ASSESSMENT OF SUSTAINABILITY OF WATER POINTS IN RURAL AREAS

STUDY AREA: DWANGWA IN NKHOTAKOTA

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ABSTRACT

Sustainability refers to the maintained functionality of water facilities through the operation and maintenance of the system at all times. The United adopted sustainable development goals (SDGs) in 2015 as a universal call to action for ending poverty, protecting the planet, and ensuring that by 2030 all people enjoy peace and prosperity (United Nations, 2021). The sixth goal of SDG emphasizes clean water and sanitation for all people.The sustainability of water points is the problem affecting water supply in the rural parts of Malawi.The objective of this study was the assessment of the sustainability of water points in rural area of Malawi.

The study was done examining the functionality of water points, evaluating the community management systems of the water points, nature of the water points and determining the level of community participation during the establishment of waterpoints.The study was carried out in Dwangwa area which is in Nkhotakota district specificall in Mulala, Maliwa and Kapala. People are scrambling for very few remaining functional boreholes and hand pump to access clean water. Despite the alarming problem of , no study has been done in the area to find out the solution to quench the situation.

The data were collected by use of questonares,field observation and focus group discussion.The finding showed that 56% of waterspoints were partially functional in the area and this was due to wear and tear.It was observed that nature of waterpoint contributed to sustainability of the facility ragdless of the proper management systems and this was based on its the materials and design of the facility.The use of waterpoints committes as management system was the effective way which highly promoted sustainability of water facilities.waterpoints with a well structured and organized commitees were properly functional and where the non-functional did not have waterpoints. There was an inverse relationship between the involvement of local people and the quality and sustainability of the water points.The waterpoints which the locals

were involved in establiment were in beter condition unlike those which did not participate in construction.

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CHAPTER ONE: INTRODUCTION

1.1 Background

The United adopted sustainable development goals (SDGs) in 2015 as a universal call to action for ending poverty, protecting the planet, and ensuring that by 2030 all people enjoy peace and prosperity (United Nations, 2021). The sixth goal of SDG emphasizes clean water and sanitation for all people. To achieve this goal as a nation, people in both rural and urban settings should have proper water supply infrastructures to continuously access clean water. Therefore, the government, non-governmental organizations (NGOs), and well-wishers put much effort into constructing water point facilities such as boreholes to reach all people with poor access to clean water in rural areas.

The sustainability of these water points is a major challenge in the rural setting of Malawi. This is because the rural water supply systems of Malawi typically have deficiencies that threaten their sustainability. According to (Sullivan and Meigh, 2003) sustainability reflects people's desire for a good life with the hope that it will endure for future generations. Shaw (2021) found that although the majority of water points continue to operate, they are not fulfilling all their roles and responsibilities. The inability of communities to contribute sufficient money to pay for replacement parts is a significant factor affecting the long-term use of installed water points. On a technical factor, Harvey (2019) also found that a borehole as a water point infrastructure sustainability solution is to obtain more hydrogeological information about the areas in which drillers are operating and to employ more highly qualified and experienced personnel. The study will employ qualitative research and the data will be collected by the use of field observation, interviews which will involve asking water points users through, and survey questionaries.

1.2. Problem statement

The sustainability of water points in Dwangwa is a major problem as it contributes to the scarcity of clean and safe water for people in the area. According to the UN (2016), billions of people globally have gained access to an improved drinking water source since 1990, with about 96% of the global urban population using improved drinking water sources, compared to 84% of the rural population. Therefore, the UN and the Malawi government are focusing on giving people access to clean water but the sustainability of these water points is the biggest challenge. People are scrambling for very few remaining functional boreholes and hand pump to access clean water. Even though the government, different NGOs, and well-wishers have been installing boreholes and hand pumps for consecutive years, most are not functioning. Therefore, there's a great concern amongst the people and even the government as to why some water points do not last long in their functionality in this area. This is also affecting the achievement of sustainable development goal number 6 of the UN in this area. The goal ensures the availability and sustainable management of water and sanitation for all (UN, 2020). So far, no research was conducted to assess and come up with possible solutions to this problem.

1.3. Objectives

1.3.1 Main objectives

Assessment of the sustainability of water points in rural areas specifically at rural Dwangwa in Nkhotakota.

1.3.2. Specific objectives

- To examine the functionality of water points.
- To evaluate the community management systems of the water points.
- To assess the nature of the water points.
- To determine the level of community participation during the establishment of the water points.

1.4. Research questions

- Is the waterpoint functional or non-functional?
- What is the maximum number of users per water point established to prolong its functionality?
- What are the management systems for waterpoint?
- What is the type of water point?
- What were the duties of the local people during
- the establishment of the water point project?
- What kind of external support towards rural water points and to what extent?

1.5. Significance

The sustainability of water points is the problem affecting water supply in the rural parts of dwangwa. Despite this alarming problem, no study has been done in the area to find out the solution to quench the situation. Therefore, the study helped to find out the factors causing and solutions to the problem affectining sustainability of water points in dwangwa. It also provided key information for managing of different water points available in the area in order to enhance sustainability of the boreholes, well,s and hand pumps. The study would be used as a reference by otheresearchersrsa the similar study, it would also provide proper procedures for organizations to put into consideration the ring establishment of waterpoints as they are focusing on achieving goal number 6 of SDGs through inwaterointsterpoints. According g to, N t2020) goal number six ensures that all people should have access to safe and clean water.

CHAPTER TWO: LITERATURE REVIEW

2.1 The concept of sustainability

The issues of sustainability firstly focused on the environmental context and attempted to protect the ecological resources and natural resources from over-exploitation (DFID, 2000). However, it has been extended to incorporate other aspects of development like social, economic, and institutional. The concept of sustainability first appeared in the thBrundtlandnd report which was published in 19 87. It was elaborated by the United Nations to warn about the negative environmental consequences of economic developmedevelopmentalization. It aimed at offering solutions to the problems rising from industrialization and population. Today sustainability tries to meet the needs of the present without compromising the ability of future generations to meet their own needs (Awoke, 2012). According totoo (DFID, 2000) the concept incorporates the managerquestionioof whetherhat sustawhetherility is achieved when prevailing structures and processes have thcanue their functions ovthe er long term.

2.2 Defining sustainability concept in rural water supply

Access to water resources is the inevitable right of the community (Mimrose, Gunawardena, & Nayakakorala, 20 11).With this in, mind the united nation sustainable development aims aims to reduce the proportion of people without sustainable access to safe drinking water and basic sanitation by 50the % by year 2015 (WH O, 2010).Several researchers did the studies in linethe with sustainability of water points to find out the common problematic cause of sustainability for water points and ta o prov e solution to the problems. The study done by Marks (2012) on water system sustainability in rural sub-Saharan countries indicated that there is a link between community participation and water system sustaCommunitye community participation in water supply projects includes users providing cash and labor contributthe ion to capital cost of the water point. According to her, participation engenders a sense of ownership of the infrastructure among community mema bers. Such sense of ownership it is essential for ensuring sustainable use and

management of water points by community members willing. According to (Beyene, 2012) his researchshowsshown that rural water supply in sub-Saharan Africa specifically those depending on hand pumps, often have low levels of sustainability. The basic causes for this include inappropriate policy or registration; insufficient institution support, unsustainable financing mechanisms; ineffective management systems and lack of technical stopping. The problem will only be solved by adopting a holistic approach to planning and implementation rather than focusing on one issue (Gbadegesin & Olorunfem, 2007).

Mukherjee & Wijk (2003) describes sustainability based on the publication of (WSP & IRC, 2003) as the satisfactory functioning and effective use of services and equity as everyone having access to benefits from projects.

2.3 Determinates of sustainability in water points

According to (CHOWNS, 2014) the key determinants of sustainability includes both technical factors such as water points type and installation and management factors such availability of funds and incidence of theft. These are mostly driven by the way that community management structures interact with socially embedded institutions. Some of the factors were discussed according to (Beyene, 2012) as pre-implementation factors and post implementation factors. Community participation, technology selection, site selection, demand responsiveness, construction quality, population and training are some of the pre-implementation factors. The post-implementation factors are technical support, community satisfaction, institutional and financial management, training and willingness to sustain the water project (Gebrehiwot, 2006). However, some of the most common determinant factors are technical factors including design, performance and maintenance issues (Awoke, 2012). Community and social factors including willingness to support projects, Institutional factors and including policy and external follow-up support, Environmental factors, including the sustainability of the water source, financial factors, including the ability to cover recurrent costs, and health factors. Below are examples of common waterpoints in rural areas.

Examples of rural water points.

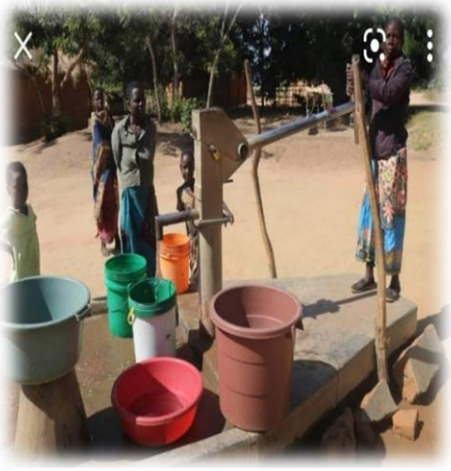


Figure 1: Afridev



Figure 2: mark 5 handpump



Figure 3: water kiosik

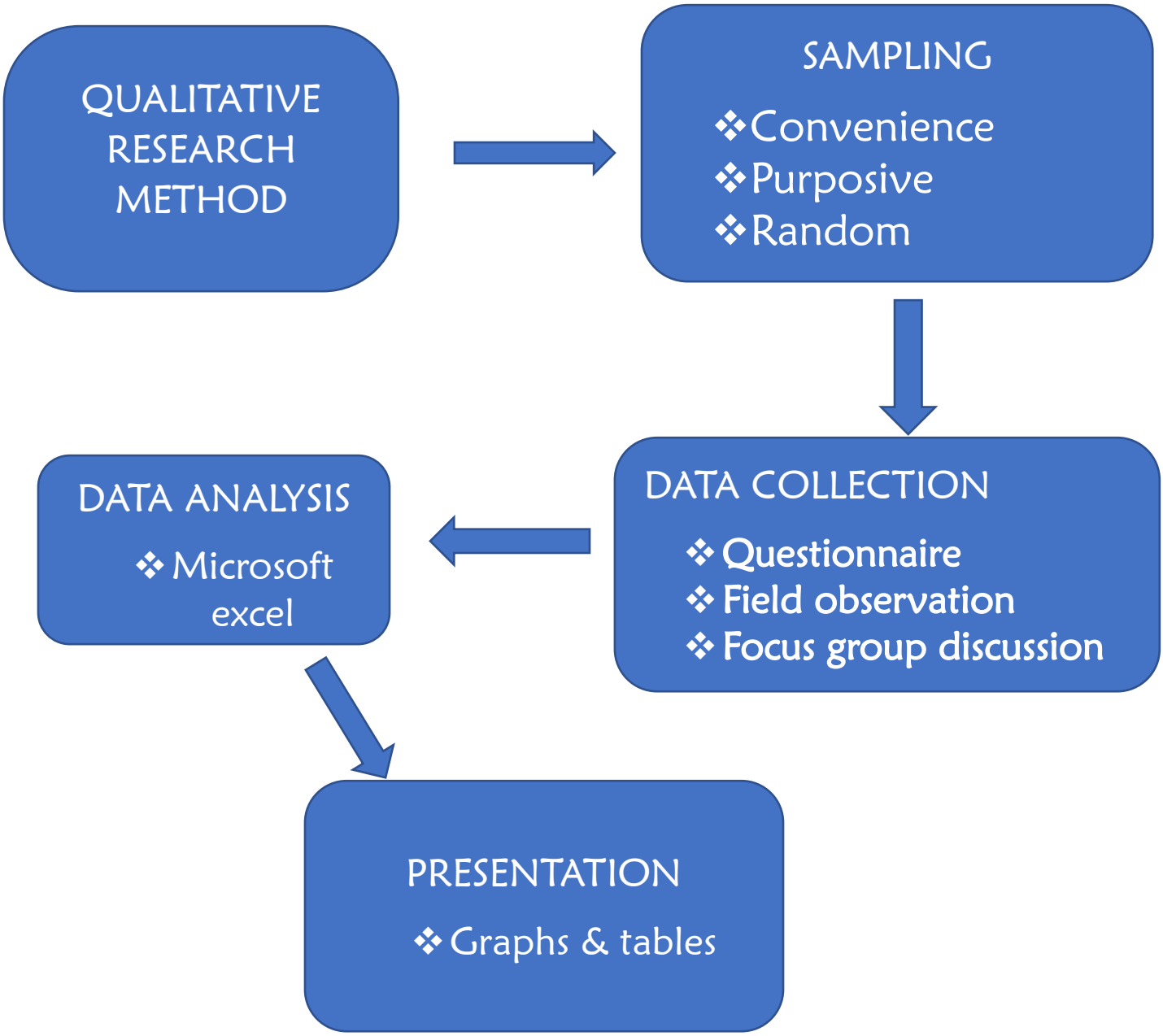


Figure 4:well

CHAPTER THREE: METHODOLOGY

3.1. Research design

The research employed qualitative research methods. Qualitative research is the interactive process in which improved understanding to scientific community is achieved by making new significant distinctions resulting from getting closer to phenom studied (Aspers & corte, 2019). Below is diagrammatic representation of research design.



3.2 Study area

Dwangwa is located in TA kanyenda, northern part of Nkhotakota district. According to (Tonho, 2021) Kanyenda population growth rate is 2.7 whereby they are 69,928 males and 46618 females in terms of population. Dwangwa is 60 km away from Nkhotakota district offices and its sub- divided into several rural areas and has a major trading center and industrial area of ILLOVO Sugar company. Dwangwa area is in north constituency Nkhunga ward of Nkhotakota District and approximately 160km away from the capital city of Malawi well known as Lilongwe in the Centre region of Malawi (Tonho, 2017). The area consists people of different culture such as Chewa, Tumbuka, Sena, Nkhonde and the predominant culture is Tonga. This is due to job opportunities at giant Illovo Sugar estate and some for-business purposes. The data was collected from three different rural areas of Dwangwa well known as Maliwa, Mulala and Kapala.

THE DIAGRAM OF STUDY AREA

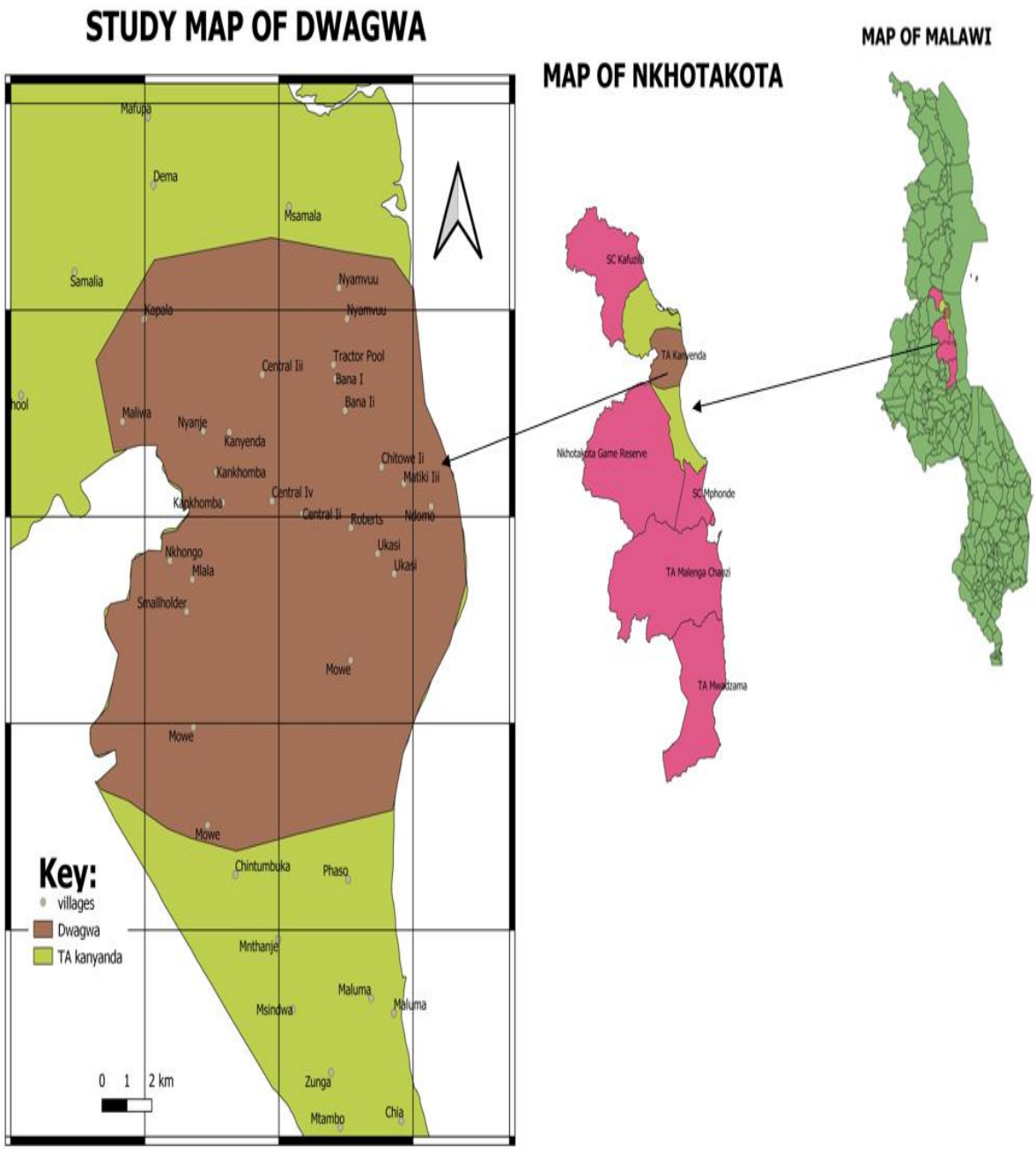


Figure 5:Map of Dwangwa Area

3.3. SAMPLING

The participants, water points and villages were selected using several sampling methods of qualitative research for assessment. Users of water points were the primary sources of data collection in all villages. The research employed use of questionnaires in 24 water points in the study area. There were on average of 4,475 members and 895 households that used the water points that data was collected. Random purposive sampling was employed to collect specific water points of which were at least 1km from the main load or secondary load.

3.3.1 Random sampling

The study was done in three head villages in dwangwa area which were selected by random sampling. To achieve this, each group village in the TAs was assigned a number in ascending order on a piece of paper (Edris, 2003), and randomly three group villages were selected. Random sampling, method that allows for the randomization of sample selection, i.e., each sample has the same probability as other samples to be selected to serve as a representation of an entire population (CFT, 2021).The specific method of random sampling was the stratified method. Stratified sampling is a method of random sampling where researchers first divide a population into smaller subgroups, or strata, based on shared characteristics of the members and then randomly select among these groups to form the final sample (Simkus, 2022).This method was employed to whereby Dwangwa area was divided into groups (strata) which are the villages. Therefore, out of these villages Maliwa, Mlala and Kapala were selected randomly to represent entire Dwangwa area.

3.3.2 Purposive sampling

This type of sampling, also known as judgement sampling, involves the researcher using their expertise to select a sample that is most useful to the purposes of the research (MacCombes, 2019).In every village 8 water points were selected to be evaluated and this was the average number for both Malamalama and Kapala villages in Dwangwa. These included boreholes (Afridev), handpumps (mark IV) and wells and these were the common water points found in both villages. In Mulala, Maliwa and Kapala, there were 7,9,8

waterpoints respectively available. The conditions for selecting were; if waterpoint point is in use or abandoned. The functional and non-functional water points were selected in each village to be evaluated.

3.3.3 Convenience sampling

According to (desertation, 2022) Convenience Sampling is a sampling technique that qualitative researchers use to recruit participants who are easily accessible and convenient to the researchers.it Oftentimes include utilizing geographic location and resources that make participant recruitment convenient. Therefore, this method was used to select households whereby the representative of the households was asked to provide information. Ten households benefiting from each water point was selected water and the household representative was chosen to be the primary source of the information. The preferred representative was well matured personnel, who continuously or currently accesses water from the waterpoint. The person should be the one of those who were there during construction of waterpoint or can provide accurate information about water point.

3.4. data collection

Face-to-face interview was used to obtain information about the functionality, community-based management and the frequency of maintenance of the water points. This helped to obtain the information about the age, population of people that use the water point as well as the efficiency of the water points. The data was collected from the chiefs of the community, persons in authority and reliable personals and a group interview of about 5 to 10 individuals to avoid data redundancy. The most significantly used technique was the key informant. This was so advantageous, to reduce time consumed during data collection and use of few resources to acquire reliable data for analysis. Village headmen provided information of the basic data about the specific study area. The data included the installation process, activities and resources that were required for the installation of water

points. The data then was gathered in a file and later was analyzed using Microsoft excel package to come up with graphs and tables for analyses and discussions. As part of the proper procedure for data collection, the village headman was first approached to ask for the permission. The village headman was told the importance of the study to villages and to the district as whole. The research was mainly for academic purpose. It was up to the village headman to approve and welcome the study and provided the village members to help point's location and necessary information.

The village members provided local knowledge of the villagers and gave directions to the water points. The data was collected based on the functionality of the water points, the age, community management, its efficiency and nature of the water point. Some of the ways which were employed in collection of data were Field observation. The focus group discussion was also employed on the households where several members were found.

3.4.1 Questionnaire

The questionnaire was used to evaluate the community management systems, degree and type of participation in water points facilities.it involved asking the house representative who is knowledgeable on the historical and current information of the specified water point. It also evaluated the institution support towards the water points to local people. The questionnaire included questions to find out the community participation in terms of labor, financial, and any material support during the construction of the water point, and evaluating the maximum number of users per water point. It also questioned the level of external support towards the management of the water point from institution established whether is a government or non-governmental organization.

3.4.2 Field observation

Field observation method was employed as one way of data collection. Field research is a qualitative method of data collection aimed at understanding, observing, and interacting with people or a facility in their natural settings (Sheppard, 2020). In the context of research, observation is more than just looking. It involves looking in a planned and strategic way with a purpose. Therefore, a specific water point was visited, where it is located with the team and the household member. Upon reaching waterpoint location, several things were observed and done. The nature, construction quality, protection mechanisms of water point was observed and recorded. Photos were also taken of the water point. The distance between water point and households for people to access water was observed and recorded. The field observation will help to identify the type of water point and relate realities of the data collected through questionnaires.

3.4.3 Focus group discussion

A focus group discussion was conducted with water user's committee members, households' members, and community leaders to collect qualitative data. This helped to get the relevant information about sustainability for boreholes in the villages. A focus group is a research method that brings together a small group of people to answer questions in a moderated setting (George, 2021). The group was chosen due to respond on the questions which were designed to shed light on the study.

3.5. Data analysis

Descriptive statistics based on the percentage were used to analyze findings. Qualitative data collected from water points users, local leaders, and water committees using structured questionnaire interviews and discussions was entered into Microsoft excel package to determine descriptive statistics for the study. Using the excel package, descriptive data like the frequencies, the means, the standard deviation and percentages were obtained and presented in graphs. Such as pie charts, bar graphs and time series for better understanding.

3.6 Limitations of the project

The study faced several challenges in the process of conducting specifically during data collection. These were insufficient funding, unwillingness of the households' members to participate and time consuming tiresome in collecting data. The parents sponsored the study by providing transport and money for food. This helped overcome the shortfall of funding. As way of motivating the responded who were unwilling to provide information, a little amount of money was given to them. This was done to those responded whom really had the very required information and he /she is the only one to provide such information like historical data. Local leaders were consulted and asked to direct us to the right personnel who give proper data specific for historical and helped to convince people about project. Therefore, villagers were aware and able to participate. Research assistances were employed for the meantime to help in order to reduce work done by individual and save time to get relevant data.

CHAPTER FOUR: RESULTS AND DISCUSSION

This section presents the results and discussion of the sustainability of water points in the study areas. This study aimed at assessing the sustainability of water points in rural areas under community participation as one of the major factors affecting the sustainability of water facilities in rural areas in Malawi

4.1 Social economic status of the respondents

Although 69% of the households in Malawi are jure facto male headed (NSO, 2000) in this study 63% and 37% of the respondents were female and male respectively. The female respondents were many unlike the male, this was due to their cultural beliefs that water collection and storage in the home for domestic purposes is the responsibility of women and girls. In most households, vested women were the priority to provide information about the water points. Men in those households thought that traditionally women are influential in any decision regarding communal water supplies.

In the study, it was observed that 10% of the respondents were able to read, write and technical staff and this indicated the level of literacy in the study area. This would be one factor influencing the sustainability of water points. Only 30% of the respondents owned and are living in properly iron thatched houses and owned proper water storage materials. 30%, 40%, and 50% of respondents commonly owned bicycles, television, and farms respectively. The mean size of the household was 6.2 with the number of household members ranging from 1 to 12. This is higher than the district's mean size of household of persons (NSO, 2000).

4.2 FUNCTIONALITY OF THE WATERPOINTS

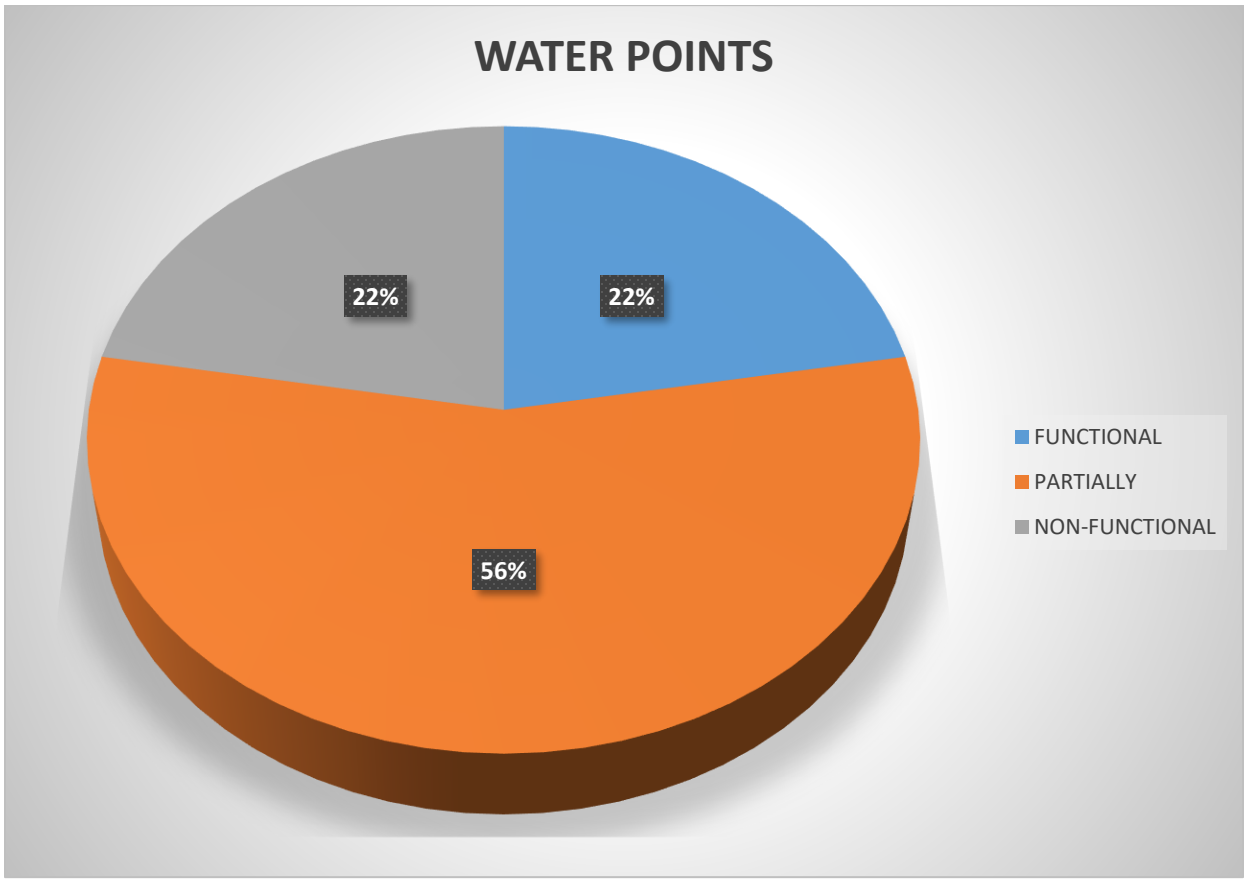


Figure 6: Chart of functionality

Figure 1 above shows the functionality of water points categorized as functional, non-functional, and partially functional as shown. Most of the water facilities in the areas are partially functional recording a high percentage of 56%. The functionality is one of the major factors that affect the sustainability of the water point as non-functional water points are abandoned in their premature life span. The functionality of the boreholes was based on several factors. Such factors were the water dry-up of the water point, wear and tear of the materials, the flowing rate of the water, and also its structure. Most water point functionality surveys are based on a binary (functional/ non-functional) definition to

adequately monitor progress towards SDG6 for safely managed water services (Whaley and Cleaver, 2017). According to the WHO /UNICEF Joint Monitoring Program (JMP), improved drinking water sources are those that, by nature of their design and construction, have the potential to deliver safe water, and include: piped water, boreholes or tube wells, protected dug wells, protected springs, rainwater, and packaged or delivered water.

Age is also the fundamental factor affecting the sustainability and functionality of water points. However, it is with shallow research concluding that most of the facilities are abandoned due to their maturity, lack of spare parts and due to the replacement of new model facilities such as taps (Cronk R and Bartram J, 2017). Although the areas in consideration are rural, which are receiving a limited progress in achieving and expanding access to clean water in meeting the sustainable developmental goals compared to the urban areas, water infrastructure installed need not to be abandoned prematurely before the end of its design life (Welle and Williams, 2014). Hence a strategy starting at local to achieve tertiary goals was in detail assessed.

On the other hand, household characteristics put a trivial impact on the sustainability of water points (Tucker J el tal, 2015). In the studied communities, there were a total of 895 households with uncertain residents that benefited from the water points. There were no privately owned facilities nor open ground sources to cater to the demand of the population. This also is to put other factors such as dryness or lowering of water table exclusive. Therefore, the data collected showed no relationship. The socio-economic status of various houses determines the consumption patterns of water as well as the technological choices in rural areas tending to be urbanized (Harris D and Jones L, 2011). Per capita domestic water consumption is a tool used by water suppliers to balance water demand and production and installation. Sustainable rural water supply management requires, ideally, accurate evidence-based estimations on per capita consumption and a good understanding of the factors influencing consumption. As per capita water consumption is widely discussed as one of the paramount considerations to the planning and future water demands but not more significant on water point sustainability.

4.2.1 Period of functionality

The period of the functionality of the sampled water points was in a range of more than one year to 22 years of age from construction. In support of some of the points elaborated before, age is ignorable if proper strategies are taken to maintain the functionality of the water point. However, as the age of the facility increase, so is the frequency of breakdown as shown below.

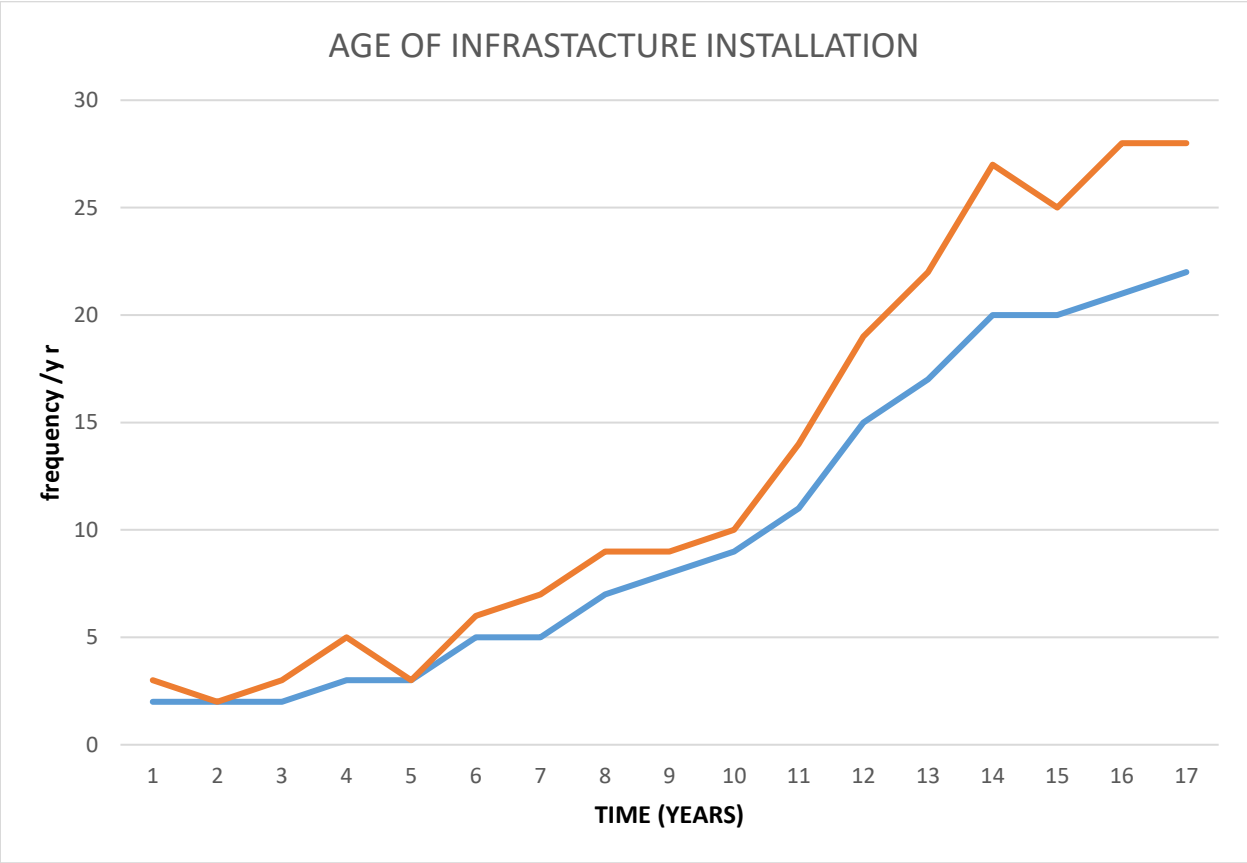


Figure 7:Graph of time against frequency of brockage

As the age of the facility was increasing, the number of breakdowns per year without considering how long it took to be maintained also increased. Boreholes which were most commonly water points used were generally notably subdued as compared to the other

water points. Such a water point distinctly holds a significant number of users as they have a longer lifespan. The number of households that benefited from boreholes was almost half the total number of households that uses all water points. In rare cases, boreholes are left for reasonable justification such as being adversely vandalized and low water tables that leave hard choices for the users. This could be due to wear and tear or rust. After taking appropriate procedures of maintenance by technicians, the water points are functional and sustain the availability of potable water in rural areas.

4.2.2 Efficiency and sustainability

The data showed a common trend that enabled the phenomenon affecting sustainability more perceived such as functionality. Although functionality is already tackled earlier, this study determined a comprehensive connection between these two terms, functionality and sustainability.

The data showed no relationship between the water points breakdowns and abandonment, at an alpha level of 95^0 one-way ANOVA. Therefore, it is knowledgeable enough to state that the high number of breakdowns per year has less effect on sustainability. This is because the sustainability of water points is the ability of the water system to continue working over the desired period without adversely affecting the environment even when there is stoppage frequency due to technical faults and breakdowns. In addition, several articles have found that the number of breakdowns is reduced by frequent maintenance of water points. However, efficiency affects sustainability. According to UNICEF (2012) boreholes should have a minimum discharge of 0.25 liters per second, that is, a 20-liter bucket is to be filled in 80 seconds for optimum boreholes. However, this was not the case with the studied communities.

Table 1:Yield of water

No=	Water points	Mean Time taken to fill 20ls	Recommended by UNICEF	Recommended by WO
1	Boreholes	0.14l/s	0.25l/s	0.25l/s
2	Mark IV	0.17l/s	0.2l/s	*
3	Wells	Dependent	--	--

Many boreholes took time to fill a bucket. As the age of the facility increased, there was a decrease in the efficiency of the water points. This is in line with the findings of Ngopa (2012), which stated that borehole yield is affected by facility age. Borehole yields are unique depending on the aquifers. Ranges have been enacted from high to low depending on the type of aquifers.

4.3 Community management

4.2.1 Water point committees (WPC)

Still and all, the water user's association WUA) is of great interest in affecting water points. Out of all the assessed waterpoints, it was observed that 80% of water points had waterpoint committees. Only 30% were functioning and had a well-constructed and organized managerial structure. Each WPC was responsible for a specific water point that facilitated operations and maintenance (O&M) activities. These WPC were indirectly supported by the water users' associations (WUA). WUA is a non-profit organization that

is initiated and managed by a group of water users along one or more hydrological sub-systems (IWMI, 2003). These were established specifically for one water point and they comprised both females and men who were responsible for the collection of funds from users for the maintenance and management of the water point. These WUA were so responsible for all requirements of the waterpoint hence making it to be in good condition which contributed to its sustainability. The purpose of a water committee is to manage and oversee the system's operation. This may include conducting preventive maintenance, collecting tariffs or payments for repairs, keeping records of financial transactions, manuals and blueprints, and sanctioning people for non-payment. Communities that do not have water committees often rely on traditional leaders to manage the water system.

The basic functions of a WPC included Collection of money from the water users for O & M of the water point, Proper facilitation of O & M of the water point, ensuring that the water point surrounding is kept clean, Controlling the pump usage and water distribution, Organizing of pump maintenance and repair and Organization of regular WPC and community meetings.

However, these local WUA's face constraints in managing the water points. Mostly is the resistance by villagers to contribute money towards the maintance of the waterpoint, they also lack external support like NGOs in terms of finance and spare parts. These, WUAs regardless they are so effective in promoting sustainability of water point they lack adequate knowledge on the management aspects. The associations need to have proper management structure and this will help in proper management of resources and increase trust by the villagers in terms of their contributions. Another challenge is shortage of members to run different duties in the in the association for continued operations of the waterpoint.



Figure 8: Memers Maliwa waterpoint committee

It was observed most installed pumps were the VLOM pump such as Afridev.VLOM pump can be operated and sustained using Village Level Operation and Maintenance

Management (Skinne & Shaw, 1999). This edition emphasizes the role of users as the managers of maintenance – they may choose to use someone from outside the village to assist with more complicated repairs. Not all maintenance and repair need to be done by the villagers for a pump to be operated and enhanced sustainability.

In contrast, most water points with no water user's association were in bad condition hence partially functioning and some were vandalized. This is because there is no security since no one is responsible for caring for it despite villagers getting water from it. No maintance done frequently towards the waterpoints no one is responsible for such work hence the sustainability is affected.

4.4 Nature of water points

A total of 24 cursively selected water points were surveyed in the area, in all the villages where the household interviews were conducted. The commonly used water points in the area were Afridev handpump, sol mark 5 and wells.

Table 2: Percentages for the availablity of different types of water points

VILLAGE	TYPE OF WATERPOINTS		
	AFRIDEV (%)	MARK 5 HANDPUMP (%)	WELLS (%)
Mulala	20	50	35
Maliwa	40	10	25
Kapala	40	40	40
TOTAL	100	100	100

The study showed that the water facilities were provided by the government, the quasi-governmental institution of Malawi Social Action Fund (MASAF), non-governmental organizations and well-wishers. such as Malawi red cross society (MRCS). MRCS provided 70% and 20% by the government whereas 10% by the well wishes. Marion Medical Mission (MMM) provided 98% of the mark 5 hand pumps in the area. The villagers dug the well and the MMM provided all the required materials such as cement and the pump and its spare parts.

The nature or design of the water point in the study was observed to be contributing factor of sustainability of these water facilities in the community. In three villages the commonly used waterpoints varies in their operation which not lasting long or being abandoned. Hand pumps (Mark 5), Afridev and well were the commonly used water points in both villages. On summer or dry season, the handpumps (MARK 5) are unable to abstract water from ground and this due to its low depth capability. The Sol **Mark 5** pump is ideally suited to shallow hand dug wells or boreholes. The recommended maximum pumping lift for "Direct Acting Pumps" is 15metres (Baumann, 2005) This, affect villagers during that season

as such they are left with no option than to use the water available in the rivers of which is not safe and clean for usage. Henceforth, on contrast the hand pumps is abandoned during this season and left un attended and no care is taken towards for long time it which hence reduces its life span. The recommended maximum pumping lift for "Direct Acting Pumps" is 15metres (Baumann, 2005). The pump has been tested at a depth of 12m (Dunde Hand Pump Project, Munda area) and the pumps worked effectively and the recommended maximum is 20 households or 100 people (Wopereis, 2019).



Figure 9: marrk 5 handpump

Afridev is a bit reliable in both the community where the study was done. It provides water throughout the year regardless of the summer or dry season. According to (Grupka & Lamarche, 2011) Afridev is a lever action handpump operating at dug wells or boreholes of 10 to 45m. It can serve up to 300 people with water consumption of 15 to 20 litres per person per day. The above ground components of the pump are made of galvanized steel and the underground parts are brass or uPVC, so the pump is fully corrosion resistant. In contrast, Afridev proved to be a not good enough solution, because of numerous technical problems. For example, in some types of Afridev, the rod connector can over time make a hole in the PVC rising main, and thus sawing and re-gluing using PVC sockets may be required (Wood, 1994). This probably would be too complicated to carry out for an average person in the developed countries, so by no means this could be performed by a rural community in Africa hence the sustainability is diminished. Below is the photo of the one Afridev borehole sampled in Mulala village.



Figure 10: Afridev hand pump

4.5 Community participation

In the accomplishment of the objectives of sustainable water points, all levels, sectors, and both men and women are put into roles that govern the maintenance and monitoring of these facilities. In communities where the water points were self-owned by the community, the data shows that the facilities were not broken down frequently. Resources provided by the community were sand, bricks, quartz, water, and cement for the construction of such water points.

Effort in uniting the community members by the leaders and heads contributed to community empowerment in fight for lack water potable water. Given the importance of these facilities by the community through awareness by several stakeholders, cooperatives and associations were arranged. Improper distribution of roles and responsibilities among men and women attributed by gender issues caused a lot of challenges facing the community-based management approach to sustainability water points. This was discernibly indicated by the data collected in all three communities.

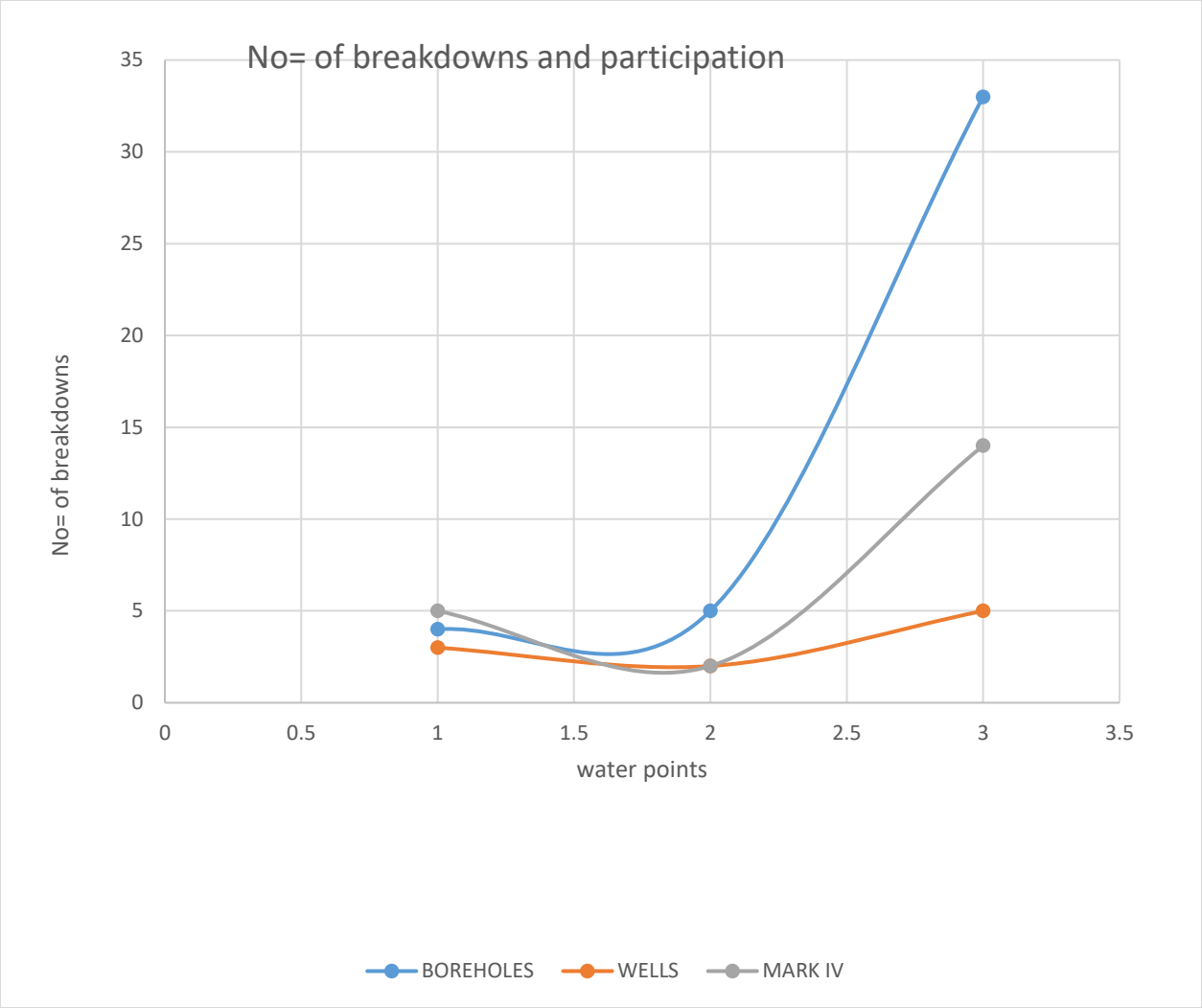


Figure 11:Graph of waterpoint against number of breakdown

Community participation should begin long before the installation of water points. This yields the beneficiary community with sufficient knowledge, skills, and a sense of ownership of the water points. As shown on the participation graph, boreholes recorded a drastic rise in the number of break downs to other water points. This is in correspondence with most of the research works which hold the same results on the relationship between community participation and facility breakdowns. As distinctly stated earlier, participation is limitless right before installation through the facility lifespan. To this effect, after handing over the facility to the designated community, monitoring assistance concedes technical support easily. As an outcome of all observed facts from the data collected, breakdowns

per year are predicated on a lack of community participation. Although the number of breakdowns per year negatively affects the functioning of water points, the sustainability of such water points is affected solely when these water points are abandoned without maintenance.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 conclusions

This study assessed the sustainability of water points in rural areas in Dwangwa. The specified villages were Mulala, Maliwa and Kapala. The questionnaire, field observation and focus group discussion were used to collect required data about the specified waterpoints and in line with the objectives of the study. The study findings show the water points which are commonly used in both villages were wells, hand pump (mark V) installed by Marion medical society and Afridev pumps which were installed by government, non-governmental organizations and well-wishers.

According to the results, 56% of the water points installed in the villages were partially functional. Therefore, this indicates that water points are not in good condition and its sustainability to meet the current demand and upcoming generation is low. Therefore, this will affect the achievement of accessibility of water by all people despite effort is put by installing the water points.

The community water users committee have great role in facilitating the sustainability of water points, as a committee is important in making plans for new water supply systems and maintenance of old ones. They, convince the villagers to be responsible and proper use of water facility to prolong its functionality. Most water points with well-organized water points where in good conditions but those with no or un-organized committee where not properly functioning.

The community participation during construction of water facilities is of the aspect which needs to seriously considered when ever the installing the water points. According to the study the villagers felt sense of ownership of the water points hence where so responsible for the management of waterpoints. Therefore, this enhanced the sustainability and most non-functional water points where those which were just provide with zero involvement by the local people.

Finally, the sustainability of water points is affected by the nature of the water facility. It was observed that different types of waterpoints are made of difference materials which determined its functionality and life spine. The in ability of handpump to continuous provision of water through the year in both villages enhanced the abandonment of the facility. The Afridev, handpumps were reliable according in all three villages according to the results. This was due to its capacity to abstract water at high depth of 40 meters which is the average depth of low water table for both villages.

5.2 Recommendations

- There should be regular trainings to both water users' committees and households on the management of water facility and how they can share responsibilities as committee when conducting their operations. This will help the members to gain more knowledge on the management of water facility.

- There should be introduction of motivation activities. Such as awarding committees of the best functioning and well protected waterpoint. This will motivate the committees to ensuring that their water point is always inn condition. Therefore, this will enhance sustainability of waterpoints in the villages.

- Construction quality, appropriate fencing, system area conservation practices and periodic monitoring, and effective supervision of rural potable water points can enhance sustainability these water facilities. In the study area, there was a gap on these water infrastructures. Hence, Nkhotakota district water office in collaboration with the organization constructing water points in rural areas should develop a standard rule for appropriate fencing, construction quality, monitoring and supervision activities.

- It is recommended that appropriate cost sharing and recovery could improve sustainability of water supply systems. However, water payment of the users in the

study area was very weak. More awareness creation efforts should be done related to the importance of tariff payment.

- The mark 5 handpumps should be innovated by increasing depth of water uptake. In the study, it was observed that on summer people suffered in terms of accessibility of water from these hand pumps since they dry up due to failure in withdraw of water. However, this was due to lowering of water table of which can vary based on the amount of water received in the year.

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APPENDIX

2022 DWANGWA RURAL WATERPOINTS SUSTAINABILITY SURVEY

No.	QUESTION	RESPONSE	
PART ONE: NATURE OF WATERPOINT			
1.1	Year		
1.2	Village name		
1.3	Maximum number of population the water point specified to serve?		
1.4	Photo of the water point		
1.5	What is the type of water point?	Gravity system	
		Afridev handpump	
		Mark II	
		Mark III	

		Mark IV	
		Kiosk with piped supply	
1.6	Who or which organization funded the construction of water point?		
1.7	The interviewee	Name	
		position	
PART TWO: COMMUNITY PARTICIPATION			
2.1	Did the local people participated in the construction of water point?	Yes	
		No	
2.2	What was the roles of men?		
2.3	What was the role of women		

2.4	What was the role of both men and women?		
2.5	What were the material contribution by local people for construction?		
2.6	Where the local leaders involved in decision making?	Yes.	
		No.	
2.7	How was the ratio of local leaders to staff participation?	Staff where many while local where less.	
		Staff were fewer while locals were many.	
		A number of staff and locals was the same.	
PART THREE: FUNCTIONALITY			
3.1	Functional status	Function	

		Partially functional but in need of repair	
		Not functional	
3.2	If functional, does the water point provide a continuous supply of water per month?	Yes	
		No	
3.3	How many villages does the water serve?		
3.4	List of villages the water point serves		
PART FOUR: MANAGEMENT			

4.1	Who is currently managing the water point?		
4.2	If there is a breakdown where is the support mainly come from?		
4.3	How long does it take to maintain?	A day	
		A week	
		A Month	
		A year	
4.4	Are users' fees being collected	Yes	
		No	
4.5	Are users' fees being managed as intended purpose?	Yes	
		Not really	

		No	

FOCUS GROUP DISCUSSIONS GUIDING QUESTIONS

- What are the major benefits of effective sustainable management of water facilities?
- How do you outsource the finances for the management of the water points
- What are the major constraints of achieving sustainable management of the water points?
- Why is that people are willing to participate in the operation and maintenance of the water facilities?
- What factors influence the people's participation in the operation and maintenance of the water?
- What rules do you have in your communities about the maintenance of the water facilities?
- How is participation enforced
- What are your immediate needs?