

The Gendered Burden of Water Scarcity: Climate Change, Socio-economic Effects, and Community-Based Solutions for Young Women in Sikalenge Ward, Binga, Zimbabwe

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Abstract—Climate change poses a significant threat to global water security, with disproportionate impacts on vulnerable populations, particularly young girls and women in low-income and marginalized communities. A qualitative study was conducted on this research to unearth the challenges faced by women and young girls. The findings indicate that climate change affects water availability and accessibility for young girls and women, highlighting the social, economic, and health implications of these changes. The socio-economic aspects of climate-induced water scarcity cannot be ignored. Research has shown that in areas affected by water scarcity, girls prioritize water collection over formal education, which results in a significant drop in school attendance. Diarrhoeal diseases, cholera, and other waterborne illnesses disproportionately affect women and children, who are already more vulnerable due to limited access to healthcare. In many cultures, fetching water is intertwined with traditional gender roles, placing an undue burden on women and girls. Adaptation strategies to mitigate the impacts of climate change on water access must prioritize the needs and voices of women and girls. Community-based initiatives that promote rainwater harvesting, water conservation techniques, and improved sanitation infrastructure can empower women while enhancing resilience. Additionally, policies aimed at addressing climate change should incorporate gender-sensitive approaches, ensuring that women are included in decision-making processes related to water management and resource allocation. Education and awareness-raising programs can help challenge harmful gender norms and reduce the burden placed on women and girls in water-scarce environments. Water availability is being drastically altered by climate change, which has serious consequences for women and young girls everywhere. Understanding the intricate relationships that exist between social injustice, environmental deterioration, and public health will help us create focused solutions that will protect the rights and welfare of this susceptible group. Governments, international organizations, local communities, and civil society must all work together to address these issues.

Keywords—climate change, water scarcity, young women introduction

I. INTRODUCTION

Reliable water access is essential for life and livelihoods [1], yet many regions face water scarcity, threatening well-being and development. Ensuring water security is key to sustainable development and poverty reduction. Globally, water scarcity affects even water-rich countries and is worsening due to climate change and human factors, depriving people of safe water and sanitation. By 2025, up to 230 million Africans may face water scarcity, with 460 million in water-stressed areas [2]. Limited access to clean water hinders hygiene, disrupts sewage systems, and

raises disease risks like cholera. High costs and long distances to water sources disproportionately impact women and children, reducing school attendance, especially for girls, and increasing physical strain and safety risks [3]. Safe drinking water and sanitation are fundamental human rights, crucial for health and progress toward the UN's SDGs. Still, over 2 billion people lack safely regulated water [4], with poor, rural communities in developing nations hit hardest by climate change.

II. LITERATURE REVIEW

Climate and socioeconomic shifts are projected to worsen water scarcity worldwide in the coming decades. By 2050, urban water consumption is expected to increase by 80%, with climate change affecting both timing and distribution [5]. Sub-Saharan Africa faces water challenges due to rapid population growth, urbanization, and climate change [6]. Semi-arid regions are experiencing longer droughts and severe floods, damaging infrastructure [7]. Surface water is declining, and groundwater is depleting unsustainably [8]. This threatens agriculture-dependent economies already struggling with water scarcity. In Zimbabwe, erratic rainfall due to climate change makes irrigation vital for agriculture, the main source of food and income [9]. Water shortages reduce soil moisture, shorten growing seasons, and lower yields, deepening food insecurity and poverty [8]. Poor soils, limited water sources, and a lack of drought-resistant seeds worsen these challenges. In Sikalenge Ward, water scarcity affects health, gender equity, and the economy, while inadequate water for livestock reduces protein sources and income. Women bear the burden of caring for sick animals and fetching water [10].

Traditional decision-making structures exclude marginalized communities from influence, exacerbating inequality by neglecting their diverse challenges related to water, health, and food [11]. In Sikalenge Ward, inadequate access to safe drinking water poses severe health risks. Due to unreliable water sources, residents increasingly rely on contaminated water, heightening the spread of waterborne diseases [12]. Frequent outbreaks of cholera, typhoid, and dysentery result from water contamination [10]. Women and children bear the greatest burden, traveling long distances to collect water from polluted streams, springs, or unprotected wells [13]. This not only endangers their physical health but also hinders girls' education and women's economic empowerment [14].

Urgent research on the water crisis is needed to inform

targeted adaptations [15]. This study bridges knowledge gaps by examining the links between water insecurity, vulnerable populations, and rural livelihood instability [16]. The findings support region-specific policies to enhance water access, efficiency, income diversification, and social resilience, especially for women [11, 17]. They also guide rights-based strategies that address gender, health, and environmental factors [18]. Overall, the study strengthens local adaptive capacity and informs national climate security efforts under Vision 2030 and the UN SDGs, emphasizing evidence-based, collaborative action.

III. MATERIALS AND METHODS

A. Ethnography of the Study

The study was conducted in Sikalenge Ward in Binga District in Zimbabwe. The area is part of the larger Zambezi Valley and is classified as semi-arid to arid regions characterized by low and erratic rainfall, high temperatures and frequent droughts. These conditions make it highly vulnerable to the impacts of climate change. The population in the Ward, is predominately rural, with most residents belonging to the baTonga ethnic group. Women and girls play critical roles in household management, including water collection, food preparation and caregiving. However, they often face significant gender-based inequalities in accessing resources and the decision-making process. Access to clean and safe water is a major challenge in the Sikalenge ward. Households rely on unprotected wells and boreholes often far from their homes.

B. Data Collection

Data was collected using qualitative methods using interviews and focus group discussions reaching 30 Participants. The interview guide was pre-tested on 15 community members before the main data collection. Based on the feedback from these participants, necessary corrections and adjustments were made. These interviews sought to understand the plights or challenges faced by young girls and women in accessing water in the changing climate. When these challenges are identified they will proffer some recommendations to address the identified challenges in the ward. A total of 30 young girls and women were randomly selected to participate in this study. The key inclusion criterion was that participants had to be permanent residents of the Ward while the main exclusion criterion was non-residency in these areas. All participants were above 18 years of age and provided verbal consent to participate in the study. The data were analysed using thematic analysis in Atlas.ti (Version 23) and content analysis. The primary survey data were supplemented by secondary literature synthesis.

IV. RESULT AND DISCUSSION

A. The Causes of Water Shortages in Sikalenge Ward

The participants noted that there are numerous factors contributing to the water shortage in Sikalenge Ward. The causes include droughts and climate change, lack of funds and support from the government, absence of stable NGO's that support rural communities on water and sanitation,

people's behaviour, attitude and character as well as ignorance. These points highlighted are among the factors which speeded poor water sanitation in Sikalenge village. All the highlighted factors are going to be discussed below.

1) Climate change

One of the main causes of water shortages in Sikalenge ward is Climate Change. Out of 30 Participants 80% of the participants mentioned climate change as the main cause of water shortage. Due to climate change there is now unstable rainfall and rising temperatures. One of the Participants said.

"Climate change has caused adverse effects in the region, leading to increased water stress and water shortages in the ward". (Participant 7)

The key informant also propounded that the environmental change, the drying up of the wetlands has led to the decrease in the availability of safe water also the likelihood of increased water stress due to climate change has been identifies as a factor contributing to water shortages in Sikalenge ward.

"Specifically, there have been mentions of water resources becoming scarcer over the past 5–10 years contributing to the vulnerability of the population in terms of water availability. Additionally, it has been noted that the wetlands are drying up, leading to a decrease in the availability of safe water". (Key informant 1)

This highlights that Sikalenge Ward faces major water supply challenges, with water only available during the rainy season. Climate change has worsened extreme weather, impacting water availability and quality. Rising temperatures have increased harmful pathogens in freshwater, making it unsafe to drink, while also speeding up evaporation and causing dams to dry faster.

2) Shortage of water infrastructure

The other reason for the shortage of water in Sikalenge ward is inadequate water infrastructure, which leads to an inability to fulfil water needs due to insufficient supplies. People have been using the same infrastructure for so many years and they are no longer functioning very well. The Participant said.

"There is lack of infrastructure and technology to draw water from the river Zambezi". (Participant 14)

The lack of infrastructure has resulted in insufficient water storage and sanitation, leading to a shortage of clean drinking water. This highlights the need for technology, such as pipelines drawing water from the Zambezi River to Sikalenge Ward, as boreholes are failing.

3) Over population

The growing population has increased water demand for agriculture, domestic use, sanitation, and hygiene, straining supplies. More people also require greater food production, leading to higher irrigation needs. The majority of participants identified overpopulation as a key cause of water shortages in Sikalenge Ward. One participant noted:

"The population growth has outpaced the development of water structure and management systems, leading to water scarcity issues". (Participant 20)

Overpopulation has led to more livestock in Sikalenge Ward, increasing pressure on water sources. This contributes to water shortages, but effective water management and surface water monitoring are also needed. Historically, the

Tonga people were promised water access during relocations, yet Sikalenge residents still lack water despite the nearby Zambezi River. This highlights the Zimbabwean government's failure to address the challenges faced by these communities, leaving the promises unfulfilled.

B. Impact of Water Crisis on Women's Livelihoods

1) Health and well-being

Lack of access to safe water severely impacts women's and children's physical well-being, as they often carry heavy vessels over long distances. Majority of the participants noted that water shortages, worsened by droughts, have led to health challenges, with water insecurity threatening both physical and mental health. Poor access to water and sanitation has caused cholera outbreaks, resulting in deaths in Sikalenge Ward. Freshwater availability is crucial for health, influencing hydration, sanitation, and food preparation, while safe housing and clean water significantly affect overall well-being and quality of life.

2) School dropout

The water crisis significantly affects school attendance and dropout rates, especially for young women and girls. Lack of clean water impairs academic performance, and participants noted that water shortages often prevent girls from attending school or continuing their education. In households with limited water supply, girls are frequently tasked with water collection, which further disrupts their schooling. This highlights how water scarcity impacts academic achievement, health, gender equality, and time management, leading to higher dropout rates. Access to water is essential for education and well-being, as it is tied to the right to life and information.

3) Poor service delivery

At Siabuzuba Clinic in Sikalenge Ward, poor service delivery is linked to water scarcity, which also affects sanitation. The focus group discussed how limited water access hampers sanitation services, raising health risks and undermining healthcare. Lack of clean water and sanitation increases the spread of waterborne diseases, putting further strain on healthcare services and impacting overall service quality, particularly for women and young women.

"We are now afraid to go to the clinic when we get sick because we will fetch water and some conditions does not allow that". (FGD 1)

Water shortages negatively impact sanitation, health, agriculture, infrastructure, and education, particularly for women and young women. Addressing these issues is essential for improving service delivery and enhancing community well-being.

4) Failure of projects

Participants highlighted that the shortage of water has led to the failure of projects in Sikalenge ward. There is crop failing due the shortage of moisture, water shortage has directly affected gardening projects as it limits the availability of water for irrigation.

"Shortage of water has brought poverty because it is disturbing the works of our hands like gardening". (Participant 4)

Water shortages have pushed people into poverty, especially for women and young women who rely on

gardening for survival. Without water, they face difficulties earning income. Despite NGOs' efforts, like mushroom farming projects, progress has stalled due to a lack of water. Attempts to drill boreholes have also failed to address the issue.

5) Local businesses and agricultural activities

Water shortages have a significant economic impact on local businesses and agriculture, particularly for women, who make up the majority of farmers in Sikalenge Ward. Reduced crop yields and lower-quality produce affect their income and the availability of food in local markets. Women farmers face higher costs for additional irrigation or alternative water sources, reducing their profitability. Drought conditions further exacerbate economic losses, as the water demand for crops exceeds the available supply, undermining the agricultural sector's contribution to the local economy. The key informant highlighted:

"Water shortages greatly affect food production, especially for women who rely on water to irrigate their crops. Without sufficient water, they are unable to maintain their gardens or farms, directly impacting their food security and livelihoods". (Key informant 2)

From the above information it is clear that water scarcity has directly impacted the agricultural sector, leading to crop failure and pasture losses this leads to financial losses and reduced productivity.

C. Possible Solutions on the Impact of Water Crisis

Numerous community-driven solutions were proposed by participants. These solutions reflect a deep understanding of the challenges faced by the community, particularly in addressing water scarcity and its broader impacts. The involvement of women in these initiatives was highlighted as crucial, ensuring that solutions are inclusive and meet the specific needs of the community. These solutions offer hope for improving water access and mitigating the effects of water shortages on the livelihoods and well-being of the residents, especially women and young girls.

1) Engaging local leaders

Engaging local leadership is essential in addressing water challenges faced by women and the community, advocating for the installation of piped water systems. Collaborative efforts between local authorities, community organizations, and relevant stakeholders are crucial for effectively tackling these issues. Highlighting successful community-led initiatives or partnerships from other regions can serve as models for improving water access and quality. Emphasizing the potential for local job creation and economic development through investments in water infrastructure can also benefit women, particularly through local hiring and workforce development. Additionally, exploring opportunities to leverage local resources and expertise can support the planning and implementation of piped water systems that meet the needs of women and the broader community. One of the participant stated that:

"By employing these strategies and emphasizing the importance of community involvement, it is possible to effectively engage local leadership and advocate for the erection of piped water systems to address the water challenges faced by the community". (Participant 17)

2) Constructing weir dams

Constructing weir dams for water harvesting and storage can provide a reliable water source for women, especially after the rainy season. Weirs are low-head, overflow dams built across rivers or streams to raise water levels and divert water for storage or irrigation. Using materials like rocks and concrete, weirs regulate water flow, capturing runoff during the rainy season. The stored water can be used for gardening, livestock watering, and other agricultural activities, ensuring that women have access to water during dry periods and supporting their livelihoods. One participant noted that:

"By strategically constructing weir dams, communities especially women can enhance their capacity to harvest and store water for use after the rainy season".
(Participant 12)

3) Conducting trainings on climate resilience agricultural practices

Encouraging farmers to adopt climate-resilient practices, such as drought-resistant crops and sustainable irrigation, can help reduce the effects of water scarcity on food production. Providing access to training programs on climate-smart agriculture equips them with essential skills for resilient farming. Additionally, financial incentives and support, including subsidies for drought-resistant seeds, irrigation systems, and soil conservation equipment, can further promote sustainable agricultural practices by women. One participant alluded that:

"Stakeholders can effectively support farmers in adopting climate resilient agricultural practices, contributing to enhanced resilience, improved livelihoods and sustainable food production in the face of climate change".
(Participant 16)

Through trainings and knowledge sharing farmers are able to adopt the resilient farming practices through climate smart agricultural practices to boost productivity and reduce greenhouse gas emissions. Also, climate resilient farming practices provide financial benefits for small scale farmers, encouraging to the adoption of these practices can contribute to the financial well-being of farmers. Farmers must be offered guidance and resources to integrate climate resilient practices into their operations.

4) Distributing water treating chemicals

Ensuring safe drinking water is vital for women's health and well-being. Public health professionals oversee treatment processes, issue advisories if needed, and monitor water quality. Since women manage household water, reliable access reduces health risks and eases their burden. One Participant noted:

"Public water systems can effectively distribute chemicals to treat water, ensuring that it meets established safety and quality standards for drinking". (Participant 2)

Especially for those who get drinking water in the rivers they must ensure that the water chlorinated or boiled before drinking to avoid the cholera outbreak in the community.

5) Developing new water conservation technologies

Innovative solutions to address water shortages in Sikalenge Ward, particularly benefiting women are a necessity. Water conservation technologies can improve efficiency and reduce wastage, easing their burden. Green infrastructure, like rain gardens and permeable pavements, can enhance water availability, reducing the time spent

fetching water. Advances in precision irrigation can also optimize agricultural water use, supporting women's roles in farming and economic activities. The key informant highlighted that:

"Implementing measures to ensure adequate water supply in schools is essential for promoting education and overall wellbeing. Proactive measures to mitigate the impact of droughts are essential for safeguarding water resources".
(Key informant 2)

The findings highlight the significant challenges that women in the community face due to limited access to water, impacting key aspects of their daily lives, including household responsibilities, agriculture, health, sanitation, and economic opportunities. As primary caregivers and essential contributors to food production and family well-being, women are disproportionately affected by water shortages. Implementing proposed community-driven solutions such as improved water infrastructure, sustainable resource management, and strengthened collaboration between local authorities and the community can greatly alleviate these burdens. These efforts will not only reduce the hardships caused by water scarcity but also enhance the overall well-being, empowerment, and socio-economic development of women, ultimately benefiting the entire community.

D. Discussion

Climate change emerges as the most significant driver of water scarcity in Sikalenge Ward. Rising temperatures and erratic rainfall patterns have severely disrupted the availability and quality of water resources. Wetlands, once reliable sources of freshwater, are drying up at an alarming rate, exacerbating water stress in the region. Water resources have become scarcer over the past decade, particularly affecting vulnerable populations who rely heavily on these natural reserves. The proliferation of pathogens in freshwater sources due to rising temperatures has also rendered many water bodies unsafe for consumption, posing serious health risks to the community. Increased evaporation caused by higher temperatures accelerates the depletion of surface water reservoirs, further intensifying the crisis. Around four billion people worldwide are currently living with water shortages and approximately half of those face water scarcity [19, 20]. Changing rainfall patterns, declines in precipitation and runoff, and increased evapotranspiration rates attributable to climate change are the most likely physical drivers of future water scarcity in Africa [7].

In addition, inadequate infrastructure plays a pivotal role in perpetuating water shortages. Participants emphasized the lack of modern facilities capable of meeting the growing demand for water. For instance, boreholes, the traditional source of water in rural areas are either non-functional or insufficient to serve the entire population. Despite the proximity of the Zambezi River, residents remain reliant on outdated and inefficient systems, highlighting the urgent need for technological advancements such as piped water networks. The absence of adequate storage and sanitation facilities compounds the problem, leaving households without access to clean drinking water during dry seasons. Some of the infrastructure problems included leakages (reservoirs, pipes, and taps) either due to damage or aging. In some areas tap heads were damaged or stolen. The poorly maintained infrastructure will in turn affect water supply as

there will be a lot of water losses during the distribution period. Poor operation and maintenance of boreholes is a major problem in the selected areas as boreholes would have a significant reduction in terms of their expected yields. Hence, other boreholes fail to meet the expected demand [21].

Population growth adds another layer of complexity to the water crisis. With 60% of Participants attributing water shortages to overpopulation, it becomes evident that demographic pressures strain existing water resources. Increased demands for domestic use, agriculture, and livestock rearing have outpaced the development of water management systems. World Health Organization (WHO), water scarcity affects 1 in 3 people in the African Region and the situation is deteriorating because of factors such as population growth and urbanisation but also climate change [3]. The population growth has outpaced the development of water structure and management systems, leading to water scarcity issues. Swift population growth and climate change continue to aggravate the water crisis in Africa. Currently, 350 million people of the continent's 1.3 billion population do not have access to clean water, and it is feared that this figure will only increase if sufficient investment is not made [12]. Moreover, the expansion of livestock numbers intensifies competition for limited water supplies, necessitating better resource allocation and conservation practices.

Water insecurity imposes severe consequences across multiple domains, impacting health, education, service delivery, livelihoods, and overall quality of life. Women and children bear the brunt of these challenges, often travelling long distances to fetch water under hazardous conditions. Such arduous journeys not only expose them to physical injury but also compromise their mental health, contributing to stress, anxiety, and depression. They are also at an increased risk for violence since they travel such great distances from their villages daily, and are even at risk when they must go to the edge of the village to find a private place to relieve themselves [22]. Additionally, contaminated water sources increase the risk of waterborne diseases such as cholera, which have claimed numerous lives in Sikalenge Ward. Ensuring access to safe drinking water remains paramount for safeguarding public health and preventing outbreaks. The implications of lack of clean water and access to adequate sanitation are widespread. Young children die from dehydration and malnutrition, results of suffering from diarrheal illnesses that could be prevented by clean water and good hygiene [23]. Diseases such as cholera are spread rampantly during the wet season. Women and young girls, who are the major role-players in accessing and carrying water, are prevented from doing income-generating work or attending school, as the majority of their day is often spent walking miles for their daily water needs [22].

Water scarcity have direct implications on health and well-being as it leads to inadequate access to drinking water, sanitation and hygiene thereby affecting overall health outcomes. This includes increased susceptibility to waterborne diseases such as cholera, diarrhoea, dysentery and hepatitis. The resulting health burdens can lead to increased healthcare expenses and reduced productivity, contributing to economic hardships. Yamey [24] states that

“water crisis can have a significant impact on hygiene and health. Without access to clean water for washing hands and keeping the environment clean, people are more vulnerable to infectious diseases”. Due to the shortage of water in Sikalenge, people are affected with Cholera and malnutrition which is leading to death almost every day.

Water scarcity hurts time and productivity, in Sikalenge individuals, particularly women and girls, may spend significant amounts of time on daily tasks required for survival, such as fetching clean water, the process can limit education opportunities, income-generating activities and community participation, perpetuating the cycle of poverty. Also, the lack of water has affected agricultural productivity, shortage of water for irrigation has become a challenge to grow food and sustain livelihoods, this has led to food insecurity, malnutrition and economic instability. Molden [25] postulated that “the lack of access to clean water can be a major contributor to poverty in the sense that when farmers don't have access to water for irrigation, they may struggle to grow enough food to feed their families or earn an income”. This is in line with what the research got, In Sikalenge people depend on local businesses and agricultural activities but then due to shortage of water now the businesses have declined because the gardens are now not producing anything.

E. Recommendations

- i. Policymakers should reform water management policies to combat scarcity, integrating sustainable conservation strategies and targeted community support. Approaches must be locally tailored and protect indigenous rights and well-being.
- ii. Development partners should invest in sustainable water management, prioritizing infrastructure, conservation, and efficient water use. Funding should support vulnerable communities, improve clean water access, and enhance drought resilience through proactive measures.
- iii. Sikalenge Community should adopt water conservation practices in households, agriculture, and businesses to improve water efficiency and sustain livelihoods.
- iv. Encouraging alternative income-generating activities that are less dependent on water can provide economic stability.
- v. Community-based adaptation strategies, such as rainwater harvesting, small-scale irrigation, and climate-resilient farming techniques, should be promoted.
- vi. Raising awareness about climate change and water scarcity through education can empower individuals to make informed decisions about water use.
- vii. Academia should conduct community-focused research on water scarcity, climate change, and livelihoods, providing practical solutions for policy and development. They should also support capacity-building through education, training, and knowledge-sharing on sustainable water management.

V. CONCLUSION

Water shortages in Sikalenge Ward are driven by climate change, overpopulation, and inadequate water infrastructure. Rising temperatures and unpredictable rainfall patterns

accelerate drought conditions, causing water sources to dry up more rapidly. The growing population further exacerbates the crisis by increasing demand beyond the available supply. Additionally, the lack of proper water infrastructure limits the community's ability to store, manage, and distribute water efficiently. As a result, residents are forced to rely on unsafe water sources, leading to widespread water insecurity. The impact of water shortages extends across various aspects of life, including public health, economic stability, and social well-being. Contaminated water contributes to frequent disease outbreaks, while prolonged dry seasons heighten tensions, potentially leading to conflicts and forced migration. Farmers, who depend on agriculture for their livelihood, struggle with declining crop yields, worsening food insecurity, and financial instability. To address these challenges, solutions such as constructing dams, implementing rainwater harvesting, and promoting sustainable water management are essential. These measures can improve water availability, strengthen community resilience, and mitigate the long-term effects of water scarcity in the region.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Knowledge Khumalo led the writing of the manuscript and contributed to the design of the research tools. Libambile Mukuli was responsible for conducting the field research, while Prince Mathe carried out the data analysis. All authors reviewed, contributed to, and approved the final version of the manuscript.

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