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ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF DEVELOPMENT STUDIES
DEPARTMENT OF ENVIRONMENT AND DEVELOPMENT

The Sustainability of Rural

Water Supply System: A Case in Homosha Wereda; BGRS, Ethiopia

By:

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A Thesis Submitted to College of Development Studies in Partial Fulfilment of
the Requirements for MA Degree in Environment and Development

Advisor:

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Title

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Ethiopia.*

By

Aschalew Mamuye

DEVELOPMENT STUDIES

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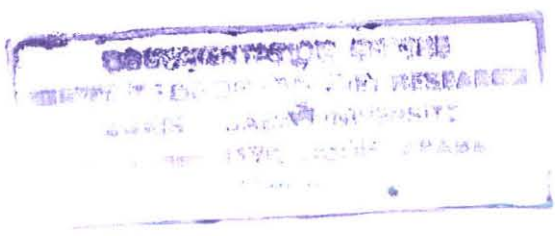


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CHAPTER ONE

1.1 Background

In many places, water use now exceeds the sustainable supply, causing rivers to run dry and underground water tables to drop. And unchecked pollution makes the available supply less usable. Increasing scarcity, competition and arguments over water in the first quarter of the 21st century will dramatically change the way we value and use water, and the way we mobilize and manage water resources. Water is an important natural resource relied upon for day-to-day economic activities and for healthy standard of living. Providing access to clean and adequate water supply system facilities and improving the performance of this sub- sector directly reduce the morbidity and mortality rates of population. It also increases the productive capacity of the economically active population. Thus the available potable water symbolized an improvement in the level of welfare and productivity. Safe drinking water is one of the basic necessities for human beings.

An insufficient access to water; on the other hand, is not only bad for health, but also contributes to a poor food security and a lagging social development. Billions of people in the world have not access to clean and adequate water supply system facilities today. Of these significant number is from the developing countries mainly residing in rural areas. Particularly women and children are the most vulnerable segments of the society. Worldwide and in Ethiopia significant number of children are dying each day because of absence of safe drinking water and appropriate sanitation and hygiene (UAP; 2009). Women and girls bear heavy burden in providing water for their families. The poor are particularly vulnerable to water scarcity, pollution and flooding. Water related diseases are the most common causes of illness and death among the poor of developing countries. According to the World Health Organization, (WHO), 1.6 million deaths of children per year can be attributed to unsafe water, poor sanitation, and lack of hygiene; (Bezabih; 2008). Sub-Saharan Africa has the lowest water supply and sanitation coverage of any region in the world and 300 million people in the region have no access to safe water supplies; ([http:// www. idh. or /news/2006/IAH. / rural. PDF](http://www.idh.or/news/2006/IAH./rural.PDF), and, Simeneh; 2010 and World Bank; 2004)



In Ethiopia where the majority of the population, about 85%, live, in rural areas, millions of people, about 39.529, are facing problems of obtaining adequate potable water supply in 2006, /MoWR, 2006:33/. Similarly, in BGRS, thousands of people (more than 339, 000) still suffered from access to safe water supply in the year 2007, (BoWRs; 2007:3). The proportion of villages with any form of modern water facility is very small. About 53.01% of the total population of the region, /23.8% of the urban and 58.64% of the rural/, is still suffered from access to safe water supply in the year 2007, /BoWMERD, 2007:3/. Similarly data from Homosha woreda water office shows that about 68% of the population in the woreda were accessed to safe water supply in 2010. Hence 32% of the total population did not access to the safe water supply. This shows that a lot has to be done to improve the situation.

Almost a third of the existing rural water facilities in the region are not functioning at any particular time (UMC: 2001). Around half of these schemes are not able to provide enough water to community members who depend wholly or partially on them, and more than a fourth of these facilities provide water of poor quality. Davis and Brikke(1995) referring to WHO estimated 30 to 60% of existing water supply schemes in developing countries are not operational at any time. It is also estimated that 35% of all rural water supplies in sub-Saharan Africa are not functioning ([http://www. wateraid .org/documents/plugin-documents/functionality-and-sustainability-study-by - alexia-haysom. PDF A](http://www.wateraid.org/documents/plugin-documents/functionality-and-sustainability-study-by-alexia-haysom.pdf)). UAP is intended to lower non- functionality rate of water supply schemes to 10% /MoWRs, 2009/.

Regarding the non functionality of rural water supply schemes in BGRS, data from MoWRs, /2006:30/ shows that about 30% of the schemes were non functional at the end of the year. Failure to appreciate these shortcomings and correct them accordingly has so far resulted in a large wastage of resources. As observed in the region and generally in the country each year, as new rural water supply facilities are constructed, an equal number will go out of function.

To improve this situation the international community adopted the Millennium Development Goal /MDG/ and committed to reduce by half the proportion of people without sustainable access to safe water and basic sanitation by 2015. The Ethiopian government is also striving to enhance the sectors development including the improvement of safe water supply to the people (UAP; 2009) To this end, it has endorsed water resource management policy in 1999 which outlines the country's views regarding the water sector, including water supply approaches,

strategies and plans for the development of the sector. A Strategy is also developed for further elaboration and translation into action of the policy and to provide concrete direction for the sector's development. It focuses on the promotion of demand driven, sustainable and affordable and user's acceptable development of water supply services. Based up on the national government policy, strategy and plan, the BGR state along with local governments at different levels, non- governmental organization and donors have made efforts to address the issue of access to safe drinking water to the community.

This research work is then intended to investigate and analyse water supply services in Homosha woreda. It mainly focuses on investigating the reasons behind for the non functionality of schemes and the un- sustainability of the water supply in the area. It also emphasizes on relevant water supply service issues: water availability, scheme distribution, and its sustainability. The study is believed to contribute towards the efforts in accessing the service through identifying those major reasons for the un-sustainability problem and suggesting for possible majors that should be taken to alleviate the challenges.

1.2 Statement of the problem

Homosha wereda is one of the twenty woredas in BGR where the effort of providing safe drinking water is in progress. Although improvements were observed, there still existed a considerable problem in the availability of safe drinking water.

Almost all the available surface sources at the area significantly reduced in amount and quality and the majority get dry during the dry season where as a result almost all access to safe water supply even for additional uses other than for drinking and cooking is confined to the available developed schemes. But most of the time these facilities are not functioning and the service they provide is seen to interrupt frequently and at other times their productivity during the dry season significantly reduced or even gets dry. According to data from a survey result conducted by the woreda water office, only 56.2% of the available schemes were found functional, due to seasonality and defective reasons, /Annex 9/. Repairing malfunctioning schemes will also take times. From these, the people of the area are being suffering from the problem of lacking adequate and quality drinking water both for them and their animals. Women at the area on whom culture has already imposed heavy burden in providing not only water but also all the

required income and food materials to the household, this has made their lives more tedious and challenging. Thus, to benefit intended beneficiaries from the developed water supply facilities sustainably, on time O&M as well as quality of schemes at construction to avoid seasonality effect need to be considered seriously.

1.3. Objective of the study

The general objective of this study is intended in assessing potential problems that affect the sustainability of the water supply developments in Homosha wereda.

Specific objectives

The specific objectives of the study are therefore;-

1. Assessing the reasons existing behind the problems of accessing safe water supply sustainably in the area,
2. Assessing the level/coverage of safe water supply in the area,
3. Assessing level of communication and integration among partners and stakeholders in planning implementing and monitoring water supply developments,
4. Examining distribution of improved/ developed water supply schemes among the kebeles of the wereda

1.4 Research questions

The following research questions may be answered in the process of this particular research.

1. What reasons/problems are accounting for the sustainable use of developed facilities in the area?
2. How much of the area/population has got the safe water supply coverage so far?
3. How far institutions and organizations are working together in promoting safe water supply in the area?
4. Are the developments made so far considered safe and proportional distribution?

1.5 Significance of the study

The output of this study can be used by interested stakeholders & partners, and help them;

- To find out the reasons for the un sustainability problem of their accomplished projects.
- To understand what important procedures they missed out during their project development processes and to correct them in their future career.
- To find solutions for the existing schemes sustainability problem in their already developed facilities.
- Can be referred as an initial document by policy makers and by students doing their thesis proposals in the area; and
- The study result may also be used through adaptation to alleviate scheme sustainability problem in other areas too.

1.6 Scope and limitation of the study

The scope of this study mainly is limited in exploring such major reasons existing behind the failure in sustainably utilizing the already developed access to water supply systems at the woreda. Water supply coverage and distribution of water supply facilities among the kebeles, communication and integration among partners and stakeholders in promoting water supply developments, and identification of the existing sources of water supply currently utilized by the communities and the types of schemes available in the area, will also be entertained in the study. Following interpretation of the study results, recommendation will be given on actions that should be taken to ensure the longevity of service provision. The sustainability problems of RWS are associated with a wide range of problems rooting from social, technical, financial, environmental, and institutional streams. Therefore it might be difficult to cover all at a time due to constraints attached to resources and competency. Thus the scope of this study is limited to the remaining factors leaving the environmental component aside.



CHAPTER TWO

Literature Review

2.1. Community management; Concept and application

Although some 20 years have passed since stakeholders involved in rural water supply system, development have recognized that unacceptably high percentage of schemes existed after completion of their implementation. The reason for not being operational still remains a major concern. One of the result of the long standing debate and continuing search on the best ways to ensure the sustainability of rural water supply service has been the focuses and impetus it has created towards adapting the concept of community management to drinking water supply.

Disparities in water supply coverage in urban and rural areas are high in developing countries, with rural coverage being much lower .The inability of governments to provide the service because of resource constraints, and the paradigm shift in development that called for a bottom up approach to development, led to the widespread adaptation of community managed rural water supply schemes since the 1980's.The issue of sustainable access & an improved water source is one of the elements under environmental sustainability in the MDG. For achieving the plan, thus, it is not only coverage that needs to be increased but sustainability of implemented water and sanitation services indefinitely.

Community management in RWS is a concept that has developed only over the last two or three decades. The concept has evolved from the practice of involving the communities in the development activities. While in states which have democratic systems the involvement was made possible through convincing and encouragement. In such states the approach is intended to create awareness among the stacks and help to develop a feeling of being an owner over the developments made which is the basic issue as far as sustainability is concerned. This is because the domains contribute to sustain the achievements, as their involvement is made knowledge based. Most of the world is thus seen to exercise it. In states with totalitarian tendencies communities were simply forcefully mobilized to participate in the accomplishment of state development plans. Thus as what has been done is not based on awaring and convincing the citizens, there is no any developed sense of being an owner over the developments, the

achievement could not stay longer. People may not contribute for sustaining it, and even may tend to damage it despite what a significance role it could play for them.

As the experience of exercising community involvement in development activities has shown its key role in sustaining achievements, the involvement has been evolved into full community participation. As the community awareness has got advancement, the participation overtime has then evolved to community management. In this process changes took place that gradually transferred the responsibility for providing rural water services from central governments to local communities. Community management is known a widely used approach in RWS and sanitation activities. The approach involves:-

- Application of the principle that decisions are to be taken at the lowest appropriate level, with public consultation & involvement in planning and implementation,
- Support & assistance to communities in managing their systems on sustainable basis,
- Encouragement of the local population, especially women, youth, indigenous people, and local communities in water management,
- Linkage between national plans & community management and local water service,
- And, Integrations of community management within the context of overall planning.

In Ethiopia community involvement and participation is undergoing similar changes; transformation from community involvement through participation to community management. The provision of water and sanitation services has been experiencing changes in terms of governance and management structures. Promoting a decentralized community management approach is in practice in the overall development agendas in general and in water supply services in particular by most actors including the Ethiopian governments towards ensuring genuine community management of water supply services,/MoWRs, UAP, 2009/.

2.2 Water supply and sanitation: policy and status in Ethiopia

To set a basis for sustainable development and management of the country's water resource, the Ethiopian ministry of water resources has formulated Water Resource Management Policy in /1999/, Water Sector Strategy,/2002/, and Water Sector Development Program,/WSDP/, /2002□ 2016/. The overall goal of the national water resource management policy is to enhance and promote all national efforts towards the efficient, equitable and optimum utilization of the available water resources of the country for significant socio economic development on a sustainable basis while the national water sector strategy is thus to translate the national water resource management policy into action by defining a set of medium to long term measurement of action plans,/ MoWR,1999: 2004, and 2006/.

The overall objective of the water policy of Ethiopia is to enhance the well being and productivity of the Ethiopian people through provision of adequate, reliable and clean water supply services and foster its tangible contribution to the economy by providing water supply service that meet users' demand, /MoWRs, 1999/. As a result, a seven years Universal Access Plan/2006□ 2012/, and a Plan for Accelerated Development to End Poverty,/PASDEP: 2005/6 □ 2009/10/ are underway to provide adequate water supply facilities to achieve the MDGs related to water supply.

Based on the 2006 annual report of the ministry of water, about 47.3%, /35.479 million/ of the total population of the country have accessed to safe water supply in the year 2006. Service coverage considerably is higher in urban areas than rural where the coverage is 78.8%,/ 9.589 million/ and 41.2%, /25.89 million/ respectively. This shows that the majority of the population, especially the rural communities suffered from the service and depend on traditional or secondary sources, / rivers, streams, ponds, and unprotected springs/, for domestic purpose. Based on similar source, the national sanitation coverage in the year 2004 was 30.63%where the urban and rural coverage represent 77.68% and 21.34% respectively. Similarly as in urban and rural, variation has been observed between regions as well,/ see table below/.

Table2; 1; coverage and non functionality of schemes in regions and in Ethiopia in 2006;

No	Region	Rural	Urban	Total	% of non functional water supply schemes
1	Amhara	36.6	80	41.5	23
2	Oromya	40.2	87.6	46.5	25
3	SNNP	53	64.5	54	17
4	Tigray	42.8	50.9	44.3	20
5	Afar	41.1	73	44	30
6	Somali	21.5	60	28	30
7	Benishangul Gumuz	46	66.2	48	30
8	Harare	29	21	24	30
9	Gambella	41.4	37	40.6	30
10	Dire Dawa	57	72	68.2	30
11	Addis Ababa	-	90.1	90.1	-
	National	41.2	78.8	47.3	25

Source; MoWR,/2006/;

As it can be seen from the table, Somali region is the least and Dire Dawa the highest in accessibility of water supply coverage in rural areas. Harare is the least both in urban and at the national level too. In urban Addis Ababa has the largest coverage. Generally the coverage lies between 21.5 in Somali to 57% Dire Dawa in rural areas and between 21 in Harare to 90.1 in Addis in Urbans where the total coverage in regions ranges between 24 in Harare to 90.1% in Addis. In regard to schemes non functionality, the SNNP region has the least, /17%/, and the highest is recorded 30% in six regions with the national average of 25%.

To improve the poor status of water supply and sanitation, the government had implemented Universal Access Program, / 2006□ 2012/, and PASDEP,/ 2005/6□ 2009/10/. The program states “water for all citizens of Ethiopia”. The target of the program is to provide safe water 15litres per person per day within 1.5km for 98% of the rural population and 20litres per person per day within 0.5km for 100% of the urban population. The program has also aimed to achieve 100%sanitation coverage both in rural and urban areas, /MoWRs, 2006/. To address the issue of



mal functioning and ensure sustainability, the goal during PASDEP is to reduce the share of mal functional RWS systems from 30% in 2005/6 to 10% in 2010, /MoFED, 2006/.

2.3 Water Supply indicators and assumption

The degree of utilization of water supply developments is commonly evaluated against the known and accepted criteria; such as affordability (ability and willingness to pay), distance, reliability (quality and quantity of water the schemes could provide), time, and balanced distribution of the RWSS (Rural Water Supply Scheme) in remote areas too, / <http://conflict.lshstm.ac.uk/page-160.htm>/. This discussion will focus only on those basic indicators most commonly measured quantitatively.

i. Amount of water available;

This indicator is usually expressed as litres of water available per person per day. It should include only safe water, that is, water from a protected well, borehole, or spring, or water which has been adequately treated to eliminate disease causing organisms. The Sphere Project, /<http://en.wikipedia.org/wiki/sphere-project/> and UN Higher Commissioner for Refugees, (UNHCR), for rural areas recommended a minimum of 15 litres of water supply per person per day.

UNHCR further stipulates that 7 litres per person per day is the absolute minimum amount to survive. In areas where traditional water sources are abundant, it is assumed that community members do not use water collected from improved sources for other domestic purposes such as for watering animals, washing clothes etc. On this assumption, the average daily per capita water consumption is estimated to be around 15 litres per day in rural areas (MoWR; UMC, 2001)

ii. Distance to water Sources;

The distance between the nearest water access point and each household is one indicator of access to safe water. This indicator can be measured in survey, but it requires actually measuring the distance between each selected household and the closest water access point. Survey respondents probably cannot accurately estimate this distance. In order to reduce the time and energy required for fetching water and to encourage the use of safe water sources the ministry of

Sphere project;- a project launched in 1997 to develop a set of minimum standards in core areas of humanitarian assistance with the aim of improving the quality of assistance provided to people affected by disasters, and to enhance the accountability of the humanitarian system in disaster responses

water states that water access points should be a maximum of 1.5kms from every household, (UAP 2009).

iii. Time needed to fetch water;

There will be long queues or too many people especially if water is available only for a short period each day .As a result people may have a water access point nearby, but spend a long time for fetching water. Although this information could be obtained from interview question during a survey, respondents may not be able to give precise enough answers. Populations in less developed countries often do not keep clock time. This indicator can probably better be estimated by observing the queue at one or more water access points and timing how long it takes someone who is just joined the queue to get the tape and fill their water container. Organizations responsible for supplying water should measure this wait time frequently to be sure it is not too long. Again in order to reduce the time required for fetching water and to encourage the use of safe water sources, the Sphere project recommends that no more than 15 minutes is spent in waiting in queues at water access points.

iv. Water quality;

Good quality water is necessary to ensure that water born diseases transmission is minimized or eliminated. Many diarrheal diseases may be spread by water including cholera, dysentery, viral diarrheal, and others. Surface sources are, by definition, unsafe because of their potential for contamination with disease producing organisms. Even well water from inadequately protected wells is unsafe to drink. Water quality testing requires laboratory assessment. Fortunately, there are cheap, easy and fast methods of testing water for bacterial organisms. Chlorine concentration can also be measured quite easily; however, both these methods require someone with the appropriate skills and experience. This task again should be the responsibility of the organization supplying water. The Sphere project recommends that water for human consumption should have a faecal coli form count of 0 organisms per 100ml of water. The presence and contamination of faecal coli forms is a measure of the extent of contamination with human or animal stool. The Sphere project also recommends that for water which is treated, the free chlorine residual at the tap is at least 0.5mg per liter of water.

2.4 Factors affecting sustainability of rural water supply

The issue of sustained rural water supply is one of the challenges that developing countries are facing. It is affected by a wide range of factors. Promoting access and maintaining the already developed ones is the challenge. It is estimated that 35% of all rural water supplies in sub-Saharan Africa are not functioning (<http://www.wateraid.org/documents/plugin-documents/functionality-and-sustainability-study-by-alexia-haysom.PDF>). UAP is intended to lower non-functionality rate of water supply schemes to 10%, (MoWRs, 2009). Sustainability, in the global debate is considered primarily in terms of continuing to improve human well-being, whilst not undermining the natural resource base on which future generations will have to depend.

The term in the context of this document, however is limited in its meaning. It is used not to refer to the tension between development and the natural environment, but rather to refer to the narrow context of service delivery in the field of water supply and sanitation. It is whether or not something continues to work overtime. Thus; for water this would mean that water continues to be available for the period for which it was designed in the same quantity and at the same quality (http://98.138.82.27.us.f1206.mail.yahoo.com/ya/secured_download/). Sustainability is best defined pragmatically as whether or not something continues to work over time (<http://www.wateraid.org/documents/plugin-documents/functionality-and-sustainability-study-by-alexia-haysom.PDF>). Sustainability pertains to multiple aspects of rural water supply with institutional, social, technical, environmental, and financial dimensions, (WELL, 1998).

2.4.1. Community related factors

It is common practice for village water schemes to be managed by a village committee which is intended to enable communities to have a major role in the project, to have a sense of ownership over the schemes and to ensure its ongoing operation and maintenance (Harvey and Reed, 2006). Without participation it has been claimed that systems are unlikely to be sustainable even if spare parts and repair technicians are available. Participation can take different forms; including the initial expression of the demand for water, the selection of technology and site of construction, the provision of labour and local materials. A cash contribution to the project costs, the selection of the management type, and even the water tariff are other areas of community participation,

(Harvey & Reed, 2006). It is thus the process through which demand - responsiveness is exercised and empowerment is achieved.

Participation is seen as a fundamental right; that beneficiaries should have a say about interventions that affect their lives (Pretty, 1995). A history of top down service delivery by the government and NGOs frequently leaves a legacy of dependency in the villages on external assistance. Consequently, in the event of a failure in water supply the villagers do not make any attempt at repairs as it is not perceived to be their responsibility. To any successful water supply scheme the concerned people has to be involved in the process. If due consideration is not paid to social aspects when planning, the risk is high that the water supply system will either not be used or it will be misused. In principle if a water supply scheme has to be sustainable, communities should participate in the planning, construction, O&M, and evaluation phases, /IDRC,1981:90/. Community participation can play significant role in developing and increasing community awareness and pride of ownership toward the village water supply system, resulting in success and a high level of performance of the system,/IDRC,1981:92/. It has now become clear that social and institutional factors play equally important roles. The critical question to ask is no longer solely “why do water supplies fail?”, but, “why do they fail and why haven’t communities and /or service providers keep them running?”

Thus, community members have to be consulted and involved in RWS project design, site selection, technology choice, etc. They have to be involved in any stage of the development of RWS projects more than involving few during construction stage by contributing labour and locally available materials. Real participation begins with identifying a problem and planning how to solve it, and ends with monitoring and evaluating performed activities, thereby leading to effective community management and real empowerment.

This principle is believed to develop sense of ownership and is the most important principle of RWS with which sustainability could be achieved. Experiences has shown that when development interventions align to the priorities of community, the sense of ownership increases, as does the likelihood that the community will work to maintain the results, there by increasing the chance of sustainability,/MoWRs, 2003/.It was also indicated that water supply services which are more demand responsive are more likely to be sustainable at the community level than services which are less demand responsive,/Sara and Katz 1997 cited in Lockwood, 2003/.

In the past staff of support agencies have developed projects by themselves without involving the users. This approach has often led to the selection of inappropriate technologies with a far reaching impact at the operation and maintenance stage. Furthermore, users of such schemes often misuse and damage the facilities due to lack of sense of ownership, putting the sustainability of the water service at risk.

In principle, rural water supply schemes are properties of the communities to which they render service. However, in reality all owners could not manage one single scheme. Therefore, few people selected from the owners should be given the responsibility of running, coordinating, and supervising the activities of the schemes. Establishing a water committee, which constitutes the smallest institution in the sub-sector, could do this. This by itself, however is not the whole story of community participation; rather is one means of promoting participation.

To improve sustainability, demand-responsive approach is recommended for identification of water supply projects. In this approach the community is given to take the initiative in seeking the improvement, to make informed choice on the technology options and service levels by considering their needs and ability to pay. This approach shifts the responsibility from government to the community. Specifically communities will identify their own needs and request assistance.

2.4.2 Institutional related factors

In order to ensure the long-term viability of water supply operations, institutions are believed to play an important role in many ways. Recently there is an increasing recognition that the majority of communities will be unable to manage their own water supply systems without some form of external assistance. In order to guarantee the sustainability of RWS projects and associated benefits, it is necessary to provide support guidance which addresses arrange of issues, /Schouten and Moritary, 2003/.

Lockwood, /2003/, also argued that it is unrealistic to expect that government can leave rural communities to their own devices after a water project is complete, and that for RWS systems to be successful, communities need some post construction technical assistance. Ideally, schemes should solely be administered by the communities to which they render services. These could be possible by establishing committees which will be the basic management bodies of the rural

water supplies at community level. Water committees will be responsible for water point construction, coordinating the input of the community and will be involved with the management of the schemes after construction has been completed. Their major responsibility is to manage water schemes on behalf of the communities they represent. As community's legitimate representatives, committee members establish tariffs, instruct users to properly utilize and care for the facilities, and collect fees. Thus, the smallest, but basic institutional unit that is organized at the community level is water committee. But water committee to be effective and efficient, it should be supported and coordinated by other higher and stronger institutions.

There should be technical and administrative relationship existing between-community based committees and the proper government bodies. The institutions should also create a policy environment conducive to RWS development. Strategies aimed at legalizing and strengthening water committee are required to be developed and made effective.

Training is another element of the institutional factor affecting sustainability of RWS development activities. It is one of the key elements to enable communities become self relevant. It ensures continuity and quality of services as well as timely inspection, minor and major maintenance of services that could also minimize operational cost. For the provision of effective training, the contents and types of training should cover at least a significant proportion of the community and should have continuity followed by a follow-up. It has to be well organized, demonstrative and illustrative as well. Trainees should be selected properly based on the actual needs of the schemes and the communities.

The development of RWS is not to be left to one single institute. All benefiting sectors should be involved and contribute to the development and sustainability of RWS schemes. In order to enable people benefit from reliable and sustainable water supply and sanitation services, it is necessary to enhance and strengthen relationship with NGOs and other international and national support agencies that are willing and ready to work in the area of RWS developments. For this a condition has to be created that could promote and increase their involvement in the sub-sector development. Operational guideline to be followed by all the NGOs and other interested groups ought to work in the areas of RWS development should be prepared.

2.4.3. Economic and financial aspects

The opportunity cost of capital gone to rural water supply development is very high due to the non-commercial nature of the product, poverty at the grass-root level, and misconception about safe water at community level. Other factors such as miss-utilization of scarce resources, unnecessary high cost of management during and before construction, and delay in implementation are also believed to have significantly contributed to the high opportunity cost of resources to improve the RWS conditions in Ethiopia.

Rural community contributions can be in cash, labour, and local materials. Cash contribution is important in order to create sense of ownership of facilities. In support of this Musonda, /2004:139/, indicated ability of communities to raise user fees is crucial to sustainability of water supply facilities because they are used to purchase spare parts and paying technicians for carrying out repairs. Full cost recovery is not a prerequisite for effective community management, but some contribution from users is needed to establish commitment. As a minimum as much of the recurrent costs as possible should be borne by the community or sustainability cannot be guaranteed, /Evas and Appleton, 1993/. Generally, to achieve sustainability in water supply projects, covering costs of O and M is highly recommended by scholars. Boydel, /1999/, cited in IRC, /2004:52/, indicated that for schemes to be sustainable, communities should pay for O and M and should make a "substantial" contribution to capital costs that should be enough to generate a feeling of ownership.

The single most important source of investment for improvement of RWS systems in Ethiopia in general and in BGR in particular, is the government. The government is not limited to constructing RWS systems, but also subsidizes most of the rural consumers. This is effected through covering almost all costs associated with maintenance of schemes. Other partners also play a significant role in promoting RWS development by means of financing different types of schemes, both directly and indirectly. However their involvement in the area of operation and maintenance is so far very limited. No water supply scheme is financially self sufficient as the community is not raising adequate amount of money to cover costs for operation and maintenance.

One of the vitality important ways of ensuring sustainability of rural water supply scheme is establishing the required financial ground for self sufficiency to be able to cover at least cost of operation, maintenance and replacement. This should be done taking cost recovery as the basic principle. In almost all the cases the basis for tariff settings are not known and the tariff rate used in almost all paying communities is not properly set; i.e. do not reflect the cost of O&M or any other necessary cost. It is mostly determined by partners who financed the construction of the schemes, and/or by water committees arbitrarily.

2.4.4. Technical factors

Appropriate technology selection, construction quality of schemes, technical skills needed to operate and maintain the system, availability and accessibility of spare parts are important factors contributing or undermine sustainability of RWS schemes. Appropriate technologies are those which are low cost, easy to maintain, simple to use, and readily available to respond to the challenges of sustainability.

i. Technology choice and construction quality

Appropriate technologies are integral to the concept of Village Level Operation and Maintenance, /VLOM/, which emerged in the water decade/1981- 1990/, ([http://www. Google .com /search? ie=UTF-8&oe=UTF 8&sourceid=navclient &gfn=1&q=first+water+decade%2C+1981-+1990](http://www.google.com/search?ie=UTF-8&oe=UTF-8&sourceid=navclient&gfn=1&q=first+water+decade%2C+1981-+1990)).

"The principle for technology selection was that "the technology chosen should give the community the highest service level that it is willing to pay for, will benefit from and has institutional capacity to sustain", /Arlosoroff et al, 1987:29/. Careful engineering design and construction are more important in addition to selection of appropriate technology for poor people than for the more affluent. It may be disastrous for people when a facility breaks down and cannot be repaired because of a fault inherent in the design or construction. Carter, (Carter et al 1999), cited in Bezabih, (2008, page 19) underlined that if the initial scheme was paid for from communities (users) resources, they will probably be unable to make the effort and a second time; if an outside agency helped, the attitude is likely to be "you have had your share, no more now".

'Water Decade, 1981-1990' is a goal set at the United Nations 'Water Conference' at Mar del Plata in 1977 to access safe water supply for everybody by 1990 on an international level

ii. Availability of spare parts and toolkits

Appropriate tools for carrying out repairs should be made available to achieve sustainability. There is also a need to ensure that the spare parts are affordable, because at the moment most communities cannot afford the cost of spare parts. (Musonda, 2004: 139,). To support sustainability of RWS schemes, spare parts and toolkits must be available. In support of this, Komives et al., (2006:7) stated without access to a reliable supply of spare parts and some qualified persons to make repairs, water supply schemes will not be sustainable. WAE (2004:4) also indicated, lack of input suppliers for spare parts contributes to lower continuity of water projects. Studies by Brikke et.al, (1995:16) cited in Musonda (2004) and Davis et. al. (1993) also considered availability of affordable spare parts, capacity at community level to operate and maintain the water supply facilities and abilities of communities to contribute user fees as being critical to sustainability of water supply schemes.

iii. Technical skills needed for operation and maintenance

The ability of the community to operate and maintain the water supply schemes is very important aspect of sustainability. However, most rural communities lack technical skills to carry out major repairs. The various reasons identified for this poor maintenance is the most important contributor for schemes non-functionality due to weak supportive systems, difficult access to spare parts, lack of sense of ownership among users and lack of trained people.

2.4.5. Environmental factors

Sustainability of water supply is also dependent upon a reliable source and a reliable system of obtaining water from the source. The reliability of the source is often determined by seasonal changes. Some springs or wells may fail towards the end of the dry season owing to a drop in the water table. This is a time when water is needed most but when supplies are least reliable, /Davis et al, 1993:26/. Obviously, deterioration of source water quantity will be a major concern in areas of low rainfall or poor ground water recharge where there is greater sensitivity to over extraction. But even in reality water abundant regions of the world, the source can fail to satisfy demand either due to population expansion or abuse of the supply for non domestic purposes.

Ground water is supposed to be the purest form of natural water where sometimes there is no need of treating it for drinking purposes. It is also the least contaminated and has very low turbidity due to natural filtration of the rain water. Surface water quality is affected by temperature, sunlight, turbidity, dissolved gases and nutrients. An understanding of the factors that affect ground water quality can help to make decisions on well depth and the best water quality for a particular application. There are several factors that affect ground water quality; depth from surface, permeability and chemical makeup of the sediments through which ground water moves and climatic variations. Desertification, deforestation, over application of water and water pollution are also other factors affecting ground water potential, <http://water.me.vccs.edu/courses/ENV110/lesson 2-2.htm/>.

i. Depth from surface

Water is the world's greatest and most abundant solvent. It attempts to dissolve everything it comes in contact with. As a result, the longer ground water takes to move through the sediments, the more mineralized it becomes. Thus, the shallow groundwater aquifers/water bearing layers to wells/yield water to wells in usable amounts. They have large enough pore spaces between grains that water moves freely. Aquicludes are water bearing formations that cannot yield adequate water for wells as the pore spaces between the grains is so small. Water from deeper ground water aquifers typically has a much longer trip to its destination and thus it is usually more mineralized.

ii. Permeability of sediments

Ground water moves very slowly through sediments with lower permeability such as clay. This allow more time for minerals to dissolve. In contrast, sediments with high permeability, such as sand, allow groundwater to move more quickly. There is less time for minerals to dissolve and thus the ground water usually contains lower levels of dissolved minerals. There is also a difference in dissolved solids between ground water in recharge zones and water in discharge zones. Recharge zones are uplands areas where precipitation readily enters the ground through permeable, sandier sediments. Generally, water in recharge zones has a low level of mineralization. Discharge areas are low areas where ground water flow eventually makes its way back to or near the ground surface. Ground waters found in such areas can be extremely high in minerals such as calcium, sulphates and chlorides.

iii. Chemical makeup of sediments

Another factor affecting ground water quality is the chemical makeup of minerals. Chemicals are more soluble than others, making them more likely to become dissolved in the water. For example, ground water in contact with sediments containing large concentrations of sodium, sulphate and chloride will become mineralized at a faster rate than if other chemicals were present.

iv. Climate variation

Climatic variations such as annual rainfall and evaporation rates also play an important role in ground water quality. In semi-arid regions, discharging ground water often evaporates as it approaches the surface. The minerals from the water are deposited in the soil, creating a salt build up. Precipitation infiltrating through the soil can re-dissolve the salts, carrying them back into evaporation rates, precipitation that reaches ground water is less mineralized.

2.5. Assumptions and estimation of water supply access coverage

The minimum service standard for RWS is to facilitate the availability of 15 litres per person per day safe water supply from a water point within a maximum distance of 1.5 km from the residence of the beneficiary to the water point (MoWR; 1998,).

Water supply access coverage is the estimate of the proportion of the population that could access from functional, temporarily non-functional but any time repairable, and that can be substituted water supply schemes. There is a difference between water supply access coverage, and water supply coverage. Water supply access coverage indicates mainly the available capacity of water supply service infrastructures which could be accessed by the beneficiaries. It does not necessarily indicate the proportion of people actually using water supply schemes particularly for RWS as it is significantly dependant on the settlement pattern. However their convergence might increase in sequence from kebele, wereda, region, and to national level as the variation of the mix of settlement pattern (under & over utilized water supply schemes) increases and compensate each other to the actual service capacity of the schemes. However, for urban water supply, water supply access coverage, and water supply coverage may be more convergent, /MoWRs, UAP, 2009/.

All non-functional water supply schemes which could be repaired, rehabilitated, or substituted to provide service are supposed to include in the computation. The number of beneficiaries for each type of scheme is determined considering the average yield at an assumed 8 pumping hrs per day, (MoWRs; UMC, 2001) at a daily per capita requirement of 15 litres. For example if there is "H" number of modern hand dug wells fitted with hand pumps in a certain kebele, thus;

$$\text{Average coverage (\%)} = \frac{H \times A \times 100}{P}; \text{ where}$$

H = number of sources

A = national average number of beneficiaries on each type of single scheme

P= CSA population of the area.

Thus the WSAC is estimated based on the number of beneficiaries which could access safe water supply by different types of water supply schemes available based on the beneficiary data (UAP & MoWR;2009).

a) water production

Type of RWSS	Total	Functional	Non-functional	% of functional
HDW				
Shallow Wells				
Developed Springs				
Total				

b) Rural population of the area

$$\text{c) Water demand} = \frac{15 \text{lit} \times \text{Population of the area}}{1000} = \text{in m}^3/\text{day}$$

d) Water supply availability

Functional HDW production per day

Functional SW production per day

Functional developed springs production per day

Total production per day from these in m³; thus RWSC in that particular area without displacement in percent therefore is;

$$= \frac{\text{total availability in m}^3}{\text{Demand in m}^3} \times 100$$

Another system of calculating reliability which is commonly adopted by many is the proportion of functional schemes (in the different types of RWS s) to the total number of schemes existing. Reliability factor is a means of accounting for effective supply of water, leaving a margin for non-functional at any given time.

Still displacement factor is the other system of estimating the water supply access. Access to water supply is said to be reasonable only when it is accessible with much less than the time required getting water from the traditional sources. Thus, the term reasonable distance is an important indicator to determine whether a given water supply scheme is accessible or not. In short, displacement is a means of excluding those who are not using the scheme due to distance. A further argument shall be presented after coverage fingers are calculated. Accordingly, 4km which is estimated to take an hour to cover, is taken as reasonable distance in this case. Rural water supply coverage with displacement; as argued, to calculate water supply coverage with a reasonable accuracy those who are not able to use the service due to distance should be excluded. Accordingly the RWS coverage of an area with displacement is calculated as follows

- Total area of that specific locality in km²
- Number of functional RWSS
- Average distance considered reasonable; in this case 4 km.
- Total number of RWSS required based on the area of the locality and on the average considered reasonable distance.
- Proportion covered = $\frac{\text{functional available RWSS}}{\text{Total no, of required RWSS}} \times 100$.

Total no, of required RWSS

It will be very difficult to accept displacement factor as a useful instrument of estimating coverage. Displacement coverage has many short comings among which are: - it penalizes coverage for large un occupied areas, doesn't consider important points such as settlement patterns and population density, considers only supply but not demand, does not consider un occupied areas like roads, assumes population distribution as homogenous, takes land areas as a base not people, is not cost – conscious and cost – effective. Thus, given large land area, proportion of land inhabited, settlement pattern etc, it will be very reasonable to accept the one calculated on fair ground that is without displacement.

2.6. Estimation and policy statements of water supply tariff

The water resource management policy with respect to tariff ensures that the price for water should be neither too high as this will discourage water use nor too low as this will encourage abuses and over use of water. The policy promotes that tariff setting shall be site specific depending on the particulars of the project, location, the users, the cost and other characteristics of the schemes. It ensures also that urban tariff structures are based on the basis of full cost and the rural based on the objective of recovering operation and maintenance costs. It establishes progressive tariff rates in urban water supplies tied to consumption rates, /http://www.uneca.org/groundwater/Ethiopian_water_policy.pdf/.

Estimation of average affordable tariff rate is affected by household income, percent of household income to be spent on water, and volume of water consumed by the household. On the other hand the willingness to pay for access to water supply is influenced by; /MoWRs: UAP, 2009, MoWRs, 1998/

- service standard (performance and consistency of the service),
- perceived benefit recognized by consumers /test, health, smell, colours, and economic etc)
- relationship to production such as gardening, Livestock watering, etc,
- level of income and ability to pay, /level at which water charges are set where alternative sources are available/,
- opportunity cost of time /time taken to collect water/,
- characteristics of existing source /acceptability of the traditional source from the point of view of quality, quantity, distance from home, the reliability of water supply,
- policy environment /the belief of people that the government or some other agency will meet the costs and/or other people get the service free/,
- socio-cultural factors/believes in relation to taking water as a natural world and basic resource; gift from God,
- local believes about good water/, perception of ownership and responsibility /beliefs that water supply facilities belongs to the government/,
- Transparency of financial management to the contributions people made towards the up keep of their water supply systems.

In regard to measure the willingness of people to pay, the most commonly used technique is the direct method called “contingent valuation method” where people are asked directly what they would be willing to pay for different water supply levels such as public taps, yard connection, house connection, etc. In the case of small systems that can be managed and operated by water committees, tariff determination can assume short and simple approach. Households can be categorized as large, medium and small based on the level of water use. Fixed tariff rate per household per year can be estimated in order to cover annual costs for O&M.

2.7. Conceptual frame work

Based on reviewed literatures the sustainability of RWS is affected by an interrelated factors that can be generally categorized as environmental, community, technical, institutional and financial factors. This accounts for the fact that understanding and measuring sustainability is so difficult and why solutions are highly context specific. Therefore for a developed water supply facility to be used sustainably, all the issues attached to these dimensions need to be considered into account seriously. This is because it is unthinkable to expect sustainable services from the schemes without facilitating on time operation and maintenance, paying the required care and contributions from the users, as well as providing the necessary technical, material as well as financial inputs towards their smooth functioning. Moreover the sustainable utilization of the facilities could not be secured unless their ground source is reliable.

Thus, based on the referred and adapted conceptual framework, (shown below); the researcher has assessed the factors that has affected the sustainability of the developed RWS facilities at the study area.

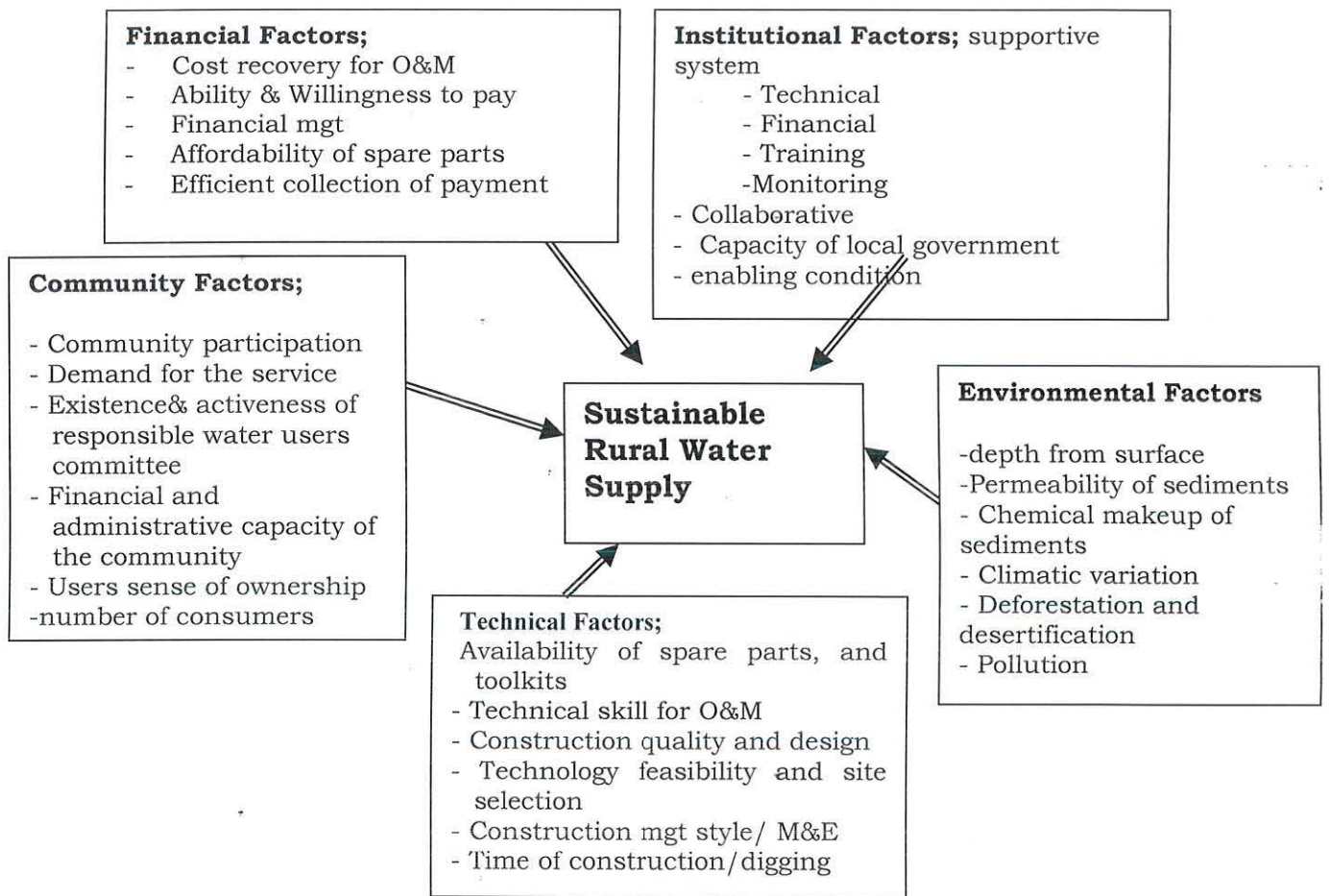


Fig2.1: Conceptual Framework used to assess problems to the sustainability of rural water supply:

Source: Adapted from Bezabih (2008 AAU), MoWRs (2009 summarized version), RWS Management Strategy Study Final Report, BGR, Dec. 2001)



CHAPTER THREE

Research Methodology

3.1. Description of the study area

3.1.1 The Region

Benishangul Gumuz Region is situated in the Blue Nile River Basin. It is one of the nine federal states that were established in 1994 by the constitution of the country. The region is divided into three zonal structures and twenty weredas. The total area of the region is estimated to be 50,380km²(SPM, BoARD; 2006). Based on the census result of 2007, the population of the region is 670, 847 of which 340,378(50.74%) are males. The proportion of people living in urban and rural areas of the region is 14.6% and 85.4% respectively. The number of households of the region is estimated to be 147,937 out of which 121,620 are rurals with an average household size of 4.7, (Central Statistical Agency, 2007). 12 peoples are estimated to live in an area of a km²

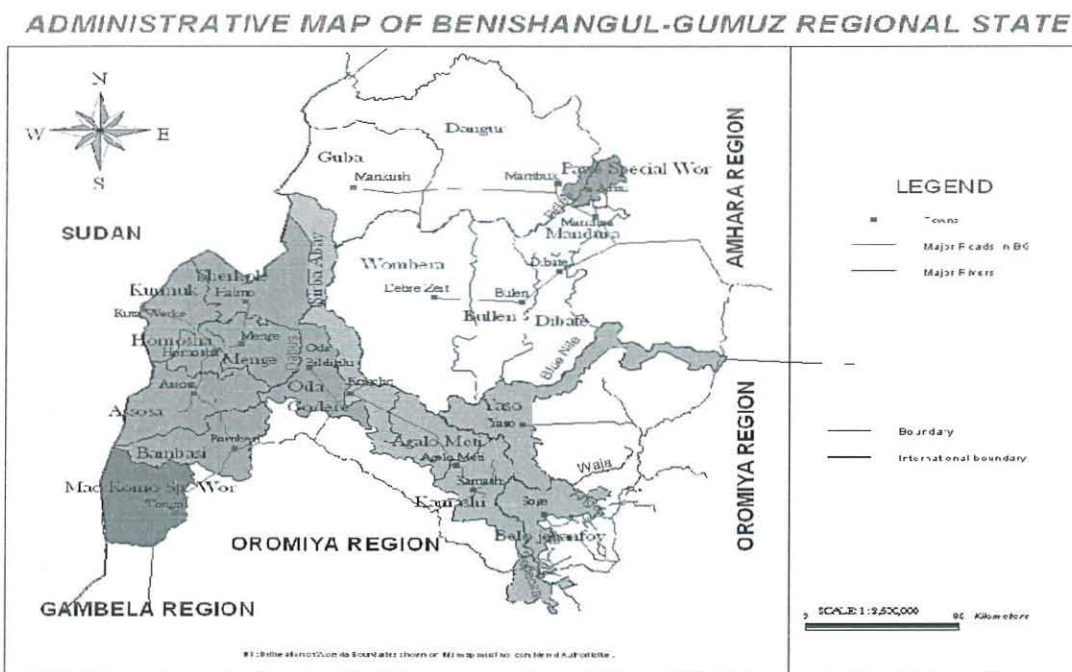


Fig 3.1; Administrative map of Benishangul – Gumuz Region,

The region is located in the North West part of Ethiopia. It is bounded by Amhara, Oromia, Gambella Regional states and the Republic of Sudan in the North, East, South and West

respectively. It stretches along the Sudanese border between 9° 35" to 11 ° 39"N, and between 34 ° 20" to 36 ° 30"E. Topography of the region is composed of mainly low land and plains and a few mountainous and gorges created by Abay river and its tributaries. River Abay divides the region into two parts. The northern part/ Metekel zone and Pawi special woreda/ comprises an area of 26,560square kilometre. The southern part /Assosa and Kamashi zones and Mao- Komo special woreda/covers an area of 23,820 square kilometres. Altitude of the region ranges from about 580-2731 meters above sea level. 75% of the region is categorized as low land, 24% mid land and 1% high land. The region's rainfall is unimodal and obtains rainfall from May to October ranging from 900 to 1500mm annually. The highest mean annual temperature ranges between 20 to 25°c, and the lowest 12°c. In the region there are five indigenous ethnic groups, Berta, Gumuz, Shinasha, Mao and Komo. They constitute 57.47% of the regional population (SPM, BoARD, 2006). Amharic is the regional working language.

Agriculture is the main stay of the economy of the region where about 92.5% of the regional population is engaged in the sector. Maize, sorghum, and millet are the major food crops grown in the region while sesame, nigger, and groundnut are the major cash crops. Fishing, hunting, petty trade and traditional gold mining are also provide supplementary sources of income for the population, /WAE- BG, 2007/.

BGRS has a substantial and varied natural resource base. The region has suitable agricultural land although not yet utilized to the expected level. Agricultural production is subsistent practiced through shifting cultivation as a mainstay economic activity. Its water resources are vast and the region is among the water rich areas of the country due to the existence of a number of large, medium and small perennial rivers such as Abay, Dabus, Dedesa, Hoha, Belus, and Giligel Belus flowing through it year round. There are also many springs with reasonably good rate of discharge in different parts of the region.

Various types of minerals; such as gold, copper, nickel, iron, gemstone, marble, silk also found in the region. Gold is the main and widely occurred metallic mineral in the region. Artisan gold mining activity is practiced in all the three Zones and is of the means of subsistence for large number of the local people.

The region is covered with a wide range of tree species. The low land bamboo tree is one of the dominant species covering large areas of the region. There are also more than 55 indigenous tree species in the region. The regional state is the leading region in Ethiopia as far as forest coverage is concerned where 45% of the existing depleted forest of Ethiopia is homed there. In addition to these, the region has a big potential in natural tourism attractions because of the existence of diversities flora and fauna resources.

In spite of abundant water resources of the region, safe drinking water for the population is in a short supply. In the region it is only the capital that has a piped water supply system, and few other woreda towns have motorized water supply schemes with two or more public taps. According to the available information, currently there are around 356 water supply schemes, (SPM, Bureau of Agriculture, 2008). Data obtained from BoWRS shows that access to safe water supply was 44.1% where the coverage was 66.16 % in urban and 40.13% in rural areas, (BoWRS, 2007) implying that urban areas have a better access than the rural areas for the service. The largest proportion of the rural water supply schemes are hand dug wells with hand pumps followed by shallow wells and developed springs. 44.1% of the total population have access to potable water from hand dug wells, medium deep, deep wells and developed spring.

3.1.2. The wereda

Homosha wereda is one of the twenty weredas of Benishangul Gumuz Regional State under Assosa zonal administration; established in 1999. Much information about the wereda could not be obtained as it was not available which might be related with the establishment of the wereda most recently as compared to the remaining. But, based on the available ones, the wereda has a population number of about 21,502 out of which 10,443 are females (Central Statistical Agency; 2007). It shares borders with Menge wereda in the north, Assosa wereda in the south and east, and with kurmuk wereda in the west. It has an estimated area of about 645.7km². The wereda is divided into 15 kebeles. Topography of the wereda ranges between 1272 and 1573 meter above sea level. Climatically the wereda is categorized under lowland. The temperature varies between 24 and 42 °C. It receives rainfall for about 6 months within a year, between summer and spring seasons extending from early June to late November (wereda SPM, 2004). Of the five indigenous people of the region, it is the Berta ethnic that only inhabited the area. There are also other ethnics in the area mainly from Oromiya and Amhara who came in search of livelihood

activities of which the majority are government workers. There existed also a refugee camp in the woreda for refugees mainly from Sudan.

In regard to land use, the highest proportion of the area is covered by natural forests, and shrubs. The woreda is believed to have a potential fertile virgin land for agriculture. Rivers are the only available surface water sources which even mostly are seasonal. The livelihood activity is dominated by subsistent agriculture where maize and sorghum are the most dominant crops accounted for 69.6% of the cultivated crops harvested mainly through shifting cultivation. Animal traction is a recent introduction following improvements in veterinary facility against the challenge of trypanosomiasis prevalence. Hunting, traditional gold mining, trade, and charcoal production are some of the additional income sources.

In regard to access to clean water supply, there are eighty nine schemes installed in the woreda. This includes sixty eight hand dug wells, nineteen shallow wells, and two bore holes. In the development of the facilities both the government and partners are actively involved where the share of the partners is much better than the government in developing the facilities. Of the constructed schemes 85.4% is accounted to the partners.

Interruption of the water supplying facilities in the area is a problem influencing sustainable access to clean water provision for intended beneficiaries. Of the available schemes, the performance of the 30.3% is told to be affected significantly during the dry season, (woreda SPM, 2004, Woreda Water Office).

3.2 Sampling design

3.2.1 Sampling frame and sample size

The sampling unit used to draw the required samples was a household. Although, the entire woreda more or less is categorized under lowland with similar agro- climatic conditions, socio-economic activities, soil nature, single ethnic society, and availability of water from different sources, the researcher of this study has assumed the population of the area heterogeneous in regard to this particular study do to the un proportional distribution of schemes among the kebeles of the woreda. This is because population pressure is one of the components under community factors that can affect sustainability of rural water supply developments longevity.

Larger population with a relatively lower facility affects the longevity as the over utilization predisposes them to malfunctioning than the ones with a lesser load. Therefore the samples were drawn through stratification of the kebeles considering proportionality of schemes' distribution among them

In the attempts made, six kebeles were found to have more additional schemes. In contrary to this six other kebeles had less number of schemes than what would have been speculated. The remaining three had the expected relative proportional schemes as compared to the number of households found in the kebeles. This does mean that schemes at different kebeles are subjected to different level of sustainability problem as they shoulder varying degrees of pressure from the user population justifying that the population for the study is heterogeneous. Thus the kebeles are stratified in to three groups accordingly.

1. Kebeles having a relatively larger number of schemes above their expected proportional share; (Tumet, Algela, Dare- Selam, Ashura, Sherkole, and Gumu)
2. Kebeles having a relatively lower number of schemes below their expected proportional share; (Shula, Darsegia, Akendo – Afafiri, Molo – Megele, Alfashir, and Jima); and
3. Kebeles having a relatively fair distribution with their expected proportional share; (Bamadon, Dunga – Arumela, and Tsore – Almetema). Then, one kebele which relatively has the highest and the least proportional coverage has been purposefully selected from each of group 1 and 2 respectively, and, of course from group three, the selection has been made considering accessibility and security issues in to account as all of them have a relative proportional coverage between the number of people they hold and the available schemes found within them. Thus, at the end, Tumet, Arumela, and Jima kebeles were selected basing on this ground ;(Annex 6).

Once selecting the sampled kebeles, sample size determination was made. Considering constraints associated with the limits in resources, the researcher had taken 10% of the 664,(64), household heads found in the sample kebeles.

The sample units which have been thus selected randomly were then provided with an interview schedule where of course 59 of them are only available. FGD has also been made with water committees from Jima and Tumet kebeles separately. Questionnaires were also been delivered to the respective governmental institutes at different levels and to partners working in the area of water supply developments such as World Vision Ethiopia, United Nations International Children's' Emergency Fund,/ UNICEF/, and International Rescue Committee,/ IRC/, where only 5 of them have responded out of the expected 12. This is because UNICEF and WVE were found in-volunteer to respond to the repeatedly requested cooperation. In the overall approaches, both the probability and the non- probability sampling methods therefore have been used.

Table 3.1; summary of respondents,

No	Source of response		Existing number of hhs	Proportionally selected hhs/10%/	Response in		
					Number	Responded	Percent
1	From sampled kebeles	Jima	284	28	28	27	96.4
		Dunga Arumela	202	20	20	20	100
		Tumet	158	16	16	12	75
2	Water committee from two schemes of the sample kebeles for FGD				10	10	100
3	Government institutes				6	4	66.7
4	NGOs				6	1	16.7
	Total				86	74	86



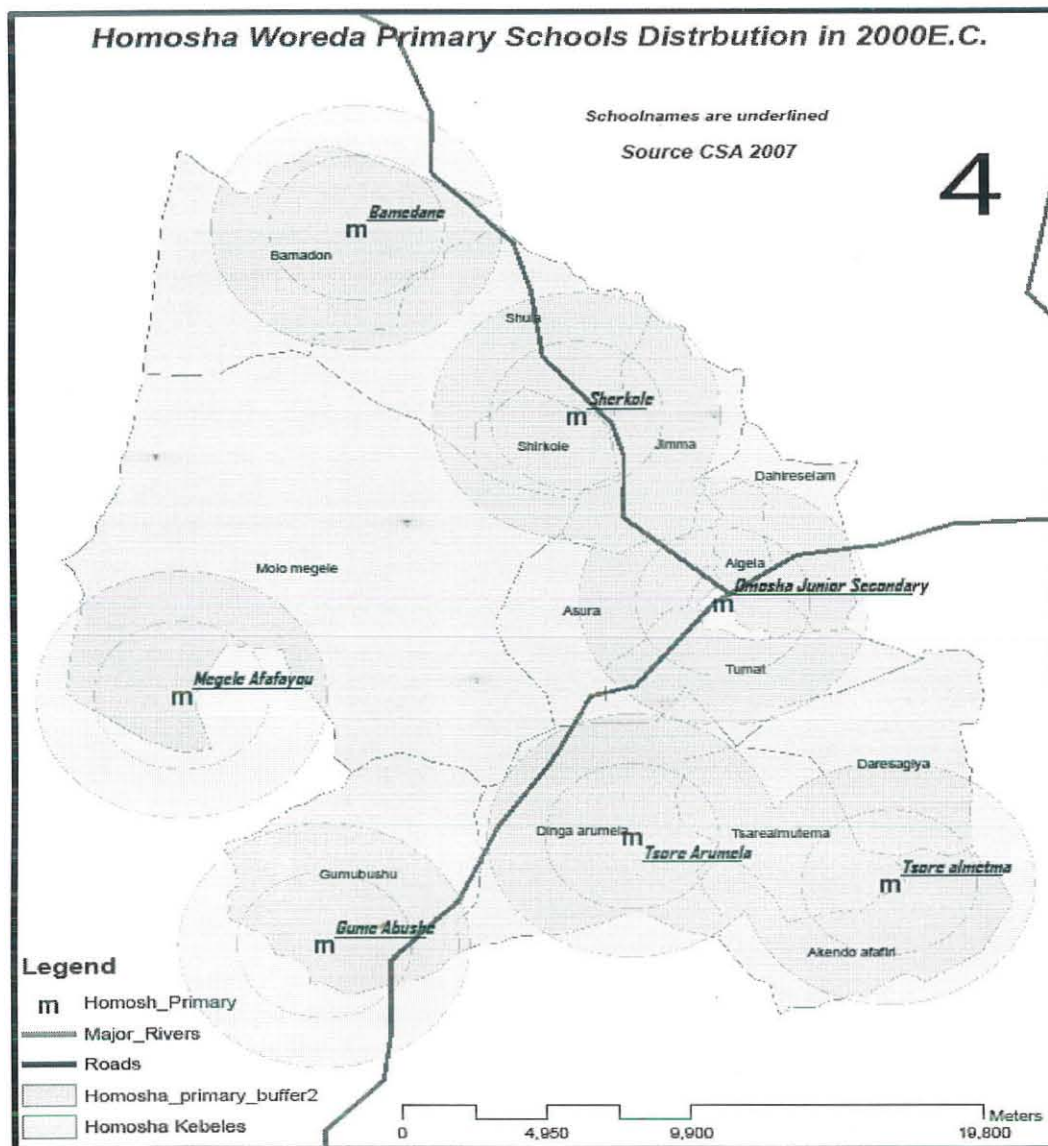


Fig.3.3; Location of kebeles of Homosha woreda

Table: 3.2, summary of the overall sample size

No	Category	Size	Tool to be used	Remark
1	HH	64	Interview schedule	
2	GO (regional, zonal and wereda water desk	6	open & closed ended questionnaires	
3	NGOs (IRC,UNHCR,UNICEF, Action Aid, Water Aid, CISP)	6	open & closed ended questionnaires	
4	Water committee	10	FGD	2 schemes' WCs from sampled kebeles
	Total	86		

3.3 Data source, type, and method of collection

3.3.1 Data source and type

Data were collected from both primary and secondary sources. The data collected are of both qualitative and quantitative in types. The primary sources were collected through the prepared open and closed ended questionnaires, interview, and through focus group discussions. Personal observation has also been made on the spot of water supply points. The secondary sources of data involved reviewing of important available documents of the relevant institutions to compliment the primary sources which include both published and unpublished documents such as reports, archives, books, and earlier research done documents from the governmental and non-governmental organizations.

3.3.2 Method of data analysis

In analysing the collected data both qualitative and quantitative methods of analysis have been used. Descriptive statistics such as percentage, ratio, frequency and tabulations were utilized to quantitative data. In the attempts made, developed formulas and standard sets for water supply coverage, water supply indicators, and assumptions were also used. To supplement the survey data collected from the sample units; suggestions, opinions, attitudes, and events drawn through focus group discussion, open ended questionnaire, and on spot observation has been analysed and summarized qualitatively.

CHAPTER FOUR

Results and discussion

4.1. Socio – economic characteristics of the respondent households

The socio – economic data of the respondent households; age, sex, marital and academic status, family size and occupational aspects; were summarized and discussed as shown below.

i. Sex and age composition of the respondents

Based on the summarized data of the respondent household heads, the age is found between 20 and 82. Ten /16.9%/ of them was found at the age of 25 or below. More than half, /91.5%/, of the respondents' age lies below 56. The majority, /55.9%/, failed between the age group of 25 to 45, /Table 4.1/. As it is observed in many parts of the country, children and youngsters were seen to involve in fetching water in the study area too. Most of the time elders were not commonly seen while fetching water. According to 63% of respondents children do not care and properly utilize the schemes while they fetch. They were accused for playing through operating the schemes and discharging the water. They were thus believed to contribute towards the scheme defect due to their additional pressure so as to account to the encountered sustainability problem.

Table 4.1; Summary of respondents' age group and educational Status,

Category	Age group							Educational status				
	≤25	26-35	36 -45	46-55	56-65	66-75	76-85	Illiterate	1 st - 4 th	5 th - 6 th	7 th -8 th	9 th to 10 th
Frequency	10	15	18	11	2	1	2	35	7	7	4	6
Percent	16.9	25.4	30.5	18.6	3.4	1.7	3.4	59.3	11.9	11.9	6.8	10.2

Source; Household survey, 2011

Out of the 59 respondents, 79.7% household heads were males. In the study area supplying the household with water is the responsibility left to women. All of the respondent male household heads responded that they did not involve in any activity of fetching water. They have reflected that it is a task that has to be covered by wives and daughters. This is believed to challenge the lives of women in the area through creating additional burden to them as they are also expected to engage in different livelihood activities such as in traditional gold mining, agricultural practices, fuel wood collection and other homemade activities. The study result showed that it was the women who worried the most for the sustainability of the facilities as providing water is their responsibility. But it was the males who mostly seen to participate in the contribution and

provision of materials and labour for the schemes as women are the busiest than the males in accomplishing different activities both within and outside home due to the culture in the area. Thus males were seen to contribute more towards sustaining scheme facilities than women.

ii. Marital status and family size of respondents

In regard to marital status, due to the deep rooted culture and tradition of the society in the area, both males and females were subjected to marry at their younger age and males practice polygamy. Thus all of the respondents were found married. In terms of family size of the respondents, the size range was found between two to seventeen with average family size of six.

Table 4.2; Response for the family size of Respondents,

Family size range	Frequency	Total no of people in the family	Average family size
2-5	31	115	3.7
6-10	24	188	7.8
11-15	3	34	11.3
>15	1	17	17
Total	59	354	6

Source; Household survey 2011

As shown in table 4.2, respondents having a family size of 2 to 5 comprises about 52.5%, 6 to 10 comprises 40.7%, 11 to 15comprises 5.1%, and more than 15 comprises 1.7%. As depicted in the table respondents having a family size of more than 10 comprises only 4/6.8%/. As it could be understood from the table below, as the coverage increased the percent of defective schemes has got reduced. This implies that the increased population number/family size over the facilities had pressurized and predisposed them to conceive defects. The case may be seen differently for Arumela. This is because in that vicinity Arumela River is available throughout the year to be utilized for additional purposes. The community in that locality was found decided not to use the improved sources for purposes other than for cooking and drinking. Thus this has believed to reduce the pressure that would have been exerted on to their schemes where as a result none of the schemes were found defective during the survey so as not to observe the impact of carrying capacity in the sustainability of the schemes. Of course other factors that could influence should be considered into account as well.

Table 4.3; Effect of population size on scheme sustainability

Sample kebele	HH number	Estimated population considering 8.8 average family size /21502people/2437HH/ of the woreda	Coverage through the assumed schemes carrying capacity	% of defective schemes
Jimma	284	2499	82	42
Arumela	202	1778	112.5	-
Tumet	158	1390	399.3	20

Source; survey data, 2011

The overall development in tables 4.2, 4.3, and 4.6 suggested that the increased population number and/or family size had directly influenced the sustainability of the developed facilities through affecting their smooth functioning.

iii. Academic status of respondents

Through the study more than half of the respondents, (59.3%), were found illiterate and the status of the literate ranges from grade two to ten. As it can be seen from table 4.1 above, of the 24 literates the academic status of respondents from grade 1-4 comprises 29.2%, 5-6 comprises 29.2%, 8-9 comprises 16.7%, and 9-10 comprises 25%. Generally of the literates; 17/70.8% was found at the academic level of grade 5 to 10. The literate ones were also found having the better understanding about the advantages of accessing clean water for community well being than those of the illiterates. While making the survey relatively larger number of the illiterates was seen unvolunteer to discuss with the issue. This could show the knowledge and the awareness gap they had towards the use of clean water supply and it is thus unlikely to expect much care and contribution from them towards the developed water supply facilities. Thus this illiteracy of most of the people of the area has believed to contribute towards the encountered sustainability problem through limiting contributions and care that would have been made by the users towards the facilities.

iv. Occupation and income of the respondent households

Occupationally, as the region in general and the woreda in particular are dominantly dependent on agricultural sector, almost all of the respondents 58/98.3% were found engaging in agricultural livelihood activities. According to woreda Agricultural office, FGD and interview feedbacks almost all of the people of the study area dependent on shifting cultivation as a major

livelihood stay. Although there existed a wide area of virgin cultivable land, the existence of trypanosomiasis epidemics has made raising cattle and using them for traction impossible. Thus they were obliged to use inefficient and tiresome hand tools for the purpose where as a result most of the households were found food insecure, /woreda and regional reports/. The reports also suggested that most of the farmers were not beneficiaries of improved agricultural inputs as they have failed to return their previous input loans due to limited ability to pay. This shows that the low level income of the families of the area has prevented the community not to be benefited from developed facilities and improved technologies. Thus this could be similarly believed to affect water supply development and the sustainable utilization of the available schemes as the community could not contribute and pay for the tariff as per the actual need both for developing new and maintaining the available facilities, /Section 4.6.2/

4.2. Information on access to safe water supply

From the study all of the respondents were found beneficiaries of improved water sources. They were unfortunately found to utilize clean water from HDWs fitted to hand pumps. About 24(40.7%) of the respondents were reported that they were using traditional sources of water from sand dug wells before the installation of their improved sources and the remaining 35(59.3%) from rivers. In regard to the quality of water from the installed sources; the majority; 58(98.3%), have rated the quality good. The remaining had rated it poor for its carrying insects and worms and for its bad smell during the dry season. The problem was reported serious as the dry season advances and it was assumed to be related with the creation of favourable environment for microbial to reproduce within the muddy wells.

This study was carried out in the winter that it was not possible to determine the effect of the dry season on the performance of the water supply schemes. Only three, (12%) of the schemes in the sample kebeles; 2HDWs and a BH were found non-functional due to the defect they had conceived where the remaining 18HDWs and 4SWs were found functional during the survey, /Table 4.9/. According to the woreda water office, 18 HDWs, of which four are from the sample kebeles, were found to dry during the dry season a period from late December to mid April. There were also nine more hand dug wells whose performances were found to reduce significantly during the period. About 95% of the respondents in association to this have

explained that they were not able to utilize similar improved sources due to this interruption and reduced performance of the schemes.

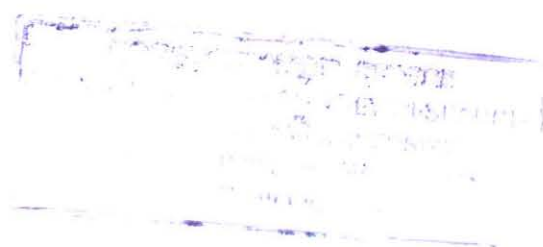
The respondents as a consequence were reported to look for other alternative sources during the interruption; both from improved sources of the neighbouring villages and kebeles such as for example between village one and two of Jima kebele, as well as from the traditional sources. About 49.2% of the respondents were reported to utilize other improved sources far away from their home, 11.9% from rivers, 30.5% from sand dug wells, and the remaining 8.5% both from rivers and sand dug wells. Thus of the respondents 50.8% were found utilizing traditional sources in time of improved source interruptions, /Table 4.4/.

Table 4.4; Alternative sources utilized during difficulty,

Alternative source	Frequency	Percent
Schemes of neighbouring sites	29	49.2
River	7	11.9
Sand dug well	18	30.5
Both river and sand dug well	5	8.5
Total	59	100

Source; study survey result, 2011

In regard to the use of improved water sources for additional purposes, 33/55.9% of the respondents have explained that they were using the schemes only for cooking and drinking purposes as they had the access from nearby river sources for the requirements such as for instance in Arumela kebele. This can be related with the fact that rural per capita water requirement was made to be 15 litres where it is 20 for urban. This was made with the assumption that rural areas have the opportunity to utilize traditional sources for the required extra home use, /MoWRs; UMC, 2001/. This indirectly implies that traditional sources are vital in reducing pressure on to the improved sources. The feedbacks from expertise and institutions also suggested that in areas where traditional water sources are available, the problem of scheme sustainability relatively found better.



4.3. Distance, time, available water supply sources, and water supply coverage

These are indicators to evaluate the status of access to the safe water supply. They are used in the study whether or not they have influenced the sustainable utilization of schemes by the users.

4.3.1. Distance, time, water supply sources, and amount

In regard to the source of safe water at least for cooking and drinking, all the 59 respondents were found accessed from HDWs. They were also found utilizing rivers and sand dug wells for additional purposes where and when they were available. In time of encountering water shortage problems or improved source interruptions, 30/50.8%/ respondents were reported to utilize traditional sources where the remaining 49.2% from improved sources found out of their village. Therefore both improved as well as traditional sources were found in use for both basic and extra purposes. This shows that accessing safe and adequate water supply sustainably in the area needs to work hard as more than 50% of the respondents were found utilizing the unsafe traditional sources when their improved sources get interrupted.

Table 4.5; Response for frequency of fetching water & schemes service provision time,

Category	Service provision time of schemes /day in hr					Frequency of fetching per day			
	4 hrs	5hrs	6hrs	9 hrs	Whole day	Ones	Twice	Four times	Five times
Frequency	7	12	8	2	30	2	55	1	1
Percent	11.9	20.3	13.6	3.4	50.8	3.4	93.2	1.7	1.7

Source; survey result, 2011

In regard to the amount and frequency of fetching water from the improved sources, the majority of the respondents, /93.2%/ was reported to fetch twice per day mostly in the morning and in the afternoon.

As it could be seen from table 4.6, in terms of average amount of water fetched, it was reported that 1.7% of the respondents fetch 25, 23.7% 50, 10.2% 75, 35.6% 100, 15.3% 125, 10.2% 150, and 3.4% 200 litres of water. It was found that the majority of the respondents; 42/71.2%/ utilized 25 to 100 litres/day/hh and the remaining 28.8% to fetch an amount more than 100 litres. The minimum amount drawn per day per household was found 25litres where the maximum was

200. From the data it can be further interpreted that an average 96.6litres of water was found drawn from the improved sources per day per household.

Table 4.6; Average amount of water fetched/day/respondent households from improved sources,

Amount Utilized in lit /day/hh	Frequency of response	Percent	Total water fetched in litre	Average
25 lit	1	1.7	25	
50	14	23.7	700	
75	6	10.2	450	
100	21	35.6	2100	
125	9	15.3	1125	
150	6	10.2	900	
200	2	3.4	400	
Total	59	100	5700	96.6 Lit

Source; survey result; 2011

As it could be recalled from the discussions made above, the average family size of the respondents was six and the average water share from the amount fetched/day/hh was 96.6litres. Thus it can be computed that the average water share of each household member will be 16.1 litres, i.e. $96.6/6$. This amount is a little more than the standard set by MoWRs. This does mean if the available schemes found healthy, they had the potential to provide the assumed 15litres of water required per capita per day.

According to the informants utilization of improved sources would increase during the rainy season as most of the traditional sources were not available during the period. The reasons, according to the study output are; one the traditional sources mostly were sand dug wells which would be damaged and filled with sand through flood. Second most of the houses were constructed with grass thatched roofs which could not allow harvesting rain water. Third such sources are mostly found deep in the bush where their utilization is difficult due to slippery roads through to the sources and heavy frost. Fourth the river sources will get turbid during the time. This makes the situation of the study area different from many of the areas in the country. According to literatures, during the summer days utilization of traditional sources in many parts of the country will be reduced significantly, (MoWRs, UAP, 2009).

From this it can be interpreted that as the supply required for all the purposes during the summer is concentrated to the improved sources the assumed 15litres per capita per day logically may not be sufficient. It is in areas where traditional sources found abundantly that the 15litres assumed is sufficient where community members are not expected to use water collected from improved sources for additional purposes, (MoWR; UMC). Thus generally schemes in the area during the summer days and in areas where there are no abundant traditional sources are therefore expected to be utilized for the additional purposes too. This implies that schemes were over loaded during the period to be predisposed to defects so as to influence sustainability. The other important point that has to be focused here is that the water supply development efforts both in the woreda and in the region as a whole is carried out with the intention of providing the assumed 15litres per day per capita despite the consideration of traditional source availability into account. Thus the researcher of this study expects that this could be another reason for the encountered schemes sustainability problem where schemes might be subjected to over utilization to provide the extra required water amount more than the assumed 15litres.

In terms of service provision time of schemes, /Table 4.5/, based on interview, questionnaires, & FGD feedbacks, and on site observations, most of the facilities were seen opened for whole day utilization. As it can be seen from the data, 32/54.2%/ of the respondents reported that their improved water supply sources were available for more than the assumed utilization time out of which the 50.8% reported for whole day utilization. The remaining 27/45.8%/ reported that the time was below the assumed. The average assumed service provision time of schemes by MoWRs is 8hrs/day, /MoWRs, UMC, 2001/.

Generally schemes were reported to be utilized much above the assumed time. This is believed to have an adverse impact on schemes healthy function and sustainable utilization as the schemes have got no time to recharge themselves. This continuous operation is assumed to predispose them to defects. This heavy operation thus contributed to the sustainability problem as the defect interrupted the service.

Distance between the water point and the house of the user is one of the factors that can influence the sustainable utilization of schemes by intended beneficiaries. With the consideration of this respondents were interviewed and from their response the maximum distance was found 500 metres which was by far below the standard set by the ministry of Water resources, which is

1.5km,/MoWRs:UAP, 2009/. As shown in table 4.7 below; of the respondents 18/30.5%/ was suggested that the maximum distance existed between their home and their respective improved water supply source was around 100metres. About 32.2% reported this distance was around 200, 22% around 300, 10.2 % around 400, and 5.1% around 500metres.The majority of the respondents; 37/62.7%/, reported that the maximum distance they need to travel to their respective improved sources was about 200metres.

Table 4.7; Summary of response to distance of schemes from residential areas,

Distance	Frequency	Percent	Cumulative Percent
Up to 100m	18	30.5	30.5
101-200	19	32.2	62.7
2001-300	13	22	84.7
301-400	6	10.2	94.9
401-500	3	5.1	100
>500 metres	-	-	-
Total	59	100	100

Source; survey result, 2011

Additional information from water office and FGD indicated that this distance is much smaller as compared with the distance to the traditional sources. From this therefore, it can be concluded that the distance to the improved sources could not have any significant adverse impact on the sustainable utilization of the improved sources. As it was found much below the assumed it rather believed to encourage sustainable utilization of the sources. Time wise, /Table 4.5/, based on the feedbacks from on site observation and FGD, there was no any queue of peoples seen at the watering points to wait for a turn. The whole day availability of the service from the schemes is expected to contribute for this. Thus there is no any time factor for a significant effect towards sustainable scheme utilization. This maximum time set is 15 minutes according to the Sphere Project, /<http://en.wikipedia.org/wiki/sphere-project/>.

4.3.2. Water supply coverage.

Water supply coverage could be estimated through different approaches using set standards for the variables which are commonly utilized for the purpose, /Section 2.5 and Annex11/. Thus 1.5km maximum distance, 21502 people and 645.7km² area of the woreda, 8 average daily pumping hours for each scheme type and the average production capacity of each HDW, (8.3), SW,(1.5), and bore hole,(93.75)litres/minute were used in computing the coverage. 15 litres water requirement per capita/day, and a carrying capacity of 250, 400, and 3000 people for each HDW, SW, and BH has been assumed respectively in the computation ,(MoWRs;UAP,2009).

Thus using these variable inputs, the water supply coverage so far achieved has been estimated and was found to be 102.2%, 128.4% and 97.8% in considering the yielding and carrying capacity of the available schemes as well as area displacement respectively, (Annex 11). The computed result shows that what has been done and achieved would higher to the expected. This result may mislead to give conclusion. One may mistakenly conclude that the area is provided sufficiently with the required clean water based on this result where the reality on the ground is different.

But woreda water office report suggested that it was only about 60% of the HDWs, if not conceived any defect in between, could provide the service during the dry season. Of the remaining 40%, (27); 9 according to the report significantly reduced in their yield and in the quality of water they produce where the other 18 get completely dried and interrupted. This state of schemes' malfunctioning at the area is summarized as shown in table 4.8 below.

Table 4.8; frequency and existence of schemes in a state of interruption

Category	Frequency of scheme interruption				Average time in a state of interruption/malfunctioning					
	Ones	Twice	Three times	Four times	In case of defect			Due to seasonality		
					A week	2weeks	A month	A month	2months	3months
Frequency	12	30	9	8	10	33	16	20	31	8
Percent	20.3	50.8	13.6	13.6	16.9	55.9	27.1	33.9	52.5	13.6

Source; Household survey, 2011

Of the 59 respondents who all had faced the non- functionality problem of schemes, 20.3% of them have reported that their water supply schemes failed to provide the service ones, 50.8% reported twice, 15.3% three times, and 13.6% four times. This does mean 79.7% of the

informants have reported that their sources were interrupted 2 to 4 times within a year. None of the respondents, as it could be seen from the data, reported that their schemes were continuously provided them with the service. This implies that majority of the community did not get proper service from the developed sources because of the frequent defects of the schemes.

In other words the respondents, as shown in the same table, were also asked about the average time of schemes in a state of malfunctioning. The result showed that in cases of defects of the schemes 16.9% of the informants have indicated that it would take about a week, 55.9% two weeks, and the remaining replied that it is about a month. In cases of seasonality 33.9% were mentioned that the schemes they were utilizing were unavailable for about a month, 52.5% for about two months, and 13.6% for about three months. From this it can be noted that according to 66.1% respondents, the seasonal schemes were not available for about 2 to 3 months per year.

From this it can be concluded that the attention given to restore defective schemes was relatively adequate. In some cases it is mentioned that it will take up to 18 days on average, /Komives et al, 2006 cited in Bezabih,2008/. Therefore the situation in the area in this regard was better. But the problem was more serious in cases of interruptions associated with seasonality of the schemes that was believed to contribute much towards the sustainability problem of the area.

This overall development showed that it is unlikely to expect sustainable service from the schemes due to seasonality impact and a great chance of conceiving recurrent defect. Therefore for a better evaluation of the access coverage and the impact of seasonality of the facilities upon the coverage, it needs to consider this seasonality problem into account to assess the real picture on the ground late alone that the non- seasonal schemes were available year-round. The coverage with the consideration of this will be now much different i.e. 68% (Annex 11).

This showed the significant impact that seasonality imposed the sustainable use of the facilities and the sustainable service provision to the people at the area. The feedback from the woreda water office was found in support of this lower level dry season coverage although there existed a bit difference between the results that might arise as a result of differences in the approaches made to compute the coverage. The coverage reported by the woreda water office was 66.24%.

The coverage resulted from the computation made with the consideration of seasonality situation was found encouraging and better as compared with the regional and national average for rural areas; that were 46% and 41.2% respectively, /MoWRS; 2006/. From the result with the consideration of seasonal impact up on schemes the coverage was found much smaller. Moreover as it has been discussed that there were no abundant traditional sources in many of the study areas, the assumed 15litres of water per capita per day might not be sufficient. This in turn points that the people of the area were not accessed with sufficient amount of safe water supply as per it was required. In this regard it can be concluded that the efforts made in accessing the supply did not consider the real environment into account so as to benefit people of the area with a reliable and sustainable water supply.

4.4. Scheme Distribution

Based on the summarized data obtained from the woreda water office, there were 15 kebeles and 72 village administrations each with different number of residents. There were also 89 improved water supply facilities constructed at the woreda where there were 21,502 people/2437households. To examine whether or not the schemes were constructed considering fare and even distribution among the kebeles and villages, a relative comparison has been made taking the number of people living in each particular area and the number of constructed facilities their into account. It was found that schemes were not proportionally and fairly distributed among the kebeles of the woreda and the villages of each kebele, /Section 3.2.1/.

Of the kebeles which had lesser relative number of schemes, Alfashir had no any improved water supply facility at all. Similarly of the total 72 village administrations 18.1% of them had no any improved facility where the remaining on average had 1.5schemes per village. This can be contrasted with the coverage computed earlier with the consideration of area displacement. Based on that computation the coverage was found 97.8% where on the ground one kebele and 13 villages were left out of any access to the facility, /Annex 11/.

In another attempts on average 299 people are expected to live in a village administration considering the people of the woreda, /21502/, and the existed 72 village administrations. With this assumption thus there were 3887/18.1%/ people living within the 13 villages who were left without any access to the improved facility. But the computed coverage in relation to the carrying capacity of the available schemes 128.4% of the peoples of the area were expected to

benefit from the access where these segment of people have no any source for the access, (Annexes 5,6, 7, 10,& 11; CSA, 2007). This also pointed the unfair and the uneven water supply developments made at the area.

Thus the unfair and the uneven developments of the facilities were believed another problem that has influenced the efforts of accessing safe water supply. This non-proportional distribution made part of the community accessed with at least 15litres and the remaining segment with no any at all. More over this unfair and uneven distribution predisposes schemes to shoulder different degrees of pressure from the users. Some areas have fewer facilities subjected to be utilized by many beneficiaries so as to conceive a greater risk of defects as the consequence of that heavy burden. This unfair and uneven scheme distribution is thus supposed to be the other problem in the area influencing sustainable use of the developed facilities.

4.5. Seasonality and sustainability of improved water supply sources

According to 62.7% respondents and questionnaire feedbacks, seasonality of schemes was a major concern for sustainability of the developed facilities in the study area. According to the responses 40% of the 68 HDWs were found significantly influenced by seasonality of which 18 of them were found completely drying and the remaining 9 were reported to reduce considerably both in their amount and quality of yield during the dry season; a period from late December to mid April,(Annex 9, Table 4.9).

The major reasons reported for the seasonality of the water schemes in the study area were depth and season of construction. Based on report and expert feedbacks the problematic seasonal sources were constructed during the rainy, and/or wet season of the year where during the times ground water was reported to be available at a shallower depth then to run down out of the reach of the installed schemes as the dry season advances where they couldn't harvest it.

Seasonality was reported that it does not create the problem only upon the availability and performance of the seasonal schemes alone, but also indirectly influence the healthy functioning of the non- seasonal facilities as well. Peoples utilizing the seasonal schemes were reported to shift in to the other available ones around where this was believed to add pressure on to the non-seasonal facilities which might be beyond their actual and assumed carrying capacity. Thus as a

consequence the schemes were expected to suffer from a greater chance of conceiving defects. This can be simply shown by the increasing number of defective schemes during the dry where the seasonal schemes were found interrupted. As shown in table 4.9 below, in the sampled kebeles the number of defective schemes for instance was three during the survey when it was too early for the onset of the dry season for its significant impact upon the seasonal schemes.

Table 4.9; Functionality status of schemes in type during the survey and during the dry period,

Scheme type	Functional status of schemes											
	During survey						During dry season/data taken from the water office/					
	Functional		Non-fun		Seasonal		Functional		Non-functional		Seasonal	
	In number	In %	In number	In %	In number	In%	In number	In %	In number	In %	In number	In %
HDW	18	90	2	10	-	-	9	45	8	40	3	15
SW	4	100	-	-	-	-	3	75	-	-	1	25
BH	-	-	1	100	-	-	-	-	1	100	-	-
Total	22	88	3	12	-	-	12	48	9	36	4	16

Source; survey result, 2011

But the number was found increased by 24% from three to nine where 4 of the sources were found interrupted due to the effect of the dry season. From this one can conclude that the additional pressure the schemes were forced to carry has predisposed them to conceive defects, /Annex 9 & Table 4.9/. Of course this study did not consider year of establishment which may have effect on sustainability of the schemes. Accordingly impact of the factor is not excluded to affect scheme sustainability in the study area.

Therefore seasonality of schemes was found the most serious problem affecting sustainable utilization of schemes and sustainable provision of the access. The coverage computed with the consideration of this seasonality situation of the schemes into account could show how this seasonality problem significantly contributes towards the sustainability problem encountered at the area. It can certainly be concluded that unless this seasonality of the available schemes is improved through increasing the depth of these schemes and at great care is given for newly implemented facilities, it is impossible to provide the service and to promote the coverage in a sustainable manner.

4.6 Community, finance, technical, and institutional related issues;

4.6.1 Community participation

Based on the data obtained from the interview, 33(55.9%) of the respondents were not informed at all about the construction of water development facility in their vicinity and about 29(49.2%) reported that they were not participated and involved in any of the development processes of the schemes. Feedbacks through questionnaires and FGD also suggested that there was no, and if any, very little work had been done in participating and involving the community during the process. The developments made both by the government and other partners were also indicated that it had mostly followed supply driven approach.

Table 4.10; Response for development initiator, selection of technology, type & site of construction,

Category	Scheme construction initiator			Scheme construction site and Technology type selected by		
	Community	Government	Do not know	Water office	Community	Don't know
Frequency	27	10	22	17	1	41
Percent	45.8	16.9	37.3	28.8	1.7	69

Source; household survey; 2011

The majority of the respondents; 32(54.2%) were responded that they had taken no role at all in the initiation of the development process of the facilities. It was only the 45.8% of the respondents have reported that their water supply sources were constructed through the requests they had made, (Table 4.10). Moreover, 58/98.3%/ of the respondents were reported that they were not involved in any aspect of selecting technology options and site of construction, and 49.2% of the respondents were reported that they had contributed nothing towards the smooth functioning of the schemes, (Table 4.11). Rather of the respondents 13.6% have given the responsibility to the government both for the provision of the facility and for the well-being and maintenance of the schemes.

Table 4.11; Response for participation and involvement of the community before, during, and post schemes construction,

Category	Involvement before construction		Participation during construction			Participation post construction		
	Informed	Not informed	Provision of locally available material	Provision of material & labour	None	Locally available materials	Labour & materials	None
Frequency	26	33	19	11	29	1	30	28
Percent	44.1	55.9	32.2	18.6	49.2	1.7	50.8	47.5

Source; survey result 2011

Generally as it can be seen from table 4.9; 55.9, 49.2, and 47.5 percent of the respondents were reported that they had not involved and participated at all during the planning, construction and post construction phases of the projects respectively.

All these indicated issues that are believed to create the feeling of being an owner over the output of any development undertakings among intended users to make them contributing, willing and caring to their smooth functioning have been missed. Thus there is no any better convincing reason more than this absence of ownership feeling among the users for paying little care and/or not at all towards the well being of the facilities and to contribute to the general sustainability problem of the schemes at the area. This can also be noted from the existence of improperly managed schemes and poor level of contribution made by the users, /Table 4.9/.

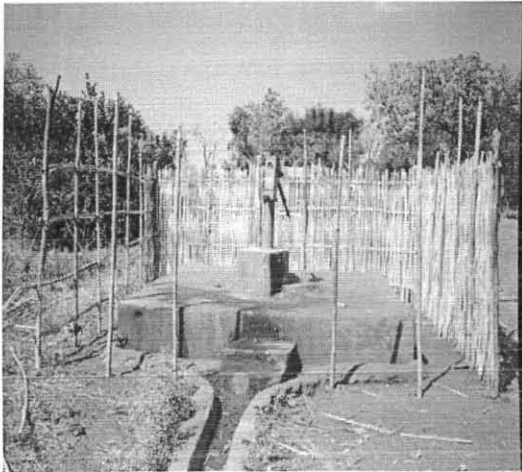
Although the information obtained from the woreda water office suggested 65% of the improved sources were unfenced, it was observed in the sampled kebeles during the survey that all the schemes were seen unfenced and/or improperly managed, (Figure 4.1)

Moreover due to the failure in involving the community, although their number has not been specified by the respondents, some schemes were constructed in areas where there were tomb places and some others deep into the bush where their utilization is difficult during the rainy season. This is also believed to contribute towards the problem of sustainable utilization of the schemes.

Therefore these overall developments imply that the failure in creating the required sense of ownership feeling through participating and involving the intended beneficiaries in the

development process has contributed towards the sustainability problem faced as schemes' well being and smooth functioning was not focused by the users as required as possible.

Figure 4.1; pictures taken to show the overall poor community scheme management and poor site selections



Source; scheme survey, 2011

Source; pictures taken during Onsite observation/survey, 2011

This can be strongly supported through the arguments made by different scholars. In support of this Harvey and Nayaran believed in that creating sense of ownership over schemes is considered as a guarantee to ensure schemes ongoing operation and maintenance, as well as to project effectiveness, (Harvey and Reed, 2006, Nayaran, 1994). Further according to IRDC, in principle if a water supply scheme has to be sustainable, communities should participate in the planning,

construction, O&M, and evaluation phases, /IDRC,1981:90/. Harvey and Reed further argue that for a water supply schemes to be sustainable, the community should participate in the areas of cash contribution to the project costs, selection of the management type, and even the water tariff, (Harvey & Reed, 2006).

The significance of community participation has also been stated by many other scholars and institutions too. In relation to this it is claimed that community participation can play significant role in developing and increasing community awareness and pride of ownership toward the village water supply system, resulting in success and a high level of performance of the system,/IDRC,1981:92/. Based on additional reviewed literatures, experiences has shown that when development interventions align to the priorities of community, the sense of ownership increases, as does the likelihood that the community will work to maintain the results, thereby increasing the chance of sustainability,/MoWRs, 2003/. It was also indicated that water supply services which are more demand responsive are more likely to be sustainable at the community level than services which are less demand ,,,, responsive,/Sara and Katz 1997 cited in Lockwood, 2003/.

All these literature out puts thus in support of this paper showed that participating communities properly and effectively in the development processes of rural water supply plays a key role in sustaining the installed facilities which indirectly implies that the failure in doing so results in influencing sustainability of the facilities. Thus from this it can be concluded that the weak community involvement and the approach made before, during and post construction of the supply facilities have failed to create the required ownership feeling among users so as to limit the care and the contribution paid to the facilities by them and to contribute towards the sustainability problem observed at the area.

In regard to governance structure of the schemes, with the objective of accessing clean water supply to the people and promoting the coverage in the region, the BGR has adapted the national plan and installed water supply and development structure from regional down to the grass root level. At the regional level the bureau of water resources is in place to plan, organize, and facilitate the development and promotion of the facility. To address the issue in an organized manner zone, woreda, and kebele water office structures were installed. The kebele water office is aimed to closely supervise and monitor the facilities for their smooth functioning. At the grass

root level a water committee that can manage the overall scheme conditions on behalf of the users was established by the community for each scheme with the objective of running and supervising the activities of the schemes and organizing the community towards the development. The criterion used for selecting the water committee were reported to include: - 30% women inclusion, regular availability in the area, ethics, commitment & willingness. The committee was made to have seven members. This includes a chairman, secretary, cashier, two committee members and two local mechanics.

Table 4.12; response on the performance of water committee and local operators

Category	Performance of the				
	Water committee		Local operators		
	Good	Poor	Good	Poor	Do not know
Frequency	40	19	46	1	12
Percent	67.8	32.2	78	1.7	20.3

Source; survey result, 2011

The committees were reported active by 67.8% of the respondents but not a little more than collecting tariff payments due to absence of incentives, lack of appropriate support from the community and timely provision of spare parts. The performance of the local operators had rated good by 78% of the respondents. From this it can be concluded that there is no any significant impact from the performance of the committees and operators that can account to contribute for any significant impact towards the encountered sustainability problem.

Generally all the users and their representative committees were found poor in performing what they were expected to carry out. This include poor tariff setting and inefficient collection, poor contribution, failure in considering the developed schemes as an own property, lack of commitment, giving the responsibility to the government (13.6%) both for the access and even for the well-being and maintenance of the schemes. Thus as the writer of this paper believes and as it was strongly supported by evidences from the cited literatures all the indicated limitations of the community related components have contributed a significant share towards the encountered sustainability problem of the facilities at the study area.

4.6.2. Financial related issues

It has been claimed in many aspects that finance is the basic requirement and a back bone not only for sustainability of water supply developments but also for the life of any project/program. Whatever the remaining conditions fulfilled unless supported with the required financial input the program/project might not stay longer in life and if it does its success is hardly maintained.

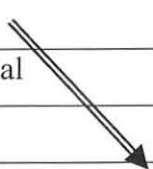
In this regard for the accomplished water supply developments, based on the interview response, all the users were found contributing nothing in cash towards the investment cost more, /Table 4.9/. Although based on the policy the cost for O&M is expected from the users the overall cost was found covered from partners, donors, as well as from government sources particularly NGOs working in humanitarian aid around the refugees in the area such as especially UNICEF and IRC, (Annex 5).

According to FGD participants and institutional feedbacks the water tariff was set by the community and water users' committee. This tariff set was found established uniformly one birr per month per household without considering household income, family size, and amount of water collected. Males having more than one wife according to the tariff set were expected to pay one birr for each additional wife monthly. The collected money was set to be deposited at the woreda credit and saving service intended to be utilized for later use for purposes of O&M as the cost for the purpose was covered by supporting agencies working in the area.

In regard to the willingness and ability of users to pay for the tariff set all the respondents were found willing to pay the one birr tariff. As it could be seen from table 4.13 below 83.1% of the informants reported that the tariff set they were expected to pay was fair implying that they were not willing to make any improvement to it as they thought the tariff amount was fair and sufficient to maintain the service. The remaining 16.9% reported that the tariff set was not fair of which 20% of them replied that the tariff set is too expensive to them where as the 80% reported that the tariff set is too cheap that needs to be improved.

Table 4.13; response on the fairness of the tariff set

What you are paying is fair?	Frequency	Percent
Yes	49	83.1
No	10	16.9
Total	59	100



How much are you thus willing to pay	Frequency	Percent
50cents	2	20
2 birr	4	40
3 birr	2	20
5 birr	2	20
Total	10	100%

Source; survey result, 2011

In other words the 3.4% were intended even to reduce the one birr tariff set into its previous amount that was 50 cents. It was only 8/13.6% of the respondents suggested that the tariff set has to be improved as the cost for spare parts gets on increasing from time to time. They stress that it could not be possible to maintain the service through the set tariff if supporting partners withdraw their hands from being intervened. They even added that if payment would have been based on the amount of water collected to be paid on the spot, the cost will be much higher than the one which they were expected to pay. They also believed that increasing the tariff will reduce water wastage as people will intend to minimize their water cost.

This respondents' argument seemed logical. If the tariff amount has got improved and decided to be paid on spot; schemes will be fenced and utilization time will be specified to control utilization. Users are believed to minimize the amount of water they required to fetch with the intension of reducing the cost they need to pay for the amount they draw. These are all expected to reduce pressure on schemes by preventing water abuse/misuse and whole day utilization so as to improve sustainability situations of the schemes.

As it was discussed in the previous portions, on average a household was assumed to fetch 96.6 litres of water on a daily basis. This amount will be about 35,259 litres on a yearly basis. The cost of this amount based on the tariff set will be then only 12birr per annum. This does mean 2938.25 litres worth only one birr. This cheap tariff set is believed to encourage abuses and over use of water, /MoWRs; UAP, 2009/. This abuse and over use of water in turn is assumed to add burden on to the schemes so as to predispose them to defects. Therefore the arbitrarily set tariff was found to indirectly influence the sustainable use of the sources through inviting over utilization of the schemes leading them to malfunctioning.

In terms of efficiency of collecting and managing payments, it has been checked that there was no any developed receipt in use for collecting the payments and none of the schemes were found audited. Financial management undertakings generally were seen unclear. In association to this some of the respondents have reported that this had created lack of trust among the users. It is thus logical to consider this as one reason for the poor will of users to improve the tariff and to contribute in cash towards the well being of the facilities.

On the other hand in regard to paying the established tariff set 8.5% of the respondents indicated that the majority were not paying for the service they have already utilized. For the question asked about the way set to collect payments from those unwilling users, 39/66.1%/ reported that they would be prohibited from the service, 15.3% replied that they would be forced by the kebele to pay and 18.3% responded that there has happened nothing to them. But as it was observed on spot during the survey there was no any favourable situation that could allow prohibition as the unfenced schemes were available for whole day long utilization and where there was no one to control it at the watering points. Thus what the majority reported couldn't be logically accepted. In regard to developing new and maintaining the available, the financial support especially from the government source was reported very insignificant and what users pay was explained unable to run the services smoothly. This can be supported by providing some financial data evidences. From the government source for the annual overall planned activities it was only 5600 birr running cost was allocated for the fiscal year /2010/11 where the actual request was in ten thousands. To bring additional evidence it was only 10,280 total birr until September 2010 has been collected and deposited from the tariff since more than 5years where tariff payment was practiced there. This does mean on average 115. 51 birr has been collected from each scheme.

This again shows that the situation in financial aspect of the water supply facilities at the area generally was very poor.

Thus generally as far as the financial situation of the facilities was concerned, the contribution in cash from the community, the efficiency of setting tariff and collecting payments, the way how the collected tariff and contribution payments were managed, and the willingness and the awareness of the user community to pay were found too weak. The adequacy and on time provision of support given from higher institutions were also found poor and infrequent. The affordability in price of spare parts according to the feedback from institutions and expertise became challenging where the majority of the respondents have no intention of improving the tariff amount.

This overall development shows that the schemes have got a serious financial limitation to sustain their services uninterruptedly. Thus the limitation of the resource was believed to contribute its significant share towards the encountered sustainability problem of the service.

In support of this Musonda, /2004:139/, indicated that ability of communities to raise user fees is crucial to sustainability of water supply facilities because they are used to purchase spare parts and paying technicians for caring out repairs implying that where providing spare parts and paying for the technicians is not possible, service maintenance will become difficult. Additionally, as Boydel, /1999/, cited in IRC, /2004:52/, indicated that for schemes to be sustainable, communities should pay for O and M and should make a "substantial" contribution to capital costs that should be enough to generate a feeling of ownership.

Therefore in such situations of the area as on time response at the required amount could not be obtained for maintaining defective & seasonal schemes due to financial limitations, thus scheme service interruption is an inevitable so as to influence sustainable utilization of the sources.

4.6.3. Issues related to technical aspects;

Availability of spare parts, their respective price affordability, the construction quality of the schemes, the technical skill developed at all levels for O&M under takings, feasibility of the technology chosen, and the selection of appropriate site were the major areas focused during the study.

Concerning the availability and price wise affordability of spare parts, the information obtained through the entire questionnaire suggested that it was impossible to obtain the materials at nearby markets and there were no any competent private sectors to provide it. It has been told from the informants that this was a general problem at the regional level. Informants were also asked in regard to the problem with which the local mechanics faced the most and 69.5% of them have responded that it was shortage of spare parts.

As it was reported by 79.7% respondents a scheme was found to interrupt more than once which in average is three times per year due to defects,/Section 4.3.2/. Based on the tariff set at least 644 birr per month which is about 7728 within a year is expected from the households found in the sample kebeles assuming that each male had only one wife. But according to the available information from the water office it was only 115.51 birr from the saved capital is accounted for each scheme in average,/Section 4.6.2; Annex 10/.

This shows that the majority users were not paying even for the poorly set tariff. Considering this weak tariff set and the recurrent defects schemes were encountering, it is believed that it is impossible to provide spare parts for timely maintenance of the schemes. Therefore both the in availability and price wise in affordability of spare parts has accounted towards the encountered sustainability problem in the area.

In support of this Musonda explained that unless appropriate tools for carrying out repairs should be made available at an affordable price, sustaining scheme service becomes challenging as most of the communities at the moment could not afford the cost of the spare parts, (Musonda, 2004: 139). Komives also stressed that in supporting sustainability of RWS schemes, spare parts and toolkits must be available. He further stated that without access to a reliable supply of spare parts and some qualified persons to make repairs, water supply schemes will not be sustainable,(Komives et al,2006:7). WAE (2004:4) also indicated that lack of input suppliers for spare parts contributes to lower continuity of water projects. Studies by Brikke et.al. (1995:16) cited in Musonda (2004) and Davis et. al. (1993) also considered availability of affordable spare parts, capacity at community level to operate and maintain the water supply facilities and abilities of communities to contribute user fees as being critical to sustainability of water supply schemes

Thus, this unavailability and in affordability in price of the spare parts, as well as the lack of spare parts suppliers in the area has believed to contribute its impact in interrupting the scheme services through influencing on time maintenance of the schemes so as to contribute to the general sustainability problem of the safe water provisions.

Poor construction quality was the other reported technical problem influencing sustainability of clean water supply. The scheme construction season was blamed for bearing seasonal schemes where their yield was mentioned to reduce following the onset of the dry season. In regard to this respondents were asked about the construction quality of their improved sources and 48/81.4%/ had rated the quality good where the remaining relating it to seasonality situation had rated poor. This could be supported by raising the existence of 27 seasonal HDWs, (Annex 9), which constitute about 40% of the hand dug wells and 30% of the total schemes of the woreda.

As far as site selection was concerned; based on FGD, office report, and onsite observation although failed to specify in number, there were schemes seen constructed in areas where there were tomb places, at the side of river banks far from residential places, and over a rocky-bed. These technical issues; poor construction quality and poor site selections, were thus believed to affect sustainable utilization of the sources. This could be due to either through interruption of the service, difficulty in the accessibility to reach at the points, and/or due to taboo prohibiting utilization from such sources so as to influence and contribute towards the sustainable utilization of the schemes.

About 93% respondents were reported the presence and technical skill of local mechanics for the schemes in their vicinity. In regard to their performance in at least maintaining minor defects, 78% of the respondents were rated the technical skill of the operators good and 1.7% poor. The remaining 20.3% were found that they did not know about it. Therefore limitation in the technical skill of the technicians is not expected for its significant impact to the sustainability problem observed at the water points.

In regard to technology feasibility and choice, it had been reported that the community had not been involved at all in selecting the options, /Table 4.9/. Of the total 89 schemes available at the area, 76.4% were found HDWs, 21.3% SWs, and the remaining 2.2% were bore holes in technology option. As far as the type of hand pumps fitted to the HDWs and SWs is concerned, it

was 98.9% Afredv type that was fitted to them where Indian mark II was only found fitted to the remaining one, /Annex 9/. Finding of the study indicated that the Afredv type was preferred for its non rusting character as is plastic in nature, for its easy replacement by local mechanics with no more technical skill, and for its spare part availability with a relatively cheap price. Therefore in this regard although the community was not involved in selecting type there was no any observable adverse impact affecting sustainable utilization of the sources as the selection made by the respective institutions was found reasonable.

In terms of selecting scheme technology options the water office told that the choice was made between level of efficiency of each type and financial capacity of the commissioning agency. From the attempts made it was found that nearly 95% of the shallow wells out of the available 19 were practically seen to provide the service with no/or little effect from the dry season. As it could be noted from the previous portions it was only 60.3% of the HDWs were found providing the service more sustainably as far as the dry season impact is concerned. But shallow wells were relatively found expensive in their investment cost. Thus HDWs was given priority by many of the partners and government except UNICEF which had constructed 16 out of the available 19 SWs, (Annex 5). It is obvious that better sustainability would be secured if most of the schemes were made of shallow well. In support of this Arlosoroff claimed that the technology chosen should give the community the highest service level that it is willing to pay for, will benefit from and has institutional capacity to sustain", /Arlosoroff et al, 1987:29/. But it was a matter of capacity that has brought this more problematic and less feasible technology to be use at the area.

Here it can be concluded that the failure of choosing the better technology type due to limitation in resources was believed to contribute towards the sustainability problem of access to the clean water supply at the woreda.

4.6.4. Institutionally related problems

Based on the study output different partners were found to involve in accessing and promoting clean water supply both by constructing and maintaining facilities. Most of these include international organizations working around the refugee. They were reported to contribute a lot towards improving the supply coverage more than any of the districts in the region. This can be shown by the existence of 85.4% of the schemes that were built by the partners, (Annex 5 & 9).

To provide additional evidence the computed supply coverage even with the consideration of seasonality impact as compared to the regional, / 46%/, and national, /41.2%/ was found much better, / section 4.3.2/. This magnifies their significant role in the area. Additionally they were reported in covering most of the cost for O&M. It was tried to find out the yearly financial share of these organizations contributed for the purpose, but the poor documentation of financial statements has made it impossible. Questionnaire responses showed that they were also involved much in the provision of training, spare parts, and finance for the deal. These organizations include UNICEF, Action Aid Ethiopia, Water Aid, UNHCR, CISP, World Vision Ethiopia, and IRC. The supports of the organizations were also reported to include capacity building and awareness creation to the community. The government institutions at different levels were also reported to involve in accessing the supply despite the great limitations they had in resources.

Table 4: 14; Response on the adequacy of support from institutions to sustain the intended service delivery and the availability of water supply workers;

Category	Is support sufficient?			Staff situation								
	Yes	Not	Don't know	Office level			Kebele level			Woreda level		
				Required	Available	% available	Required	Available	% available	Required	Available	% available
Frequency	16	40	3	11	7	63.6	45	13	28.9	56	20	35.7
Percent	27.1	67.8	5.1									

Source; Woreda water office and survey result 2011

But respondents, FGD participants and institutional feedbacks suggested that the overall support provided was insufficient. The existence of a number of seasonal schemes that need to be improved, absence of continuous training at all levels, and failure of higher institutions to respond for requests timely and adequately were the major points they have raised to argue. In this regard to the question respondents asked about the sufficiency of the support given to their water supply facilities, the majority, /40/67.8%/, responded that it was insufficient where 27.1% reported for its sufficiency, and the remaining 5.1% reported that they did not know, /Table 4.14/. This means around 73% of the respondents were reported either the insufficiency of the support or knows nothing about it. This farther helps to understand that the holistic support given to sustain the water supply facilities was not sufficient enough to run them smoothly.

The water office at the woreda level in terms of resource was reported and observed very poor such as in office facility, staff number, and in the respective qualification and experience of the staffs. From the available information the woreda has no any independent office, store, and own means of transportation. Of the required 11 at office and 45 at kebele levels, at the time of the survey it was only 7/63.6% and 13/28.9% of the employees respectively were available. This figure will be 20/35.7% as far as the required workers at the woreda level was concerned, /Table 4.13/. As per qualification and experience of the employees was concerned, all the available ones at both levels were diploma holders from vocational and technical colleges with less than 2 years of experience. Undoubtedly this absence of qualified and experienced workers was expected to limit the efforts of promoting and sustaining the clean water supply.

On the other hand the water institute at the bureau level was blamed for not decentralized resource wise down to the grass – root level. Based on institutional informants qualified and experienced human resources, donated finance and spare parts, vehicles, office furniture and facilities were centred at the bureau level where the lower levels were obliged to provide recurrent requests. They suggested that maintaining defected schemes were thus subjected to delay as a consequence so as to give room for service interruptions of the sources to extend, and thus to influence sustainable utilization of the sources. Financially it has been already discussed in portion 4.5.2 that the financial support being given especially from the government source was insufficient and negligible to maintain scheme services.

In terms of existence of conducive and enabling environment to promote and improve the situation of safe water provision, based on reviewed documents and suggestions, similar efforts were taken place in the region in general to achieve the MDG. The existence and active participations of partners in the area was reported an opportunity for the intended promotion. Institutional frameworks were also installed from regional level down to the grass root just to create a better and conducive environment for the purpose, /6.6.1/. Water users' committee was also established for each scheme to develop linkage between the community and institutes and to organize the community towards managing their clean water supply sources. Therefore, these overall existing conditions were thus believed to promote the efforts of accessing safe water to the community.

As far as the capacity of local government is concerned, as the majority, /59.3%/, of the respondents were found illiterate they were expected relatively poor in their capacity to administer and organize all development and administrative activities in general and the water development efforts in particular, /Table 4.1/. This has been observed during the survey. Most of the kebele administrators who mostly were illiterate were seen unwilling to discuss and to organize respondents for the purpose. As they were the responsible body to manage & to control the facilities and the water committees, their poor administrative capacity is believed inevitably to affect the schemes smooth functioning.

On the other hand, as the water development expertise claimed rural water development partners were blamed for not communicating their project plans to the respective institute. They were reported rarely to make assessment and negotiation with the community and with the institutes. Although a guideline to coordinate the activities of NGOs' working in the area of rural water supply developments has been developed, /BoWRs, 2001/, questionnaire feedbacks showed that stakeholders did not follow it accordingly. This might be due to the reason that they may not reach at a consensus on the issue, or the guideline may not been developed through involving the stakeholders and partners.

Based on the opinion of employees those poor quality schemes were rooted from the absence and/or from poor monitoring and supervision on construction. The intention of creating the feeling of being an owner among users was not been focused by the partners. The NGOs in constructing the schemes were also reported to concentrate with their respective project sites and where there existed infrastructures. This was indicated one reason accounted for the unfair and uneven distribution of the developed facilities in the area, /Section4.5/, where this uneven and unfair distribution enforces fewer schemes to be utilized by a relatively larger number of peoples. This is assumed to predispose schemes to defects so as to influence their sustainable availability.

Thus from the overall outlined existing institutional situations, it can be concluded that the institutions were not provided the required support timely and sufficiently as require as possible. Thus as its impact shown in section 2.4.2 is significant it is believed to contribute a great share towards the encountered sustainability problem of the water supply facilities of the area.

In support of this Schouten and Moritary have underlined the necessity of providing support guidance in addressing arrange of issues to guarantee the sustainability of RWS projects and associated benefits, /Schouten and Moritary, 2003/. Lockwood, /2003/, also argued by arising an idea that it is unrealistic to expect that government can leave rural communities to their own devices after a water project is complete, and that for RWS systems to be successful, communities need some post construction technical assistance.

Therefore with these scholars' views the holistic assistance provided in support of the developed facilities to run them smoothly is very poor in relation to the actual need. Thus this absence of timely and sufficiently support has impacted the sustainable operation of the schemes in the area.

CHAPTER FIVE

Conclusion and Recommendation

5.1. Conclusion

In the previous portions where data inputs were summarized, analysis of distance of water points from the residence of users, time required to reach the watering points, available water supply sources and coverage, scheme sustainability and fairness were discussed in detail. Moreover, community, financial, technical and institutional related issues that could affect the sustainable use of the available facilities have been entertained. From the overall developments made it could be concluded that:-

- As the intended beneficiaries were not properly and sufficiently involved and participated in the development process from the very beginning, the required sense of ownership was not created among them. Thus the community was found less willing to pay, to contribute, and to manage the schemes.
- As there is no any means of incentive, continuous training, and support designed to encourage the water users' committee, thus they were found less committed to their responsibility.
- As there was no any integration & communication among stallholders, projects were found implemented under poor supervision and monitoring where as the consequence a number of seasonal schemes, unfair and uneven scheme distribution were resulted.
- As what has to be done in creating awareness among the users was not dealt sufficiently, the community were set a very poor tariff and almost all of the respondents were found none willing to improve the tariff suggesting that the government is the one responsible to provide them with the access.
- Because the tariff set basis household level payments and number of wives a male household owns, as there was no clear information from the community and as there was no any clear approved rule to be taken on those who were denying to pay for the service, the way by which the tariff set was made and the efficiency of collecting and managing the payments was found very weak.

- As spare parts were not available at the nearby markets and their price was found none affordable, thus on time maintenance of defected schemes usually seen to take time where as a consequence they were found longer in a state of malfunctioning.
- As there was no any established minimum reference depth for each type of schemes to have on construction as per that agro-ecology is concerned and the schemes were not found constructed under close and appropriate supervision, thus a number of seasonal facilities were rooted as a consequence. Although it has been tried to identify the reasons and the problems accounted for the encountered sustainability problem of the water supply facilities at the area, because of the existence of potential and complex influencing components, it was found difficult to identify the contribution made by each of the components towards the problem. Despite the variation in degrees of their influence all in aggregate are believed to affect the sustainable use of the developed schemes seriously. This indicates that alleviating the problem needs holistic approach considering all the issues discussed in this paper into account.

5.2. Recommendation

So far it was tried to assess and identify the key bottlenecks which were believed to affect the sustainable use of water supply schemes in the study area. After identifying the problems suggesting a solution to alleviate or, if not, to minimize their effect has to be the next. Thus with this intention in mind;

- Any party intended to work in the area in first place should aware the community about the overall water supply strategy, the role, the limit, and the responsibility that the government, partners, and the community should play with the intension of creating the required sense of ownership among the users from the very beginning of the plan so as to make them caring and contributing towards the sustainable and smooth functioning of the schemes.
- The insignificantly and arbitrarily set tariff and the way used to set the tariff has to be summarized taking either the family size, the income level of the household, or on the amount of water drawn not only to secure the financial need of the schemes for maintenance but also to avoid the unnecessary wastage of water and load on to the schemes.
- Effective and transparent tariff collection and management approach need to be implemented so as to sustain the service by creating schemes financially able to administer themselves so

as not to be affected if supporting agencies withdraw their hands any time from the intervention.

- Established water committees should be supported, provided with incentives , inspected for their responsibility, need to be blocked and accounted reasonably as otherwise this will discourage users to pay due to lack of trust.
- Partners and respective government institutes need to communicate and integrate themselves to avoid poor quality schemes and unfair and uneven facility development. They, in relation to this even need to develop a guideline that has to be followed by them during intervention.
- The way how the budget allocation was made should be revised considering the planned activities in to account.
- Shallow wells despite their expensive investment cost were found available throughout the year with no or little effect from the dry season. Thus the comparative advantage between their relative sustainable use and the frequent interruptions of the HDWs requiring recurrent cost for their recovery need to be contrasted just to develop feasible technology options.
- Priority should be given for improving the quality and performance of the already available facilities rather than planning for new projects as the coverage in terms of schemes carrying capacity was found better.
- The costly constructed bore hole in Tumet kebele was in a state of malfunctioning years since few months of its handover to the users with no any justified reason. Thus a study has to be conducted on the problem to recover it as its recovery significantly believed to improve the coverage, and to reduce the load on to the available smaller watering points.
- Performing all the development activities being waiting for the arrival of the dry season seems difficult as the wetter season covers almost half of the year. But the seasonality problem associated to depth has to be prevented by any means such as through close supervision and establishment of a minimum reference depth for wells to be developed in the area.
- The consideration of 15litres of water requirement per capita per day in accessing the service does not seems logical in the area where the traditional sources expected to be utilized for extra home purposes does not exist in many areas. Thus a study should be made to identify areas which are deprived of such a sources to provide sufficient and reliable supply.

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Glossary

Bega; – Dry season in Ethiopia

Got; – Village level in the study area which is the smallest administrative structure under the kebele

Jarikan- Plastic container with a capacity of holding 20 litres used to fetch water

Kebele; - local level administration holding a number of gots under its structure

Woreda; - administrative structure above kebele.

Acronyms

AAE - Action Aid Ethiopia

BGRS – Benishangul Gumuz Regional State

BPR- Business Process Re- engineering

BoWR –Bureau of Water Resources

CISP- Committee International Support Program

CSA – Central statistical Agency

EKCH- Ethiopian Catholic Church

EPA– Environmental Protection Authority

ESRDF– Ethiopian Social Rehabilitation & Development Fund

GO- Government

HDW – Hand Dug Well

HH – Households

IRC– International Rescue Committee

Km² – Square kilometres

m³ – Cubic meters

M& E – Monitoring & Evaluation

MDG – Millennium Development Goal

MoWR – Ministry of Water Resources

NGOs – Non – Governmental Organizations

O & M – Operation & maintenance

PASDEP – Plan for Accelerated and Sustainable Development to End Poverty

SAP – Structural Adjustment Program



SNNPR – South Nations, Nationalities, and Peoples Region

UAP– Universal Access Program

UMC– United Management Consultants

UNHCR– United Nations High Commissioner for Refugees.

UNICEF– United Nations International Children’s Emergency Fund

VOLM – Village Level Operation, and Maintenance

WSAC– Water Supply Access Coverage

WSC– Water Supply Coverage

WVE- World Vision Ethiopia

Definition of Terms

Access to Water Supply;- the opportunity or the right to use water; concerned as well with the average distance of the water point and the time required to collect the available water;(WHO, 1971)

Institutional Capacity;- the overall capacity for planning, implementing,& managing water supply projects, and controlling processes such as construction, operation, supervision of water supply;(MoWMRs, 2002)

Rural water supply;- refers to provision of clean and safe water for rural communities through constructing HDWs, SWs, and Deep/Boreholes

Rural water supply schemes;- water supply points installed in rural areas that include HDWs, SWs, and Boreholes

Sphere project;- a project launched in 1997 to develop a set of minimum standards in core areas of humanitarian assistance with the aim of improving the quality of assistance provided to people affected by disasters, and to enhance the accountability of the humanitarian system in disaster responses;(Wikipedia, the free Encyclopaedia; <http://en.wikipedia.org/wiki/sphere-project>),

Sustainability; - refer to the narrow context of service delivery in the field of water supply and sanitation. It is whether or not something continues to work overtime. Thus; for water this would mean that water continues to be available for the period for which it was designed in the same quantity and at the same quality/<http://98.138.82.27./us,f1206.mail.yahoo.com/ya/secured>

'Water Decade, 1981-1990' is a goal set at the United Nations 'Water Conference' at Mar del Plata in 1977 to access safe water supply for everybody by 1990 on an international level

Water Production; - it is the total daily amount of water that rural water supply schemes could produce. The yield for different types of schemes has been estimated by the MoWR (UMC 2001). Accordingly, the water production is estimated to be 8.3 lit/min or 4m³ /day for a Hand Deg Well, 1.5 lit/min or 0.72m³/day for Shallow wells, and 20 lit/min or 9.6m³/day for a Developed spring at an assumed eight pumping hours/day for each type.

Water source;- is concerned with the type of opportunities from which water can be collected. This includes surface water, ground water, rain water harvesting, etc; (WHO, 1971)

Water supply coverage;- implies the proportion of people served with adequate level of safe water provision;(CSA, 2004)

Abstract

Water is one of the basic materials that make life possible on earth. Providing access to clean & adequate water supply facilities and improving the performance of the sub- sector directly reduce the morbidity & mortality rates of population. It also increases the productive capacity of the economically active population. An insufficient access to water; on the other hand, is not only bad for health but also contributes to a poor food security and a lagging social development. The Ethiopian government at the national level in general & the Benishangul- Gumu Region in particular is striving to enhance the sectors development including the improvement of safe water supply to the people.

Homosha is one of the 20 woredas of BGR where water sector institutes and other partners were working to promote access to clean water supply. Through the efforts made a number of physical facilities have been developed. But their sustainable utilization became a great challenge to achieve intended outcomes. Schemes were frequently seen to interrupt and the people of the area seen suffering from this in an area where schemes are available mostly near the backyard of the residents.

This significant problem with the objective of accessing reasons existed behind the problem has necessitated to conduct this study. Social, economic, institutional, & technical components of each influencing factors have been focused. Users, respective institutions & their water development partners were included for their information & feedback for the study. Literatures have been reviewed. On site observation at the watering points and a focus group discussion with water users committees has been made.

From the attempts made, seasonality of most developed schemes creating a heavy burden on to the remaining schemes was found the major problem rooted as a consequence of weak supervision made on construction. As the approach in almost all of the cases was supply driven with a very weak participation and involvement of the intended users, creating the required sense of ownership filling has been missed. Thus users have given little attention to care and to contribute towards the maintenance and well being of the schemes. The poor communication and integration among partners and institutes has contributed for the unfair and uneven distribution of the schemes among the communities where this in some areas has brought utilization of fewer schemes beyond their carrying capacity. Poor financial management, unavailability of spare parts in the nearby markets and lack of sufficient institutional support have also got un- undermined contribution for the encountered problem. Therefore for promoting and sustaining the access and coverage it is recommended that a considerable measure need to be taken to the suggested limitations and gabs in order to maintain the available and to be effective with the ones planned in the future.

Annexes

Annex; 1; Questionnaire prepared for government institutions at different levels .

1. How do you generally evaluate the situation of access to safe water supply in Homosha woreda in terms of coverage, scheme distribution & sustainable unitization of developed sources?
2. What type of rural water supply technologies & schemes are most commonly used in the woreda?
3. What do you think the reasons be for this?
4. How do you evaluate your institution in terms of number of employees, office space, furniture, equipment, transport, store building, institutional arrangement and spare part availability?
5. Do you think that this is enough to provide the intended service appropriately? If not , how?
6. What type of support your institution is giving to the lower level governmental & community institutions in relation to sustaining developed water supply schemes?
7. How far the supports are frequent? Do you feel that the support is sufficient for proper service provision?
8. If rarely, what problems your organization has faced not to support rural water supply services adequately?
9. Are the established schemes providing the intended services sustainably? A. yes B. Not.
10. If not; A. What do you think the reasons be for this? B. how frequent the interruption is?
11. Who is responsible to correct malfunctioning schemes?
12. Are the malfunctioning schemes readily available soon through correcting the defects they have?
A. yes b. no
13. If not why?
14. Are spare parts and toolkits available and affordable price wise at regional/zonal / woreda &/or at community level?
15. Are there competent private sectors that provide spare parts?
16. What conducive and enabling policy environment is in place about costs of rural water supply, and cost recovery of O&M to access rural water supply in the region?

17. Which approach, demand or supply driven, your institution is using in the development of rural water supply in the region in general and at Homosha wereda in particular?

18. Why this is so?

19. Are rural water supply developments partners communicate their projects from the very beginning of the proposal until it is made ready for use with your organization? A. yes B. not

20. If not, A) Why?

B) What an impact do you think that this has brought in the sustainably use of the developed schemes?

21. Are the designs, construction quality, and the construction mgt styles similar among the sectors and partners involved in the development of RWS? A. yes B. not

22. If not, what is the reason for this?

23. How do you evaluate the water supply schemes developed by your institute with that of other partners deal in terms of sustainability & quality?

24. If your answer for question 22 is <<not>>, what problem do you think that it has brought on the continuous use of the schemes?

25. Is there a principle and rule for the design and construction of water supply schemes that have to be followed both by governmental and other partners in the attempts made to rural water supply developments? A. yes B. Not.

26. If "not", what challenges exist on the consequence of this in terms of sustaining rural water supply functional?

27. If "yes", are the stakeholders followed it accordingly?

28. If, not why?

29. How do you explain the impact of scheme construction season and site selection in terms of sustainable use of the sources in the area?

30. How far the water supply development institutions are decentralized financially and structurally down to the grass-root level & do you think that the decentralization was made complete to facilitate the water supply services properly?

31. What impact do you think that this has produced on the efforts made to provide the community with the service through improving the conditions and coverage?
32. Are partners constructing schemes involved in the area of O&M at least for the schemes they have developed?
33. If not, is there a gap created you thought of in operating and maintaining those schemes by your institution because they are being built without the plan of your organization?
34. What role is set for the community to play in the development of rural water supply systems? Are they thus responsive accordingly?
35. How much intension is given to establish water committee for the schemes? Why is so?
36. Are the committees performing their responsibility as much as required?
37. If not why?
38. How do you evaluate the willingness and the ability of the community to pay for the access provided to them; are the majority willing and able? A. yes B. Not
39. If "not" what reasons do you think of for this?
40. Are there trained technicians & operators at different levels (regional, zonal, woreda and community) to restore malfunctioning schemes based on the degree of the difficulties of malfunction?
41. If yes, I. in what criteria community level trainees are selected? II. Who has selected them?
III. How do you evaluate the performance of the trainees?
42. Are the developed schemes provide enough water throughout the year?
43. If not; A. what do you think the reason be? B. When do you think this is significant/higher?
44. What water quality problems from the developed scheme exist?
45. What causes are accounted for the poor quality of water?
46. Who is responsible to control the water quality problem?
47. What recurrent requests are mainly reported to your organization from lower institutions and/or from the community?

48. Do you think that you are responded adequately to the requests? A. Yes B. Not
49. If "not", what has limited to respond sufficiently?
50. What is the source of finance for O&M and for M&E of schemes at the woreda level? Do you think that this source is enough for the purpose?
51. How much tariff and what criteria were set for the community using the service to pay?
52. Are the community willing and able to pay accordingly? A. Yes B. Not
53. If not, what reason do you think is accounted for this? What do you and your institution recommends and thought for the situation?
54. How do you evaluate the contribution made by the community during the construction and maintenance of the schemes financially, materially, and in terms of labour?
55. How far your institution has involved the community in general and women in particular during the construction of the water supply schemes from the very beginning?
56. In principle, who is believed to take the initiative for water supply developments?
57. Do you, thus, believe that the developments made so far by your institution bases on this ground? A. Yes B. Not
58. If not, how and why?
59. What methods and assumptions are being used by your organization to estimate the coverage of rural water supply in the region in general and in the Homosha woreda in particular?
60. What proportion of the people in the area is estimated to have the coverage so far by the service?
61. What reasons you believe are accounted for the unsustainably use of the developed water supply facilities in the area?
62. What measures do you thus think should be taken to promote access to safe & adequate rural water supply sustainably?
63. If you have any additional suggestion and idea on the issue.....

Annex 2; Interview schedules prepared for sampled household respondents

Part I. Socio-economic situation

1. Age in complete years
2. Marital status a. single b. married c. divorced d. widowed
3. Size of the household/family number
4. Sex
5. Educational status
6. Major occupation
7. Average estimated annual income of the family/household?

Part II. Water supply related issues

8. Are you among the beneficiaries of potable water supply sources? A. yes b. not
9. What was the source that you have utilized before the development/ establishment of the improved source?
10. What improved water supply sources are you using now?
 - a. hand dug well
 - b. developed spring
 - c. shallow well
 - d. other; specify
11. Is the improved source you are using functional at the moment?
 - a. Yes b. Not
12. Is the improved source you are using at the present healthy and potable?
 - a. Yes b. No
13. If not what are the specific problems?
 - a. salinity
 - b. bad smell
 - c. carries insects/worms
 - d. turbid
 - e. sand particles
 - f. causes disease
 - g. bad taste
 - h. others(specify)
14. How do you rate the quality of water you are drawing from the source? /Good, fair, bad, worst
15. Have you encountered a water shortage problem from the improved source? yes/no
16. If yes, what do you think the reason is?
 - i. High population pressure,

II. Not deep enough,

III. Bad site selection,

IV. Construction season,

V. Other/specify

17. Are you using the same source of water throughout the year? A. yes B. no

18. If not, why?

19. When such a problem did happens in a year?

20. What do you think the reasons be for this?

21. What sources do you utilize during such an occasion?

22. Do you use the same source of water for purposes other than drinking and cooking? A. yes b. not

23. If not, what makes you to use different sources?

- a. to reduce cost
- b. in a adequate supply from that source
- c. its frequent interruption
- d. its physical distance
- e. other, specify

24. What was your contribution during construction?

I. Labour, II. Material, III. Cash IV. Cash and material, V. Labour and material

25. How do you explain your contribution? I. Expensive, II. Reasonable, III. small,

26. Is there any interruption of the scheme you are being utilizing? A. yes B. no

27. If yes;

a. how frequent this interruption was for example within a year in an average?

b. What do you think the reasons are for that?

c. Are the interruptions having any relation with the season? A. Yes B. No

d. If yes, during which season of the year the interruptions are significant /frequent?

e. What do you think the reasons be for this?

28. What is the average duration of interruption/ how long the interruption will take until recovered to provide the service?

29. If you are not among the users of the improved sources,

A. what is your reason for this?

- a. high price
- b. poor quality
- c. physical distance
- d. absence of developed facility
- e. high interruption
- f. long time for waiting turn
- g. easy access from other sources
- h. Others (specify).

B. What sources you are using thus?

30. What is the daily service provision time of the improved sources in hrs? How many times do you elaps in waiting for your turn at the improved sources?

31. Is it appropriate /sufficient? A. Yes B. Not.

32. If not, what do you think is thus appropriate?

33. How far is your residence from the improved source? Is it at an appropriate distance?

34. How many times do you fetch water on a daily basis?

35. What amount of water do you collect from the improved source per day in litter?

36. How do you evaluate the availability of water from the improved source? /Always available, not always available, depend on the season/

Part III community related issues

37. Have you got any information about the development of the schemes you are unitizing before its construction was being started? A. Yes B. Not

38. If yes, who have told it to you?

39. Have you and the community been participated and consulted in the development process?

40. If yes, in what aspect are you involved?

I. In selecting the site,

II. Choosing the design and the technology,

III. In sharing the cost,

IV. In providing locally available materials,

V. Labour,

VI. Any mix of this/Describe/

41. Whom do you think has initiated the idea for the construction of the scheme in the area? I. the community ii. Others (specify)
42. Are you willing to pay for the service? A. Yes B. Not, Why?
43. Are you willing to contribute more? A. Yes B. Not, Why?
44. What was the construction season of this particular source you are utilizing? A. Rainy B. Dry
45. Do you feel that this has brought any problem for sustainable use of the source throughout the year? A. yes b. not
46. If yes; how?
47. Is there a water committee at the scheme where you are using? A. yes b. not
48. If yes, how is the committee at the moment? Liquidated, active, not active
49. Whom do you think is responsible for the scheme operation and maintenance?
50. Were women allowed in the overall water supply development processes? A. Yes B. Not
51. If yes, what was the extent of their involvement? I. Small II. Good, III. High
52. If your answer to Q47 is yes;
- a. Who has selected the members of the committee?
- b. What were the criteria set for selecting the members?
- c. What is their individual and group responsibility?
- d. Do you think that they are performing based on the responsibility they have given? I. Yes II. Not
- e. If not, how?
- f. Who is looking for behind the committee?
53. Are there trained scheme operators and care takers out of the community? A. Yes B. Not

54. If yes, how do you evaluate the trainees' performance in caring and operating the schemes?

55. What was your contribution during the construction of the scheme?

A. Labour B. cash C. material, D. labour and material, E. none

56. Whom do you think is the responsible body to administer the water supply schemes? I. Individual
II. Water Committee, III. Kebele/PA, IV. None V. other

57. Do you feel as if this developed scheme is yours? Yes/not

58. If yes, how do you thus care for it?

59. If not, why?

Part IV financial related aspects

60. What was the source of finance for the construction of the scheme you are using?

- a. government
- b. NGO
- c. Community
- d. Any mix of them (specify)
- e. Others; specify

61. What is the source of finance for O&M of the scheme?

- a. government
- b. NGO
- c. Community
- d. Any mix of these (specify)
- e. Others; specify



62. What contribution have you made both in cash and in kind during the construction of the scheme?

62. Is there a tariff set for the developed source you are using? A. Yes B. Not

63. If yes; A. who has formulated it?

B. what was the criteria for the setting?

- i. on the basis of the size of the container per fetching on the spot
- ii. On a monthly/yearly basis based on the size of the household
- iii. other, describe

C, how much is this tariffs according to the criteria you are expected to pay?

D, are you thus paying according to the tariff set? A. Yes B. Not

E. If not, why?

F, do you think that what you are paying is fair?

G, If not; I. how?

II, how much are you willing to pay?

64. How much of the users are paying the tariff for the service appropriately especially in cases of payment on a monthly/yearly basis; are the majority paying? A. Yes B. Not

65. What is your payment time? A. Monthly B. yearly C. On spot

66. What will happen to him if one fails to pay? Is there a rule set for this by the users /community?
A. Yes B. Not

67. Do you pay in addition to the tariff in cash or in-kind for the sustainability of your water supply source? Explain if any

68. for what purposes the collected tariff and the additional payment contributed by the users is utilized for?

69. Does the tariff set consider costs for operation and maintenance? A. yes B. Not

70. If not, from whom the cost for this purpose is expected? Why?

71. Do you know how the collected finance is deposited and utilized? A. Yes B. No

72. If yes;

I, where is the money deposited?

II, How is it drawn when required?

III. For what purpose is it set to be drawn?

IV, have you encountered any problem so far in the process of financial management?

A. Yes B. Not

73. If yes; describe it; what measure has been taken so far in such an occasions?

Part V Technical Related Issues

74. Who has selected the scheme type and the site of construction?

75. If not by the community, is there any problem brought in sustainably use of the scheme as a result? A. Yes B. No

76. If yes, how/why? Explain

77. How do you rate the construction quality of the scheme? A. V. Good b. Good c. poor

78. If poor, why you said so?

79. Is the type easily operatable and manageable by the users? A. Yes B. Not

80. Who is responsible to look for behind the well performing of the scheme?

81. If it is by the care takers and operators, what role is played by them in time of malfunctioning?

82. Are their technically trained local personnel to correct disorders? A. Yes B. Not

83. If yes,

a) Would you think that they are skilled enough in at least to repair minor defects of the scheme?

b) Are they provided with the required equipments adequately for the deal?

84. if not,

a) Who is responsible for the repair?

b) Who is responsible to report to the concerned?

c) How soon is it reported and responded to the request? Explain

85. If the technicians are capable of recovering malfunctioning schemes, what limiting problems are they facing to operate? A, financial B, spare parts C, others; specify

86. Who provides the spare parts?

A, through purchasing by the community

B, by NGO; specify

C, by the government; specify

D, others; specify

87. If the spare parts are provided by the community;

a, are the spare parts readily available in the market?

b, is their price affordable to them?

88. what major technical problems the community is facing to make the water supply schemes functional and sustainable?

a) Lack of spare part b) Inappropriate technology c) Inappropriate design/poor construction quality d) Lack of technical skills to carry out O& M e) All

f) Any mix of the above; specify g) Others; specify

Part VI Institutional related issues

89. Which governmental and non governmental organizations are supporting the community/ the water committee in the rural water supply developments? Name them

90. In what area they provide the support?

a) Establishing water committee and set responsibility for them

b) Provision of training

c) Financial support

d) Provision of spare parts

e) Participation in the area of O &M

f) Other; specify

91. Do you think that the support being given is sufficient? A. Yes B. Not

92. if not, explain how should it be?

93) How the community is aware and organized to sustain developed water supply sources?

94. Generally, what major problems have you noticed in the sustainable use of the developed water supply sources are critical?

95. What measures do you think to be taken to solve the problems?

94. If you have any general feeling to explain and to suggest on the issue;

Annex 3; Questionnaire Prepared for Non Governmental Organizations Working in Rural Water Supply developments at the Study Area

Date of response -----

Name of the organization represented -----

Position of the respondent -----

1. How long your organization been working in rural water supply in Homosha wereda?
2. What are the objectives and goals of your organization as per the water supply in the project area is concerned?
3. Would you expect that you have succeeded in what you deed so far according to your objectives and goals?
4. If not, what do you think the reasons be for this?
5. What an intervention is made so far by your organization in the process?
 - a)constructing water supply scheme and providing them for the community
 - b) technical support
 - c)financial support
 - d) provision of spare parts
 - e)provision of training
 - f) other; specify
6. if you have given training;
 - a) How continuous it was?
 - b) What was the objective?
 - c) For whom the training was given?
 - d) Are the trainees accomplished what was expected from them after the training?
7. If not; why?
8. How far are you involved in post implementation management such as in O & M facilities at least in the developments where your organization has involved?
9. If you are involved in the construction of water supply schemes, how far and when have you been consulted and participated the community? What role have you given for the community to paly in the process?



10. From your involvement in the process of water supply activities in the area, what do you think are the major bottleneck problems especially in sustaining the developed water supply sources considering financial, technical, community, environmental, and institutional related factors?
11. What technologies have you mainly used?
12. Is it appropriate for the area?
13. If not; what enforces your institution/ the community to choose it?
14. What do you think be the better technology thus? How?
15. What deficiencies have you observed in regard to the users and your organization as well in sustaining the schemes?
16. What do you suggest to be done in order to alleviate the existing bottleneck problems accounted for the failure in the sustainably use of the developed water supply systems of the area?
17. If you have any idea and suggestion to add on the issue

Annex4; Points of discussion with sampled water committee of the study area

Date of discussion -----

Kebele -----

Got -----

1. How many members are there in the committee, what responsibility is given for each of you?
2. How do you explain the overall improved water supply service provision in your area?
3. What problem you and the community are facing in terms of access to clean water supply?
4. Is there any service interruption from the sources you are utilizing? If so, what do you think the reasons be for the interruption, and what solution would you suggest for this?
5. Whom do you think is responsible to repair schemes? What role the community should play you thought of in maintaining the developed watering sources? Why?
6. Is there a tariff set for the users? If yes; who has set it, what was the criteria used in setting the tariff? How much is it based on the criteria? Do you think that the tariff set is appropriate? If not how much do you think is appropriate?
7. Are you, and the community is willing to pay for the service? If not, why?
8. How the tariff is collected, deposited, and utilized, for what purposes? Is there a receipt for the financial movement? Who is controlling the financial management?
9. Who is looking behind for the overall responsibility of the committee? Have you encountered any problem in managing the finance so far? If yes, describe it, and what solution has been given on it, by whom?
10. What rule is set for those who are using the source without payment?
11. What measure is set for users who have refused to pay for the service they have utilized?
12. Do you think that all the resources allocated for the purpose are utilized appropriately including the collected tariff and the contribution payments?
13. What support, by who is so far given for developing rural water supply? Do you think that the support is sufficient? If not, how?

14. How do you evaluate community participation in general and women involvement in particular at all phases of the development of the scheme?

15. What role do you suggest that the community should play to sustain water supply schemes?

16. What measures would you think should be taken to overcome the existing water supply problems in the area?

Annex 5; Distribution of schemes constructed by different commissioning agencies schemes

Commissioning agency	Type of RWSS				
	HDW	DS	SW	Total	percent
WV Ethiopia	2		2	4	4.5
Water bureau	13			13	14.6
ESRDF	9			9	10.1
CISP	7	1		8	9.0
UNICEF	4		16	20	22.5
Action Aid Ethiopia	2			2	2.2
IRC	24	1		25	28.1
Others	7	1		8	9.0
Total					

Annex 6; Dtribution examination for proportionality of schemes among villages & kebeles

Ro. No	kebele	No. Of HH in the kebele	Existing number of schemes in the kebele	No. Of schemes that would have been existed for the distribution to be said proportional	D/ce
1	Sherkole	203	9	7	+2
2	Alfashir	65	0	2	-2
3	Shula Afenkelen	203	6	7	-1
4	Jimma	284	7	10	-3
5	Bamadon	191	7	7	0
6	Algela	148	7	5	+2
7	Tumet	158	10	6	+4
8	Asura	109	6	4	+2
9	Dunga Arumela	202	7	7	0
10	Darsegia	135	4	5	-1
11	Dare _selam	121	6	4	+2
12	Gumu	179	8	7	+1
13	Molo- Megele	185	5	7	-2
14	Akendo- Afafiri	143	3	5	-2
15	Tsore _Almetema	111	4	4	0
Total		2437	89		

Annex 7; Distribution of water supply schemes among gots of the kebeles in the woreda,

Ro.No	Kebele	No. Of water supply schemes in the kebele	No.of Gots in the kebele	No. Of gots without any developed scheme
1	Sherkole	8	3	-
2	Alfashir	-	3	3
3	Shula Afenkelen	7	6	2
4	Jimma	7	4	1
5	Bamadon	7	4	-
6	Algela	7	5	1
7	Tumet	10	5	-
8	Asura	6	4	-
9	Dunga Arumela	8	9	2
10	Darsegia	4	4	-
11	Dare _selam	5	4	1
12	Gumu	8	8	2
13	Molo- Megele	5	5	-
14	Akendo- Afafiri	3	4	1
15	Tsore _ Almetema	4	4	-
Total		89	72	13



Annex 8; Water Quality Report for 12 schemes, Source; Homosha Woreda Water Office,

Ro. No.	Scheme Type	Kebele	Result as compared to the standard set		Sanitary condition of the area/ presence of potential contaminator	Recommendation given by the diagnostic party
			Physio-chemical analysis	Bacteriological analysis		
1	SW	Tumet	Within the standard	Potable	Not	chlorinization
2	SW	Molo- Megele	"	"	"	"
3	SW	Darsegia	"	"	"	"
4	SW	Gumu	"	"	"	"
5	SW	Akendo	"	"	"	"
6	SW	Darsegia	"	"	"	"
7	SW	Gumu	"	"	"	"
8	SW	Molo- Megele	"	Coli form number equals with the maximum limit of the range; but still potable	"	", and disinfection
9	SW	Jima	"	Potable	"	Chlorinization
10	SW	Molo- Megele	"	"	"	"
11	SW	Tumet	"	"	"	"
12	HDW	Jima	"	Non – potable; coli form count is beyond the upper limit of the in the standard	"	", and disinfection

Annex 9; Data on the available schemes

Kebele	Scheme Type	Technology used	Existing condition			Contracted by								
			Fun	N-fun	seasonal	AA	UNICEF	ESRDF	GO	MSF	IRC	WV	CISP	EKCH
1.Dareselam 5	HDW	//			X							X		
	HDW	//			X					X				
	SW	//	x				X							
	HDW	//			X		X							
	HDW	//		x									X	
2.T.Almetema 4	HDW	//	x										X	
	//	//		x				x						
	//	//	x										X	
	//	//	x					x						
3.D.Arumela 8	HDW	//		x								X		
	//	//		x								X		
	//	//		x								X		
	//	//	x						x					
	//	//	x										X	
	//	//		x								X		
	//	//	x									X		
	//	//	x						x					
4.Gumu 8	SW	//	x										X	
	HDW	//			X							X		
	//	//			X			x						
	//	//	x									X		
	//	//		x								X		
	SW	//	x					X						
	//	//	x					X						
	//	//	x					X						

kebele	Scheme Type	Technology used	Existing condition			Contracted by								
			Fun	N-fun	seasonal	AA	UNICEF	ESRDF	GO	MSF	IRC	WV	CISP	ERCH
5.Molo	HDW	//			X							X		
	HDW	//			X							X		
	5	SW	//	x			X							
	//	//	x				X							
	//	//	x				X							
6.Tumet	SW	//			X		X							
	HDW	//	x						x					
	//	//			X				x					
	//	//			X				x					
	//			x					x					
	10	//	Indian M II	x					x					
	//	AFRDEV	x								X			
	SW	//	x				X							
	BH			x						x				
	HDW	AFRDEV	x						x					
7.Ashur a	HDW	AFRDEV		x					x					
	//	//		x					x					
	//	//	x				X							
	//	//	x							x				
	6	//	//		x						X			
	//	//		x								x		

Kebele	Scheme type	Technology used	Existing condition			Contracted by									
			FN	NF	S	AA	UNICEF	ESRDF	GO	MSF	IRC	WV	CISP	ERCH	
8.Jima 7	SW	//	x				x								
	HDW	//		x							x				
	SW	//	x				x								
	HDW	//		x					x						
	//	//		x			X								
	//	//	x				X								
	//	//			x		x								
9.Algela 7	HDW	//	x									X			
	//	//	x						x						
	//	//		x								X			
	//	//			x				x						
	Sw	//	x				x								
	HDW	//			x					x					
	//	//	x				x								
10.Aken do 3	SW	//	x				x								
	HDW	//	x							x					
	//	//	x									X			
11.Bama don 7	HDW	//	x									X			
	//	//	x										x		
	//	//	x											x	
	//	//	x							x					
	//	//			x							X			
	SW	//	x				x								
	HDW	//			x							X			

Kebele	Scheme type	Technology used	Existing condition			Contracted by								
			FN	NF	S	AA	UNICEF	ESRDF	GO	MSF	IRC	WV	CISP	ERCH
12.Darsegia 4	HDW	//	x									X		
	SW	//		x									x	
	//	//	x				x							
	//	//	x				x							
13.sherkole 8	SW	AFRDEV	x											x
	HDW	//	x							x				
	//	//	x											x
	//	//	x								X			
	//	//			x			x						
	//	//			x			x						
	//	//			x					x				
	//	//			x					x				
14.shula 7	HDW	//	x						x					
	//	//		x										x
	//	//	x								X			
	//	//			x						X			
	//	//	x								X			
	//	//	x								X			
	BH	//	x								X			
15.Afashir														
Total	89		50	21	18	2	19	9	13	7	25	4	9	1

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Annex 10; Household information of Homosha woreda

Ro. No	Kebele	No of male HH	No of female HH	Total HH
1	Sherkole	201	2	203
2	Alfashir	60	5	65
3	Shula Afenkelen	200	3	203
4	Jimma	145	139	284
5	Bamadon	168	23	191
6	Algela	134	14	148
7	Tumet	144	14	158
8	Asura	100	9	109
9	Dunga Arumela	173	29	202
10	Darsegia	115	20	135
11	Dare _selam	118	3	121
12	Gumu	172	7	179
13	Molo- Megele	181	4	185
14	Akendo- Afafiri	136	7	143
15	Tsore _ Almetema	103	8	111
		2150	287	2437

Source; Homosha woreda Agricultural Office,

Annex 11, coverage computations through different approaches

A. Based on the consideration of number of available schemes and average yielding capacity of each per day;

Estimated available water supply per day = $(68\text{HDW} \times 3984\text{lit}) / \text{day} + (19\text{SW} \times 720\text{lit}) / \text{day} + (1\text{BH} \times 45,000\text{lit}) / \text{day} = 329,592\text{litres} / \text{day}$

Required water supply per day at the woreda level = $15 \text{ lit/day/capita} \times \text{Number of population} = 15\text{lit} \times 21,502 = 322,530 \text{ lit}$; therefore the coverage will be;

Available supply $\times 100 / \text{required} = 329,592 \times 100 / 322,530 = 102.2\%$

B. Considering the assumed minimum carrying capacity of schemes;

Available coverage based on the assumed carrying capacity of schemes = $(68\text{HDW} \times 250\text{peoples}) + (19\text{SW} \times 400\text{peoples}) + (1\text{BH} \times 3000\text{peoples}) = 27,600$ peoples are expected to have the access;

Thus coverage will be = $\text{people expected to have the access} \times 100 / \text{Total population of the study area} = 27,600 \times 100 / 21,502 = 128.4\%$

C. Considering displacement; excluding those who could not use the scheme service due to distance

Required number of improved water supply points

= $\text{Area of the woreda} / \text{Area with the assumed conceptual radius}$

= $\text{Area} / \pi r^2$

= $645.7\text{km}^2 / 3.14(1.5\text{km})^2$

= 91 water points.

The available water supply schemes so far are 89. Thus, the coverage through this parameter will be = $\text{number of available schemes} \times 100 / \text{Number required}$

= $89 \times 100 / 91$

= 97.8%

D. Coverage computation with the consideration of seasonal schemes

Available water supply during dry season = $(68-27\text{HDW}) 3984 \text{ litres} + (19\text{SW} \times 720 \text{ litres}) + 45,000\text{lit} (1\text{BH})$

= $(163,344\text{lit} + 13680\text{lit} + 45,000) \text{ litres}$

= 222,024 litres /day


Required supply = $15 \text{ litres/day/capita} \times 21502 = 322530 \text{ litres}$. The supply coverage will be then:-

Availability $\times 100 / \text{Requirement} = 222,024 \text{ lit} \times 100 / 322,530\text{lit} = 68\%$

Declaration

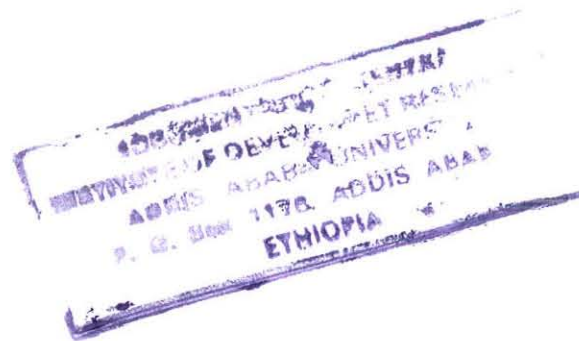
I, the undersigned, declare that this thesis is my original and real work that has not been for a degree in any other university and that all sources of materials used for the thesis have been duly acknowledged.

Declared by


Candidate

Confirmed by


Advisor



DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other University, and that all sources of material used for the thesis have been duly acknowledged.

Name: Yechale Mehiret

Signature: _____

Date : _____

This thesis has been submitted for examination with my approval as University advisor.

Name : Mulugeta Feseha (PhD)

Signature: _____

Date : _____