STAKEHOLDERS' VIEW OF SUSTAINABILITY OF PUBLIC WATER SUPPLY SCHEMES IN A RURAL AREA: THE CASE OF MUYUKA SUBDIVISION, CAMEROON

ABSTRACT

Background and aim: It is certain that without readily available water in sufficient quantity, and free of pathogens, man's progress is tremendously hindered. In Muyuka, Cameroon, though there exist public taps littered "here and there", the population most often find themselves fetching water from nearby streams raising to surface the question of sustainability of the available water systems which was the aim of this study.

Methods: This was a cross-sectional, analytic study targeting household heads and water committee members in the rural communities of Muyuka. Three communities were randomly selected and from each, five quarters were randomly selected. In the quarters, convenience sampling technique was used for the household heads while snowball sampling technique was used to get the water committee members. An interviewer administered questionnaire was used and data analyzed using R.

Results: A total of 371 persons participated in the study. The average number of years lived in the community was 22.08 (SD=10.61) and ranged from 10 to 66. Only 13.00% of the participant didn't see the water system as challenging while 81.5% finds it to be severely problematic. Utilization of water averaged far less than the 50L/person/day and the situation worsened as the household size increased. Close to half (49.6%) of participants did not participate at any stage in the development of the water system. According to the participants, water systems breaks down averagely 3 times in a year and last for about 67 days before being repaired. Water committee members reported difficulties in accessing spare parts and inadequacy in their training.

Conclusion: Frequent breakdown of the water schemes compounded by the unavailability of spare parts and hence delays in repairs, and in expansion, user dissatisfaction and unwillingness to pay their bills; inadequacy in training of water committee members, has resulted in poor sustainability of the water system.

Keywords: Sustainability, Public Water Supply Schemes, Rural Area, Muyuka, Cameroon

1. INTRODUCTION

Introduction

It is certain that without water there would be no life of any kind on earth and that, without readily available water in sufficient quantity, and free of disease-causing agents, man's progress is tremendously hindered. Safe water is the first aspect of public health that has enormously reduced disease morbidity and mortality. Access to water and sanitation is an important ingredient of quality of life and is also crucial to many other public health indicators like poverty rate, infant mortality and maternal health. Although actual count is impossible,

billions of man-days of labour are undoubtedly lost annually because of illness and death from water-related diseases. Unfortunately, the areas which can least afford this economic loss are the places where such sickness and death are most rampant [1]. Being fully aware of this and the importance of water, public health authorities have exerted huge efforts to get water to the population in rural areas. During the past two to three decades there has been relative success in providing new rural water infrastructure – building the physical systems – and driving increased coverage levels [2]. However, despite this positive trend, there has to a large extent been a failure to achieve sustainable solutions. Tens of millions of rural people face continuing problems with systems that fail prematurely, leading to wasted resources and false expectations. For many of those who supposedly already enjoy an improved service, the reality is one of poor continuity, poor quality and premature failure [2, 3].

Although the MDG target for drinking water was met way back in 2010[4], the improvement in water supply has greatly been uneven with eight out of ten people without improved drinking water sources living in rural areas[4] and majority of people in the world without improved water supply services have remained practically the same over the past two decades. For example, between 1990 and 2006, the absolute number of un-served people across 19 sub-Saharan African countries increased from 29 million to 272 million[4]. In part this is due to population growth, but many of those who supposedly count as having been 'served' actually have systems that are now not working properly or have failed completely. Both population expansion and migration patterns have led to more urbanization, but also an increase in more densely populated rural areas, with accompanying increased demand for higher levels of service. However, it is still the rural population that continues to suffer most from poor services; the Joint Monitoring Program (JMP) reports that 84% of people without access to improved drinking water sources live in rural areas [5].

In the early 1990s, estimates suggested that at any given moment, 30–40% of rural water supply systems in developing countries were not working [6]. This rate has not changed much since then and although figures vary, studies from different countries indicate that somewhere between 30% and 40% of systems, particularly hand pumps, still either do not function at all or are working at sub-optimal levels[4]. A study by Tarlor in Tanzania indicated that only two years following installation 25% of systems are already non-functional [7]. Failures on this scale represent significant levels of wasted investment, probably many hundreds of millions of dollars over the last 20 years.

Sustainability in water supply management is becoming more crucial because new sources of water are becoming more scarce, more expensive to develop, requires more expertise and technology for planning, design, implementation and operation and are contributing to more social and environmental disruption[8]. Poor sustainability of water supplies has been recognized for some time, and a number of management approaches have come and gone with the aim of addressing these problems; the predominant model of community management has been adopted as policy in many countries [9]. Successful operation and maintenance of widely dispersed rural water systems cannot be done without the full involvement and commitment of the users. As presented in figure 1 and adapted from Lockwood et al.,[10] the involvement of all stakeholders from conception of the project is paramount to its sustainability. However, donors usually do support the implementation of water supply systems, whilst at the same time paying insufficient attention to sustained institutional support.

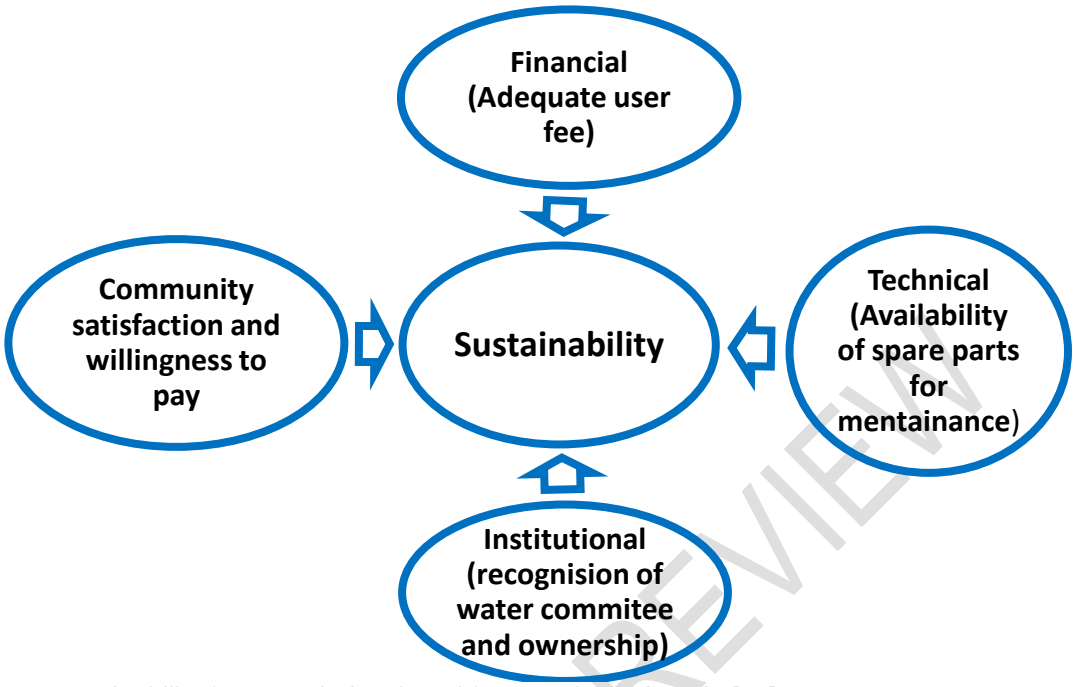

Figure 1: Sustainability framework developed from Lockwood et al., [10]

Generally, the Cameroon government's policy concerning the provision of potable water to its citizens has been largely tilted towards urban areas with virtual negligent of rural areas as is with the case with Ekondo Titi in the South West region[8] and other host of rural areas. This has generated the problem of water scarcity in these areas. Muyuka is another rural area in the South West region of Cameroon. It is about 45 meters above sea level with a very hot climatic condition. Though there exist public taps littered "here and there" in Muyuka that vomit the good quality of the precious liquid when there are functional, the population most often find themselves fetching water from nearby streams since most of the times the waters sources are dry as can be seen in figure 2. The consequences of this are obvious as the medical record in the health facilities of Muyuka tell it all. Do we continue to create new water systems; an investment that often appears to be at the expense of the sustainability of services already in place? This study seeks to investigate the sustainability of water systems in the Muyuka Sub-Division of Cameroon.

Figure 2: A non-functional public tap in the Munyenge neighbourhood of Muyuka Sub-Division. (Source: Authors)

2. MATERIAL AND METHODS

2.1. Study design

This study was a cross-sectional, analytical study where a questionnaire was designed getting inspiration from Lockwood *et al.,*[10] to evaluate local stockholders' view on the sustainability of the water scheme in place.

2.2. Study setting and procedure

Muyuka subdivision is made up of rural and semi urban areas. Since this study focused on rural water system, three of the rural communities were randomly selected. There were: Ikata, Bafia and Munyenge communities. In these communities, heads of household and water committee members who could read and write were targeted.

Immediately after the sorting of potential participants, informed consent was obtained and then administration of the questionnaire to those who consented to be part of the study. The questionnaires were interviewer administered by trained data collectors. There were two set of questionnaires, one for household heads and the other for water committee members

2.3. Sample size determination

The following formula was used to estimate the sample size of the study[11].

$$N = \frac{4(Zcrit)^2\big(P(1-P)\big)}{D^2}$$

Where N is the desired sample size, Z_{crit} is the value of α at 95% level of confidence of a standard normal distribution. P is the pre-study estimate of the prevalence and since no such studies in similar conditions is easily traceable, P is assumed to be 50%. D is the total width of the expected confidence interval. In this case the width is desired to be ±5%, making D=10%

$$N = \frac{4(1.96)^2\big(0.5(1-0{,}5)\big)}{0.1^2}$$

N= 384

To add a non-response fraction, 10% of the total sample size was added to it to give

N=384+38=422.

2.4. Sampling technique

A multistage sampling technique was used. First the three rural communities in the Muyuka Subdivision were randomly chosen from the available list of rural communities. Then, random sampling technique was used where the names of the quarters making up the each of the three communities were written and put in a basket and raffle draw was made to determine the five quarters to be sampled. Into the quarters, convenience sampling technique was used to sample household heads. For the water committee members, a purposive sampling technique was used.

2.5. Study procedure

Immediately after the sorting of potential participants, informed consent was obtained and then administration of the questionnaire to those who consented to be part of the study. The questionnaires were interviewer administered by trained data collectors. There were two set of questionnaires, one for household heads and the other for water committee members.

2.6. Data management and analysis

Data collected from households and water committee members using the structured questionnaire was organized and analyzed using R software and MS excel. Descriptive statistics based on percentages, mean, and standard deviations was used to analyze findings. Test of association was done using the chi square test at a 5% level of error.

2.7. Ethical approval

Ethical review was done and approved by the Biaka University Institute of Buea Institutional Review Board (BUIB-IRB).

3. RESULT AND DISCUSSION

3.1. Results

This study was carried out in Muyuka Sub-Division of the South West Region, Republic of Cameroon. A total of 371 persons participated in the study. The average number of years lived in the community by the participants was 22.08 (SD= 10.61) and ranged from 10 to 66 years. Respondents age ranged from 21 years to 85 years with a mean age of 40.59 (SD= 9.92) years. Close to half of the respondent 175(49.30%) had just First School Living Certificate (FSLC) while 148 (39.80%) earned between 51 and 100 USD per month as presented in table 1.

Table 1: Socio demographic characteristic of study population

variable		Frequency	Relative frequency (%)
Occupation	Farming	204	54.92
	Business	106	28.69
	Hair dressing	15	4.10
	Tailoring	11	3.01
	Teaching	6	1.64
	Others	28	7.65
Educational level	A Level	76	21.41
	First School	175	49.30
	O Level	88	24.79
	Others	16	4.51
Sex	Male	244	65.80
	Female	127	34.20
Monthly income (USD)	≤50	112	30.30
	51-100	148	39.80

	101-200	81	21.70
	≥201	31	8.30

3.1.1. Level of Satisfaction of Users for the Water supply systems in Muyuka

3.1.1.1. Severity of problems posed by the current water scheme

As presented in figure 3, only 13.00% of the participant viewed the water scheme in place is not at all problematic. 42.9% finds it to be a severe problem while 38.60% find it to be a very severe threat to their survival.

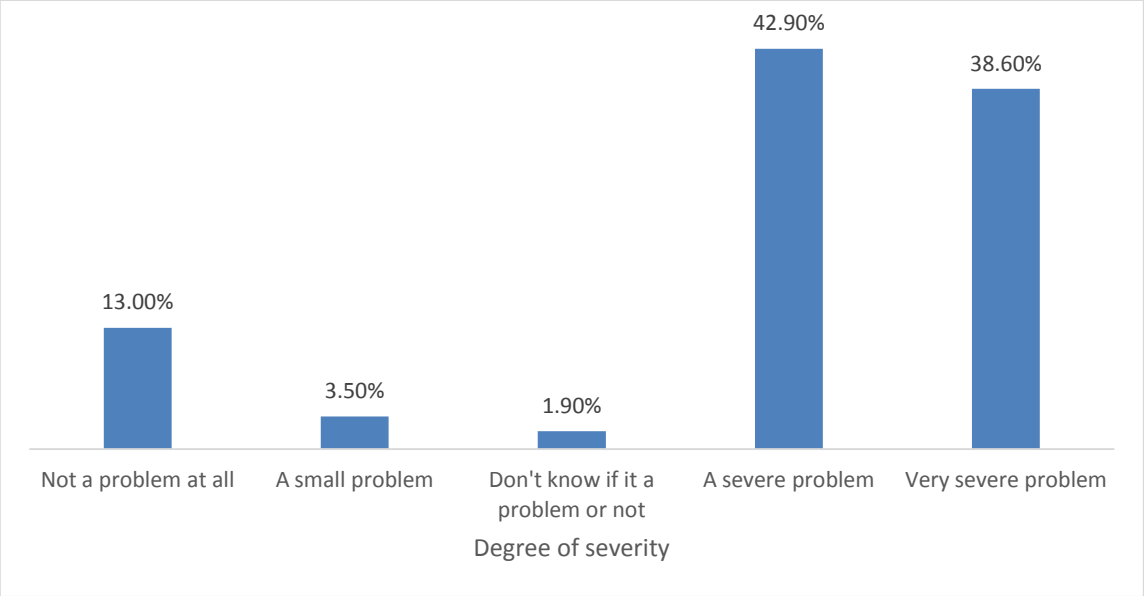

Figure 3: Perceived severity of problems posed by the current water scheme

3.1.1.1. Consumption pattern and Satisfaction level of respondents

The results show that more than 90% of the respondents consume below the standard minimum liter per day, showing that the water scheme in the study area fails to fulfilled the minimum requirement. Further analysis of consumption considered quantity of water consumed and household size. Generally, households averaged less than the 50L/person/day and the situation worsens as the number person per houdehold increase as presented in figure 4.

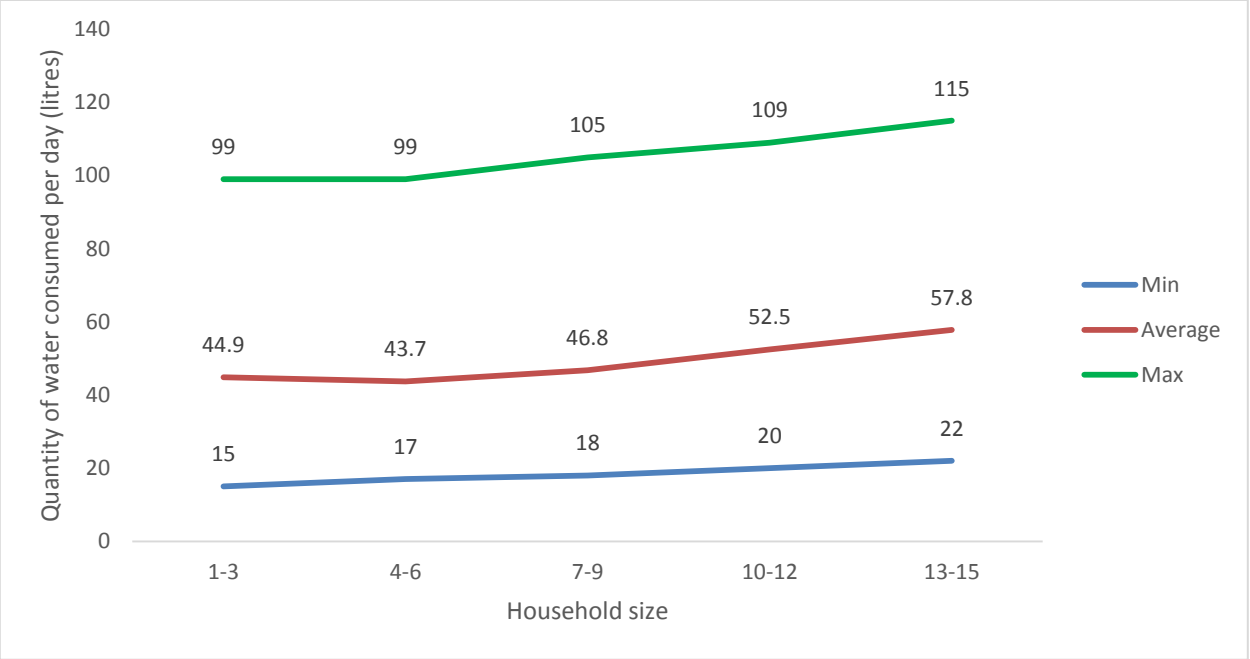

Fig 4: Water quantity used in household and household size

3.1.2. Level of community participation in the rural water supply systems

Participants where asked if they participate in any way in the conception, implementation or management of the current water supply scheme. Close to half 183 (49.6%) of respondents did not participate at any stage in the development of the water system. As presented in the table 2, it seems like more educated people participates in the water supply scheme but level of education is not statistically significantly associated to participation with a p value of 0.5059. Whether or not the site of the water supply scheme was chosen either by community (or local) authority or the site was chosen by government or NGO was statistically significantly associated with participation with a chi square ($\chi 2$) value of 7.24 and a p-value of 0,0071. Income level was also association to participation.

Table 2: Level of community participation in the rural water supply systems

variables		Participation		$\chi 2$	p-value
		Yes	No		
Educational level	A Level	43	32	2.33	0.5059
	First School	83	92		
	O Level	43	44		
	Others	7	9		
Site choosers	Community and local authority	160	136	7.24	0.0071
	Government and NGO	26	47		
Monthly income (USD)	≤50	48	54	10.11	0.0179
	50-100	57	75		
	101-200	47	26		
	>200	17	11		
Source of idea	Community and local authority	6	4	-	0.6850
	Government and NGO	9	4		

3.1.3. Sustainability of the water scheme in Muyuka Sub-Division

3.1.3.1. Number of breakdowns in last year and length of time to repair the breakdown

Table 3 shows the results obtained when the water source breaks down. It shows that the water source breaks down averagely three times in a year according to the community members and 2 times a year according to the water committee members. However, ones the system has broken down, it takes averagely 22 days (according to the water committee members) before they can be repaired and 67 days (according to the community members) before it can be repaired.

Table 3: Rate of breakdown of water scheme and duration it takes for them to be repaired, comparing responses of community members to those of water committee members

Sustainability indicators	Community members	Water committee members
Average number of days of breakdown in the previous year (Range)	2.66 (0-30)	2.03 (0-17)
Average number of days it t00k for the breakdown to be repaired (Range)	67.4 (1-700)	22.38 (7-60)

3.1.3.2. Evaluation of some indicators of sustainability by local stakeholders

As presented in figure 5, 59.3% of community members reported complete dissatisfaction with the management of the user fee. The result also show that 85.7% water committee members admitted that spare parts are not readily available for the operation and maintenance of the public taps in the rural areas of Muyuka Sub-Division. The training received by the water commute members is of doubtful quality as 67.4% of the water committee members don't think they were sufficiently trained for the sustained management the rural water scheme.

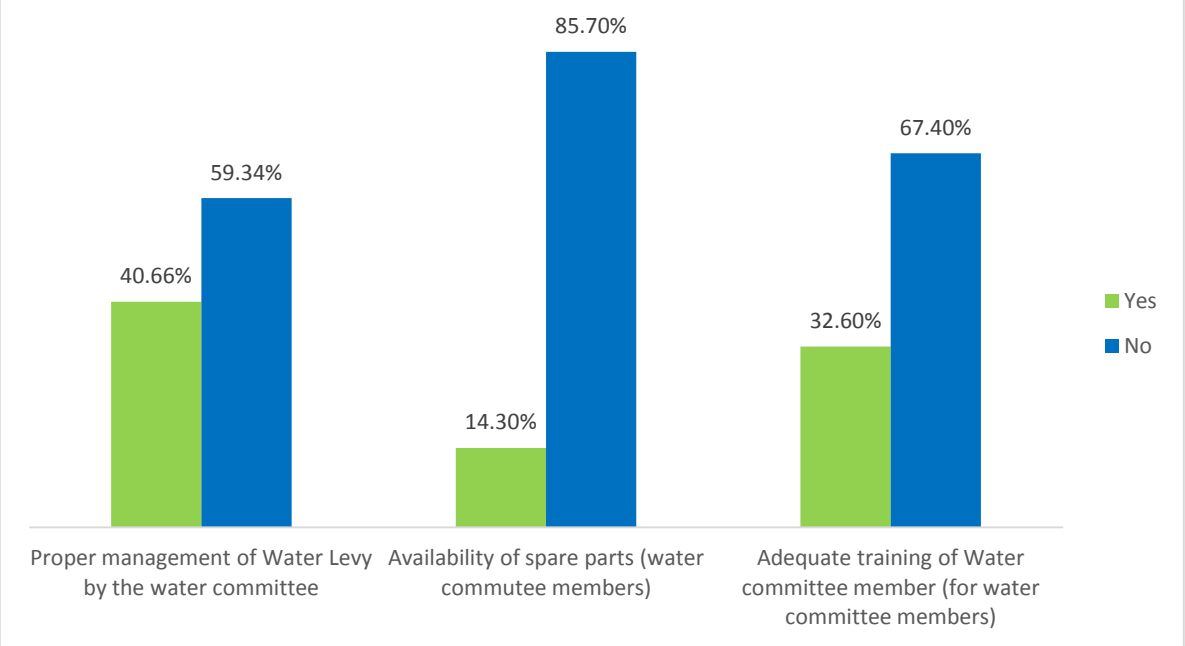

Figure 5: Stakeholders evaluation of some indicators of sustainability

3.2. Discussions

It is difficult to imagine any clean and sanitary environment without water. Invariably, the progress of sanitation throughout the world has been closely associated with the availability of water; and, the larger the quantity and the better the quality of the water, the more rapid and extensive has been the advance of public health[1]. Nonfunctional water systems therefore pose problems to the community that range from mild to very severe nature depending on the degree of the mal functioning of the water system. In the Muyuka Subdivision, the rural water supply scheme is clearly unsatisfactory to 81.5% of the community. This is in line with Anna *et al.,*[12] who reported, a large majority of community members and even construction agencies being literally dissatisfied with the services provided to them as rural water supply systems, since most of the investment in water supply is usually concentrated in the urban areas.

Probably one of the most disturbing finding is the quantity of water used by household per day. More than 90% of the respondents consume below the standard 50 liter per person per day, showing that the water scheme in the study area fails to fulfilled the minimum requirement defined in Mishra and Dubey[13]. Further analysis of consumption considered quantity of water consumed and household size show that generally, households averaged less than the 50L/person/day and the situation worsens as the number person per houdehold increase. Understandbly, respondents also reported dissatisfaction with the quantity of water consumed, given the vitality of water to human existence.

In a community like Muyuka Sub-Division where 49.6% of the population do not participate at any level of the development of the water scheme, it will be clear that the sustainability of such a water scheme is questionable. In a longitudinal study conducted by Mehta and Virjee[14] and another study in Tanzania[15], the sustainability of the water system was directly proportional to the quality (whether participation is self-motivated or through force) and quantity (the proportion of the population that actually participates in one way or the other towards the realization of the water system) of participation from the community. At first when the water system is in place and very functional everyone is elated but this elation will not be for long if there was no community participation. When the system starts developing faults (which is natural) there will be nobody to look at the faults with keen attention and so the population soon gets a water problem phase.

The community members know best their needs more than any other person. So in the need identification, the community must be actively implicated otherwise the water scheme will be seen as “theirs”. This is exactly the case with the Muyuka rural water supply because when the government authorities or Non-Governmental Organizations brings up the idea of the construction of a water system, the community members are less likely to participate. Evans and Phil[6] also noted similar result that 30-40% of water systems in Africa don’t function some few months after installation due to the lack of participation of users in the preliminary phases of the initiation of the water scheme.

The problem with the Muyuka water supply scheme may not only be at the level of the frequency of breakdown but at the duration the water source stays unrepaired once it has broken down. Taking into consideration the importance of water, 22 days (according to water committee members) or 67 days (according to community members) is a lot of time to keep the population without water. Similar results were obtained by Njuguna[16], when they studied the sustainability of sources of portable water in Harambee, Uppsala.

4. Conclusion

The water schemes in Muyuka was constructed many years ago and today faces serious crisis. Even those that were just constructed encounter similar challenges such as premature failure, leaving the inhabitants unsatisfied with the current water supply. Government and Non-Governmental Organizations do their best to see that the inhabitants of Muyuka have good water but they fail to get a good proportion of local community members involved in project sustainability of the water scheme. This has had a negative impact on the

sustainability of the water schemes as there are a lot of the water sources that are just a shadow of what they use to be. Frequent breakdown of the water schemes compounded by the unavailability of spare parts locally, and in expansion, user dissatisfaction and unwillingness to pay for maintenance, little training of water committee members on water management and delays in repairs, has resulted in poor sustainability of the water system.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

CONSENT

Written informed consent was obtained and then administration of the questionnaire to those who consented to be part of the study

ETHICAL APPROVAL

All authors hereby declare that the study have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. Ethical approval was granted by the Biaka University Institute of Buea Ethical Review Board (BUIB IRB). Administrative authorization was gotten from the Regional Delegate of the Economy, Planning and Regional Development for the South West and from the Mayor of the Muyuka Council.

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