

# Access to Potable Water by Rural Communities in the Era of Climate Change: A Case of Ward 17 in Gwanda District

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# Abstract

Water and sanitation-related issues have attained the attention of critical establishments such as the United Nations over the past years, resulting in the inclusion of such subjects in Sustainable Development Goals. Despite the Sustainable Development Goals efforts, access to potable water around the world remains a global problem. Zimbabwe has witnessed ever-increasing mortalities from water-borne diseases in the form of cholera and typhoid owing to a lack of access to potable water. This study sought to identify factors influencing access to potable water, the perception of the communities on disasters related to water scarcity and climate change and the challenges faced by rural communities of Ward 17 in Gwanda District, Zimbabwe. Key informant interviews, observations, and questionnaires triangulated with secondary data sources shaped the outcome of the study. Results indicated that there are dwindling water sources as a result of climate change. The study further showed that numerous sources of water like communities to access water from unsafe water sources like dams and rivers. Further to that, results indicated that the clean and safe water sources that are available in Ward 17 are inadequate for the population that is growing at an alarming rate and are susceptible to climate change.

**Keywords:** Potable water; Water access; Climate change; Water scarcity; Gwanda district

# Introduction

Water is a critical resource that is considered to be essential for life on the earth. Water is a precondition to life on Earth and is essential for sustainable development. Safe drinking water and sanitation are human rights. Water and sanitation are critical for socioeconomic development, food security and healthy ecosystems, and are vital for reducing the global burden of disease and improving the health, welfare and productivity of populations [1]. The world faces severe and growing pitfalls to sustaining water quality and meeting the rapidly growing demand for water resources, particularly among rural communities. The United Nations declared access to potable water as a fundamental human right, and an essential step towards improving living standards [2]. Access to potable water is one of the main goals of the Sustainable Development Goals (SDGs) [3, 4]. Postulates that increased attention on water and sanitation issues within the global political agenda is embedded in the development of SDG 6, to ensure the availability and sustainable management of water and sanitation for all. This SDG is a continuation of its predecessor, the Millennium Development Goal (MDG) 7, target 10 which aimed to halve the proportion of the world population without access to safe drinking water and sanitation between 1990 and 2015 [4]. However, it has been noted that this target was unattainable as per the set timeframe due to various factors such as poverty, and poor economies, especially in African countries. Therefore, there is a need to assess the water situation and challenges faced by communities in accessing potable water in Gwanda District.

#### Water situation at the regional scale

At a regional scale, lack of access to potable water as a result of climate change is a major threat to rural communities. Potable water is becoming scarce because of climate change which results in more frequent droughts in some parts of Africa. According to less than 5% of the Sub-Saharan African population has access to improved water, sanitation and hygiene. It is widely recognized that Africa is one of the regions that are most vulnerable to climate change in the world due

to widespread poverty, limited coping capacity and its highly variable climate. [5] states that the proportion of the African population at risk of water stresses and scarcity is projected to increase from 47% to 65% in 2025. This could generate conflicts over scarce water resources, particularly in arid and semi-arid regions. also state that the lack of potable water and poor hygiene facilities may significantly contribute to the relatively high diarrheal disease burden in sub-Saharan Africa. According to [6], it has been estimated that in Africa, 85% of the diseases that can be prevented by access to potable water supply, are mainly caused by faecal-oral transmission. This is an indication of how poor water, sanitation and hygiene (WASH) are responsible for high mortality rates in Africa.

#### The water situation in Zimbabwe

At the national level, lack of access to potable water has extreme effects on rural communities. Zimbabwe is facing challenges of water scarcity and lack of access to potable water, especially in semi-arid areas of Gwanda South. As noted by the [5] approximately 65% of the water facilities in the rural areas are non-functional. The situation of water stress is expected to be more serious in the drier provinces of Matabeleland North and South which fall in agro-ecological regions IV and V and receive mean annual precipitation below 600 mm, [7]. Lack of access to potable water is accelerated by climate change-

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induced droughts, aged water and sanitation infrastructure which is more expensive to maintain. Zimbabwe has been plagued by waterborne diseases in the form of cholera and typhoid owing to a lack of potable water supply, poor sanitation and poor hygiene [8]. Concurs that the 2008/9 cholera outbreak in Zimbabwe resulted from a lack of water to flush toilets, a lack of clean water supply and bursting sewage pipes, among others. These conditions therefore pose serious hazards which when combined with social vulnerability quickly spiral into disaster situations. It is noted that these disasters only happen when a hazard interacts with a vulnerable community as put forward by [9] in his Pressure and release model (PAR). It is therefore critical for rural communities to be provided with potable water to curb the emergency of such disasters.

Climate change is ravaging rural communities in Zimbabwe resulting in a lack of access to potable water. In Zimbabwe, the concept of climate change is understood as referring to statistically significant variation in either the mean state of the climate or its variability persisting over prolonged periods (Zimbabwe Meteorological Department, 2017). Climate change, with rare and irregular precipitation, is the key driver of the availability of water and access to potable water by rural communities [10]. State that climate-induced water stress threatens to decrease the quantity and quality of drinking water in rural areas, reduce the run-off necessary to sustain the country's hydroelectric power supply and contribute to declining agricultural productivity. The country is witnessing the increased intensity of severe weather events, particularly droughts, prolonged intra-sessional dry spells, extreme storms associated with widespread hail and flash flooding, increasing incidences of heat waves and related health challenges [7]. Drought is the most common climate change hazard which occurs in Zimbabwe and becomes more acute in south-western parts such as Gwanda District. Persistent drought in Gwanda District has severely strained surface and groundwater systems, contributing to the country's deteriorating water supply. Surface water is the major source of water in Zimbabwe accounting for 90 per cent of the supply [10]. The impacts of climate change are acute, despite the efforts through the Integrated Rural Water Supply and Sanitation Programme, by the Zimbabwe Government and the donor community to improve the availability of water to rural communities as an important policy matter since the 1980s.

# **Theoretical framework**

The theoretical basis that was used for this study is the Pressure and Release (PAR) model provided by [10, 11]. The theoretical framework states that a disaster only happens when a hazard interacts with a vulnerable community. This framework is relevant in understanding the link between climate change and access to potable water by vulnerable rural communities. The basis for the model is the idea that disaster is the intersection of two opposing forces that is, those processes generating vulnerability on the one side and the hazard event on the other side. As noted by [11] the PAR model argues that disaster occurs at the tangent between two counter forces, those of natural hazards and the processes that generate vulnerability. It is when these two forces coincide that a disaster happens. Increasing pressure can come from either side, but to relieve the pressure, vulnerability has to be reduced. The PAR model can be linked to the context of Zimbabwe's climatic hazards which reduces water quality and quantity limiting the vulnerable rural communities' access to potable water. Taking a leaf from the PAR model, the lack of access to potable water together with other socioeconomic and environmental pressures will increase the vulnerability and susceptibility of communities to water-related disasters. In Ward 17 in Gwanda district, the communities are susceptible to climate change which results in water scarcity and lack of access to potable water. The water-related disasters are the product of intersections between the lack of access to potable water and the vulnerability of rural communities.

In the PAR model, there is a progression of vulnerability which can be defined as the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards [12]. The progression of vulnerability to climate change in association with root causes, dynamic pressures and unsafe conditions leads to a disaster from any hazards like drought or flood can be explained by this model. The model identifies a progression of vulnerability, in which root causes are shaped by a series of dynamic pressures and can give rise to unsafe conditions [11]. In the context of this research, the root cause of water scarcity is climate change which triggers a lack of access to potable water.

The PAR model also argues about the root causes of disasters, which are the underlying factors that influence the occurrence of a disaster. The underlying causes of water and sanitation disasters are poor access to potable water and water scarcity which forces the local communities to resort to unsafe water sources (unsafe conditions). According to root causes are the most remote influences which are economic, demographic and political processes within society. It includes limited access to political power, decision-making, information and resources. In the context of Gwanda District vulnerable rural people like women, children, disabled and aged persons have limited access to power, resources and decision making which results in a lack of access to potable water. As noted by [12] they are a set of well-established, widespread economic, demographic and political processes within society (including global processes) and the world economy that give rise to vulnerability (and reproduce vulnerability over time) and affect the allocation and distribution of resources between different groups of people. This affects the fair distribution and provision of potable water to the people of Gwanda District.

The PAR model also argues about dynamic pressures which refers to the processes and activities that transform the effects of root causes into vulnerability. They channel the root causes of disasters into unsafe conditions [12]. These include reduced access to resources such as potable water, lack of training, appropriate skills, lack of integrated water resource management and local conditions of markets and policies. Drawing it closer to Gwanda District the dynamic pressures like lack of resources and lack of integrated water resource management increases the vulnerability of the marginalized groups, therefore triggering waterrelated disasters such as cholera, diarrhoea and typhoid.

Unsafe conditions are the specific forms in which a population's vulnerability is expressed in time and space in conjunction with a hazard [12]. In this study, drinking water from unsafe water sources and lack of potable water in Ward 17 can be viewed as unsafe conditions that might trigger water-related disasters. In addition, some people in Ward 17 live in dangerous locations for example along the Tuli River flood plain to access water and fertile soils for agriculture hence increasing their vulnerability to climate change effects like flooding. Eventually, disasters occur as a result of unsafe conditions combined with physical exposure to hazards.

The PAR model is the best conceptual framework for looking at climate change vulnerability and access to potable water as it takes a holistic, multi-dimensional and multi-hazard approach in the view of vulnerability. It places livelihood strategies at the centre of coping strategies, for all kinds of disasters. Intervention strategies need to be taken to relieve pressure on the rural communities of Gwanda. The potential measures to release pressure from water-related disasters are

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embedded into the PAR model. The measures related to root causes; unsafe conditions and public institutions should be addressed properly to cater for the socially vulnerable groups of Ward 17 in Gwanda District. As noted by [12] vulnerable people are to be supported with both ex-ante (mitigation) and ex-post measures (coping). This model is critical for this study (of disaster management) as it can give disaster managers a framework for understanding vulnerability to disasters and for reducing it [9] (Figure 1).

# Study area

Gwanda District is located within the geographic coordinates along the latitude -21.55929 and longitude 28.99414. The GIS Map in (Figure 2) below shows the location of ward 17 in Gwanda District and the spatial distribution of water sources. Gwanda district lies in Region V found in the lowland areas of the country, lying up to 900 m above sea level. The region receives very low, unreliable and erratic rainfall. The mean annual rainfall is 300 mm, and rainfall decreases from Gwanda North to Gwanda South with the average being 380 mm per annum in the North and 300 mm per annum in the South [13]. The rainfall season stretches from October to April though with variability. Rainfall exhibits considerable spatial and temporal variability characterized by shifts in the onset of rains, increases in the proportion of low rainfall years, decreases in low-intensity rainfall events, and increases in the frequency and intensity of mid-season dry spells [14]. As a result of the high frequency of droughts in the area, water scarcity is a major challenge hence socially vulnerable groups suffer the most from the devastating effects of climate change. The region is characterized by high temperatures (with an annual average of 21 °C) and mid-season dry spells.

# Factors influencing access to potable water by rural communities

Various factors have exerted a lot of pressure on access to potable water by rural communities. These include climate change, population pressure, increasing water pollution and over-abstraction of groundwater. Despite much attention and effort being put towards water and sanitation, it has been noted that lack of access to potable water remains a challenge globally. In accordance to [15], 771 million people lack access to clean water globally, that's 1 in 10 people. The author added that women and girls spend an estimated 200 million hours carrying water every day globally, with an average woman in rural Africa walking 6 kilometres every day to access reliable sources of water [4]. Further points out that about 844 million people still lack even a basic water service, and further 2.1 billion people lack water that is accessible on premises, is available when needed and is also free from contamination. This has resulted in an increased burden of disease and consequent disasters resulting from poor water and sanitation. The annual global deaths resulting from diarrhoea are linked to a lack of access to potable water and sanitation infrastructure and poor hygiene. Every year, 580,000 children die worldwide due to diarrhoea from waterborne diseases [16]. This severely affects rural communities particularly women and girls as a result of lack of access to potable water and sanitation services. These statistics indicate the severity of factors that influence access to potable water.

Climate change is a major factor that hinders rural communities from accessing potable water. Climate change presents a serious obstacle to the access to potable water and it has intensified in the last three decades. It has resulted in unpredictable weather patterns causing rolling droughts in marginal areas of Gwanda District resulting in dwindling water sources for domestic and agricultural usage and challenges to access potable water by socially vulnerable groups. Climate change has accelerated drought, which is the most common hazard which occurs in Zimbabwe and become more acute in south-western parts such as Gwanda District. Persistent drought in Gwanda District has severely strained surface and groundwater systems, contributing to the country's deteriorating water supply. Surface water is the major source of water in Zimbabwe accounting for 90 per cent of the supply [9]. According to the [1], the global climate change crisis is increasing variability in the water cycle, thus reducing the predictability of water availability and demand, affecting water quality, exacerbating water scarcity and threatening sustainable development worldwide.

Population pressure is also another factor that influences access to potable water. As the population is growing at an alarming rate the water infrastructure is inadequate to cater for the growing population. There is intense competition for water between rural communities



Figure 1: Pressure and release model.

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![](_page_3_Figure_1.jpeg)

Figure 2: A map of ward 17 in Gwanda district showing the location and spatial distribution of water sources (Author generated).

and livestock. Water scarcity has resulted in social conflicts in rural communities.

The other factor that influences rural communities to access potable water is the socio-status of the marginalized groups. The socially vulnerable groups face social, economic and political barriers that limit their coping capacity and ability to access potable water. Inequalities that exist in the provision and access to resources like water and decision-making processes, and limited mobility, place socially vulnerable groups in rural areas in a position where they are disproportionately affected by climate change. As noted by householdlevel vulnerability in Zimbabwe is influenced by conflict and insecurity, inequitable land distribution, low levels of education, poor infrastructure, gender inequality, dependence on climate-sensitive resources, poor health status, and HIV/ AIDS. These factors derail the effectiveness of measures put forward to ensure provision and access to potable water.

# Challenges faced by rural communities in accessing potable water

Access to potable water is an intense challenge in Gwanda District, which lies in a semi-arid region with limited and unreliable rainfall patterns and temperature variations. The research findings indicate that rural communities of Gwanda District are facing extreme water challenges where women and children are seen walking long distances to water sources, carrying heavy water containers on their heads and spending a lot of time in queues at water points (Figure 3). Women and girls fetch water from unsafe water sources located far away from their homes and spend long periods in long queues.

Lack of access to potable water has resulted in time poverty among

![](_page_3_Picture_8.jpeg)

Figure 3: Women walking long distances from water sources (Author generated).

the rural people especially the socially vulnerable groups such as women and girls. Research findings indicate that women wake up as early as 4 am to access water from drying boreholes and wells. Due to the marginal nature of the topography, bare soils promote more surface runoff resulting in the siltation of water sources such as the Humbane, Mnyabetsi and Bengo dams hence increasing the challenges of water scarcity.

Many Rivers in Gwanda District are now seasonal not perennial as a result of accelerated climate change. Tuli River is an intermittent

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![](_page_4_Picture_1.jpeg)

Figure 4: A rocky Tuli river with no base flow due to frequent droughts (Source: Author generated).

stream, dominated by bare rock surfaces with no base flow indicating the effects of climate change on water sources (Figure 4).

Climate change is accelerating water challenges, ravaging sources of livelihood resulting in severe deaths of livestock in Gwanda District increasing the susceptibility of rural communities to the effects of climate change. Livestock are a panacea to food insecurity in Gwanda District however, grazing lands and sources of water are plummeting due to high frequencies of drought in the district. The people are sharing water sources like boreholes with their livestock in some parts of Ward 17 such as Mnyabetsi D, Mnyabetsi S, Humbane and Magaya Villages. There is tense competition for scarce water resources between people and their livestock. The tense competition for scarce water resources results in social conflicts. The challenge is hectic to the extent of some people are losing large numbers of their livestock due to water scarcity in marginal areas of Gwanda District. The magnitude of the problem is evident as the socially vulnerable people have to rely on outside intervention from both the government and Non-Governmental Organizations (NGOs) yearly to offset food insecurity. Also, massive out-migration to cities and neighbouring countries like Botswana and South Africa depicts the intense effects of climate change on the rural economies of Gwanda District.

Economic challenges are further accelerating pitfalls faced by rural communities in their efforts to access potable water. The Zimbabwean economic situation is deteriorating resulting in the collapse of water infrastructure resulting in abandoned boreholes and wells in some areas. These challenges have led to a decline in water quality availed as there is often inadequate money for the rehabilitation of water infrastructure such as dams, taps, boreholes and protected wells in rural areas. Some boreholes are abandoned because of dry conditions which lowers the water table (Figure 5). Lack of funds, training on the operation and maintenance of boreholes, dwindling donor support for borehole projects and vandalism are some of the major challenges facing people in rural areas of Gwanda District. The District Development Fund (DDF) does not have the adequate financial capacity to drill the required number of boreholes, nor can the government afford to subsidize all boreholes. This has worsened the challenges faced by socially vulnerable groups like women in accessing potable water.

Accessing clean, safe water every day poses a major headache for many rural households in Zimbabwe because of climate change. The unavailability of safe and clean water has been exacerbated by the breakage of borehole stands and pulley ropes, damaged pistons, poor

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![](_page_4_Picture_7.jpeg)

Figure 5: An abandoned borehole in ward 17 (Source: Author generated).

maintenance of water sources to prevent the build-up of dirt, algae and weeds which clog the pump and pipes during suction, and breakdowns owing to the suction of mud [17]. Thus, the challenge of access to potable water in Zimbabwe's communal areas is still largely a pipe dream and faces challenges in the wake of achieving the Millennium Development Goals.

The fact of human-induced climate change is no longer in dispute in the peer-reviewed scientific literature. Rural communities are hardly hit by water scarcity challenges because of poverty. More so, the challenges faced by rural dwellers are exacerbated by HIV/AIDS pandemic that has wiped out able-bodied people leaving the aged and children who are more susceptible to climate change. The HIV/AIDS pandemic makes women and children more vulnerable to climate change because it diverts their time and channels it towards caring for sick household members. There is a lack of government intervention to adequately supply potable water to these groups.

Climate change has triggered prolonged droughts in Gwanda District which has resulted in scarce water sources, exacerbating the vulnerability of rural communities. The water table levels are deteriorating due to high temperatures which promotes high rates of evapotranspiration. Evapotranspiration exceeds precipitation resulting in the drying up of water sources. This exacerbates the severity of water challenges faced by rural communities.

# Results

### Access to potable water

Many people in Ward 17 live below the poverty datum line, in conditions where access to clean drinking water sources and adequate sanitation are limited. This creates inequalities in the provision and access to potable water. The study research findings acquired from the households' questionnaire state that the major communal water sources include tapes, boreholes, protected wells, dams and rivers. It is noted that seventy-four per cent (74%) of people have access to water from the community boreholes, ten per cent (10%) from protected wells, seven per cent (7%) from rivers, five per cent (5%) from dams and only four per cent (4%) from taped water system Figures 4, 5. Some of the households mentioned that they sometimes use rooftop rainwater harvesting to supplement water during the rainy season. It is important to note that some protected water sources like boreholes and wells were seasonal and even those communities that use protected water sources often resort to unprotected sources at some point during the dry season (May to October).

The water sources like boreholes and wells are drying up as a result of drought. The boreholes usually have a low yield of water during the greater part of the summer season and dropped water levels during the dry season. The main key factor that drives people to access water from unsafe water sources like dams and rivers is climate change-induced drought which triggers the drying of boreholes forcing people to resort to contaminated water sources like Tuli, Humbane and Mnyabetsi rivers and dams Figures 4, 6. The alternative sources used when there is no supply from the borehole had a great bearing on the issue of access to potable water. The respondents alluded that during the dry season, the situation was worse, such that the only times they would have water was early in the morning and the evenings, as water tables drastically fell. More so, the respondents cited that the water supply challenges in the community were exacerbated by the breakdown of boreholes and were rarely attended to, on time. This tended to increase distances to the water points and the workload for mainly the women and children.

Some of the respondents cited that they resort to water from rivers to avoid salty, hard water from the boreholes. The excessive temperatures draw up salts from underground through capillary action to the sub-surface causing salty water conditions. Water fetched from rivers is contaminated by mud and animal or human waste. The five per cent (5%) that access water from dams cited that there are few boreholes in their villages hence a lot of congestion which might result in the easy spread of contaminable diseases such as COVID-19, therefore they preferred to access water from Mnyabetsi dam and rivers which are less congested. Only four per cent (4%) that access piped water from tapes are the people living around Manama rural service Centre, Manama high school and Manama Mission Hospital. However, the information gathered through key informants' interviews from Manama Mission hospital health staff indicated that the taped water from the school and hospital is also faecal contaminated. The ZINWA key informant cited that they use the natural method of sand abstraction to ensure a potable water supply.

The above pie chart (Figure 6) indicates the various sources of water used by people in Ward 17. The data gathered from the respondents indicates that community boreholes are the dominant sources of water used by people and the least source of water used by people is taped water system. It provides water to the people living at Manama rural service centre and only households that can afford it and is located 500m away from the water tanks. The respondents also indicated that scarcity of water (as a result of drying of boreholes) forces them to exploit poor quality alternatives and to carry heavy water containers over long distances, which may lead to negative health implications. The women and children carry full (heavy) containers of water which

![](_page_5_Figure_4.jpeg)

Figure 6: Sources of water in ward 17 (Author generated).

can cause damage to the spine and pelvis creating future problems in pregnancy.

# The measures that can be done to ensure provision and access to potable water

The study findings from respondents and key informants interviews indicated the measures that can be done to ensure the provision of potable water. Ninety-four (94%) of respondents mentioned the need for the drilling of more boreholes and only six per cent (6%) advocated for widening of taped water system since it only saves people located 500m away from Manama rural service centre. This means that many households are left out. The ZINWA operator in charge mentioned the need for expansion of the capacity of water tanks to cater for the population that is growing at an alarming rate. This is related to the ideas of [9] who postulate that macro forces such as rapid population change are dynamic pressures that enhance the progression of vulnerability. Therefore, there is a need to expand the capacity of existing water tanks and boreholes to cater for rapid population growth. The household respondents also cited the need for a large dam along the Tuli River. This might help in improving their sources of livelihood like livestock production, gardening and irrigation schemes. Some respondents indicated the need for rehabilitation of the existing boreholes since they cannot afford to rehabilitate such water sources at the community level. Therefore, all these measures will ensure an adequate supply of potable water to the socially vulnerable groups of Ward 17 in the Gwanda district.

# Conclusion

Even though some parts of the world have made encouraging progress in meeting the MDGs target for safe drinking water and basic sanitation, serious challenges are faced by many rural communities in Zimbabwe. In this study, climate change was the strongest factor that results in the lack of access to potable water. The major conclusion is that rural communities of Gwanda District are facing a water crisis as a result of climate change. The potable water sources that exist in ward 17 are insufficient to cater for the population that is increasing at an alarming rate. Climate change is severely affecting water sources resulting shortage of potable water. Drying boreholes and community-protected wells have forced socially vulnerable groups to resort to unsafe water sources. This is linked to the PAR model by [9] who state that unsafe conditions may trigger a disaster. Drinking contaminated water sources is related to unsafe conditions that result in water-related disaster risks.

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Both authors would like to disclose that there are no commercial or other associations that might pose a conflict of interest in connection with the submitted material.

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