



Technical Challenges Facing Water Users in Accessing Water Services from the Public Water Supply Authority in Dodoma City, Tanzania

Felix George Masanja ^{a*}

^a *Community Development and Project Management Programme, University of Iringa, Tanzania.*

Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/ARJASS/2023/v21i3481

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/107578>

Original Research Article

Received: 09/08/2023

Accepted: 13/10/2023

Published: 04/11/2023

ABSTRACT

Water service is essential for human survival. For it to be easily accessed with adequate amount in an increasing population, there are number of challenges that need to be addressed with existing expertise, protocols and operations. Thus, this study aimed to examine the Technical Challenges Facing Water Users on Accessing Water Service from the Public Water Supply Authority in Dodoma City namely Dodoma Urban Water and Sanitation Authority (DUWASA). The study employed a mixed research approach where a cross sectional research design was used to collect data at one time from July to August 2021. A sample size of the study was 96 respondents drawn from three wards in Dodoma City who are clients of DUWASA, 3 local government leaders and 5 officials from DUWASA. A Multi-stage random sampling was chosen to collect data accurately represents the technical water-related challenges faced by water users. Three wards were selected to represents Dodoma City residents, two streets were then selected from each of the three wards. Sixteen households were randomly selected from one street in each ward, resulting in a total of 32 households per ward. The study used purposive technique in selection of 5 key informants who are

*Corresponding author: Email: felixmassanja@gmail.com;

the DUWASA officials, one local ward leaders from each of the selected wards. Both qualitative and quantitative data collection techniques were employed in the study. Using descriptive statistical analysis, the findings revealed that, limited number of days and number of hours, limited water resources, poor infrastructures which leads to the loss of water through water leakage as technical challenges hindering accessibility of water services. The study recommends for construction of modernized water networks and efforts to increase more sources of water that will lead to exploit more water.

Keywords: DUWASA; water users; accessing; water services; public water supply authority.

1. INTRODUCTION

Water is an essential component for supporting human survival and wellbeing in all over the world. Water becomes scarce when demand for water exceeds the available sustainable resources [1]. In 2017, 71% of the global population (5.3 billion people) used a safely managed drinking water service – that is, one located on premises, available when needed, and free from contamination [2]. A study by Sharma et al. [3], highlights that, lack of access to improved water excessively affects vulnerable populations in low-income regions, perpetuating social inequalities.

Data from WHO states that in 2022, 27% of the global population (2.2 billion people) lacked access to safely managed drinking water services, leading to high water stress” [4]. Projections suggest that by 2025, half of the global population will reside in water-stressed areas, significantly impacting their livelihoods. By 2050, the urban population in Sub-Saharan Africa (SSA) is expected to triple, while the rural population will increase by one-third. This rapid population growth poses a significant challenge in meeting the domestic water needs of the region. Urban areas may experience a surge in domestic water demand ranging from 650% to 1,300%, putting additional strain on the livelihoods of urban residents. Currently, only 61% of the SSA population has access to improved water, and a mere 15% have access to piped water. Access to safe and clean water is considered a universal human right, as it is crucial for human survival [5,6]. Growth in population means increasing demand and competition for water for domestic and industrial uses. Urbanization leads to increased pressure on water sources as individuals become more concentrated in one area hence to number of technical challenges on accessing water from the public water supply authorities [7,8]. The rapid population growth and urbanization could expose more people to water shortages, with negative

implications for livelihoods, health and security [5,6].

In Tanzania, urban areas are experiencing rapid expansion, with the growing rate of more than 3.2% per annum, which is exerting enormous strain on the delivery of various services including water services [9]. In urban areas, the urban water supplying system has been improving the water service to be easily accessible. Safe water availability in urban areas has risen from 84% on March 2020 to 86% on March 2021 [9] but still urban residents are facing number of challenges on accessing water from the public water supply authorities. Manyele et al. [10], highlights the technical barriers faced by urban residents, such as inadequate infrastructure, intermittent water supply, and aging distribution networks have been identified in studies by Mwandosya et al. [11] and Magembe et al. [12]. These challenges exacerbate the difficulties faced by urban residents in Tanzania, hindering their access to a reliable and safe water supply.

DUWASA has implemented multiple water projects in Dodoma city, with a focus on enhancing water accessibility and service delivery [13-15]. DUWASA expanded water supply networks, extending pipelines and distribution systems to unserved areas, thereby increasing access to clean and safe water for a larger portion of the population [16]. These initiatives significantly improved water production capacity and supply in the region. DUWASA also prioritized water source development, optimizing existing sources like the Mzakwe source, resulting in increased water quantity and reliability. The Mzakwe source alone witnessed a boost in production capacity and supply from 32,000m³ to 61,500m³ per day.

Concurrently, the authority focused on enhancing water treatment and distribution systems, adopting advanced technologies, implementing quality control measures, and improving

maintenance practices to ensure better water quality and a more reliable water supply for residents. Despite the diligent efforts made by the government and DUWASA to ensure an adequate water supply to its clients, persistent complaints have been reported regarding the provision of water services among the population of Dodoma city. The rapid increase in population has exacerbated the challenges faced by DUWASA in meeting the water demand of these areas [17]. The existing water treatment plants, storage reservoirs, and distribution networks struggle to keep pace with the rising demand, leading to water shortages, low pressure, and irregular supply in some areas. Moreover, the expansion of water supply networks in these wards may not have kept up with the population growth, resulting in insufficient coverage and limited access to clean and safe water for the residents.

Additionally, technical issues such as aging infrastructure, leakages, and system failures further hinder the smooth provision of water services. These technical challenges lead to service disruptions, reduced water quality, and increased vulnerability to contamination, thereby causing concerns among the population. In light of these challenges, it was crucial to conduct a study to assess the technical challenges facing water users in Dodoma city in accessing water services from DUWASA.

2. MATERIALS AND METHODS

2.1 Description of the Study Area

The study was conducted at Dodoma city, of which is the capital city of Tanzania, Dodoma city is located in the middle of the country. The city has been developing quite fast, and the current population of Dodoma is exceeding 400,000 people. The latitude of Dodoma, Tanzania is - 6.161184, and the longitude is 35.745426. Dodoma, Tanzania is located at Tanzania country in the cities place category with the GPS coordinates of 6° 9' 40.2624" S and 35° 44' 43.5336" E [9]. Selection of Dodoma as the location of the study was driven by several compelling reasons. Firstly, Dodoma's rapid urbanization as the capital city of Tanzania has resulted in increased pressure on limited resources, particularly water. With a growing population and urban sprawl, ensuring adequate access to water has become a pressing issue for the city's residents. Secondly, Dodoma is situated in a semi-arid region where water

scarcity is a prevalent problem. Examining the challenges faced by water users in accessing water from the public water supply authority in this context is crucial for understanding and addressing the unique issues associated with water access in semi-arid areas. By conducting the study in Dodoma, researchers could delve into the challenges faced by water users in this specific setting, generating valuable insights and tailored solutions.

2.2 Research Design

This study employed a cross sectional research design to examine the technical challenges facing water users on accessing water service from DUWASA. The cross sectional design allows deep investigation of a problem or issue basing on multiple units [18]. Also, a cross sectional design allowed the depth investigation of the phenomenon, particularly the technical challenges on accessing water service and this method enabled me to understand fully the technical challenges facing water users on accessing water service from DUWASA.

2.3 Target Population, Sample Size and Sampling Techniques

2.3.1 Target population

The population in this study was DUWASA's Water Service Users at Dodoma City and specifically at Mkonze, Dodoma Makulu and Mnadani wards where DUWASA supply water in the wards respectively. The study involved the households' direct clients of water services from DUWASA at the respective wards. The study also involved key informants from DUWASA and local ward leaders.

2.3.2 Sample size and techniques

Sample size of the study was 96 respondents. This involved clients of DUWASA safe water service projects from Mkonze, Dodoma Makulu and Mnadani ward. According to Kothari [19] regardless of population size, minimum sub-sample of 30 is acceptable minimum sample for studies involving statistical analysis the sample was obtained from the Cochran (1963) formula.

The study used purposive technique in selection of five key informants. These include water engineers on the planning, designing,

Table 1. Distribution of Sample Size in Wards and Streets

Wards	Streets	Number of households
Mkonze	Chinyika	16
	Muongano A	16
	Total	32
Dodoma Makulu	Njedengwa West	16
	Msangalale West	16
	Total	32
Mnadani	Mnadani	16
	Mbwanga	16
	Total	32
Total of number of key respondents		96
Key Informants	DUWASA Officials	5
Key Informants	Ward local leaders	3
Grand total		104

construction and project section, commercial and customer relation officers and the human resource officer, all from DUWASA in Dodoma City. One local ward leaders from each of the selected wards. The rationale for selecting them purposively was based on the expertise and experience they possess on the operational of water service supplying projects.

A Multi-stage random sampling was chosen to ensure that the collected data accurately represents the technical water-related challenges faced by water users. Three wards (Mkonze, Dodoma Makulu, and Mnadani) were selected due to their high population growth rate. Two streets were then selected from each of the three wards. Sixteen households were randomly selected from one street in each ward, resulting in a total of 32 households per ward. The key respondents in this study were clients of DUWASA and hence the core criterion for household selection was being a client of DUWASA safe water services. A researcher engaged with one household representative from each selected household where the household had a water tap provided by DUWASA.

2.4 Data Collection Methods and Instruments

Both qualitative and quantitative data was collected. Quantitative data were collected by using questionnaires with both open and closed ended questions, whereas qualitative data was collected using semi-structured interview. The questionnaires that consisted of both close and open-ended questions were used to collect data from the water users from DUWASA. Sei-

structured interview method was used to obtain data from the ward leaders and the DUWASA officials.

2.5 Data Analysis

Statistical Package for Social Science (SPSS) version 20 was used to analyze quantitative data. The descriptive analysis involved calculation of percentages and frequencies. Findings were presented using tables in which frequencies and percentages were utilized whereas content analysis was used to analyze qualitative data in accordance to the study objective.

3. RESULTS AND DISCUSSION

3.1 Technical Challenges Facing Water Users on Accessing Water from the Public Water Supply Authority

Water users identified technical challenges that hinders them on accessing water from the public water supply authority. The responses are presented in the following subsection as follows:-

3.1.1 Limited continuity of water supply

The researcher first sought to establish the number of days water flows per week in respective wards. Respondents were asked the number of days do they access water from their water tapes and the findings reveals that due to scarcity of water supply leads to water cutoff and the respondents are accessing water services in limited number of days, whereby about 100% of respondents from Mnadani ward agreed to access water for three days per week while only

9.4% and 53.1% of the respondents from Dodoma Makulu and Mkonze wards respectively agreed that they access water for three days per week. Additionally, 90.6% of the respondents from Dodoma Makulu revealed to access water for about four days per week while Mkonze ward access water for two days per week as 46.9% of the respondents declared as the Table 2 indicates.

The findings implies that there is variation of water flows in accordance to the ward, most of the wards that are around the city have more days of accessing water services than the wards that are somewhat to have distance from the city center where they have few days of accessing water compared to other wards around the city center. Majority of the respondents from Mkonze ward who are somewhat far from the city center agreed to receive water just for two days per week than the respondents from Dodoma Makulu and Mnadani ward who agreed to receive water for three to four times per week. From researchers' personal observation and responses from residents demonstrated that the areas that are somewhat far from the city center have new residents that its population is rapidly increasing as the city keep on growing, therefore those areas need more water so as to fasten the development of such areas.

A researcher wanted to know the response of the responsible water supply authority concerning to the variation of water flows in weekly timetable among the wards, the water engineer agreed on such situation and confessed that;

...Due to the deficit of water produced and supplied, we decided at least to supply the amount of water we managed to produce in schedule among the areas in some days so as to ensure people are not lacking water at all days rather we are trying to balance the supply of water in the city...

Also, a researcher sought to know the response of the local leaders concerning to the variation of water flows in weekly timetable, among all of the wards, the local leader agreed on such situation and confessed that;

...It is truly that there's a water scarcity, and people are accessing water for the specific days in a week, hence they ensure to keep a reasonable amount of water that they can use in the days when water is not flowing from their water tapes, others are accessing

water from the local deep wells among their streets or nearby streets and others are accessing water from the water vendors...

Personal observation and responses from residents attested that water storage is the strategy adopted in managing the acute water scarcity in the study area. According to residents, one cannot survive without storing water. This helps them to have water for regular use and helps cut the cost and time used on water. Different kind of containers ranging from small gallons, buckets, bowls, drums and small tanks to large poly tanks were used in storing water. It is important to note that the costs involved in acquiring some of these storage facilities are high depending on the kind and the capacity of the storage. This meaning that, those with stable financial status were able to acquire these facilities and cope better. In the majority, others would have to depend on small gallons, bucket, and small drums for storing water for daily use and when their storage get off they depend water from the vendors and local well.

This finding concur with the findings disclosed by Ahile et al [20] and Senna [21], where they discover that residents from the respective areas had the problem of water cutoff from the public water supply authority but they ensures to stored water in big containers and domestic utensils when they are able to access water from their taps even for the few hour when water flows so as to cope with the scarcity of water.

3.1.2 Limited hours on accessing water service

The researcher further sought to establish hours per day with water flow in respective wards. Respondents were asked to identify the hours do they access water service from the water authority, the study find out that, on the notified days of water flows from the tapes, water do not flowing for the whole 24 hours as recommended by the Key Performance Indicators and EWURA. The service hours has reported to decrease for the past three years whereby, the year 2018/2019 the service hours was averagely 22 hours, but in 2019/2020 service hours decreased to 12 hours and 10 hours of service for the year 2020/2021.

The study found that, 62.5% of the respondents from Mnadani ward said that, the water flows averagely for 6 to 12 hours per day, followed by Dodoma Mkulu ward where 50% of respondents

agreed to receive water for the same averagely time of 6 to 12 hours per day, while only 31.3% of respondents from Mkonze ward also agreed to receive water for the same averagely time of 6 to 12 hours per day. Also, about 18.8% of respondents in Mnadani ward said to receives water for averagely about 5 to 12 hours per day, while 37.5% of respondents from Dodoma Makulu agreed also to receives water for averagely about 5 to 12 hours per day and 25% of the respondents in Mkonze wards said to receives water for the same time of averagely 5 to 12 hours per day.

Additionally, 37.5% of respondents from Mkoze ward agreed to receive water for averagely 5 to 10 hours per day and 6.3% of respondents from the same ward said to access water for averagely 6 to 10 hours per day. Also, 18.8% of respondents from Mnadani ward and 12.5% of respondents in Dodoma Makulu ward said to access water for averagely 5 to 10 hours per day. The flow of water on these hours is on the specific days set for water flows in the specific areas. On top of that, the flow of water is only during the day on the area where data were collected from Mnadani, Dodoma Makulu and Mkonze wards. Hence this implying that there is

hindrances of water supply continuity in the area where the study were undertaken.

This findings implying that, despite water service is supposed to be accessed for 24 hours in a day but the residents in the area where the study were undertaken access water for fewer hours due to inadequate water supplied by the water supply authority. In other side, the water supply authority is keep in progress to ensure the water service is adequate supplied to the residents of Dodoma although there have been increasing of complaints towards the provisions of water service. This gives a picture that there haven increasing of the customers that need to be connected to DUWASA's safe water service.

3.1.3 Water leakage due to poor infrastructure

Also, respondents were asked if they had experienced water leakage on their water supply network to the nearby tapping point, and the findings discovered that majority of respondents agreed to have experienced water leakages on their water supply network from the nearby water tapping source due to poor installment and outdated of the water network infrastructure.

Table 2. Number of days do water flows per week

Number of days do water flows per week	Mnadani		Dodoma Makulu		Mkonze	
	N	%	N	%	N	%
Two times per week	-	-	-	-	15	46.9
Three times per week	32	100	3	9.4	17	53.1
Four times per week	-	-	29	90.6	-	-
Total	32	100	32	100	32	100

Source: Research Findings (2021)

Table 3. Time do water flows per day (in the days do water flows)

Hours do water flows in a day	Mnadani ward		Dodoma Makulu ward		Mkonze ward	
	N	%	N	%	N	%
5 to 10 hours	6	18.8	4	12.5	12	37.5
6 to 12 hours	20	62.5	16	50.0	10	31.3
5 to 12 hours	6	18.8	12	37.5	8	25.0
6 to 10 hours	-	-	-	-	2	6.3
Total	32	100	32	100	32	100

Source: Research Findings (2021)

Table 4. Water leakages on the individual's water network

Experienced on water leakages	Mnadani ward		Dodoma Makulu ward		Mkonze ward	
	N	%	N	%	N	%
Yes	14	43.8	16	50.0	6	18.8
No	18	56.3	16	50.0	26	81.3
Total	32	100	32	100	32	100

Source: Research Findings (2021).

Table 5. Measures taken to resolve the water leakages

Measures taken to resolve the water leakages	Mnadani		Dodoma Makulu		Mkonze	
	N	(%)	N	(%)	N	(%)
Contacting with DUWASA to resolve the issue	10	71.4	14	82.4	6	100
Contacting with local personnel to resolve the issue	3	21.4	2	11.8	-	-
Resolving the issue by own experience	1	7.1	1	5.9	-	-
Total	14	100	17	100	6	100

Source: Research Findings (2021)

The findings shown on the Table 4 indicate that, about 43.8%, 50.0% and 18.8% of the respondents from Mnadani, Dodoma Makulu and Mkonze wards respectively signified to have experienced water leakage on their water supply network from the nearby water tapping point while 56.3%, 50.0% and 81.3% of the respondents from Mnadani, Dodoma Makulu and Mkonze wards respectively signified not to have experienced water leakage on their water supply network from the nearby water tapping source. Mkonze wards seems to have little cases of water leakages due to the fact that most of the water supply network installed are advanced and are newly because most the water users from Mkonze ward are the new residents. The findings implying that, water leakage is the challenge that hinders Dodoma residents in accessing water service from the government authority. Not only the residents who are faced with water inaccessibility are in a worse situation, but also the water supply authority lack revenue from the unaccounted water that are lost from the leakage, instead become a burden to the water supply authority.

3.1.3.1 Respondent's intervention on water leakage

Respondents were asked on what measures they undertake to cope with the issue of water leakage of their water supply network from their nearby water tapping point. The Table 5 shows the responses of the respondent concerning their intervention towards water leakage.

The study found that, among 37.5% of the respondents who agreed to have experienced water leakage of their water supply network from their nearby water tapping point, about 71.4%, 82.4 and 100% of respondents from Mnadani, Dodoma Makulu and Mkonze ward respectively connoted that they contacted with the DUWASA water technician to come and resolve the issue of water leakage.

Also, the findings revealed that, about 21.4% and 11.8% of respondents from Mnadani and

Dodoma Makulu ward respectively connoted that, they contacted with the local personnel who are somehow knowledgeable on fitting water pipes to come and fix the issue of water leakage they have faced on their water supply network from the nearby water tapping point. Likewise, about 7.1% and 5.9% of respondents from Mnadani and Dodoma Makulu ward respectively denoted that, they solved the issue of water leakage they have faced on their water supply network from the nearby water tapping point by their own experience.

Respondents who denoted to call for DUWASA assistance added that, the water technician from DUWASA came late on time to resolve the issue of water leakage to the water users. This gives an implication that, DUWASA has fewer personnel to work within the institution as a result they retards the fastest and easiest operation of the activities and water service to the water users. But also, by the time water technician are late to resolve the water leakages to their clients, a loss is counted from the non-revenue water that threatens the better performance of the water authority.

The findings from the water engineers on the planning, designing, construction and project section revealed that; for ensuring adequate water supply and sustainability of the water infrastructure equipment, the water authority uses modern working facilities and equipment for water supply of which they were not used prior, hence due to the use of the modernized facilities and equipment not only they are assure of sustainability of the water network infrastructure but also on providing quality service to their clients.

Likewise, the study intended to know whether the water authority has the tendency of doing water infrastructure connection network check and maintenance. The findings from the water engineers on the planning, designing, construction and project section in DUWASA revealed that, the water entity usually conducting

water infrastructure network check and maintenance in the water system with the interval of six month especially to the most outdated water infrastructure but the water engineer added that, for the sustainability of the water infrastructure they ensure to install the most qualified equipment materials that will still be used for a longer time. On his words, the water engineer said;

...we usually conducting physical infrastructure checkups and maintenance after each six month, mostly to the outdated infrastructure, but for the new infrastructure installment we use the eligible equipment so as to ensure they last longer and shorten up the period of conducting checkups for several times. But also, for the equipment that seems to be worse outdated we change them and place the new ones...

These findings implying that despite DUWASA agreed to make a cross check on the water supplying network system that they have been installing, and despite the use of modernized equipment on the water network supplying system, there are number of complaints reported to face the water users concerning to water leakage from their locality as a results such leakages hinders the accessibility of adequate water to the clients. On top of that, DUWASA also were reported to come late on time when they were requested by the clients to go a resolves the water leakages disputes.

3.1.3.2 Reasons of dissatisfaction of water service provided

Respondents were further gave out their reasons of desertification towards the water service provided by the water supply authority and indicated that, low pressure of water from the taps and unevenly water service supply leading to high scarcity of water were declared as the reasons of strongly dissatisfied with the water service provided as indicated on the Table 6.

3.1.3.3 Low water pressure

The findings from the Table 6 indicates that, 45.1%, 50.0% and 31.7% of respondents from Mnadani, Dodoma Makulu and Mkonze wards respectively signified that, there is low volume of water and speed on their water tapes when water is accessed on the identifies days of accessing water hence they use much time to fetch for water from their water tapes before the water get off. This put connected consumers into a risky situation of lacking water at all since there is no assure if the water pressure would have speed up in the near future or water is going to cut off, hence to their desertification with the water service provided by DUWASA. One respondent who had a water tank installed in her house claimed about the water pressure from the tapes by stating that,

...I am about to rung down that tank because it is not helpful anymore since water does not enter into it due to low pressure; water cannot flow up to there. It's better the tank to be down so that I can fetch water on the tape by my own hands and pour it to the tank for uses on the days when water will not be accessible; otherwise that tank is not useful...

A researcher sought to know the reason of low water pressure from the tapes on the days when water is accessed; the water engineer replied that;

...we are trying to provide better services to our clients but challenges are inevitable especially for now where the scope of our clients is increasing daily regarding the population growth in the city, it is true, sometimes the water pressure is very low as due to the number of the client we serve but sometimes it is because of the technical reasons or due to electricity cutoff. You may found at the time when the electricity went off, the water pressure also starts to cease and hindering the accuracy speeds of wate.

Table 6. Reasons for the dissatisfaction of the water service

Reasons	Mnadani		Dodoma Makulu		Mkonze	
	N	%	N	%	N	%
Unevenly water service supply leading to high scarcity of water	28	54.9	30	50.0	28	68.3
Low water pressure/ speed	23	45.1	30	50.0	13	31.7
Total	51	100	60	100	41	100

Source: Research Findings (2021)

The findings implying that, the low water pressure is the challenge that hinders most of the people in accessing water services from the the responsible authority had also agreed to have such a challenge. Although for the side of the water supply authority has denoted that, such problem might due to their faults or due to the electricity challenges that supports the water pumps in pushing water to different places in the city.

3.1.3.4 Unevenly water service supply leading to high scarcity of water

The findings from the Table 6 reveals that, about 54.9%, 50.0% and 68.3% of the respondents from Mnadani, Dodoma Makulu and Mkonze wards respectively agreed to have unevenly water service supply that leading to high scarcity of water that also leads to water-cut off for some days. The findings from the study imply that, Mkonze ward receives water for fewer days as a result there is high scarcity of water that leads to water cut-off for several days than Dodoma Makulu and Mnadani wards, this is due to the fact that, Mkonze access water just for two days per week as revealed by majority of the respondent; this situation was also observed during the field visit at Mkonze ward where there is new water connection network supply to most of the new customers.

For the case of fewer days of accessing water that leads to high water scarcity at Mkonze wards, water engineers from DUWASA agreed on that and connoted that it is due to the amount of water being produced is still not adequate but DUWASA still on progress to ensure the water is adequate enough to serve for the population in Dodoma city.

A number of complaints were reported to increase as the number of the clients also increases, hence there were 3001, 6,957 and 12,099 customer complaints reported for the fiscal year 2018/2019, 2019/2020 and 2020/2021 respectively. Much of the complaints were relating to water shortage, unreported water cutoff and low speed of water flowing on the tapes. When asked to reply on these complaints, a water engineer from DUWASA confessed their intention in serving for the population in Dodoma city.

...as an institution which has the responsibility to serve the population with adequate water at all the time, we are trying to our level best to do so... but the coverage

public water supply institution because most of the respondents had appealed about it, of which

that we are supposed to serve is dynamic and everlasting which challenge us on speeding up our projects on time but shortage of fund from the internal source has been a hindrance on keeping pace on complying with the situation of high water demand although there are clients who are late on paying their bills on time, this also is a challenge because we depend on such money to keep operating smoothly...

Another water engineer replied;

...there are series of activities that are on the progress by DUWASA which intends to expand the water supply network reaching new customers and excavating new boreholes while the other boreholes are being rehabilitated, all these projects facilitates to reduce the scarcity of water and improve water service supply in the city, but The amount of fund planned for the implementation of such activities does not comply with our internal monthly revenue collection and the funds from the ministry of water are given periodically and sometimes not on time, hence to delay of the activities and project as a results it leads to customers complaints...(Water engineer from DUWASA. 2021).

These findings implying that, regardless of the complaint reported concerning to unevenly water service supply that leads to water scarcity among the residents of Dodoma City, still there are number of efforts and initiatives that are done by the water supply authority in DUWASA that aimed to distribute adequate water to the clients.

These findings are dissimilar with the findings from Tembo [22], who conducted a study on evaluation of the effectiveness of water supply improvement projects; a case study of Blantyre Water Board, Malawi. In his findings, he disclosed that there were improvement on the provision of water service where customers were able to get pressurized supply for 24 hours after the improvement has been done and about 70.19% of the customers were strongly satisfied with on the water pressure. The situation is dissimilar in Accra Ghana where the water supply is unreliable and rationed, customers receives water once a week or not at all as indicated in the study of impacts of urban land

use change on sources of drinking water in Kumasi Ghana [23]. The situation is similar with what reported in Dar es salaam in the study of water service delivery for the urban poor in Tanzania, where disclosed that, only 76% of the growing population were served by DAWASA with the huge scarcity of water but its contrary to Tanga where production of water exceed the demand and 106% of the population are served by the UWSA in Tanga city indicating that there is no scarcity of water (Simon, 2008).

Like in Malawi as the findings disclosed by Tembo [22] where there were improvement on the provision of water service thus customers were able to get pressurized supply for 24 hours, DUWASA should also have to ensure that they make more efforts that will results them to provide adequate water services so as to let the Dodoma city residents to be well satisfied with the water services provide by the public water supply authority.

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The research findings revealed several significant technical challenges hindering access to water from DUWASA in Dodoma city. One of the primary challenges is the limited continuity of water supply, with respondents from different wards reporting varying numbers of days per week when water flows. This scarcity of water supply leads to water cutoffs, forcing residents to access water services on limited days. Additionally, there is a decrease in service hours over the past three years, with some respondents receiving water for as little as 5 to 10 hours per day, far below the recommended 24 hours. Low water pressure is another prevalent issue, with many residents facing inadequate water flow from their taps, resulting in time-consuming water collection and dissatisfaction with the services.

The study also uncovered cases of water leakage due to poor infrastructure, with a considerable percentage of respondents reporting experiencing water leakages from their nearby water tapping points. While some residents took measures to cope with these leaks, such as contacting DUWASA for assistance, delays in resolving the issues were noted. Furthermore, the research found high water scarcity in Mkonze ward, leading to water

cut-offs for several days, which is exacerbated by inadequate water production. The high number of customer complaints related to water shortages, unreported water cutoffs, and low water flow speed further highlights the challenges faced by residents in accessing reliable water services.

The responses from DUWASA's water engineer acknowledged the existence of these challenges and the efforts made by the authority to address them. However, resource constraints, such as insufficient funds and delays in project implementation, have been significant obstacles in meeting the increasing water demand in the rapidly growing city. Despite using modern facilities and equipment to ensure sustainable water supply, the authority still grapples with technical issues arising from outdated water infrastructure and leakages. These findings underscore the need for continued investment in infrastructure upgrades, proactive maintenance, and sustainable water management strategies to ensure equitable and reliable access to water services for all residents in Dodoma city. Addressing these technical challenges is crucial for DUWASA to fulfill its responsibility of providing adequate and quality water services to the growing population in the region.

4.2 Recommendations

4.2.1 To the dodoma urban water and sanitation authority

The water authority should use modernized water networks and ensure to increase more sources of water that will lead to exploit more water; it is necessary for the water entity to establish an advanced fast water networks to reallocate water resources, regulate water supply and consumption in the city so as to fulfill the demand of the clients and shutdown the water scarcity. The water authority should have to ensure adequate water supply to the clients in all the days and hours as recommended by the Key Performance Indicators and EWURA of providing the water service for 24 hours in all days of a week.

The water authority should keep installing the modern water supply infrastructure and equipment to the water network system for ensuring its sustainability and always keep cross checking and doing maintenance several times especially to the most outdated water infrastructure so as to avoid water leakage and non-renewable water.

4.2.2 To the residents of dodoma city

The community should be responsible on paying their water bills on time as when they receive their water bills invoice through their mobile phones. Paying the water bills on time facilitates the water authority to take its operation smoothly because such payment of bills is the source of income of the water authority. Thus for the continual of the water service supply, clients should be responsible on paying their water bills on time.

The clients should also participate with the water authority by giving information on what is going on within their respective areas that may be negatively affecting the water authority. Clients should participate by giving report when they see water leakages or illegal water connection happening from their locality. This will facilitate to reduce the non-revenue water to the water authority and increases the revenue of the produced and supplied water; also it will assure the sustainability of the water network supply infrastructure and reduce the costs of technical checks and maintenance.

4.2.3 To the government

The central government through the ministry of water should also keep supporting the urban water supply and sanitation authority in Dodoma in financial matters timely so as to fasten the operation of the authority in supplying water to the clients.

Based on the local water resources and population size in urban area of the Dodoma city, the central government through the ministry of water should continue to support the water authority in Dodoma to ensure controlling the population to align with the urban water infrastructure this will facilitate to keep the water infrastructure in longer life without water leakage that might leads to non-revenue water.

CONSENT AND ETHICAL APPROVAL

Ethical issues play critical role in determining credibility and legitimacy of research in the social science disciplines like community development. In this study the researcher considered the following ethical issues: the researcher sought an approval letter from Dodoma City Council for conducting the research before collecting data in the targeted area. The researcher protected respondents in the manner that, there were no

personal descriptions on the interview processes and also the information that collected was only used for the purpose of this study. Respondents were also informed on all issues relating to this study, and the possibility for them to access the findings and research report at the end of the study.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Avolio C. Water service delivery solutions in rural and peri-urban areas in developing countries: are public partnerships a valuable alternative to private sector participation? UPC Polytechnic University of Catalonia. 2016; 4:9-20
2. Wakode HB. An Analysis of Urban Growth and Assessment of Impact of Urbanization on Water Resources – A case Study of Hyderabad, India. Aachen University. India. 2016:48-59.
3. Sharma A, Bharti B, Joshi H. Water Scarcity in Developing Countries: A Review of the Evidence. International Journal of Environmental Research and Public Health. 2018;15(3):536. DOI:10.3390/ijerph15030536
4. WHO. Water Sanitation and Health: Water supply, sanitation and hygiene monitoring; 2023. Available:www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/monitoring-and-evidence/wash-monitoring [Accessed on 08 October, 2023]
5. Dakyaga F, Kyessi AG, Msami JM. Households' assessment of the water quality and services of multi-model urban water supply system in the informal settlements of Dar es Salaam, Tanzania. Journal of Civil Engineering and Architecture. 2018;12(5):362-381.
6. Dakyaga F, Kyessi AG, Msami JM. Water access today and tomorrow: domestic water sustainability under informal water supply markets in Dar es Salaam, Tanzania. Journal of Sustainable Development. 2018;11(6):120.
7. Bhandari P. An Introduction to Qualitative research; 2020.

- Available: <https://www.scribbr.com/methodology/qualitative-research/> [Accessed on 16th April, 2021].
8. WHO. Drinking-water. Key facts; 2019. Available: <https://www.who.int/news-room/fact-sheets/detail/drinking-water> [Accessed on 10 March, 2021].
 9. URT. Dodoma Municipal Council Profile; 2012. Available: <http://dodomamc.go.tz/storage/app/media/uploadedfiles/DODOMA%20MUNICIPAL%20PROFILE.pdf> [Accessed on 23rd March, 2021]
 10. Manyele SV, Majani B, Masanyiwa ZS. Assessing water supply challenges in urban areas of Tanzania: A case study of Dar es Salaam city. *Journal of Environment and Earth Science*. 2016; 6(6):64-74.
 11. Mwandosya R, Mwaseba D, Mlozi MRS. Analysis of challenges facing urban water supply infrastructure: A case of Arusha city, Tanzania. *International Journal of Innovative Science and Research Technology*. 2018;3(5):529-538.
 12. Magembe AA, Luhunga PV, Temu RP. Assessment of technical challenges in urban water supply systems: A case of Iringa municipality, Tanzania. *International Journal of Engineering Research and Technology*. 2019;12(5):561-572
 13. Energy and Water Utilities Regulatory Authority (EWURA) Water utilities Performance Reports, Dar es salaam, Tanzania. from 2011/2012 to 2013/2014: 15
 14. Pullan RL, Freeman MC, Gething PW, Brooker SJ. Geographical inequalities in use of improved drinking water supply and sanitation across sub-Saharan Africa: mapping and spatial analysis of cross-sectional survey data. *PLoS Medicine*. 2014;11(4):e1001626.
 15. Tiwale S, Rusca M, Zwarteven M. The power of pipes: Mapping urban water inequities through the material properties of networked water infrastructures-The case of Lilongwe, Malawi. *Water Alternatives*. 2018;11(2):314-335.
 16. Songa S. DUWASA Vows to solve Dodoma City Water woes within 100 days. *The Guardian Publications*. Friday 8, January. Dodoma Tanzania. 2021;5.
 17. Wawa AI. Challenges facing wastewater management in fast growing cities in Tanzania: A case of Dodoma city council. *Huria: Journal of the Open University of Tanzania*, pg. 2020;27(1).
 18. Cherry K. How Does the Cross-Sectional Research Method Work? *Journal on Features of a Cross-Sectional Study*; 2019. Available: <https://www.scribbr.com/cross-sectionalresearchmethod/research-design/> [Accessed on 14th March, 2021].
 19. Kothari CR. *Research Methodology: Methods and Techniques*. New Age International. New Delhi. India pg. 2015;2: 55-62,95-152.
 20. Ahile SI, Udoumoh EF, Adzande P. Residents Coping strategies with water scarcity in Makurdi Town, Nigeria. *Mediterranean Journal of social sciences*. MCSER Publishing, Rome-Italy. 2015;6(4): 100. Available: <https://www.richtmann.org/journal/index.php/mjss/article/view/7056> [Accessed on 15th May, 2021].
 21. Senna R. Household Coping strategies of water scarcity: the case of Madina, A suburb of the La-Nkwantanang District in the Great Accra Region. *School of social sciences, Evangelical Presbyterian University College*. Volta Region, Ghana. 2021;68.
 22. Tembo, J. Evaluation of the effectiveness of water supply improvement projects; A case study of Blantyre Water Board, Malawi. *University of Dar es salaam*. 2016: 35:40
 23. Eduful MK. Impacts of urban land use change on sources of drinking water in Kumasi, Ghana. *Graduate Student Thesis, Dissertations, & Professional Papers*; 2014:4219. Available: <https://scholarworks.umd.edu/etd/4219> [Accessed on 14th May, 2021].

© 2023 Masanja; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/107578>