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Portable Water Shortages on Households in Bomaka in the Buea Municipality, South West Region of Cameroon: Challenges and Coping Strategies

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Abstract

Today, in most urban areas in Sub-Saharan Africa, dwellers are facing difficulties in adequately accessing potable water in sufficient quantity and quality for their daily needs and uses. Analogously, there have been fledgling challenges triggered by portable water Shortage in Bomaka. This study aims to assess the problem of potable water accessibility in Bomaka in the Buea Municipality and the coping strategies developed by dwellers to meet their needs. The study used exploratory, inferential and descriptive research approaches. In this light, the cross-sectional research design was adopted to address the overall problem. A preliminary reconnaissance survey was accomplished whereby questionnaire and interview guides were administered. A total of 200 households were selected and investigated based on purposive and systematic random sampling, particularly around the water points. Secondary information was sought from published and unpublished materials. Results reveal that in Bomaka 100% of the households sourced their water from alternative sources (boreholes, wells, streams and springs) without any pre-treatment. Most of these sources do not flow regularly because of siltation or a drop in the volume of flow, especially in the dry season. The Cameroon Water Utilities Corporation (CAMWATER) is absent in this locality. Results also revealed that water sources were located at reasonable distances. This study records that the major causes of portable water shortages were population increase, poor planning and water pollution. The implications of irregular and portable water shortages are increased health risks, poor hygienic condition, disruption of economic activities and domestic routines. The study concludes that water remains the yard stick and a panacea to many countries and households. Thus, adequate planning, undivided attention and holistic measures should be implemented in order to sustain its accessibility.

Keywords: Alternative water sources, Bomaka, challenges, coping strategies, water shortages

1. Introduction

Access to water has always been a major preoccupation to man in time immemorial. Today, the main difficulty faced in most communities is not only the access to water but more precisely access to potable water. Indeed, the problem arises in terms of water quality, quantity, and the availability this resource. Many people in the world lack access to clean and drinkable water, with women and children in developing countries being more vulnerable (Millennium Development Goals Report 2008). According to the Millennium Development Goals Report (2008), 1.6 billion people in the world live in areas of economic water scarcity, where human habit, institutional weaknesses and financial capitals shortage limit access to portable water. In the frame of its 2010-2020 Document of Strategies for Growth and Employment (DSGE), the Cameroonian Government's objective was to increase the access rate to drinking water from 45% (national average in 2010) to 80% and the sanitation access rate from 13.5% (national average) to 60% by 2015. In the Municipality of Buea in general and particularly in the Bomaka, this goal is far from being achieved.

With the absence of CAMWATER services in this locality, dwellers resort to alternative sources of water; they rush to wells, boreholes, springs and even streams to obtain water for their daily uses and most often this in complete ignorance of the quality of these waters. This study therefore aims to assess the problem of potable water inaccessibility in the Bomaka and the mitigating strategies developed by inhabitants to meet their needs accordingly.

According to World Health Organisation (WHO, 2018), portable water shortages is the condition in which there is poor quality and insufficient quantity of portable water needed daily in order to sustain socio-economic activities which continue to be the rise. Portable water shortage is trigger by natural calamities such as drought or anthropogenic factors such as pollution, population increase (Nkemngu, 2011) and inadequate distribution schemes. Over the years, the availability of portable water for most of the households and industries has been fluctuating at rate which has resulted into water crisis (water scarcity) in almost most parts of the world. In January 2015, World Economic Forum made mentioned that water crisis is the number one global risk on the basis of its effect to the society. In the world, there are 650 Million people having no access to portable water (Boisson et al., 2013). It has been noted that the demand of fresh water by the leap-frogging population is increasing every day. This is acute in the Sub-Saharan Africa and Asian. According to the UNICEF (2008) water scarcity affects 1 in 3 persons in the Sub-Saharan African region and getting worse with population growth, urbanization and the increase in household sizes beside industrial uses. According to Ahmed and Roy (2007) agricultural intensity has dropped in Bangladesh due to insufficient water to carry out irrigation schemes and other related agricultural activities.

It has been estimated that every year, nearly 1 Million people die due to water shortages that often resulted to the development of water borne diseases. In addition, more that 37.7 million people are affected by water borne diseases, 1.5 million children are estimated to die of diarrhea alone, and 73 million working days are lost due to waterborne diseases annually (Gambbir, 2012 and Baba et al., 2019). Water shortages are also at its peak in some major cities in Cameroon such as Douala and Yaounde beside towns like Buea and Limbe. Water shortages

has ushered in many challenges such as the emergent of waterborne diseases, poor sanitation, and increased number deaths in many of these towns (Mofor, 2001). Over the years, Bomaka has been faced with frequent portable water shortages.

2. Methodology

2.1 Conceptual Framework

Population growth in urban areas is maintained by an increase in births, rural exodus and the *"internally displaced persons" (IDP's)* (UNFPA, 2004). People move towards large urban centres each day in search for a better living and others move for safety. According to experts of the United Nations Fund for Population Activities (UNFPA, 2004), population growth is one of the main causes of the increase in needs as concerns housing, water, hygiene, energy, healthcare, education, social services, food and difficulties of sustainable sanitation (Keyetat, 2014; Tiafack et al., 2014; Tiafack and Mbon, 2017). According to WHO (2011), the importance of water, sanitation and hygiene for health and development has been reflected in the outcomes of a series of international policy forums, showing the importance of water to human societies. Access to safe drinking-water is essential to health, a basic human right and a component of effective policy for health protection. Water is therefore considered as a necessary element on which relies the development of a civilization. All forms of life are intimately linked to the presence of water (Kenfack, 2018) (Figure 1).

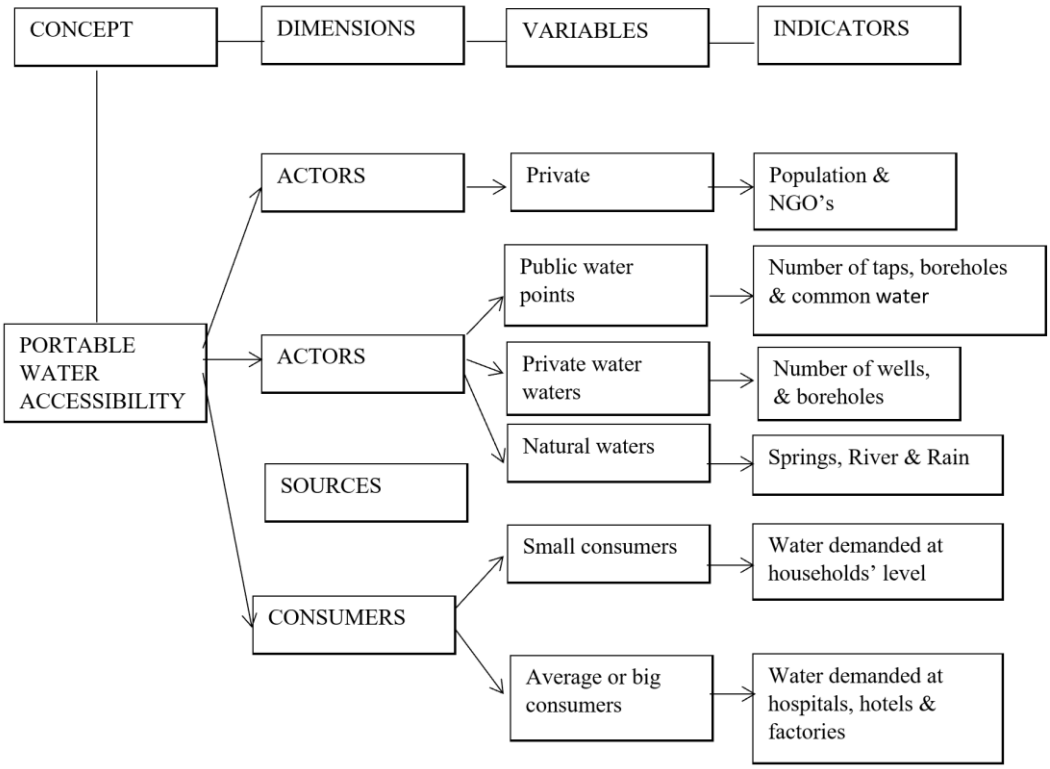


Figure 1: Conceptual framework on portable water Source: Conceived by the authors, 2023

Source: Fieldwork 2023

The World Health Organization (WHO, 2011) defines potable water as water which is drinkable, good for food preparation or personal hygiene without any harmful effect to health over a lifetime of consumption, including different sensitivities that may occur between life stages. It is also evident that each year, unsafe drinking water, poor hygiene and lack of sanitation facilities contributes to the death of millions of the world's poorest people from preventable diseases and particularly waterborne diseases (Pruss et al., 2002; Cairncross et al., 2003; Mara et al., 2007). Waterborne diseases are sickness conditions caused by pathogenic micro-organisms that are transmitted through use or consumption of contaminated water, or by eating food exposed to contaminated water. Waterborne diseases include cholera, dysentery and other diseases that are responsible for diarrheas (Black and Fawcett, 2008; Djaouda et al., 2022). Concerning diarrheal diseases, it is estimated that 1.8 million people die worldwide every year. Amongst them, 90 % are children under 5 mostly in developing countries (WHO, 2011).

Bomaka is one of the neighbourhoods in Buea Sub-Division of Cameroon. It is located between longitude 9.3164º and 9°18' 59'' east and Latitude 4.1578° & 4°9'28'' north (Figure 2). It has an elevation of some 494 metres and is divided into 6 quarters.

The completion of this study required the collection and processing of sets of both primary and secondary data from which we obtained the information needed to achieve the objectives of the study. Secondary information and research on existing documents, articles, journals and the internet, and audio-visual sources opened the way for the identification of some key concepts on water accessibility` and basic sanitation rules, as well as statistics on population growth, water demand and water sources. To collect primary data, field surveys were done with a team of researchers. The survey covered households in Bomaka, and used a purposive and systematic random sampling procedure to select targeted households. Free talks and semi-structured interviews were done with the quarter heads of quarter, some members of the population and stakeholders involved in water management (NGO's and Councilors), Ministry of Economy, Planning and Regional Development, Ministry of Water and Energy, and Ministry of Housing and Urban Development) to gather information on urban planning and water accessibility in Buea. A total of 200 standardized questionnaires designed were administered primarily to heads of the selected households or their representative. The questionnaire sort to obtain information on water sources, availability, quantity and quality; also on the challenges faced having access to potable water and the coping strategies developed.

The research was a descriptive and an exploratory study. These approaches were adopted in order to investigate the factors responsible for the portable water shortage in Bomaka as well as its implications on the livelihood of households. In this light, the cross-sectional research design was adopted. The targeted population for the study was the inhabitants of the Bomaka, institutions and NGOs in charge of water management and sanitation, the council and the various health institutions in the area. Through a simple random sampling, 200 questionnaires were administered to the different households of Bomaka. Also, structured interview guides were administered through the stratified techniques. Primary data sources for the study were equally obtained through observations, interviews and questionnaires. Secondary data for the study were obtained through the review of published and unpublished articles, offline and online libraries, magazines, database and reviewing of daily records of some private health

centers. Data collected during the field survey were analyze through two statistical techniques. The qualitative data obtained during the course of the survey was analyzed through the content analysis whereas themes and codes were given to the different opinions and perceptions of the informants and their frequencies and percentages were being determined from there. Qualitative information which could not be analyze were used as recommendation measures in the study. Inferential statistical techniques were equally used during the analysis. Here, mean and variance were mostly used. The results of the analysis were visualized on graphs, tables, pie-charts, histograms and plates. Precautions against Covid 19 and cholera were highly practice during field survey. Also, authorization was taken from quarter heads to carry out the study in this locality.

2.2 Statement of the Problem

Bomaka remains one of the most influential neighborhoods in the Buea Municipality. It is an area with fast growing socio-economic activities (particularly *"small businesses")*. Because of the perennial and the intergenerational opportunities that this locality offers to its population, many of them have successfully set up socio-economic activities which have greatly improved their living standards over the years. However, such socio-economic activities have slowed down with the rising shortage of portable water. Individuals who depend on different water source are faced with poor sanitation and health problems which result from doubtful water sources. Some water sources are polluted with chemicals he from nearby farms and toilets. Water shortages have disrupted many socio-economic activities. Apart from the fact that many women and children now trek for long distances in search of portable water, it has increased pupils and students' lateness and absences during lessons. Consequently, a greater proportion of the households have been grappling with different adaptation measures to curb this precarious situation, but their individual measures adapted has yielded temporal success and with most of these measures being futile. It is in this background that this study seeks to provide collective and sustainable measures to improve on portable water accessibility to the dwellers in Bomaka in the Buea Municipality.

During the early morning and late evening hours these points are overcrowded and the situation is even severe during weekends particularly on Saturdays. Portable water shortages are mainly caused by irregular flow, no pre-treatment. Consequently, this has led to water rationing by different owners and management committees. Again, the rapid population growth experienced in this locality and the extension of settlements lack congruence with accessibility to portable water sources. To fill the gap in portable water accessibility, it is imperative for public authorities, NGO's and quarter committees involve in managing the resource in this locality to harnessed water sources that are undeveloped and write petitions to the Buea Municipal Council requesting for solar powered boreholes at strategic road junctions with multiple head taps and improve its maintenance system to serve the ever increasing population in this locality. The *raison d'etre* is to highlight good practices in the adaptation measures to mitigate the challenges posed by portable water shortages.

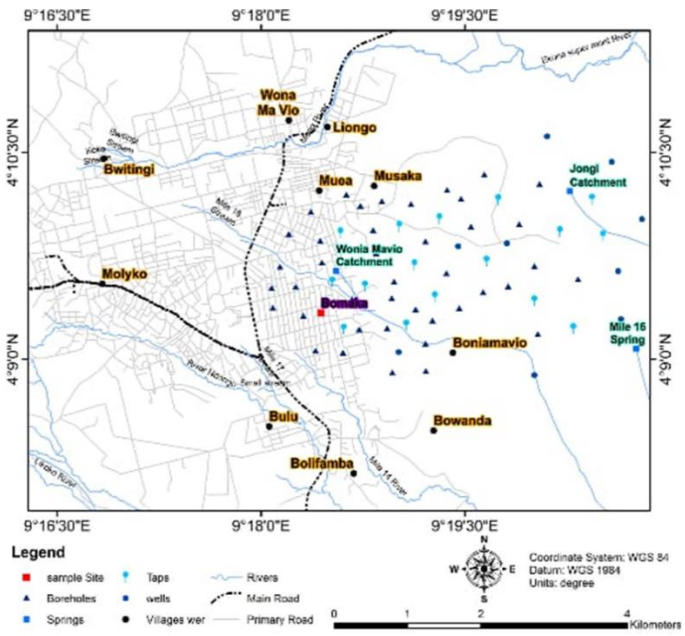
3. Research Justification

This study focused on a challenging issue that has plagued many regions in the world where

there is weak governance in the background of poverty, rising population densities and increase water uses. This is very pertinent in Sub-Saharan Africa and so renders the choice of Bomaka in the Buea Municipality of Cameroon apt to illustrate the vivacity and relevance of the study. Thus, addressing portable water shortages in this locality is of utmost importance because water is a necessity to support these inflated population numbers. Again, the topic is current and relevant, as it is framed in accordance with the National Development Policy of Cameroon (Vision 2035). More so, this study contributes greatly to the attainment of the Sustainable Development Goals 2030 (Goal 6 that targets safe drinking water and maximum sanitation in all the communities).

3.1 The Spatio-Temporal Analysis of Portable Water accessibility

Spatio-temporal analysis of portable water was analyzed in respect to its availability, affordability and spatial distribution.



Map 1: Spatial location points in Bomaka

Source: Field survey (2022)

As concern the sources of portable water, pipe borne, boreholes, wells, and springs are used by the dwellers in Bomaka (Map 1 and Figure 2).

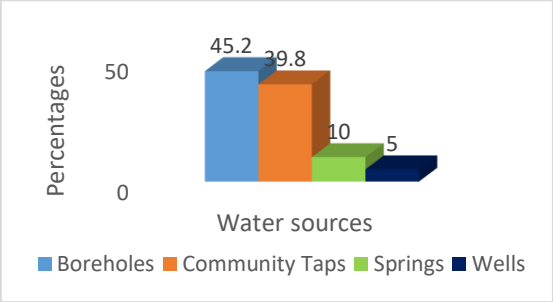


Figure 2: Sources of portable water in the Bomaka
Source: Field survey (2022)

Results from field survey showed that boreholes are the main source of water in Bomaka as confirmed by 45.2% of respondents (Figure 2). This was followed by community taps (39.8%) spring (10%) and the least is well (5%).

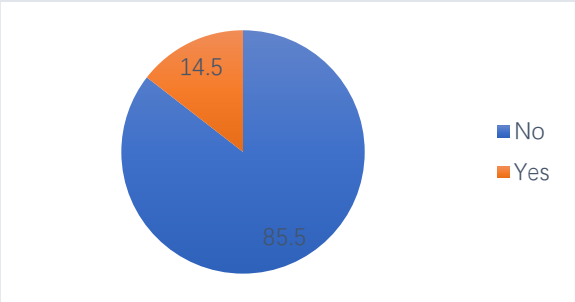


Figure 3: General Perceptions on portable water availability
Source: Fieldwork (2022)

General investigations according to the information on Figure 3 revealed that most of the households do not always have enough portable water as indicated by 85.5%, while 14.5% of the respondents claimed that they do have enough water. This result was the primary indicator of water shortage.

A survey was done on the number of times that owners of portable water sources usually make it available for the population and also on the number of days that these sources of portable water flow in a week. Results revealed that it was always morning and evening times.

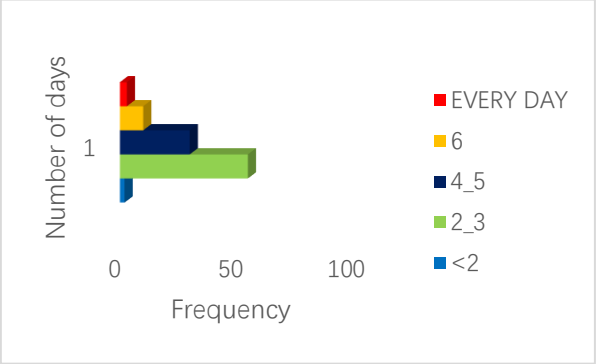


Figure 4: Weekly days of water availability in the Bomaka
Source: Fieldwork (2022)

Most of the portable water sources flow 2-3 days in a week as indicated by 55% of the respondents, while 30% of the households revealed that water flows between 4-5 days (Figure 4). According to the survey, water hardly flows above 5 days in a week. Findings also revealed that majority of the households do not get close to 20 liters of portable water daily.

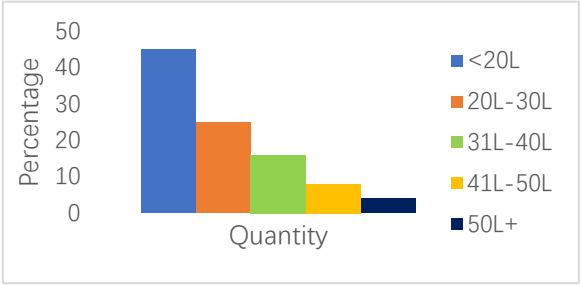


Figure 4: Daily quantity of water access by each household

Source: Field Survey (2022)

Since the installation of some taps, they have remained abandoned (Plate: 1).

Plate 1: An abandoned water Tap in Bomaka

Source: Fieldwork (2022)

Some 45% of households obtain less than 20 litres while 25% of them access 20 liters-30 litres of water daily. And the least were those who access >40 litres of portable water daily. Plate 2, showed individuals stranded at a borehole source in Bomaka to fetch portable water. As concern the spatial patterns of portable water, majority of the dwellers trek for about 2km distances before getting access to the portable water. Figure 5 showed the distances covered by individuals on daily basis to access portable water.

Plate 2: Individuals over crowded at a borehole source to fetch water in Bomaka
Source: Fieldwork (2022)

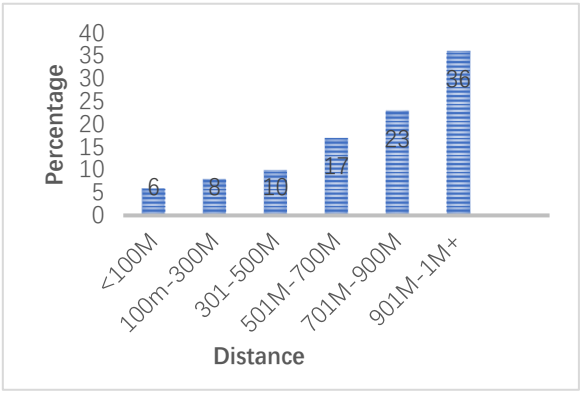


Figure 5: Distance covered by the households to access portable water sources
Source: Field Survey (2022)

Some 36% of the households cover a distance of 901m and above 1 km to access portable water sources, followed by those covering 701m-900m (Figure 5). Few of the households cover less than 300m to access portable water sources. From this analysis, it is clear that there is water shortage in this neighborhood which posed challenges on many of the households especially women and children. Plate 3, show an individual leaving Bomaka to fetch water on a truck at Mile 18 which is a distance of over a km.

Plate 3: The quest for water in Bomaka
Source: Fieldwork (2022)

A survey was also done on the seasonal variability of portable water in Buea Municipality from the year 2015-2021. Result showed that portable water accessibility has been unstable in this Municipality over the years with more fluctuations in the quantity of portable water obtained by each household during the dry season (Figure 6).

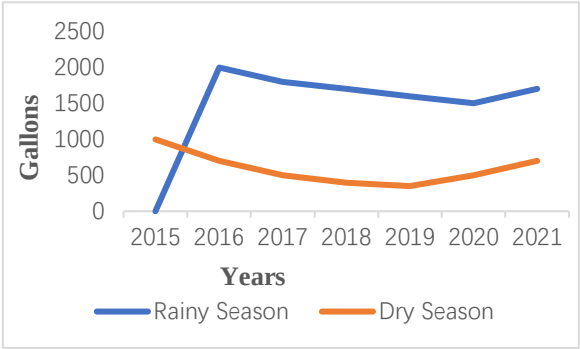


Figure 6: Seasonal variability in the quantity of portable water access by households in from 2015-2021

Source: Fieldwork (2022)

In line with Figure 6, results showed that portable water accessibility has been on its peak in the year 2015 and 2016 and from 2017, it started fluctuating drastically up to date. The reasons behind the steady water accessibility in the year 2015 and 2016 was due to the presence of reliable catchment areas that were not yet exploited and also due to the limited number of people who were in this locality. Since 2017, there has been an inflated population growth in the area, intensive and rampant exploitation of water catchment areas through the construction of settlement and farming. There has also been visible climatic variability affecting most of the portable water sources. Although, the aforementioned phenomenon still exist in 2021, portable water accessibility is rising amidst those challenges because there have been a lot of improvements in individuals' artificial sources of portable water such as boreholes and wells in the locality.

3.2 Causes of Portable Water Shortages

According to field survey, water shortages in Bomaka are not only occurring naturally but the factors are interwoven with more being of anthropogenic origins. From field finding, deforestation, domestic pollution and population pressure constituted 30%, land anthropization constitute 20% Domestic pollution constituted 17.5% and the least limited water resources constituted 2.5% as revealed on Figure 7.

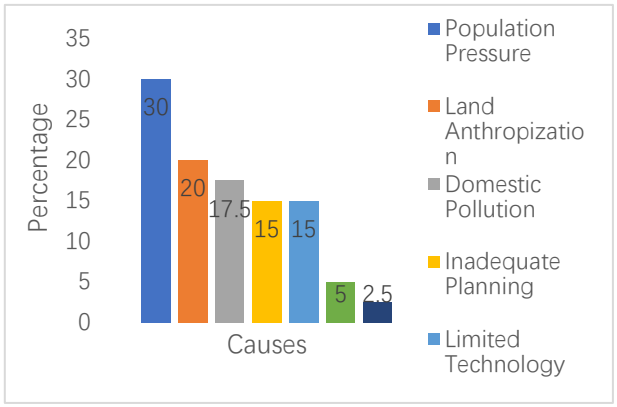


Figure 7: Major Causes of Portable Water Shortages in the Bomaka

Source: Fieldwork (2022)

3.3 Implications of portable water shortages on households and adaptation measures in Bomaka

With the prevailing situation of water shortages in the Bomaka, most of the population consider themselves living in an uncomfortable environment and many of their livelihoods activities have been disrupted. Investigations on the implications of portable water shortages was done age wise, taking in consideration those below 5 years as children, 6-18 as youths and the adults and aged population. Results of the survey showed that mostly children and the aged population suffer more from the incidence of water shortages as presented on Figure 8.

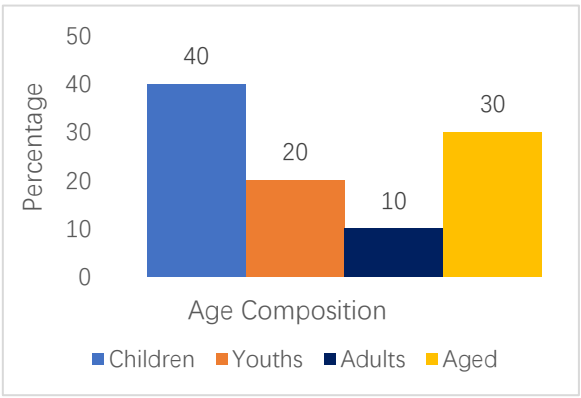


Figure 8: Age-wise implications of portable water shortages

Source: Field Survey (2022)

Figure 8, 40% children and 30% age groups were the dominant ages faced more pressure as a result of portable water shortages; 20% attested to the youths while the least (10%) pointed to the adult population. Details investigations on the implications of portable water shortages in the neighborhood shows that majority of the population suffer from elevated health challenges such as water borne diseases as well as poor hygienic conditions as presented on Figure 9.

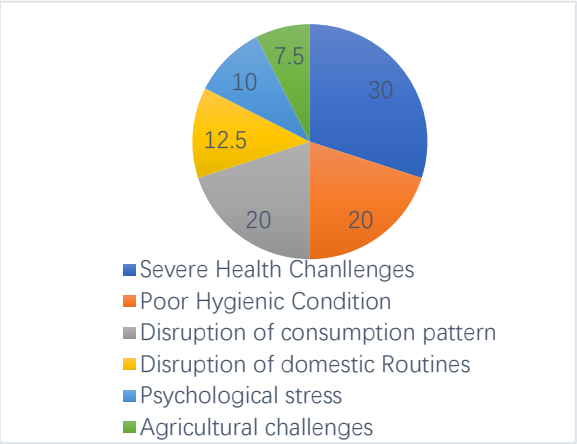


Figure 9: Implications of Portable Water Shortages in Bomaka

Source: Field Survey (2022)

During the course of the survey, majority (30%) of the households revealed that because of portable water shortages, they usually faced the problem of poor health conditions, 20% attested to poor hygienic conditions and little quantity to consume. 10% said that they faced psychological stress while the least (7.5) stood for agricultural challenges.

Due to the aforementioned challenges, most of them (35.2%) said they consumed untreated water most of the times as a way of adaptation while 10% said they buy processed water. Majority also claimed that they travel along distance to fetch portable water while 5% said they purify water by boiling. While majority said they do strict rationing of portable water. Others said they do get up at early and odd hours to fetch water from nearby sources.

4. Discussions

In developing countries, access to potable water remains a great issue in the 21st century as stated in the United Nation Development Programme (UNDP, 2016) sustainable development goals number 6 (SDG6: Clean Water and Sanitation). Water scarcity affects more than 40% of people all over the world, an alarming figure that is projected to rise as temperatures do. Therefore, one of the SDG6 targets was to assure adequate access to safe and affordable drinking water for all by 2030.

According to the strategic document for growth and employment, the level of poverty in Cameroon is residual and the level of revenue per inhabitant makes Cameroon a country with intermediate revenue. In Bomaka, people spend time and money to get water, and most often travel long distance to fetch the precious liquid. In the same vein, Tadesse et al., (2013) reported that in the Adama area of Ethiopia, the water schemes were located at reasonable distances. That is less than 2 km in most cases and the time taken for round trip to fetch water from source was less than or equal to 30 minutes in most cases, however the queuing time was more than an hour.

The study has investigated the challenges of portable water inadequacy in households in Bomaka. During the survey, boreholes which constituted 45.2 % were noted as the major source

of portable water in the locality due to the current technological improvement and increase in the income levels of individuals. This was followed by community taps, springs and wells. This was in contrast with the study of Baba et al., (2019), who noted that pipe borne water was the major water source in the Buea Municipality. Further investigations showed that most of the individuals cannot boost of 20 litres of water daily and many of them traveled over 1km distance in search of portable water. These were evidences of vulnerability as the aforementioned do not match with the criteria stipulated by the WHO (20) and UNICEF (2008). According to them, each individual should have access to 20 litres of portable water per day and within 1 km from household.

Portable water accessibility has also been wavering in this locality and intensifying with the coming of the dry season. In recent times, there have been some improvements in water availability because of the development of boreholes in the area. However, this study revealed that 64 % of these households in Bomaka face frequent water shortages mostly during the dry season. The fluctuation in water availability which has been linked to the reduction in the frequency and amount of rainfall was earlier confirmed by Ayonghe (2001) who observed that the seasonal variability of climatic condition was one of the most challenging factor affecting hydrological systems.

The major factor responsible for portable water shortages in this locality is population pressure. The population in the area has grown naturally and also through migration triggered by the prevailing socio-political crisis. Because of this, nearby water catchment areas and spring sources have been rapidly exploited through deforestation for farming, settlement construction and other land uses. This finding was in conformity with (Mofor, 2001) who in assessing the challenges of portable water supply noted that population pressure on water resources was one of the multiple factors hindering water availability in an area. Also, water pollution from agricultural and domestic activities was contributing factors to water shortages in the locality. Water catchments were noted to be polluted by farmers with chemicals such as insecticides, pesticides and fungicides during the crop cultivation periods. This finding confirms that of Kimengsi et al. (2009) who in assessing water rationing, its patterns and effects in the Buea Municipality noted that one of the factors which fueled up the frequent shortages and rationing of portable water was poor planning by the Local Council and the government. Another profound cause of water shortages was the leaking of water pipelines. This is because most of the pipes used in distributing water in this locality were too old and have expired developed cracks and are leaking and needed to be replaced. This has led to a reduction in the quantity, frequency and duration at some portable water source points.

Most of the households examined revealed that mostly children below the ages of 10 years are at risk because of water shortages in the locality. This was true with the findings of WHO (2012) and Lui et al. (2012) who made mentioned in their publications that inadequate water was responsible for every one in ten child deaths recorded daily in most parts of the world. The main challenge of inadequate portable water in the locality was poor health conditions. Water shortages have led to the development of diseases such as cholera, typhoid, dysentery and diarrhea in this neighbourhood. Over the years, many cases of cholera have been recorded because of doubtful sources of water that people consume from untreated boreholes and wells.

There was also catarrh and rashes on children's body as well as small pox. More so, there was a poor hygienic condition with most of the households. Children's outfits were sucked 4-5days in basins without being wash because of limited water availability, flush toilets were untidy as well as the existence of poor personal hygienic conditions. Some housing utensils contained maggots, flies, mold and cobwebs because they were not often being rinse with clean water. These findings were in line with that of WHO (2012) who in assessing water quality and the associated health risks in the city of Yaounde, noted that 50% of the diseases in the area were airborne diseases caused be inadequate portable water. Baba et al. (2019) also noted that poor sanitation was also one of the most devastating effects of water shortages worldwide. According to the WHO (2012) about 1.8 Billion people use unsafe drinking water and are allergic to disease. According to them, 53% and 35% of the population in Africa and South-East Asia are vulnerable to waterborne diseases. Psychological stress and disruption of domestic routines are also some of the major challenges faced by households in the Bomaka locality. There is always little water to drink, bath and do other household chores. As such, many of the individuals end up being stranded with activities.

5. Conclusion

This study highlights that the inadequate access to water in Bomaka is the consequence of poorly harnessed water sources, siltation, poor maintenance by water management committees and pre-treatment of water. From a conceptual point of view on the urbanization process, we can state that if the current African urbanization is due to many failures in on-going policies, it is time to articulate urban policies that strike a balance between urban growth and provision of basic urban infrastructure. Moreover, these policies must also extend services in order to supply less equipped neighbourhoods with potable water, and thus reduce waterborne disease risks. Concrete action should be taken with emphasis on the improvement and implementation of urban planning and drinking water accessibility.

Although there have been plethora of measures and strategies to improve water quality and availability in most parts of the world, today, a greater proportion of the population still do not have access to adequate portable water. Many countries especially those in the Sub-Saharan Africa are confronted with severe health conditions resulting from inadequate portable water and poor sanitation which sometimes result to loss of lives. Water is not primarily needed only for domestic and economic activities, but health wise, it is use as a first aid measure during emergency health situations. The improvement in portable water condition in the Buea Municipality has not been evenly done. Bomaka being one of the areas with a multitudinous number of "*IDPS"* with majority between at the ages of 1-14 years is still faced with extreme water crisis all year round. The rationale for its elevated cholera incidences recently is due to inadequate portable water. Most of its households depend on water from boreholes which are not often pre-treated. Knowing fully well the aftermath of water shortages on the population, it is therefore the right of the government, local government and the public to engage into holistic measures so as to provide multiple sources of portable water in the area to foster domestic activities, economic growth and development in the locality.

6. Recommendations

In order to create a safer environment for the population, the following should be strictly implemented in the area.

- The population should avoid deforestation around catchment areas.
- Farmers should avoid activities that deal with chemicals around portable water sources.
- Adequate planning on water distribution should be done in the area.
- NGOs should assist in the provision of artificial water sources such as solar powered boreholes and harnessing springs.
- NGO's should also do sensitization campaigns on personal hygienic and food preservation in the area for compliance with the norms
- The Council should maintain and renovate public taps and pipelines that have worn out.
- The various water sources in the area should be frequently pre-treated to make it safe for consumption

Acknowledgement

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References

Ahmed, A., & Roy, K. (2007). Utilization and conservation of water resources in Bangladesh.

Ahmed, A. (2006). Water Quality Assessment in Al Jabal Al Akkhdar Region of Oman for Sustainable water Resources management.

Ayonhe, N. S., Anyang, N. G., & Ngabie, M. N. (2001). Evaluation of the variability of drinking water quality within Bamenda Metropolis, North West Region, Cameroon.

Baba, A., Balgah, S., & Pambounda, N. (2019). Patterns of pipe-borne water supply in the Buea Municipality: Challenges and way forward

Barlow, M. & Clark, T. (2017). The battle against corporate Theft of the World's Water.

Black, M., & Fawcett, B. (2008). The Last Taboo: Opening the Door on the Global Sanitation Crisis. Earthscan publications, 224p.

Boisson, S., Schmidt, W.P., Berhanu, T., & Gezahegn H & Clasen, T. (2009). Randomized controlled trial in rural Ethiopia to assess a portable water treatment device. Environmental Science & Technology 43, 5934-5939.

Boisson, S., Stevenson, M. & Shapiro, L. (2013). Effect of household-based drinking water

chlorination on diarrhoea among children under five in Orissa, India: a double-blind randomised placebo-controlled trial. PLoS Medicine 10, e1001497.

BUCREP. (2010). Third general census of population and housing, file of major cities of Cameroon. Central Bureau of the Census and Population Studies.

Cairncross, S., Neill, D. O., McCoy, A., & Sethi, D. (2003). Health, environment and the burden of disease: a guidance note. Department of International Development, London, 9p.

Djaouda, M., Nougang, M. E., Dékouché L. J., Demgodéré, T. F., Wakayansam, B. R., Amani, D. D., Zébazé, T. S. H., Liang, S., & Nola, M. (2022). Public clay pot waters: a hidden risk for diarrheal diseases transmission in a cholera endemic area of Cameroon. Research Square, https://doi.org/10.21203/rs.3.rs-1277105/v1

Emmanuel, N. B., Roy, L. M. & Amos, F. Z. (2021). Increasing Challenges of Potable Water Supply and Its Implications on the Population of Buea Municipality, Cameroon.

Gambbir, R. S. (2012). Water pollutants and new promising techniques in purification process.

Kenfack, G. (2018). Analysis of the socioeconomic costs associated with the treatment of waterborne diseases. Master's thesis, Department of Geography, University of Yaounde I, 145p.

Keyetat, M. L. (2014). Popular participation and drinking water supply in the Nkom-Nkana plateau district in Yaounde. Master's thesis, Department of Geography, University of Yaounde I, 145p.

Kimengsi, J. N. (2009). Pamol industrial growth and land use conflicts in Ekondo-titi subdivision, south west region of Cameroon. In Proceedings of the 2nd Post Graduate Seminar.

Kimengsi, J. N., Amawa, S. G. & Gwan, S. A. (2018). A Model for Sustainable Water Supply in Rural Communities: The case of Ekondo-Titi, Cameroon. Sustainability in Environment 3(1), 46-58.

Lambi, C. M. & Kometa, S. S. (2009). An evaluation of water resources on the eastern slopes Of mount Cameroon. Journal of Human Ecology. 28(1):47-55.

Lui, C., Kroeze, C., Arjen, Y. & Hoeskstra. (2012). Past and future trends in grey water footprints of anthropogenic nitrogen and phosphorus inputs to major World rivers.

Lumnwi, M., Wilson, Y.F. & Samuel, A. (2019). Challenges of portable water supply management in Bafut Sub-Division, North West Region of Cameroon.

Mara, D. D., Sleigh, P. A., Blumenthal, U. J., & Carr, R. M. (2007). Health risks in wastewater irrigation: Comparing estimates from quantitative microbial risk analyses and epidemiological studies. Journal of Water and Health, 5(1), 39-50.

Millennium Development Goals. (2008). Report of United Nations, New York, 56p.

Mofor, J. (2001). Equity and Social Justice in water Resource Management in Bangladesh.

Nkemngu, M. A. (2011). The paradox of Cameroon's chronic water crisis. The Star News 23rd

March 2011. http://thestaronline.info/?p=316

Saddamul, I. (2019): Water Scarcity and Conflict in Bangladesh.

UNDP. (1990): Secretariat for the Global Consultation on safe Water and Sanitation for the 1990's; UNDP 1990.

UNICEF. (2008). Handbook on Water Quality. Available: https://www.unicef.org/french/wash/files/W Q_Handbook_final_signed_16_April_2008. pdf Accessed 12/19/2020

United Nations Conference on Water. (1977). UN "Millennium Development Goals". United Nations, New York. USA; 1977.

WHO. (2018). Drinking-water. World Health Organization fact sheets, https ://www.who.int/en/news-room/fact-sheet s/detai l/drink ingwater, Accessed 27 Dec 2018

World Health Organization. (2004). Water Sanitation and Hygiene Links to Health Facts and Figures. WHO, Geneva. Retrieved from http://www.who.int/water_sanitation_health/factsfigures2005.pdf.

World Health Organization. (2012). Diarrhoeal Diseases. WHO, Geneva. Retrieve from http://www.who.int/vaccine_research/documents/DiarrhoealDiseases 20091122.pdf