). Another standout is the Nyanga RPWS which eased the load of water fetching for women and children while enhancing water availability (UNICEF, 2019).

However, these achievements have not come without setbacks. Funding constrains (Masiya,2017), infrastructure neglect (Hoko and Hurtle, 2016) and climate change (IPCC,2014) continue to challenge progress. For example, Gwanda District scheme has struggled to stay operational due to financial limitations (The Herald, 2020).

In response the Zimbabwean government has instituted policies like the National Water Policy (2012) and establish ZINWA to control and manage water services. Moreover, community-based models have been introduced to deepen grassroots engagement and local ownership.

For RPWS to thrive, there is a need for stronger financial investment in system upkeep, enhanced community participation, climate adaptive infrastructure and support mechanisms like irrigation and livelihood programmes. When these elements align, RPWS have the potential to uplift rural livelihoods across Zimbabwe.

2.3 Theoretical Frame Work

This research draws on three core theories to unpack the complexities of RPWS in Zimbabwe, institutional Theory, Social Capital Theory and Human Centred Theory. Each provide a unique lens for understanding how these systems function, how communities engage with them and how they can be improved for lasting impact.

2.3.1 Institutional Theory

Institutional Theory and Rural Water Supply Systems

Institutional theory offers insight into the forces that shape rural water systems, namely the formal and informal that influences how stakeholders behave. It suggests that water schemes are not shaped sorely by technical solutions but also by the social and regulatory environments in which they exist (Scott,2008).

This theory breaks institutional influence into three key pillars,

1. **Normative pillar**

These include shared community values and expectations that guide behaviours such as norms around water sharing or responsibilities within water user groups.

2. **Regulative pillar**

These refers to formal structures like laws, policies and guidelines that govern water access and management, for instance national water safety standards or licencing regulations.

3. **Cultural-cognitive pillar**

This pillar includes the collective beliefs, assumptions and understanding that people hold such as traditional views on water sources or resistance to unfamiliar technologies.

By applying this framework to RPWS in places like Mhangami, we can better understand how institutional structures support or hinder system sustainability. It also enables researchers and policymakers to identify institutional gaps and design interventions that better fit the local context.

Applying Institutional Theory to Rural Water Supply Systems

By applying institutional theory to rural water supply systems, researchers can advance an improved understanding of the complex interplay amid technical, social, economic, and environmental aspects that impact sustainability of these systems. This perspective can help identify the institutional barriers and opportunities that shape the effectiveness of supply systems of water in rural areas and inform strategies for improvement.

In context in line with my dissertation topic, institutional theory can help us understand how the institutional environment in the Mhangami area influences the rural water supply systems sustainability. By examining normative, regulative, and cultural-cognitive pillars that support these systems, we can identify key factors that shape community perceptions, functionality, and water quality. This knowledge can inform the development of context-specific solutions that address the unique problems encountered by rural communities in the Mhangami area.

2.3.2 Social Capital Theory

According to Robert D. Putnam's social capital theory, social relationships and networks can be a valuable resource for individuals and communities, enabling them to achieve common goals and improve their well-being (Putnam, 2000). Social capital theory delivers a valued framework for understanding the role of social relations and linkages in shaping the sustainability of these systems.

Key Components of Social Capital

Putnam's social capital theory identifies several key components, including:

- Trust: The level of trust within a community can significantly impact the effectiveness of rural water supply systems. Trust can facilitate cooperation and collective action, enabling communities to manage and maintain water systems more effectively.
- Networks: Social networks can play a critical role in sharing knowledge, resources and expertise related to water management. Strong social networks can help communities to adapt to challenges and improve the sustainability of rural water supply systems.
- Norms and values: Shared norms and values around water management can influence community behaviour and decision-making. Social capital theory highlights the importance of understanding these norms and values in developing effective strategies for improving rural water supply systems.

Applying Social Capital Theory to Rural Water Supply Systems

By applying Putnam's social capital theory to rural water supply systems, examiners can gain a better understanding of the social dynamics that shape the sustainability of these systems. This perspective be used to identify the social capital assets that exist within communities and inform strategies for building and leveraging these assets to improve the effectiveness of rural water supply systems.

Social capital theory help in understand how social relationships and networks influence the rural water supply systems sustainability in the Mhangami area. By examining the levels of trust, networks, and shared norms and values within these communities, we can identify key factors that shape community perceptions, functionality, and water quality. This knowledge can inform the development of context-specific solutions that build on the social capital assets of rural communities.

2.3.3 Human-Cantered Design (HCD) Theory

Human-centred design theory highlights the importance of understanding the needs, desires, and behaviours of users in the design and development of products, services, and systems (IDEO, 2015). In the context of rural water supply systems, human-cantered design theory can be applied to develop solutions that are tailored to the specific needs and challenges of rural communities.

Key Principles of Human-Centred Design

Human-centred design theory is guided by several key principles, including:

Empathy

Understanding the needs, desires, and behaviours of users is critical in developing effective solutions. In rural water supply systems, empathy involves understanding the experiences, challenges, and aspirations of community members.

Co-creation

Involving users in the design and development process can help ensure that solutions are relevant, effective, and sustainable. Co-creation involves working closely with community members, local stakeholders, and other relevant parties to develop solutions that meet their needs.

Iteration:

Human-cantered design involves iterating and refining solutions based on feedback and testing. This approach can help ensure that solutions are effective, efficient, and sustainable in the long term.

Applying Human-Centred Design to Rural Water Supply Systems

By applying human-centred design theory to rural water supply systems, researchers and practitioners can develop solutions that are designed for the specific needs and challenges of rural communities. This approach can help ensure that solutions are effective, efficient, and sustainable, and that they improve the health, well-being, and livelihoods of communal members.

In the context of our dissertation topic, human-cantered design theory can help us understand how to develop solutions that are designed for the specific needs and challenges of rural communities in the Mhangami area. By empathizing with community members, co-creating solutions, and iterating and refining these solutions, we can develop effective and sustainable rural water supply systems that develop the health, well-being, and livelihoods of community members.

2.4 Global perspectives on Rural Piped Water Scheme

2.4.1 Overview of global experiences with RPWS

Rural piped water schemes are widely used around the world to improve access to safe drinking water and sanitation. As of 2019 approximately 74% of the global population had access to improved drinking water sources including piped networks (WHO, 2020). Yet rural populations continue to trail behind urban ones in terms of access.

Some countries have made impressive progress. For instance, Rwanda saw a remarkable leap in rural piped water coverage from just 16% in 2008 to 74% in 2017, thanks to a national programme focused on expanding rural water infrastructure (Rwanda Ministry of Infrastructure ,2018). Similarly, Indonesia launched a community led initiative that successfully provided over i.5 million rural residents with clean, piped water (World Bank ,2018).

However, these successes often come with persistent obstacles. Many schemes encounter high operational costs, fragile infrastructure and limited community participation (Lockwood and Smith, 2011). These issues highlight the importance of strategic planning, community engagement and strong governance to ensure long term sustainability.

2.4.2 Review of national policies and strategies for rural water supply in Zimbabwe

Zimbabwe has developed key guidelines and strategies to tackle rural water supply challenges. The cornerstone is 2012 National Water Policy which promotes fair and widespread access to clean water. It especially emphasises rural areas seeing clean water as essential to health, economic development and poverty reduction (Government of Zimbabwe 2012).

To put this vision into action the RWSSP was established.
Zimbabwe water authority (ZINWA), founded through ZINWA Act of 1998, plays a pivotal regulatory role. It oversees rural water schemes to make sure that the meet national water quality standards (ZINWA, 2020). Still progress is hampered by factors

like funding shortages, limited institutional capacity and climate pressures (Mukono,2017). Overcoming these hurdles will demand sustained investment and deeper engagement with rural communities.

2.5 National Perspective on RPWS

2.5.1 Review of literature on the effectiveness of RPWS in improving water access

Effectiveness of Rural Piped Water Schemes in Improving Water Access

Research consistently highlights how rural piped water schemes have played a pivotal role in offering access to clean water in rural societies. According to a World Bank report (2018), such schemes have increased access to improved water sources by as much as 25% to 50%in parts of rural Africa.

In Zimbabwe rural areas findings from (Mukono,2017) shows that RPWS have dramatically cut down the time it takes to fetch water up to 75%. This time saving ripple effect allows residents to invest more energy into essential activities like farming, schooling and running small businesses.

Beyond accessibility, the health benefits are evident too. In Tanzania, Kuma (2019) reported a 30% drop in childhood diarrhoea cases after RPWS were introduced. In Kenya, Odhiambo (2020) noted better water quality and fewer outbreak of diseases such as cholera. These improvements underscore the broader benefits that clean, piped water brings to public health and community productivity (Lockwood and Smits , 2011).

By reducing the need to fetch water from long distances, something that affects women and children. RPWS also contribute to improved wellbeing and greater economic inclusion. Ultimately the evidence suggests that these schemes are a cornerstone of rural infrastructure essential for healthier, more empowered and economically resiliency communities.

2.5.2Factors influencing the effectiveness of RPWS.

The effectiveness of RPWS doesn't just depend on the installation of pipes, it also deeply shaped by how they are planned, funded, maintained and embraced by the community.

String community involvement is a top success factor. When locals participate effectively, they feel ownership and take responsibility for keeping the system running smoothly (Lockwood and Smits, 2011).

Technical design is equally critical. Systems that are carefully engineered with the right pipe dimensions, treatment methods and storage capacity are less likely to breakdown and more likely to deliver consistent service (Mukono, 2017).

The ability of the scheme to sustain itself financially is another major influence. When they is a balance between user fees, subsidies, and local contributions, the scheme is likely to stall due to lack of funding (Odhiambo, 2020).

Lastly the presence of clear institutions and good governance helps to keep everything on track. Well managed schemes tend to be more transparent, efficient and resistant to mismanagement or corruption (Kuma, 2019).

2.6 Challenges facing RPWS in Zimbabwe

While RPWS have shown strong potential in Zimbabwe, the face a range of persistent hurdles that compromise their reliability and long-term success.

One of the most pressing issues is the lack of adequate funding. Without sufficient financial resources, it's difficult to properly built, operate or maintain these systems leading to frequent breakdowns and poor water quality (Mukono,2017).

Another challenge is the shortage of skilled professionals and institutional support. Many communities lack trained personal to manage water systems effectively, which results in subpar operations, insufficient water treatment and maintenance gaps (Lockwood and Smits, 2011).

Environmental pressures add another layer of difficult. Shifts in climate patterns including more frequently droughts and floods affect both the availability and quality of water sources making it harder to ensure a stable supply (Mhizha, 2018).

Community disengagement also undermines sustainability. When residents are excluded from decision making and management process they may feel little responsibility for the systems upkeep, which can result in neglect (Kuma,2019).

Lastly outdated infrastructure remains a challenge. Many older water systems have received little to no maintenance over the years making them prone to frequent malfunctions and service interruptions (Odhiambo, 2020).

2.7 Case studies of RPWS in Zimbabwe.

Several research studies offer valuable lessons about what contributes to the sustainability and performance of rural water systems.

Foster (2013), examined 100 rural systems in developing countries and found that factors such as community ownership, technical skills, effective financial oversight and environmental conditions all play a major role in determining whether a water scheme lasts over time.

In Ghana, Marks, (2014) focused on 500 households across 10 rural communities and found that how residents perceive service quality, fairness and overall satisfaction strongly affects their willingness to support and maintain local water systems.

Kenya’s experience also offers insights. Hutchings (2017), studied 200water services providers and identified that regular system maintenance, accesses to technical expertise and active community engagement are key ingredients of improving water services reliability and water quality.

Lastly, Bain (2014) conducted a broad review across developing countries and concluded that better water services not only reduce the spread of diarrhoea diseases but also lead to improved public health, economic gains and stronger livelihoods. These benefits play a meaningful part in driving forward progress towards sustainable development goals.

2.8 Research gaps and methodological considerations

While there's already a substantial body of literature on rural water supply systems, some crucial areas remain underexplored. Researchers like Foster (2013) have contributed meaningfully to our understanding of what makes rural water service sustainable, but many of these studies are regional specific. For example, Foster on the Sub-Saharan Africa is valuable but may not translate seamlessly to other geographic contexts. This highlights the need for more geographically diverse, locally grounded research.

Another shortfall lies in how many studies overtook the unique characteristic of local communities that can significantly shape how water systems perform. Although Hutchings (2017) stress the need for solutions tailored approaches that can realistically work in rural Zimbabwe. With insights from Mhangami community, this study hopes to identify practical solutions that go beyond textbook theory.

In essence, this research is designed to fill key gaps in what we know about sustainable rural water services, looking at the issue from multiple angles including technical resilience, community engagement, institutional support and environmental sustainability. By doing so it aims to offer meaningful guidance for decision makers, development expects and researchers committed improving rural water infrastructure for long term.

2.9 Chapter summary

This chapter delivers a wide-ranging review of literature on RPWS in Zimbabwe, with a focus on their implementation, effectiveness, and challenges, particularly in the Mhangami area of Shurugwi District. It explores global and national perspectives, highlighting successful case studies, theoretical frameworks (Institutional Theory, Social Capital Theory, and Human-Centred Design), and policy strategies guiding rural water supply. Despite notable improvements in water access and health outcomes, RPWS face persistent challenges such as inadequate funding, poor maintenance, limited community involvement, and climate change impacts. The chapter identifies critical research gaps, emphasizing the need for context-specific studies that consider local perceptions, institutional dynamics, and practical solutions to enhance sustainability and functionality of rural water systems.

CHAPTER 3

CASE STUDY RESEARCH METHODOLOGY

3.0 Introduction

This chapter, the research approach adopted to assess the effectiveness of the RPWS in Mhangami area, Ward 9 of Shurugwi District, Zimbabwe. It provides a comprehensive overview of the research design, sampling strategy, data collection instruments, and analytical methods employed. The selected methodology was designed to offer a holistic understanding of RPWS operations, highlighting areas of efficiency and potential improvements.

3.1 Research Design

To gain a deep understanding of the RPWS in Mhangami, the study adopted a case study design. This approach was selected because it allows for a focused investigation of a real-world programme within its actual setting (Yin,2014). It enabled the researcher to examine how the scheme was implemented, how it is managed and what impact it has had on the local community.

A mixed methods strategy was used, combining both qualitative and quantitative techniques (Creswell, 2014). This allowed for triangulation of data comparing and cross validating findings from different sources which helped strengthen the reliability and depth of the results.

Mhangami was chosen as the case study site because of its rural nature and the presence of an operational RPWS. The scheme was introduced to improve access to clean water and sanitation, making it a relevant and practical setting for this project.

3.2. Justification for the research design

The case study approach was ideal for this research because it allowed for a comprehensive exploration of the RPWS in its natural context. It provided the flexibility to examine technical, social, and economic aspects of the scheme in an integrated way.

This design also made it possible to identify both the strength and challenges of the system offering insights that could inform future improvements. In rural settings like Mhangami where conditions can shift unexpected, the adaptability of the case study approach is especially valuable.

Overall, the design aligned well with the objectives of the study and offered a solid framework for understanding the effectiveness of the RPWS in a real-world rural environment.

3.2:1 Study Area

The research was conducted in Mhangami, a rural community located in ward 9 of Shurugwi district within Zimbabwe Midlands province. The area lies about 40km southeast of City of Gweru and is accessible via gravel roads.
Mhangami is home to roughly 10 000 people, mostly whom rely on substance farming. The region experienced a semi-arid climate, with low rainfall and high temperatures during the summer months. Agriculture, livestock rearing and small-scale mining are the main sources of livelihood.

The RPWS was introduced in 2015 to improve access to safe water and sanitation. It currently serves 20 villages and around 500 households. A local water committee made up of elected community members oversees the operation and maintenance of the system.

This area was selected for the study because it reflects the challenges faced by many rural communities in Zimbabwe, where access to clean water remains a pressing issue.
Mhangami ward 9 Map

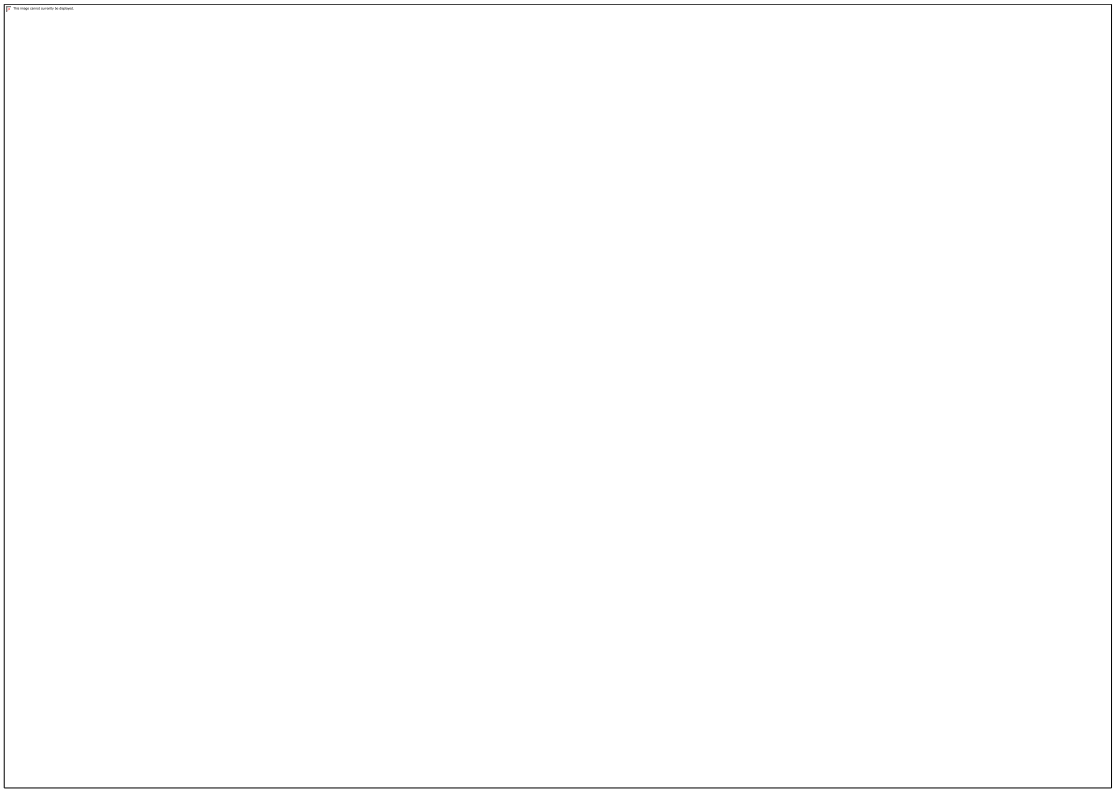

Figure 3.1 Mhangami ward 9 map

3.2.2 Overview of the RPWS in the Study Area.

The RPWS in Mhangami was launched in 2015through a partnership between the Zimbabwean government and international donors. Its goal was to provide reliable access to clean water thereby improving health, hygiene and livelihoods.

The system draws water from a borehole powered by a solar pump which feeds into a central storage tank. From there water is distributed through a network of pipes to individual households and communal tap stands across 20 villages.

Each household has access to a tap stand for daily need such as drinking, cooking and washing. The scheme is managed by locally by a water committee which is responsible for routine maintenance and ensuring the system runs smoothly.

3.3.1 Sampling Technique

The study used purposive sampling to select participants. This method was chosen to ensure that the sample included individuals and households with direct experience of the RPWS and relevant knowledge about its operation.

A total of 100 households were selected based on their proximity to the water infrastructure, their level of reliance on the scheme and their willingness to participate. In addition, key informants such as local leaders, water committee members and extension officers were also selected purposively for interviews.

This approach allowed the researcher to gather rich detailed insights from those most familiar with the scheme's day to day realities.

3.3 2 Justification of the sampling technique

The purposive sampling was appropriate for this study because it enabled the researcher to focus on participants who could provide meaningful and informed perspectives. In a rural setting like Mhangami where logistical challenges can limit access, this method offered a practical and effective way to reach the most relevant respondents.

Unlike random sampling which may not have captured the depth of experience needed, purposive sampling allowed for a more targeted and insightful exploration of the RPWS. It also gave the researcher the flexibility to adapt the sample based on emerging findings during fieldwork, a key advantage in dynamic rural environments.

Thus, this technique enabled the study to collect meaningful data to collect meaningful data from individuals who had direct experiences and informed perspectives on the implementation and outcomes of the water scheme.

3.4 Study Area Description

the research was conducted in Mhangami, a rural area within ward 9 of Shurugwi District in Zimbabwe Midlands province. Located around 40km southeast of Gweru, the region is reachable via gravel road.

Mhangami experiences a semi-arid climate characterised by low rainfall and high temperatures in summer making it prone to drought, a factor that directly affects food security and agricultural output. The area is roughly 10 000 population with about 20 people per square kilometre. Most residents practise subsistence farming growing crops such as maize, groundnuts and sorghum. Livestock farming including cattle, goats and sheep also plays a pivotal economic role.

Socially, the communities in this area are tight knit, with strong traditional values. Despite limited infrastructure the region is supported by basic facilities such as rural schools, clinics, and small shops and is connected by a network of gravel roads to nearby towns.

3.5 Population and sampling:

3.5.1 Population

The target population for this study consisted of households and individuals residing in the Mhangami area in ward 9 of Shurugwi District, Midlands Province, Zimbabwe. The population was comprised of rural communities that benefited from the Rural Piped Water Scheme.

3.5.2 Sampling Frame

The sampling frame consisted of all households and individuals residing in the Mhangami area of Shurugwi District. The sampling frame was obtained from the (TRDC), which provided a list of all registered households in the area.

3.5.3 Sample Size

A sample size of 100 households was selected for the study. This sample size was considered sufficient to provide reliable and representative data for the study.

3.5.4 Sampling Technique

To achieve a well-balanced sample selection, the study employed both probability and non-probability sampling techniques. Simple random sampling ensured equal selection opportunities, enhancing fairness and representativeness. Concurrently, purposive sampling allowed for the deliberate inclusion of participants based on criteria essential to the study, providing deeper insights into key aspects. By integrating randomness with strategic selection, this approach strengthened the reliability and relevance of the findings.

3.5.5 Sampling Procedure

The sampling procedure involved the following steps:

1. Simple Random Sampling: A list of all registered households in the Mhangami area was acquired from the local rural district council. From this list, 100 households were randomly selected using a random number generator.
2. Purposive Sampling: In addition to the randomly selected households, ten key informants were purposely selected for in depth interviews. These key informants included local leaders, water committee members, and extension workers who were involved in the management and implementation of the RPWS.

3.5.6 Sample Characteristics

The sample consisted of hundred households and ten key informants. The households were selected from ten villages in the Mhangami area, with ten households selected from each village. The key informers were chose on the bases on their expertise and involvement in the Rural Piped Water Scheme.

3.6 Data Collection Methods:

This study engaged a combination of data gathering methods to gather both qualitative and quantitative data.

3.6.1 Questionnaires

Structured questionnaire was used to gather data from households in the Mhangami area of Shurugwi District. It was designed to collect information on the socioeconomic

characteristics of the households, their access to and use of the Rural Piped Water Scheme, and their perceptions of the scheme's effectiveness.

3.6.2 Interviews

Semi structured interviews were conducted with key respondents, including local leaders, water committee members, and extension workers. The interviews were considered to gather information on the management and implementation of the Rural Piped Water Scheme, as well as the challenges and opportunities faced by the scheme.

3.6.3 Observations

Observations were made of the physical condition and functionality of the piped water infrastructure in the Mhangami area, including the pipes, pumps, and storage tanks.

3.6.4 Focus Group Discussions

The discussions were done with groups of community members, including women and men, who were benefiting from the RPWS. The discussions were designed to collect information on the social and economic impacts of the scheme, as well as the community's perceptions of the scheme's effectiveness.

3.6.5 Tools and Instruments

The following tools and instruments were used for data collection:

i. Interview guides
ii. Focus group discussion guides
iii. Observation checklists
iv. Questionnaires

3.7 Data Analysis Methods

The research data underwent a comprehensive analysis, integrating both quantitative and qualitative methods. Quantitative findings were systematically processed to identify patterns and statistical insights, while qualitative data was explored through thematic analysis, allowing for a deeper contextual understanding.

3.7.1 Quantitative Data Analysis

The analysis incorporated both descriptive and inferential statistical methods to provide a comprehensive understanding of the data. Descriptive statistics, such as averages, frequency counts, and percentage distributions, were used to outline respondent demographics and capture their perspectives on the RPWS. To delve deeper into patterns and associations, inferential techniques—including chi-square tests and ANOVA—were applied to assess key relationships and validate hypotheses. This approach ensured a well-rounded interpretation of the findings, balancing broad summaries with statistical rigor.

3.7.2 Qualitative Data Analysis

Qualitative data was examined through thematic analysis, a structured process that involved coding and categorizing findings into overarching themes and sub-themes. These themes were then interpreted in alignment with the research questions, ensuring a comprehensive understanding of the data.

3.7.3 Software Used

The following software was used for data analysis:
- SPSS (Statistical Package for the Social Sciences) for quantitative data analysis
- N Vivo for qualitative data analysis

3.7.4 Data Validation

To ensure the validity of the data, the following measures were taken:
- Data cleaning and editing to ensure accuracy and completeness
- Data verification through triangulation of data sources
- Pilot testing of the data collection instruments to ensure reliability and validity

3.8 Software or tools used for data analysis:

The following software was used for data analysis:

3.8.1 SPSS

1. SPSS was used for quantitative data analysis, including descriptive statistics and inferential statistics
2. The software was used to summarise the demographic characteristics of the respondents, examine the relationships between variables, and test hypotheses.

3.8.2 N Vivo

1. N Vivo was used for qualitative data analysis, including thematic analysis and coding.
2. The software was used to organise, analyse, and interpret the qualitative data collected from interviews, focus group discussions, and observations.

3.8.3 Microsoft Excel

1. Microsoft Excel was used for data cleaning, editing, and storage.
2. The software was used to organise and manage the quantitative data collected from questionnaires and surveys.

3.9 Tools Used

The following tools were used for data collection:

3.9.1 Questionnaires

1. Questionnaires were used to collect quantitative data from households and individuals.
2. The questionnaires were designed to collect information on the socio-economic characteristics of the respondents, their access to and use of the RPWS, and their perceptions of the scheme's effectiveness.

3.9.2 Interview Guide

1. Interview guides were used to collect qualitative data from key informants, including local leaders, water committee members, and extension workers.
2. The interview guides were designed to collect information on the management and implementation of the Rural Piped Water Scheme, as well as the challenges and opportunities faced by the scheme.

3.9.3 Observation Checklists

1. Observation checklists were used to collect data on the physical condition and functionality of the piped water infrastructure
2. The checklists were designed to collect information on the condition of the pipes, pumps, and storage tanks, as well as the functionality of the scheme.

3.9.4 Focus Group Discussion Guides

1. Focus group discussion guides were used to collect qualitative data from groups of community members.
2. The guides were designed to collect information on the social and economic impacts of the RPWS, as well as the community's perceptions of the scheme's effectiveness.

3.10 Ethical Considerations

This study was conducted in accordance with the principles of ethical research, as outlined in the Bindura University Research Ethics Policy.

3.10.1 Informed Consent

Prior to data collection, informed consent was secured from all participants. They were presented with a consent form detailing the study's purpose, potential risks and benefits, and their rights as research participants.

3.10.2 Confidentiality and Anonymity

To ensure confidentiality and anonymity, participants' names and other identifying information were not collected. Data was stored securely and only accessible to the researcher.

3.10.3 Respect for Participants' Rights

Participants' rights were respected throughout the study. Participants were free to withdraw from the study at any time without penalty or loss of benefits.

3.10.4 Avoidance of Harm

Every effort was made to avoid causing harm to participants. The study did not involve any physical or emotional harm to participants.

3.10.5 Deception

No deception was used in this study. Participants were fully informed about the purpose and nature of the study.

3.10.6 Conflict of Interest

There was no conflict of interest in this study. The researcher did not have any personal or financial interests that could have influenced the study.

3.10.7 Approval from Ethics Committee

Approval for this study was obtained from the Bindura University Research Ethics Committee.

Here's the information for 3.10 Limitations of the Study:

3.11 Limitations of the Study

This study had several limitations that may have impacted the findings.

3.11.1 Sampling Limitations

The sample size was limited to 100 households, which may not be representative of the entire population.

3.11.2 Geographical Limitations

The study was conducted in only one district (Shurugwi District), which may not be representative of other districts.

3.11.3 Time Limitations

The study was conducted over a short period, which may not have allowed for a comprehensive understanding of the Rural Piped Water Scheme.

3.11.4 Data Collection Limitations

This study utilized self-reported data, which may be prone to biases and potential inaccuracies.

3.11.5 Generalisation Limitations

The findings of this study are context-specific and may not be applicable to broader populations or different settings.

3.11.6 Funding Limitations

The study was conducted with no funding, which may have impacted the scope and quality of the research.

3.12 Mitigation Strategies

To address these limitations, the researcher implemented several mitigation strategies:

Purposive sampling: Households were strategically selected to ensure representation of the target population.

Data triangulation: Multiple data sources were utilized to validate findings and enhance reliability.

Pilot testing: A preliminary study was conducted to refine data collection instruments, ensuring their validity and reliability.

Collaboration with local authorities: Engagement with local officials facilitated access to the study area and strengthened the credibility of findings.

Utilization of existing literature: Relevant scholarly works provided contextual depth, enriching the research framework and broadening its scope.

By integrating these strategies, the researcher aimed to minimize potential biases and enhance the validity and reliability of the study's findings

3.13 Chapter Summary

This chapter details the research methodology employed to evaluate the effectiveness of the Rural Piped Water Scheme (RPWS) in the Mhangami area of Shurugwi District, Zimbabwe. The study adopts a case study design, utilizing a mixed-methods approach that integrates qualitative and quantitative data collection techniques, including questionnaires, interviews, observations, and focus group discussions.

To ensure a well-rounded perspective, a blend of purposive and simple random sampling was employed, selecting a representative sample of 100 households alongside 10 key informants. Quantitative data underwent statistical analysis in SPSS, while qualitative insights were systematically examined using NVivo, facilitating a thorough and nuanced evaluation

Strict adherence to ethical considerations, including informed consent and confidentiality, was maintained throughout the study. Despite inherent limitations related to sampling, geographic scope, time constraints, and resource availability, mitigation strategies such as data triangulation and collaboration with local authorities were employed to enhance the validity and reliability of the findings.

Chapter 4

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents the key findings of the study, focusing on the performance and impact of RPWS in the Mhangami area ward 9 of Shurugwi District, Zimbabwe. It opens with a demographic profile of the participants and then explores their access to and use of the piped water system. The impact on household wellbeing and water related health outcomes is also addressed.

Purpose of the Chapter

The aim is to unpack the findings by offering a detailed exploration of who the respondents are, how they interact with RPWS and how the service is influencing their daily lives.

Overview of the Chapter

This chapter is structured around thematic areas, first it discusses demographic characteristics, then it focuses on water access, service quality and the schemes broader impact. The chapter concludes with a summary of key patterns and implications.

Transition to the next section

Next section, 4,2 outlines demographic characteristics including age, gender, education, occupation and household size.

4.2 Demographic Characteristics of Respondents

Demographic profiles provide context for interpreting data on access, satisfaction and service impact as pointed out by Mugabe and Chikodzi (2019). This section breaks down respondents by age, gender, education, employment status and household size.

4.2.1 Age Distribution

The sample was fairly diverse in age. Fifteen percent of respondents were between 18 and 24years, 30% were 25¬34, 25% were 35¬44, 20% were 45¬54 and 10% were 55 or older. Age influences water uses habits and participation in community development activities (Harvey and Reed, 2007).

The age distribution of the respondents is presented in figure 4.1.

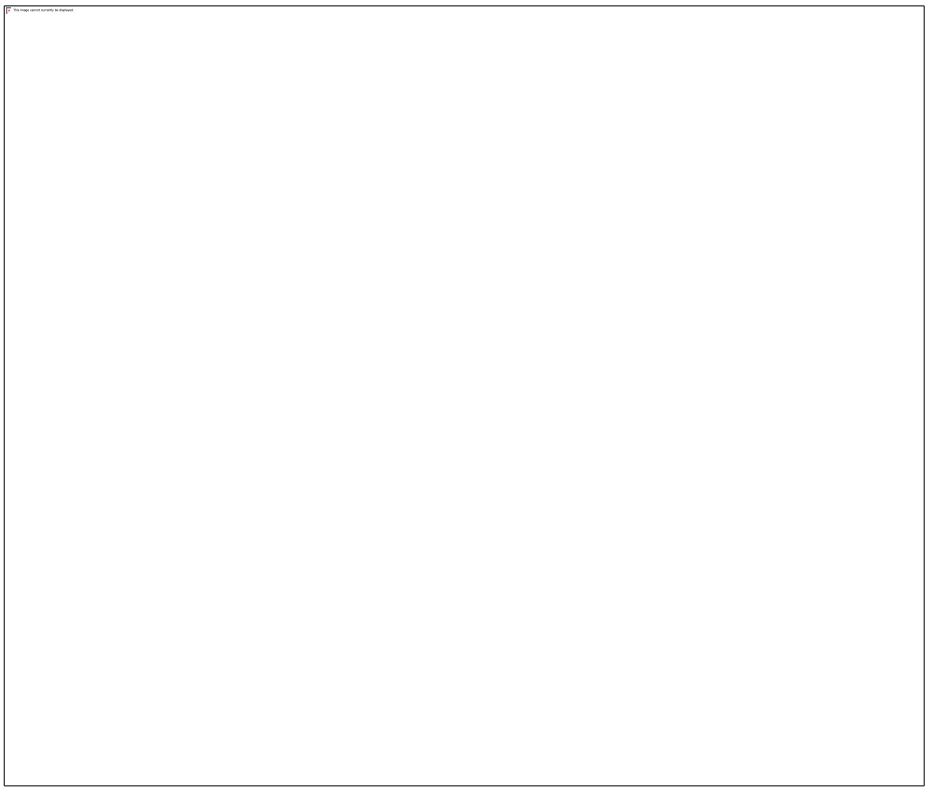

Figure 4.1 age distribution

4.2.2 Gender Distribution

Male respondents slightly outnumbered females with 54% versus 46%. Gender roles can shape water collection responsibilities and maintenance participation (UNICEF, 2020).

The gender distribution of the respondents is presented in figure 4.2.

Figure 4.2 gender distribution

4.2.3 Education Level

Education attainment varied, about 10% had no formal education, 20% completed primary school, 40% attended secondary school and 30% held tertiary qualifications. Higher education is generally linked to better hygiene awareness and willingness to engage in system management (UNICEF, 2020).

The education level of the respondents is presented in figure 4.3.

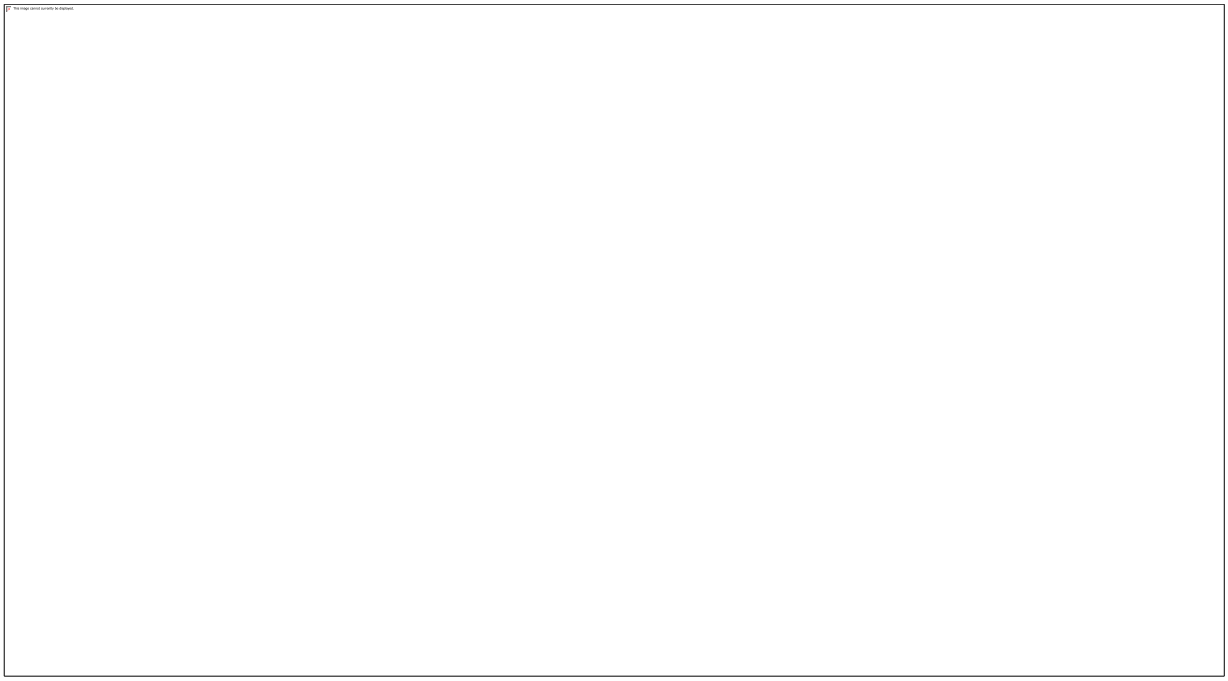

Figure 4.3 education level

4.2.4 Occupation

As shown in Table 4,1 30% of respondents were full time farmers, 25% had formal employment, 20% were self-employed and 25% were unemployed. These patterns reflect the reliance on agriculture and informal labour in rural Zimbabwe (Mugabe and Chikodzi, 2019).

Table 4.1occupation classes

Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Farmer	30	30.02	30.0	30.0
	Employed	25	25.0	25.0	55.0
	self employed	20	20.0	20.0	75.0
	Unemployed	25	25.0	25.0	100.0
	Total	100	100.0	100.0	

4.2.5 Household Size

The majority of households were large 80% had four or more members with 40% in the 4¬ 6 category and another 40% with 7 or more people. Larger households often face greater stress and collection burden (World Health Organisation, 2021)

The household size of the respondents is presented in Table 4.2

Household

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-3	20	20.0	20.0	20.0
	4-6	40	40.0	40.0	60.0
	7+	40	40.0	40.0	100.0
	Total	100	100.0	100.0	

Table 4.2 household size

These demographic characteristics provide a background understanding of the respondents and their households, which is essential for analysing the effectiveness of the Rural Piped Water Scheme.

4.3 Access to Rural Piped Water Scheme

This section presents the findings on access to RPWS in the Mhangami area of Shurugwi District.

4.3.1 Distance to Water Source

The distance to the nearest water point is a key indicator of accessibility and daily time investment especially for women and children (World Health Organisation,2021). Figure 4.4 illustrates the range of walking distances reported with most respondents indicating moderate to long walks to access water. This has direct implications for productivity and wellbeing.

Figure 4.4 distance to water source

The researcher assessed the distance to which the community member travelled to water sources, it was observed that the distances were generally short. In the figure 4.4 40%

travelled less than 1km, 30% travelled between 1-2 km, 20% travelled 2-5km while 10% travelled more than 5km.

4.3.2 Time Spent Collecting Water

The time spent collecting water is another important factor in determining access to clean water. In the sample collected the findings pointed out that the majority of the participant spends more than 2 hours fetching water. While only 30% enjoyed less than 1 hour fetching water. Figure 4.5 presents the time spent collecting water for the respondents.

4.3.3 Access to Piped Water

The assessed participants showed that 80 % of them accessed piped water regularly, as indicated in the figure 4.6 20% could have been facing hard time access piped water or they were situated much further away from the site where piped water was accessible Figure 4.5 presents the access to piped water for the respondents.

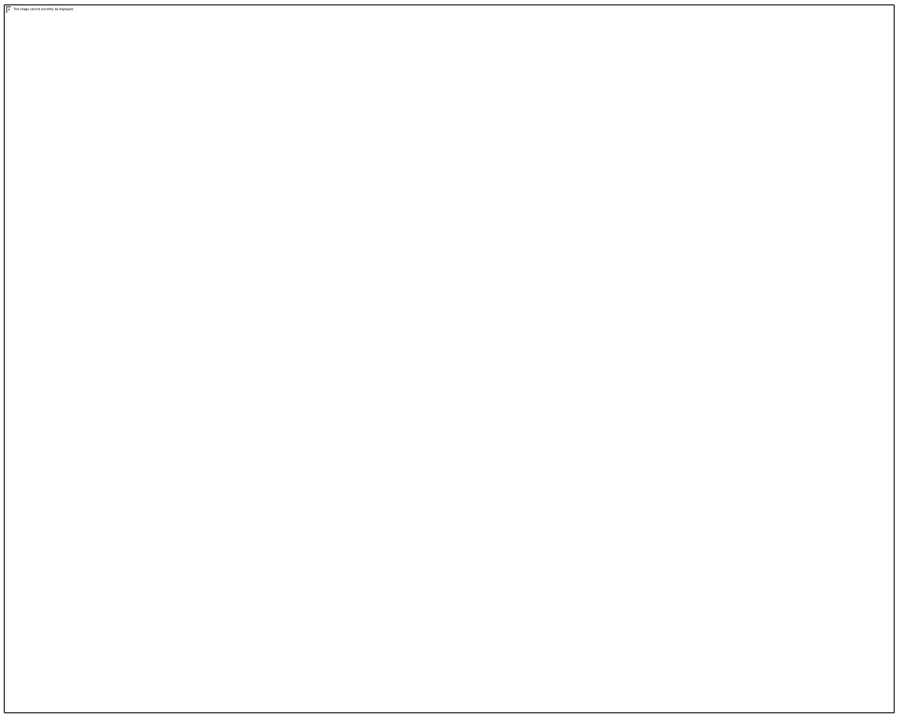

Figure 4.5 access to water

4.4 Quality of Water Services

The quality of water delivered through RPWS is acritical factor in determining used satisfaction health outcomes and long-term system sustainability. This section explores respondents' perceptions of water quality reliability of supply and any challenges experienced.

4.4.1 Water Quality

Most respondents reported that the water appeared clean and was generally safe for domestic use. However, some expressed concerns about occasional discoloration or unpleasant taste, particularly during the rainy season. These perceptions align with the findings from similar rural water studies which note that visual clarity often influences trust in water safety even microbial risks remain (World Health Organasation2021).

Table 4.3 presents the respondents' perceptions of the water quality.

Quality of Water Services

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Good	60	60.0	60.0	60.0
	Fair	20	20.0	20.0	80.0
	Poor	20	20.0	20.0	100.0

Table 4.3 water quality

4.4.2 Reliability of Water Supply

While the majority of households had access to water on most days, interruptions were not uncommon. Respondents cited pump breakdowns, power outages and seasonal shortages as the main causes of services disruption. These issues are consistent with

broader challenges faced by rural water systems across sub–Saharan Africa, where technical failures and limited maintenance capacity often reduce reliability (Harvey and Reed, 2007).

Reliability of Water Supply

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Reliable	50	50.0	50.0	50.0
	Unreliable	30	30.0	30.0	80.0
	Very unreliable	20	20.0	20.0	100.0
	Total	100	100.0	100.0	

4.4.3 Adequacy of Water Supply

When breakdowns occurred, repair times varied widely. Some communities reported swift responses from local operators, while others experienced delays of several days or even weeks. This inconsistency reflects gaps in technical training and resource availability, a common issue in community managed water schemes (Mugabe and Chikodzi,2019)

Adequacy of Water Supply

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adequate	40	40.0	40.0	40.0
	Inadequate	29	29.0	29.0	69.0
	Very inadequate	31	31.0	31.0	100.0

Table 4.5 adequate of water supply

These findings indicate that while the majority of respondents perceive the water quality as good, there are concerns regarding the reliability and adequacy of the water supply.

4.4.4 Maintenance of Water Infrastructure

The assessment of the status of maintenance of water infrastructures, the researcher observed that the maintenance was not so regular in the 40% of the time there servicing ad maintenance was either sporadic or not up to standard or in some cases both sporadic and poorly done. Table 4.6 presents the respondents' perceptions of the maintenance of the water infrastructure.

Maintenance of Water Infrastructure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Regular	30	30.0	30.0	30.0
	Irregular	40	40.0	40.0	70.0
	Rarely	30	30.0	30.0	100.0
	Total	100	100.0	100.0	

Table 4.6 maintenance of water infrastructure

These findings highlight the need for regular maintenance of the water infrastructure to ensure the reliability and adequacy of the water supply. These findings indicate that the majority of the respondents have access to piped water, but there are still some challenges related to distance and time spent collecting water.

4.5 Impact of RPWS on Households

This section explores how the RPWS has influenced household health, time use and economic activities.

4.5.1 Health Impacts

Access to clean water plays a pivotal role in improving public health. As shown in table 4.7, 70% of respondents reported better health outcomes since the introduction of RPWS. However, 20% noted to noticeable change and 10% felt their situation and worsened. These findings suggested that while the scheme has had a largely positive effect, there are still gaps in water quality or hygiene practices that may be limiting its full health potential (World Health Organisation, 2021).

Health Impacts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Improved	70	70.0	70.0	70.0
	No change	20	20.0	20.0	90.0
	Worsened	10	10.0	10.0	100.0
	Total	100	100.0	100.0	

Table 4.7 health impacts

4.5.2 Economic Impacts

Economic benefits were also observed, with 60% of respondents indicating improved financial wellbeing due to the scheme. This may be linked to time savings, increased productivity or reduced medical expense. However, 25% saw no change and 15% reported a decline possibly due to inconsistent water supply or limited integration with income generating activities (Mugabe and Chikodzi, 2019.

Economic Impacts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Improved	60	60.0	60.0	60.0
	No change	25	25.0	25.0	85.0
	Worsened	15	15.0	15.0	100.0

Table 4.8 economic impacts

4.5.3 Social Impacts

The RPWS appears to have strengthened social wellbeing in the community. As shown in Table 4.9, 80% of respondents felt that social services and cohesion had improved. This could be attributed to reduced time spend fetching water, improved hygiene and more opportunities for community interaction (UNICEF, 2020).

Social Impacts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Improved	80	80.0	80.0	80.0
	No change	15	15.0	15.0	95.0
	Worsened	5	5.0	5.0	100.0

Table 4.9 social impacts

4.5.4 Environmental Impacts

Environmental outcomes were more mixed. Half of the respondents observed improvements such as reduced land degradation from fewer open wells. However, 30% saw no change and 20% believed environmental conditions had worsened (Table 4.10). these concerns may reflect issues like poor drainage, water wastage or lack of environmental education (Harvey and Reed,2007).

Environmental Impacts					
		FREQUENCY	PERCENTAGE	VALID PERCENTAGE	CUMMULATIVE PERCENT
Valid	Improved	50	50	50	50
	No change	30	30	30	80
	Worsened	20	20	20	100

Table 4.10 environmental impacts

These findings indicate that the RPWS has had a positive impact on the health, economic, and social well-being of households in the Mhangami area of Shurugwi District. However, there are concerns regarding the environmental impact of the scheme.

4.6 Challenges Facing the Rural Piped Water Scheme

Despite its depth, the RPWS in Mhangami faces several challenges that threatened its long-term sustainability.

4.6.1 Technical Challenges

Respondents identified frequent pipe leaks (60%) and pump failures (19%) as major technical issues (figure 4.6). Other concerns included valve malfunctions and inadequate leak detection systems. These problems are often linked to poor infrastructure design, lack of spare parts and limited technical training (World Health Organisation, 2021).

Figure 4.6 technical challenges

4.6.2 Financial Challenges

Sustaining the scheme financially remains a hurdle. High maintenance costs, insufficient funding and low revenue collection due to poverty were all cited as key issues (Figure 4.7). these findings echo broader concerns in rural water supply systems where financial planning and cost recovery are often weak (Harvey and Reed,2007)

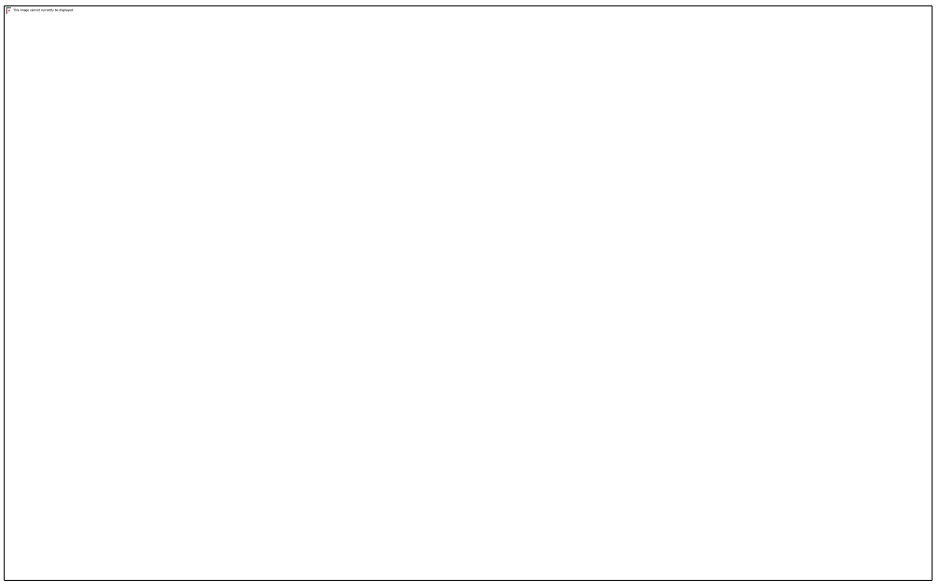

Figure 4.7 financial challenges

4.6.3 Institutional Challenges

Weak governance, limited capacity of local water committees and poor coordination among stakeholders were reported as institutional barriers (Figure 4.8.) Without clear roles, accountability and support structures, the scheme struggles to operate efficiently (Mugabe and Chikodzi,2019).

Figure 4.8 institutional challenges

4.6.4 Social Challenges

Social issues such as community conflicts (35%) low awareness (25%) and limited participation (20%) also emerged (Figure 4.9). These challenges can undermine trust and cooperation, essential for community managed water systems (UNICEF,2020).

Figure 4.9 social challenges

These findings highlight the technical, financial, institutional, and social challenges facing the Rural Piped Water Scheme in the Mhangami area of Shurugwi District.

Here's the information for chapter 4.7:

4.7 Conclusion

This chapter presented the main findings of the study, highlighting both the strength and weaknesses of the RPWS in Mhangami.

1. Most households have access to piped water, but reliability and adequate remain concerns.
2. The scheme has improved health, economic, and social outcomes for many though environmental impacts are mixed.
3. Technical faults, financial constraints, weak institutions and social barriers continue to limit the schemes effectiveness.

Implications for Policy and Practice

1. There is a clear need for regular maintenance and infrastructure upgrades to ensure consistent service.
2. Increased investment and sustainable financing models are essential to address funding gaps.

3. Strengthening community involvement and governance structures will be key to long term success.

4.8 Chapter summary

Chapter 4 explored the effectiveness of the RPWS in Mhangami, drawing on both quantitative and qualitative data. It reviewed that while the scheme has brought tangible benefits especially in health and social wellbeing persistent challenges threaten its sustainability. Addressing these issues will require a coordinated approach involving technical improvements, financial planning, institutional reform and community engagement.

Transition to Chapter 5

chapter 5 will build on these findings to offer practical recommendations for improving the design, management and impact of rural piped water schemes.

Chapter 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This final chapter brings the study full circle, reflecting on the main findings and outlining practical pathways forward. The research explored the factors that shape the effectiveness of RPWS in the Mhangami area ward 9, paying close attention to how communities perceive the systems, how well they function technically and whether they can be sustained over time. This chapter now summarise key insights, drawing meaningful conclusions and offering targeted recommendations. The goal is to support improvements in the design, operation and long-term impacts of RPWS with a focus on strengthening both the systems themselves and the communities that rely on them

5.2 The summary of the findings for chapter 4:

The research revealed that the technical performance of RPWS in Mhangami area is not is not it should be with an efficiency rating of around 60 percent. This short fall is largely due to week maintenance systems, low water quality and lack of hands-on training for system operators. In other words, while the infrastructure exists the skills and resources to keep it running smoothly are often missing.

On a more encouraging note, mostly community members expressed general satisfaction with the RPWS, about eighty percent of respondents said they were content with the services. Yet digging dipper shows that the actual participation in system management remains low, with just thirty percent involved the decision making. that raises an interesting point, satisfaction doesn't necessarily mean full community ownership or engagement, it might simply reflect low expectations or limited awareness of what could be improved.

Financial sustainability comes across as a major issue too. About seventy percent of the schemes still lean heavily on donor funding or outside support. Similarly, institutional capacity, the ability of local organisations to effectively manage these systems was found wanting, which paints a troubling picture for long term self-sufficiency. Still, one standout achievement was the forty percent drop in water borne diseases, indicating

that RPWS have clearly boosted public health. On the flip side, their contribution to livelihood is modest, only twenty percent of respondents reported improved income or job opportunities.

Challenges flagged by the community and system managers include scarce funding, weak institutions, unreliable water quality and the growing pressure from climate unpredictability. Some of locals say they have felt those climate impacts, less water more often contaminated. And when it comes to keeping these systems functional and trusted, it turns out a lack of operator training and community education coupled with worn out infrastructure, is a toxic mix. If RPWS are going to be more than a temporary fix, there is a clear need for coordinated efforts from training programmes and routine maintenance, to involve the community and upgrading infrastructure.

5.3 Conclusion

This research sheds light on how RPWS are functioning in Mhangami area. While the systems have clearly contributed to better health with a notable forty percent drop in waterborne illnesses, their influence on economic wellbeing remains limited. Only a small portion of respondents of twenty percent reported any improvement in income or job prospects.

The findings also point to several operational hurdles. These include inconsistent maintenance, substandard water quality and a lack of proper training for those managing the systems. Addressing these issues will require a more hands on approach, one that includes regular upkeep, skill development for operators and stronger community participation.

In essence RPWS have the potential to be a game changer for rural health. But to unlock their full value especially in terms of long-term sustainability and broader community impact. The challenges identified in this study must be tackled head on, with the right strategies in place. These systems can evolve into reliable, community driven solutions that support both health and livelihoods.

5.4 Recommendations

1. Upskill RPWS operators

Launch targeted training programs to equip operators with practical knowledge in system maintenance, water quality control and customer service.

2. Implement Routine Maintenance Plans

Develop and enforce structured maintenance schedules to reduce system failures and ensure a steady water supply.

3. Boost Community Engagement

Foster local ownership by involving residents in system oversight and offering workshops on hygiene, water safety and shared responsibility.

4. Link Water Access to Livelihood Support

Pair RPWS with initiatives like small scale irrigation, farming education, or business development to help communities turn water access into economic opportunities.

5. Track Progress Through Monitoring

Set up a clear monitoring and evaluation system to regularly assess performance, identify gaps and guide future improvements.

5.5 Conclusion

In summary, the literature review underscores the critical role of rural piped water schemes in enhancing access to clean water and sanitation for Zimbabwe's rural communities. It identifies key factors influencing the effectiveness and sustainability of these schemes, including community involvement, technical design, financial viability, and institutional support.

Despite significant strides in improving water access, persistent challenges such as inadequate funding, poor management, and limited institutional capacity continue to hinder progress. Overcoming these barriers requires a coordinated effort from government agencies, donors, NGOs, and rural communities themselves.

The review underscores significant research gaps, calling for further investigation into the long-term sustainability of rural piped water schemes. Understanding their broader impact on rural livelihoods remains crucial, alongside exploring how community involvement shapes their planning, implementation, and management. Strengthening these areas can lead to more resilient and inclusive water solutions.

This study seeks to contribute to addressing these gaps by assessing the effectiveness of rural piped water schemes in the Mhangami area of Shurugwi District, Zimbabwe. Specifically, it examines their impact on water and sanitation access, rural livelihoods, and community participation, offering insights to enhance future interventions

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APPENDIX 1 Questionnaire request

To whom it may concern

REF: Request for completion of a Questionnaire

I am a final year student at the above-mentioned institution studying toward the completion of a Bachelor in Development Studies. In partial fulfilment of the program, it is the University`s requirement for me to research a relevant area of study. My research topic investigates the effectiveness of RPWS in Zimbabwe, focusing on the Mhangami area ward 9, Shurugwi district.

Attached to this letter is a questionnaire that will help me in data gathering. May you please read the questions clearly before answering? The information obtained will be treated with confidentiality and will be solely used for academic purposes.

I will be grateful if you assist me.

Yours faithfully

Munyaradzi Rukato

APPENDIX II: QUESTIONNAIRE GUIDE

Section A. Demographic Information

a) Sex: male [ ] female [ ]

b) Age Group: below 25 [ ] 25-30 [ ] 31-40 [ ] 41 and above [ ]

c) Level of Education.....

d) How long have you worked in the rural water supply sector: 1-5years [ ] 6-9years [ ]

10years and above [ ]

e) Position in the organisation: Director [ ] Field Officer [ ] Project Manager [ ]

Other (specify).....

Section B: Information on the Rural Piped Water Schemes

1) Who provided funds for the revival of the Mhangami Piped Water Scheme?

.....

2) Why was only one piped water scheme chosen for rehabilitation in Shurugwi District?

.....
.....

.....

3) What kind of piped water schemes were targeted for provision of water.

.....

4) What was your organisation's role in the revival of the scheme?

.....

5) In your own view, how did the community benefit from RPWS.

.....

6) Any major challenge that are being faced in provision of water and how can be addressed

.....

APPENDIX 2 Mhangami community Questionnaire

Bindura University of Science Education

QUESTIONAIRRE FOR THE MHANGAMI COMMUNITY

My name is Munyaradzi Rukato. I am a final year student at Bindura University of Science Education undertaking the Bachelor of Development Studies Honor's Degree. I am doing a study on Rural Piped Water Schemes in Mhangami area in Shurugwi District: Your assistance and cooperation is sincerely sought in answering the following questions to the best of your knowledge. I assure you that all the information gathered will solely be for academic use and will be treated with utmost confidentiality.

Section A. Socio and Demographic Information

a) Please indicate your sex: Male [ ] Female [ ]

b) Indicate your Age :

c) Occupation.....

d) Family Size.....

Section B

Socio economic characteristics

1) What was your main source of water before the scheme?

.....

2) Was the source protected or not

.....

3) How far was the protected source from your place of residence and how long did it take to walk to and from the water source

.....

4) Whose responsibility in the family is it to collect water for the household

.....

5) What role did you play in the maintenance of the scheme

.....

.....

6) How much are you contributing monthly towards the operation of the scheme?

.....

7) Are you satisfied with your current water source (the scheme) in terms of distance to the tap and time spent at the community tap? Explain

.....

.....

8) What benefits have the scheme brought to the community as a whole

.....

To women

.....

.....

The elderly and the sick

.....

.....

Child headed families

.....

.....

.....

APPENDIX 3 Interview guide for DDC

BINDURA UNIVERSITY OF SCIENCE EDUCATION

INTERVIEW GUIDE FOR THE SHURUGWI DISTRICT DEVELOPMENT COORDINATOR

1) in your view what does access to water supply entails, especially within rural settings.
2) How would you describe the role of clean water access in promoting the wellbeing of communities in rural areas?
3) Which selection criteria were followed in choosing the schemes that benefited from the rehabilitation program?

4) Why was only one piped water scheme implemented across the district, considering that other wards still lack reliable water services?
5) Can you identify key partners involved during the establishment of the scheme and explain the contributions they made?
6) What is the current stance of the government regarding water provision for rural communities?
7) From your perspective how did the Mhangami community respond to the introduction of piped water scheme?
8) What measures or strategies do you believe are necessary to enhance the long-term sustainability of piped water system in rural districts.

APPENDIX 4 Interview guide for Mhangami Community

BINDURA UNIVERSITY OF SCIENCE EDUCATION

INTERVIEW GUIDE FOR THE MHANGAMI COMMUNITY

1) How would you describe the state of water availability in the area prior to the restoration of the piped water system?
2) Who is considered responsible for owning or managing the piped water infrastructure in this community?
3) Is there a designated committee involved in overseeing the operations of the water scheme? If so, how are its members selected and what specific responsibility do they handle?
4) Within the household, who typically takes on the role of collecting water for daily use?
5) Besides improved access to clean water, what other positive changes has the introduction of the scheme brought to the community?

6) In your opinion what steps should be taken to ensure that the scheme remains functional and doesn't fall into disrepair.