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Factors that Affect Multiple Uses and Sustainable Supply of Water in Rural Communities of Binga; Zimbabwe

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Abstract: The study focused on investigating the factors that affect multiple uses of water and its sustainable supply in rural communities with reference to Binga District; where a number of water supply systems exist in different agro-ecological regions. The research used a descriptive survey design and a population comprising of rural community members of Binga District was used. A sample of 40 (N=40) people was selected to answer the questionnaires which were used as research instruments to gather data. Several factors such as relying on seasonal unprotected water bodies such as springs, dams, ponds and rivers were found to be the causes of limited use of water in rural areas. The borehole was the most common source of water but, however, the people are still dependent on traditional water sources such as rivers, streams, hand dug-wells and ponds. On other water uses, vegetable gardening was the most common livelihood activity in the area. However, vegetable gardening strongly affected water consumption because watering gardens accounted for the largest outdoor water use. The researchers recommended that there should be provision of alternative sources of water supply through construction of more water treatment plants, boreholes, wells and solar powered driven water supply systems. Traditional water sources such as rivers, streams, hand dug-wells and ponds should be mainly reserved for gardening so that congestion in borehole use is reduced.
Keywords: multiple uses, water, sustainable water supply, rural communities.

INTRODUCTION

Water is a common name applied to the liquid state of hydrogen and oxygen compound which ancient philosophers regarded as a basic element representing all liquids. It is a substance found naturally in all three common ***states of matt***er and is essential for all life on Earth. The Zimbabwean Ministry of Water, Environment and Climate holds the responsibility of water provision in the country. Essentially, water is characterised by multiple uses andplays a vital role in the sustenance of livelihoods, both in urban andrural areas. Water is life and especially potable water is essential for life and health sustenance. Access to safe drinking water, improves the overall socio-economic and environmental existence of humanity as well asall flora and fauna [1].

Makoni and Smiths [2] note that people require water for a wide range of activities all of which are meant to sustain and build their livelihoods. In rural and peri-rural areas, the varied water uses include but not limited to; drinking, washing, cooking, sanitation and productive usessuch as small-scale irrigation, livestock, watering, post-harvest processing, brick making or micro-enterprises. All these, if combined, can lead to multiple benefits to people, for example, improved health, income, food security and poverty alleviation among other positive impacts. Water for domestic and other productive uses in the home is a scarce resource in most rural areas including Binga District, and generally, the group mostly affected by the scarcity of water is the women.

Background To The Study

At global scale, more than one billion people do not have access to safe drinking water and over 2.5 billion people have inadequate sanitation due to water related problems [3]. In the same vein, the Africa Development Fund [4] states that in Africa, around 300 million people do not have access to safe drinking water and related sanitation facilities. Notably, Africa has the lowest total water supply coverage compared to the other continents in the world (ADF, ibid). As noted by Gleick [5] echoed by Muthusi *et al* [6], insufficient water in most rural communities of the developing world is also compounded by lack of technology to harvest water especially rainwater which is another critical factor which has an effect on the sustainability of water supply

Water scarcity is considered a major constraint to socio-economic development in any country and Zimbabwe is not an exception. Zimbabwe, just like many developing countries, still lags behind in terms of multiple uses of water and its sustainable supply in rural communities. Several factors such as relying on seasonal unprotected water bodies such as spring, dam, ponds and rivers are some of the causes of limited use of water in rural areas [7]. In most parts of the country, water resources are already fully utilised or overdrawn. While the agricultural sector is the highest consumer of water which accounts for about 62% of total water consumption, domestic and industrial water use accounts for 6% and 32% respectively [8].

In rural Zimbabwe, like in most parts of Africa and other parts of the developing world, rural water services provision is done by different institutions which are both government and the private sector. Since 1980, when Zimbabwe got independence, government and non-governmental agencies have continued to dedicate human, financial, technical, and organisational efforts on the provision of safe drinking water and related adequate sanitation in both rural and urban areas of Zimbabwe. In essence, this has been regarded as one of the country's developmental goals (Guzha, ibid).

However, the rural water supply situation in Zimbabwe has deteriorated in the past 10 years which has largely been due to the declining economy, worsened by the withdrawal of donor funding whichhas traditionally been the principal funder of rural water supply and sanitation projects since independence [9]. Since independence, the water supply and sanitation sector has been characterised by a supply-focused approach based on norms that do not take into account the productive water uses at household level.These approaches proved unsustainable and partially met the users' water needs. Instead, they have been mainly concerned with the health aspect of the rural people and this has left many rural people still caught in the vicious cycle of poverty [10, 11]. Notably, rural livelihoods, and Binga district not being an exception, are in many ways hinged on their multiple uses of water and its sustainable supply.

Water is an indispensable natural resource to all living organisms and is equally important for several human domestic and productive purposes. More often than not, not enough water is available due to a host of reasons and in the case of Binga District; a number of water supply systems exist in different agro-ecological regions but it is not readily available from single water supply sources and is also used for many purposes. There is a river, supplying water for productive purposes in summer, boreholes, wells fitted and not fitted with lifting devices for domestic uses with the potential to supply water for multiple purposes. It is against this background that the current study sought to investigate the factors that affect multiple uses of water and its sustainable supply in rural communities using the case of Binga District in Zimbabwe.

Statement Of The Problem

The accessibility to and sustainable supply of water in Binga district, like some other rural communities in Zimbabwe, is often problematic due to geographical features, sectoral policies, institutional arrangements and otherfactors. The problem at stake is which factors affect the multiple uses of water and its sustainable supply with reference to the rural community under study.

Setting Of The Study

Binga is one of the seven districts of Matabeleland North Province and lies in the northern part of Zimbabwe. It has a total population of about 139 092 where 75 356 (54%) are females while 63 736 (46%) are males [12]. It falls under agricultural region V and the landscape of the district is generally rocky and hilly; with mountain ranges and largely divided by major and minor drainage systems. However, there are a few patches of flat land and the District shares the boundaries with Lupane to the south, Hwange to the west, Gokwe to the east and the Zambian country to the north, demarcated by the Mighty Zambezi River. Tonga is the dominant native language spoken in Binga and other languages spoken are Ndebele, Shona, Nyanja, Chewa and Nambiya (Zimstat, ibid).

Purpose And Objectives of Study

The purpose of this study was to investigate the factors that affect multiple uses of water and its sustainable supply in rural communities of Binga district.

In pursuit of this purpose, the following objectives guided the study:

i. To identify the main sources of water in the district
ii. To profile water related livelihood activities in the district
iii. To assess household willingness and ability to meet cost requirements for multiple water uses in order to promote sustainable water supply

Significance Of The Study

The researchers anticipated that this study would:

- assist both private and public companies to identify the factors that affect the multiple uses of water and its sustainable supply in rural communities of the district
- serve as a reference document of the causes, effects and solutions to problems encountered

in factors that affect the multiple uses of water and its sustainable supply

- help rural communities in the district to get quality water services through improved community and relevant authority involvement
- assist the Binga Rural District Council in particular and Government of Zimbabwe in general to evaluate the application of the legal framework on factors that affect the multiple uses of water and its sustainable supply in rural communities by both the private and the public companies involved in water issues.

REVIEW OF RELATED LITERATURE

The human body's basic water requirement largely depends on climate, work load and other environmental factors. If the work load is high and the season is dry for example;individuals and the family uses large amounts of water per day, while family size also determines the amount of water consumption per day. In this regard, Gleick [5] defined the minimum requirement for the human body and found that it is between 3 and 10 litres per day.

The amount of water needed for other purposes, including cooking or hygiene, is more variable and depends on cultural habits, socio economic factors and types of water supply in terms of quantity, quality and availability. Gleick [5] stated that the international acceptable standards for water requirementsfor human basic needs is commonly referred to as basic water requirement; which is defined as water requirement in terms of quantity and quality for the four basic needs of drinking water, human hygiene, sanitation service and unassertive household needs. This standard is defined by World Health Organisation guideline as at least 20 litres per capita per day [13].

Research has shown that rural water supply in Sub-Saharan Africa, predominantlyfor thoserelying on free open water sources and hand pumps often demonstrate low levels of sustainability. The fundamental causesfor this include inappropriate policy or legislation; unsatisfactory institutional support, unsustainable supportinginstruments, ineffective control systems and lack of technical backstopping [14]. It appears that the problem will only be solved by adopting a holisticapproach to water supply planning and implementation rather than focusing on one issue.

According to Gebrehiwot [1], the contributing factors for the sustainability of rural water supply systems arecategorised into two notable categories. These are pre-implementation factors and post-implementation factors. Community participation, technology selection, site selection,demand responsiveness, construction quality, population and training are some of thepre-implementation factors. Post-implementation factors include technical support,community participation and satisfaction, institutional and financial management, training andwillingness to sustain the water project (Gebrehiwot, ibid).

One of the major pre-implementation factors for rural water supply systems is demandresponsive factor. In this context, 'demand' is defined as the quantity and quality of water which the community members will choose to consume at a given price [15]. In a demand responsive factor, beneficiaries should feel the need for safe drinking water supply, in order to identify appropriate safe drinking water supply projects. As Gebrehiwot (ibid) notes, water projects are more or less demand responsive to the degree that beneficiaries make choices and carry out resources in support of their choices. If there is willingness in the community to provide valued resources in the exchange for services; then these community members valued the service. As a result, demand for supply of water will facilitate the management of the water supply system which enhances the rate of sustainability of the water supply system [10].

Consequently, literature in the water supply sector has shown thatsustainability of rural water supply structures has become positively associated with small-scale water use initiatives, which maintain public participation [16]. For them, involving the users in the planning, implementation, operation, protection and maintenance of water supply systems meaningfully is fundamental to sustainability. Community members' contributions might take the form of money, labour, material, equipment, or participation in project-related decision-making and meetings (Davis and Liyer, ibid).

USAID [3] says that generally, human water activities are most effective and sustainable when they adopt a participatory approach that acts in response to genuine demand, builds capacity for operation and maintenance and sharing of costs, involve community members directly in all key decisions, develop a sense of communal ownership of the project, and uses appropriate technology that can be maintained at the community level. Also important are educational and participatory efforts to change behavioural practices.

When rivers, streams, springs or dams are used for multiple purposes such as domestic use, livestock watering,irrigation and tanker supply, care should be taken to prevent contamination of water used for human consumption [6]. Relative to hand dug wells, natural water sources such asrivers or springs are easily polluted by different pollutants.The effective progression and maintenance of rural water supply systems is a crucial element for the sustainability of the water supply. The community control of rural water supply systems on operation and maintenance's success

is limited, if, financing resources are not available and frequent support is not provided. Thus, budgeting sufficient funding for rural water supply systems and maintenanceis an important issue for water sustainability.

RESEARCH METHODOLOGY

This study used the descriptive survey design which generally encompasses getting information about one or more groups of people on their characteristics and/views through asking them questions and compiling their responses [17-19]. For Neuman [20] echoed by Cohen *et al* [21], the logic of the descriptive survey design is to learn about a large population through surveying, hence, was thus, adopted because it accrued advantages to the researchers as observed by Leedy and Omrod [22] who suggest that the descriptive survey design enables the collection of large amounts of data from a large population. It was, therefore, found appropriate since the current study sought to establish community members' ideas on the level of embracing factors that affect the multiple uses of water and its sustainable supply in the rural communities of Binga.

The population of the study was derived from the households in the area under study. There are 31 284 households whose average size is 4.4 [12]. Population refers to any group of individuals that have one or more characteristics in common that is of interest to the researcher [23, 24]. The population consisted of selected community members from households in rural communities of Binga.

From the above population, a sample of 50 (N=50) participants was selected. A sample is generally a subgroup of a large population and reflects typical characteristics and the main features of a population [17, 26, 27]. Convenience sampling technique was utilised in coming up with the sample. Its major advantage was that researchers were able to include community members as participants based on the convenience of meeting them. In agreement with Cresswell [25], this technique was found appropriate because it reduced research costs and made it easier to collect data from participants who willingly agreed to participate in the study.

In this study, the researchers used questionnaires as research instruments to gather data. Research instruments are the tools that are used in the collection of research data [18, 28]. Research instruments are used to ensure that accurate data is collected and that the data is relevant in bringing solutions to the research questions [29, 30]. In line with Cohen *et al* [21] advise, these instruments were pre-tested for validity and reliability before being administered. This involved refining the questionnaires so that respondents would not have difficulties in answering them.

STUDY FINDINGS

Availability of nearby water sources

Table 1: Availability of nearby water source (N=50)

Nearby water source available	Number of Participants	Percentage (%)
Yes	29	58
Somehow	10	20
No	11	22
Total	**50**	**100**

From the study, 29 (58%) of the participants indicated that the water source is nearby, while 11(22%) said that it is not near, with the 10(20%) indicating that it is somehow nearby. By the inhabitants' standard, nearby water sources were not more than 2km from their places of residence. The researchers noted that most people in Binga generally live nearby water sources, though the quality of the water was not qualified in this item question. This trend agrees with the fact that most rural areas in Zimbabwe are endowed with several sources of water. The sources vary from natural sources like rivers, streams, ponds, rainwater, and human made sources like wells, boreholes and in rare cases, piped water. Rural communities, such as those of Binga district therefore depend on many of the above water sources as no one source is capable of supplying all the water needs throughout the year.

Types of water sources

Table 2: Types of water sources

Source(s)	Number of Participants	Percentage (%)
Borehole	18	36
Well	12	24
River and stream	8	16
Dam	2	4
Spring and pond	10	20
Total	**50**	**100**

In terms of types of water source, as many as 18 respondents (36%) frequently used boreholes followed by 12 (24%) who used Well. A total of 10(20%) used springs and ponds, 8(16%) used river and stream while only 2(4%) used dam.This was found to be consistent with Akintola et al who indicated that many rural inhabitants have no choice but to make use of whatever sources of water that are available to them no matter the quality of water.The researchers noted with great concern some communities still depend on traditional types of water sources such as rivers, streams, hand dug-wells and ponds. Most of these sources are unsafe due to pollution and consequently serve as main sources of water-born and water-related diseases [32]. The 2006 UNDP report highlighted that diarrhoea remains one of the killer diseases in rural Africa as most of her communities are exposed to unsafe water.

Major Productive Uses of Water

Table 3: Major Productive Uses of Water

Major Productive Uses of Water	Number of Participants	Percentage (%)
Gardening	22	44
Brick moulding & building	6	12
Pottery	5	10
Livestock feeding	13	26
Other	4	8
Total	**50**	**100**

The survey gathered information on other productive uses that communities were putting the water to, apart from domestic uses. Figure 4.3 shows as many as 22(44%) didvegetable gardening, followed by 13(26%) who used water for livestock feeding. Interestingly, vegetable gardening topped the list as it is crucial to rural households in developing countries considering the fact that it increases the annual income of peasant families by approximately 30% through providing fresh vegetables and reducing food deficiency[33]. A total 6(12%) used water for brick moulding and building while 5(10%) used it for pottery.The study showed that there was limited variety of water related livelihood activities and some participants explained that although the water from most water points was adequate for household use, it was not enough for other productive activities. This is line with findings by Katsi [34]who indicated that unavailability of water of adequate quantity can impede multiple uses of water.

Time taken to collect water

Table 4: Time taken to collect water

Time taken to collect water	Number of Participants	Percentage (%)
<5 minutes	6	12
5- 15 minutes	10	20
16-30 minutes	19	38
31-60 minutes	8	16
>1hour	7	14
Total	**50**	**100**

The table above shows that the time taken to fetch water from different sources differed as it ranges from below 5 minutes to more than 1 hour.Thus, any time taken that is greater than 15 minutes to fetch water is higher than that of the findings in Lesotho, Zambiaand Ethiopia [13]. Queuing time during the dry periods from around August to October in these countries could, however, go up to one hour. In some instances, the time taken to fetch water from sources exceeded the guide line value recommended time by WHO [31], which is set at not more than 15 minutes of walking distance, which is roughly equivalent to a distance of about one kilometre.

Frequency of collecting water

Table 5: Frequency of collecting water

Water collection frequency per day	Numberof Participants	Percentage (%)
Once	14	28
Twice	20	40
thrice	9	18
More than thrice	7	14
Total	**50**	**100**

As the above table shows, most people collected water twice per day (40%) followed by once per day (28%), with others collecting thrice (18%) and more than thrice (14%). The availability of unprotected water sources assists the community to collect water say three times or more per day. The people who opted to get their drinking water from protected sources would do that once usually due to long queues and distances.

Willingness and ability to meet the cost requirements for multiple water uses

Table 6: Willingness and ability to meet the cost requirements for multiple water uses

Willingness and ability to meet costs for multiple water uses	Number of Participants	Percentage (%)
Willing	13	26
Undecided	3	6
Not willing	34	68
Total	**50**	**100**

The study revealed that only 13(26%) were willing to and capable of paying for their multiple uses of water. On the other hand, as many as34(68%) indicated that they were not willing and were unable to meet the costs for their multiple water uses. The remainder 3(6%) indicated that they were undecided as yet.

Management of Water Points

Table 7: Management of Water Points

Description	Number of Participants	Percentage
Water committees	32	64
NGO	5	10
Government	3	6
Church	3	6
Village committees	7	14
Total	**50**	**100**

Study results show that water committees are largely responsible (64%) for the management of water points. Other players involved were village committees (14%), non-governmental organisations (10%), government (6%) and church (6%). Researchers noted with great concern the need for government to step up its efforts in managing water points as the provision and general management of water to the populace is in essence a government responsibility.

Composition of Water Management Committees

Table 8: Composition of Water Management Committees

Description	Number of Participants	Percentage
Both Men and Women	25	50
Women only	4	8
Men only	8	16
More men and few women	8	16
More women and few men	5	10
Total	**50**	**100**

Furthermore, the composition of water point management committees was established and the results were obtained as presented in Table 4.8 above. From the presentation above, the majority of the respondents (50%) said that there were both men and women, while 8(16%) reported that there were only men in the committees while the 4(16%) indicated that they were only women in the committees. Another total 8(16%) reported that there were more men than women in the committees whileonly 5(10%) indicated that there were more women and men in the committees. The results therefore reveal that most water management committees are made up of both men and women.

Community Participation on Water Issues

Table 9: Community Participation on Water Issues

Community participation	Number of Participants	Percentage (%)
Labour	38	76
Cash	3	6
Other Services	9	18
Total	**50**	**100**

Regarding community participation on water issues, 38(76%) indicated that the community provided labour, 9(18%) indicated that they provided other services such as security and sharing of information while only 3(6%) indicated that they provided cash. The results, therefore, showed that the majority of community members provided labour which is consistent with Admassu *et al* [13] study findings in Ethiopia which revealed that rural inhabitants largely provide labour more than any other services to projects within their communities.

Factors that affect Water Consumption

The study found out that water consumption patterns involved various factors even though its effects differ from one rural area to the other and among communities. It was realised that among other factors, physical and socioeconomic factors are the major ones. The major physical factor which affected the consumption rate and multiple uses of water within each community is the distance of village units from the water points or sources of water. The prime and most influential socio-economic factors which affect water intake in Binga rural communities is the size of household, purposes to which the water is put and the nature of the source of water with respect to its quantity and quality.

CONCLUSION AND RECOMMENDATIONS

Based on the above findings, the researchers concluded that:

- Most rural areas in Binga are endowed with several sources of water, which include boreholes, rivers, streams, ponds and Wells
- Gardening is the major productive use of water in the rural communities in question, while other include bricklaying and building, pottery and livestock feeding
- The time taken by inhabitants to fetch water from different sources differed, and for some, it exceeded the standard of 15 minutes set by World Health Organisation. Consequently, distance from water points hindered the multiple use of water for some inhabitants
- The frequency of water collection from water sources differed as it ranged from once to more than thrice
- Most people were not willing and were unable to meet the cost requirements for multiple water uses

The following were the major recommendations of the study based on the findings and conclusions;

- Provision of alternative sources of water supply through construction of more water treatment plants, boreholes, Wells and so on is necessary so that water sources are nearby all rural inhabitants
- Traditional water sources such as rivers, streams, hand dug-wells and ponds should be mainly reserved for gardening as the water is often polluted and also so that congestion in protected water sources like boreholes is reduced.
- Water reservoirs for use during dry season to be built so that they can be used when water bodies run dry
- To avoid long queues at boreholes, a water collection rooster can be created by water point committee members to allow community members to collect water at different times
- Members to be encouraged to pay subscription and user fees in cash so that there is always money for spares and paying technicians in case there is a breakdown of water serving systems

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