

**DEPARTMENT OF COMMUNITY HEALTH
FACULTY OF MEDICINE
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**Factors related to sustainability of water and
sanitation projects in the rural setting of North
Gondar, Ethiopia**

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**Factors Related To Sustainability Of Water Supply
And Sanitation Projects In The Rural Setting Of
North Gondar, Ethiopia**

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DEDICATION

To my wife W/ro Haregewoin Tadesse, our daughters Kalkidan Mengesha and Bamlak-fekad Mengesha. To our son Behidet Wogayehu

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LIST OF ABBREVIATIONS

- CRDA – Christian Relief Development Agents
- CSA – Central Statistics Authority
- DCH – Department of Community Health
- DPPC – Disaster Prevention and Preparedness Commission
- EOC – Ethiopian Orthodox Church
- ERCS – Ethiopian Red Cross Society
- FGD – Focus Group Discussions
- GCMS – Gondar College of Medical Sciences
- IDWSSD – International Drinking Water Supply and Sanitation Decade
- MOA – Ministry of Agriculture
- MOH – Ministry of Health
- NGO – Non-Governmental Organization
- NWRC – National Ethiopian Water Resource Commission
- PHC – Primary Health Care
- SWOT – Strengths, Weakness, Opportunities and Threats
- UNCDF – The United Nations Capital Development Fund
- UNDP – United Nations Development Programme
- VIP – Ventilated Improved Pit Latrines
- WATSAN – Water and Sanitation
- WIBS – Woreda Integrated Basic Services
- WME – Water and Mining Energy Department

Abstract

A descriptive cross-sectional study to assess factors of sustainability of water supply and sanitation projects was done in the rural setting of North Gondar in North Western Ethiopia, January 2002. The quantitative study included an interviewing 768 female household respondents using a structured questionnaire. A qualitative study was conducted from one hundred fourteen water and sanitation projects using observation checklist and supported by slide film and computer print out pictures. Focus group discussion was conducted, both at the community and at the project funding organization level. The study examined Utilization, Functionality and Participation of the community as important elements of sustainability to their water and sanitation projects. The mean age of the respondents were 37.09 years. Seventy (9.11%) were literate, six hundred thirty two (82.3%) were married, of these 267(42.25%) of their husbands were literate, a mean family size of 5.31 persons per household, a mean of 60.72 Birr family income per month. Four hundred forty two (57.6%) households were using protected water projects and 5 (0.7%) were having pit latrines. The mean per capita water consumption was 6.68 liters, the mean time to collect water; total time, from house to source, staying at the source, and back to the house were 20.51, 6.11, 5.65, and 8.76 minutes respectively. The average frequency of water collection was 2.04 times per day. Three hundred thirty nine (76.7%) were participated in the development of the water projects. Fifty-two (11.76%) of the respondents were complaining of not functionality of the water projects. A significant positive association of adequate water per capita was found with the family size four and less number of people ($p = .009$).

A very significant positive association with the respondents complains of projects not function ($p < .00001$) was found time waiting at the water point (mean \pm SD 5.65 \pm 2.24). Significant positive association with the participation of respondents contributed ($p < 0.05$) was found with the type of water projects (protected springs) than Protected hand dug well.

Results from the observation checklist showed that 77% of the protected spring and 52% of the hand dug wells were broken at least once since of their duration of services. Animal trough and cloth washing facilities were observed in 11(21%) protected springs and 9(17%) hand dug wells. There were Guards at the water source points in 12(23%) of the protected springs and 19(36.5%) protected hand-dug wells. Based on the findings, the need of training on proper financial management of the contributed money, strengthening the skill and resource capacity of the water desk agents at the Woreda level, and planning to construct additional protected water are recommended.

INTRODUCTION

Access to water supply and sanitation is fundamental need and human right. It is vital for the benefits and health of all people. The absence of reliable water supply and sanitation services and inadequacies in these services have been the main cause of death of millions of children. Poor sanitary conditions and lack of clean water causes diarrhea diseases and related child deaths. Furthermore, many skin diseases are water related, associated with deficiency of water and poor personal hygiene. At the beginning of 2000, 1.1 billion people of the world's population was without access to improved water supply and two-fifths (2.4 billion people) lacked access to improved sanitation. The majority of these people live in Asia and Africa (1,2). A review of 28 studies carried out by the World Bank gives the evidence of water washed, water borne, water based and water sanitation associated are related to the quality or quantity of water and sanitation available to users (3).

The concept of " health for all by the year 2000" (1977) and the deceleration of Primary Health Care (PHC) as the key for achieving this goal (1978) has emphasized the need and urgency of providing safe and adequate water supply and basic sanitation (4,5). Thus, the international Drinking Water Supply and Sanitation Decade (IDWSSD) was launched in 1981 with the objective of providing safe and adequate water supply and proper sanitation facilities to all people in the world by the year 1990 (6). In line with this the National Ethiopian Water Resource Commission (NWRC) has launched strategies for the realization of the decade's goal. The WASSA under the NWRC is entrusted with the responsibility of providing safe water supply and sanitation (7).

The lack of access to safe water and sanitation, accounting as it does for 70-80% of health problems in Ethiopia, has been identified as a major causes of morbidity and mortality. Moreover, rural services still lag far behind urban services. Sanitation coverage in rural areas, for example, is less than half that in urban settings. Ethiopia is considered the lowest in the world. As evidence by statistics given, coverage in both water supply and sanitation, 26% and 15% respectively of these urban water supply and sanitation coverage was 77% and 58%, whereas rural water supply and sanitation coverage is 13% and 6% respectively (8).

Public health has a role in identifying situations where sustainable development may be hardest to achieve. An improved understanding is needed of how people's health and the condition of the environment are linked, and how both contribute to the quality of life; local health education should embrace these matters. The notation of health vulnerability should be expanded in keeping with the need to examine the situations of people, where they live, in a more holistic manner (9).

In rural areas poor people have to work hard for their water, often fetching it from far-off sources and using it carefully and sparsely. The time spent collecting water is a double burden, as it means less time is available for the productive activities on which subsistence economics depend. In cities, the urban poor suffer the indignities of inadequate sanitation and frequently have to purchase water from private vendors.

In rural areas the outreach of central government agencies is often very limited, and based at best on rural district centers, which may be physically remote from communities in need. The situation is aggravated by differing institutional responsibilities, for example for water, sanitation, and health.

Mobilizing programme support can be problematic in terms of local institutional commitment, and staff is frequently reluctant to spend time at remote locations and work under support in the field requires close attention during project identification and preparation.

The Fundamental Challenge of Africa 2000 is to promote the expansion of water supply and sanitation services to even the most remote community under acceptable conditions of sustainability, effectiveness and efficiency (13). The Challenge is to make the components work together coherently. It is not just to set up multi- component program, but also to make the components work together coherently, so that the whole is greater than the sum of the parts. It is a particular challenge when combined with decentralization and management at the lowest appropriate level (two of the commonest principles). On the other hand, the integrated approach is an intuitive one for communities, who live on a daily basis with the links, which are at the heart of it. Sustainability is achieved by building problem-solving capacities in communities and in partnership agencies to solve problems as they arise (8,9).

Ethiopia being one of the most underdeveloped countries in the world, the coverage of safe water supply is poor. In alleviating the water and sanitation related health problem, the NGOs support to the sub-sector is quite substantial. According to a recent survey done by CRDA member churches and agencies have been active in water and sanitation sector compared to the previous report produced by UNICEF in 1991. Field observation shows that many systems are non functional due to breakage, wear and tear, there is also shortage of spare parts, may be due to lack of standardization or may be due to heterogeneity of hand pumps. Besides the operational and management problems,

lack of backup facilities or follow-up mechanism from the donor agency has negatively contributed for the weakness of the sub sector.

Therefore underlined the information on funding and constructing organizations, supervising agencies and beneficiaries are very mandatory. All water and sanitation projects constructed in the respected woredas by different organizations were handover to the water and mining and energy organization. There are water desk agents at the woreda level responsible for the water projects.

Dynamism of the sub sectors was not observed as such, schemes remain as it were since establishment while there had been a dramatic increase of potential users. The households survey and observations had also shown that the sanitation aspect was almost non-existence in rural water supply programme despite the obvious inter linkage of the two. It was common to hear that no sooner that a water well has been dug, and pump put in place, that it was out of order due to neglect, improper use or theft. In many instances this was due to the fact that little attention is paid to the training of local community to decide upon their own affairs (10).

In North Gondar Zone, many studies have shown that the coverage of safe/ adequate/ water supply and sanitation is very low. At The same time morbidity related to these adverse environmental conditions is also high (11-18). To solve the above health problems, water and sanitation projects were constructed in Gondar area, yet majority of them are non-functional at present. The reasons of failure to promotion of many health infrastructures including, protected springs, other water supplies, latrines etc., has not been clear. Few reports from Ethiopia as well other as developing

countries show that insufficient and inappropriate technology are account for the failure of the projects (19,21).

The effect of the intervention on health improvement in general did not depend on solely on the inputs but also on how that inputs were managed. The effect on water and sanitation projects future functionality and continued use in modified by active community participation.

It is paramount important to find about a feasible and practical method of bringing up most determinant factors as sustainability of water and sanitation projects by different organization during planning, construction, maintaining as well as evaluating the mentioned environmental health activities.

In view of the above, this study was designed to investigate factors affecting the sustainability of the water and sanitation projects using locally modified indicators to the water supply and sanitation projects. The study was carried out in North Gondar rural areas of Northwestern Ethiopia. The study area has varied landscape dominantly covered with rugged hills and plateau formations, which imports variable temperatures largely favoring a wide range of illness. It has a population of 2,391,543, of these 1,213,354 (50.7%) are males, and 178,189 (49.3%) are females. The urban population accounts 270,937 (11.3%) whereas 2,120,608 (88.7) reside in rural areas (22).

BACKGROUND

The brief description of the Watsan project funding and constructing organization in the study areas was as followed:

The United Nations Capital Development Fund (UNCDF), in collaboration with UNDP, is preparing a programme of capital assistance to North Gondar Zone of the Amhara national Regional State since 1994. The main objective of the UNCDF is to support in the development of the governmental organizations and communities. Some of the activities were: water and sanitation projects, capacity building and community participation.

Water Aid and Ethiopian Orthodox Church (EOC) has been involved in Ethiopia since 1983. It opened a country office in the capital, Addis Ababa, in 1991 and has since been promoting community-managed integrated water supply, sanitation and hygiene projects through its partner organizations. In 1992, it supported the formation of water unit within the Ethiopian Orthodox Church/ Development and inter Aid Church Commission (EOC/DICAC) which to date has developed two projects in North Gondar Zone of northwestern Ethiopia.

Ethiopian Red Cross Society (ERCS) of the North Gondar Branch was assisted by the British Red Cross Society 1993. The main area of interest was to promote the water supply, sanitation and health education activities for the most vulnerable groups of the North Gondar rural community. Currently the programme has terminated as of 2001.

Woreda Integrated Basic Services (WIBS) have a basic concept to assist the most forgotten and inaccessible for transport and had no and previous intervention access to social services. Mainly the programme assessed by UNICEF and responsibility for general management and constructional operation has been given to the North Gondar planning and economic Office.

The Ministry of Health (MOH) and The Gondar College of Medical Sciences (GCMS) were integrated and had promoted the water and sanitation projects in the area as the first of its kind in the history of the zone since 1958. Then after both organizations independently have continued in providing the same projects to the community at large.

Water and Mining energy (WME) previously was one of the departments of Ministry of Agriculture (MOA) and currently working independently at the zonal level. Alike the UNCDF the water and mining energy is the leading agency by constructing more small water scale projects comparing with others similar task oriented organizations. All watsan projects constructed in the respected woredas by different organizations were handovered to the water and mining and energy organization. There are water desk agents at the woreda level responsible for the water projects.

The Role of Sanitarians (MOH) and Woreda Water Desk Agents(Ministry of Water Resources)

The sanitarians are assigned by the Ministry of Health, and Water desk agents at the woreda level assigned by the Ministry of Water Resources. The sanitarians were responsible for the last 5 decades to the small-scale water supply (hand dug wells and springs) and sanitation projects both for construction and quality control. Large-scale water projects (Deep wells Drillings) were the responsibility of the Ministry of Water Resources. The Ministry of Health has supervised the all over

quality control. It was very recently that the Ministry of Water Resources has taken the responsibilities of all water constructions; large or small scale projects of the rural and urban areas of the country. The Ministry of Health now responsible more on the water quality control. Therefore sanitarians are responsible for quality of water by supervision, sample taking and making a report to the concerned institutions.

Now a days all water projects, constructed by governmental and non-governmental organizations are handed over to the respected woreda water desk agents. The woreda water desk agents are recently assigned at the woreda level as immediate responsible agents for the respected woreda concerning water. The water desk agents at the woreda level are two people; one has diploma in water technology and the second person has only skill and short training exposure as a field water project-constructing agent. Currently the water desk agents have no guidelines for reporting, supervising and handovering the projects. They don't have regular sites visit and resources; such as means of transport, tools and spare parts to maintain the broken or stolen water projects.

The Ministry of Water Resources has a newly open water and sanitation unit, as there has been the same unit in the Ministry of Health. The responsibilities to the water quantity and quality have been made clearly. Regarding the sanitation, the Ethiopian Water Resource Authority is seems to be responsible for the waste drainage at the urban level but not including pit latrines at the rural level. Therefore, in addition to the quality control of water, the pit latrine construction is still remained as a responsibility of the MOH.

LITERATURE REVIEW

HISTORICAL DEVELOPMENT OF WATER SUPPLY AND SANITATION SCHEME

Water supply and sanitation rose up the development agenda more than 20 years ago. The 1977 UN Water Conference in Mar del Plata, Argentina, recommended that should be proclaimed the *International Drinking Water Supply and Sanitation Decade (IDWSSD)*, 1980. In preparation for the launch of the Decade, the World Bank and the World Health Organization (WHO) carried out rapid assessments of the water supply and sanitation sectors in more than 100 developing countries.

The WHO/UNICEF Joint Monitoring programme were published in 1996 and based on the situation at the end of 1994. They showed an estimated 2.9 billion people lacking adequate sanitation and 1.2 billion without access to safe water. By the year 2000 the number without sanitation was predicted to reach 3,300 million, approaching 70 per cent of the population of the developing world (23).

The Dublin Principles,1992

1. Freshwater is a finite and vulnerable resource, essential to sustain life, development, and the environment

Since water sustains life, effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems. Effective management area or aquifer.

2. Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels

The participatory approach involves raising awareness of the importance of water among policy-makers and the general public. It means that decisions are taken at the lowest appropriate level, with full public consultation and involvement of the users in the planning and implementation of projects.

3. Women play a central part in the provision, management, and safeguarding of water

The pivotal role of women as providers and users of water and guardians of the living environment has seldom been reflected in institutional arrangements for the development and management of water resources. Acceptance and implementation of this principle requires positive policies to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation, in ways defined by them.

4. Water has an economic value in all its competing uses and should be recognized as an economic good

Within this principle, it is vital to recognize first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognize the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources. *The Dublin Statement, January 1992 (23)*.

THE CAUSE OF THE PROBLEM

Why do so many millions of people in the developing world not have a sufficient supply of safe and adequate water?

In general terms, the answer is well known. First, the people concerned have not enough money to pay for water as it is produced today. Secondly, they do not understand what constitutes safe water or how it can become contaminated; they may even collect safe water and then contaminate it themselves. Thirdly, and perhaps most significantly, they have no idea how they can find a way out of their miserable, depressing, and exhausting condition (24).

PERCEIVED PROBLEMS

If a community has been selected for water supply improvements it is important to know whether its members consider that problems exist in this sphere. When there are multiple water sources of different types and the population is very scattered, households are not equally affected by water problems.

The single most important problem mentioned by women was that of water collection. For men the most important problem was lack of money, although water was mentioned by 13% of them. The main complaint of men in respect of water related to the distances to sources and the time and labour involved in water collection this is particularly interesting in the light of the fact that 87% of the water journeys observed were made by women or by children below 17 years of age. Men were more likely to be involved in water collection if the distances were long and the terrain steep (24).

RURAL WATER SUPPLY AND SANITATION SYSTEM

The definition for rural varies widely. Ethiopia uses the population size for classifying population and areas as rural or urban. For water supply purposes a community with a population less than 10,000 is identified as rural.

Rural watsan systems share the following characteristics: low in capital costs; use of local materials whenever possible; create jobs, employing local skills and labor; they are small enough in scale to be afforded by a small group of people; they can be understood, controlled and maintained by villagers whenever possible; they make technology understandable to the people who are using it and thus suggest ideas that could be used in future innovations; and they are flexible so that they continue to be used or adapted to fit to changing circumstances. The expected outputs of any rural watsan systems are assumed to be public health benefits, economic benefits, social benefits, community benefits, and environmental benefits (25).

Water Projects

Definition of the project life cycle as the basis for all planning. The cycle indicates the different steps of a project (project related to planning, constructing, operating, maintaining, repairing, rehabilitating, and upgrading a water supply system). Distinction is made between the hard side of the cycle (the technical activities) and the soft side (consultation, explanation, information exchange with the communities, training, etc.). The basic idea is that “we are never finished with a project”: After the physical completion the phase of after-care will start, and the whole process will start again as rehabilitation is required (26).

How should small farmers pay?

The money earned by small farmers amounts to only a low proportion of their total income. Consequently, there is no certainty that they will stop drinking water from the springs they have traditionally used at no cost. They would rather spend their money on goods that could not otherwise be acquired. However, it may be possible to persuade them to work on the construction, operation and maintenance of drinking water and sanitation works (27).

Water supply and sanitation projects funding organizations

NGOs have been instrumental in filling up the gaps. With the advent of the National Resistance Movement regime, multi-lateral agencies, NGOs both external and indigenous flourished.

Decentralization and Service Delivery

- Districts have the role coordinating NGO and government programmes to ensure optimal allocation and utilization of resources. This is supposed to be instituted through NGO for and the donor coordination units at the districts.
- NGOs that have strong connections with the district sectors are more aware of the effects of decentralization, are benefiting from partnerships and playing their role in the process. In the water sector, NGOs and communities manage most of the ongoing programmes.
- At national and district levels, there is some evidence of lateral linkages among NGOs through umbrella organizations.

- NGOs in environmental health and water sectors have high levels of coalition. Umbrella organizations are vital in coordination, networking, capacity building, sharing of new practical knowledge, and promotion of accountability culture, self-criticism, participatory approaches and gender awareness.

Sustainability

A good basic definition of sustainability is “whether or not something continues to work over time”. In more detail, in the context of rural water and sanitation projects, it is the continuous functioning of the system, both hardware (physical), and software (non-physical), and the continuance of the derived benefits at the beneficiary level from that system once the ‘external’ hardware & software assistance have been essentially phased-out.

Experiences within Ethiopia indicate that within 2-3 years, even with full community participation from the outset, WATSAN Committee members and scheme caretakers lose interest or move away, and without the backstopping mentioned, the schemes are in danger of collapse. Other studies, notably in South West Uganda (Bagamuhunda, 1998) support this.

Sustainability is achieved by building problem-solving capacities in communities and in partnership agencies to resolve problems as they arise (28).

- NGOs’ role as actors in development under decentralization should be evident not only through effective partnership with the district sectoral departments, but also effective participation and capacity building of the communities towards sustainable delivery of services.

- In most cases, communities strongly believe that they have been empowered to sustain the services. In addition to establishment of communities, health education and resource mobilization, Red Cross, VED Co and AMREF have facilitated communities establish income generating projects both at individual and collective levels, taking an integrated approach.
- The water sector at local level has been linked to Directorate of Water Development (DWD) for purposes of sustainability. It is clear that most NGOs with intensive participatory approaches and collaboration with the relevant district sectors performed best overall.
- NGOs provide services to grassroots using participatory community based oriented approaches that should be emulated by district line sectors. They also reveal high emulated by district line sectors. They also reveal high levels of flexibility, adjustment in adverse contexts. There is substantial gender integration and involvement of minorities even at committee levels. Participation at all levels, exposure, leads to increased awareness, leading to demand for more accountable systems, which contributes to chances of sustainability. NGOs with close partnership with relevant sectors at the district have better performance and definitely have higher chances of sustainability (of services) in case of phasing out than NGOs that operate independently. Those that are transparent at this level also tend to do the same at local level. Relations with districts are expected to improve with increasing levels of decentralization.
- NGOs therefore, need to take their place in the decentralization process; to strengthen their links with relevant sectors at district level for purposes of sustaining service delivery. Alternative

plans, for instance accessing resources designated for community development at local and districts is crucial for sustaining service delivery. Accountability by NGOs and relevant committees should be both upwards to their bosses and downwards to lower committees and the community.

Participation

Community participation in decision-making about low-cost systems leads to solutions that are socially relevant, as local knowledge and preferences interact with technical expertise from the outside. When communities have helped to make decisions they are more likely to pay for, use, maintain and repair a system than would otherwise be the case. Although many view community participation, as a means of cost reduction, eliciting it is costly and time-consuming, a factor usually overlooked when budgets are being prepared (29, 30).

Effective Community participation

- The key variables crucial to ensuring that a scheme will have a chance at becoming sustainable are:
 - That the scheme is managed and implemented at local community level through a representative community-based institution with effective decision-making powers.
 - Sufficient attention is placed on developing local capacity through training and monitoring programs.
 - Appropriate and affordable technology is incorporated into the project.

For community participation to be effective it has to be more than simply keeping people informed at steering committee meetings, or seeking their ratification of decisions already worked out elsewhere, or letting the recipient communities be employed to build portions of the system. Effective participation by the community requires decision making at all levels of the project cycle, and 'hands-on management' (WASH, 1990) (30).

Women and Water Supply

Studies have indicated that the average energy spent on water collection varies from 12 to 27 per cent. Significantly fewer women than men were aware of plans for future activities. In 1985 and 1987, women and children made 88% of water-carrying trips. However, the average time per trip made by women declined from 41 minutes in 1985 to 21 minutes in 1987. Convinced about the merits of the community-based approach, in which women are encouraged to come to the fore, the Ministry of Health is seeking assistance to develop a new training curriculum for sanitarians (31).

RATIONALE OF THE STUDY

1. Safe water supply and proper sanitation coverage at the national level and local level is very low.
2. Factors affecting the sustainability of water and sanitation schemes not well studied.
3. It is an area of public concern, because water is a must to have for life on a daily bases
4. Rural water and sanitation services still lag far behind urban services

Objectives

General objectives

To assess factors related to sustainability of water supply and sanitation projects

Specific objectives

1. To assess factors affecting water and sanitation utilization
2. To assess type and degree of community participation
3. To assess functionality of water and sanitation projects.

Research Methodology

STUDY DESIGN

This is a descriptive; community based cross sectional study design complemented by focus group discussion.

STUDY AREA

North Gondar administrative zone is found in Northwestern Ethiopia. It had a population of 2,391,543; of these 1, 213,354 (50.7%) and 1.178, 189 (49.3%) were females. The urban population accounts 270,937 (11.3%) whereas 2,120,608 (88.7%) reside in rural areas (22). The study area has varied landscape dominantly covered with rugged hills and plateau formations, which imports variable temperatures largely favoring a wide range of illness.

SOURCE POPULATION: The rural population of the North Gondar, who were using properly constructed small scale water supply and sanitation projects and projects with the stakeholders (Figure 1).

SAMPLE SIZE DETERMINATION

The required sample size was obtained using the following formula and desired degree of confidence:

The sampling was calculated using the formula of:

$$n = \frac{Z_{\alpha/2}^2 P(1-P)}{d^2} ; \quad n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384 \times 2 = \mathbf{768}$$

Where= P= 50% of participation level of the community, a conservative proportion that will yield maximum sample size.

- d= the margin of error between the sample statistics and the population parameter (=0.05)
- $Z_{\alpha/2}$ = critical value at 95% confidence of certainty (=1.96)

Assuming a design effect of 2 the minimum sample size required for the study became 768 households.

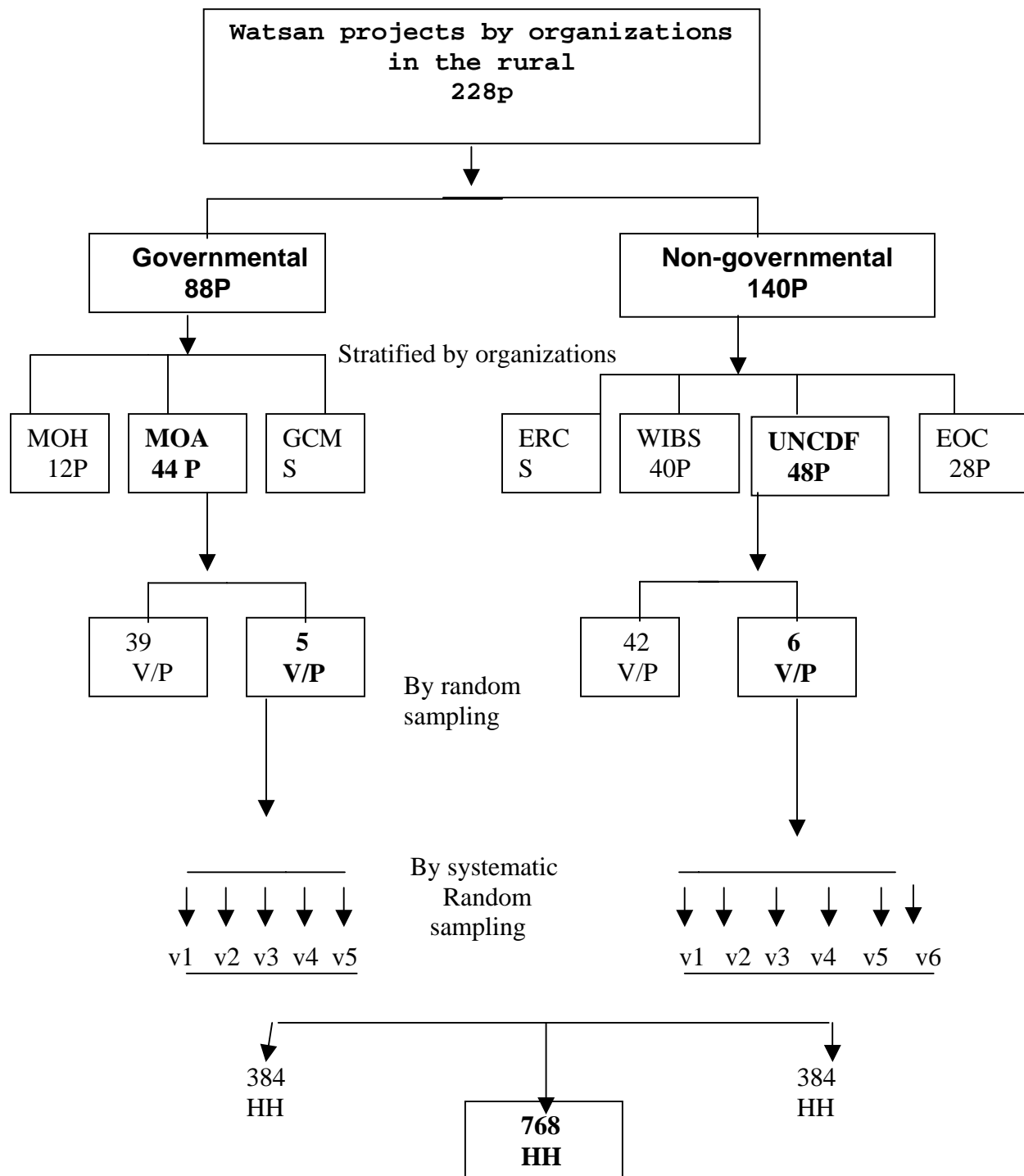
Sampling procedure:

Taking the total number of small-scale water supply and sanitation projects (228) in the North Gondar Zone, a multistage sampling technique was employed. First it was stratified by organizations (governmental and non-governmental) and five to six villages were selected from each strata. Funding Organizations from each strata were selected considering that they have more projects and resources than others.

Then a total of eleven villages were selected randomly. One village means one protected water project site and has a range of 50 -200 households. From each village by systematic random sampling the households were selected.

Therefore a total of 768 households were selected from 11 villages (Figure 2). For project observation, fifty percent (114) of the Watsan projects (228) were conducted by observation checklist. Since there was no previous study on similar issue in Ethiopia, a fifty percent of participation of the study subject was considered adequate. A total of 11 villages (five from governmental and six non-governmental projects) were selected randomly.

Figure 2: - SAMPLING FRAME FOR A HOUSEHOLDS SURVEY, NORTH GONDAR, JANUARY 2002.



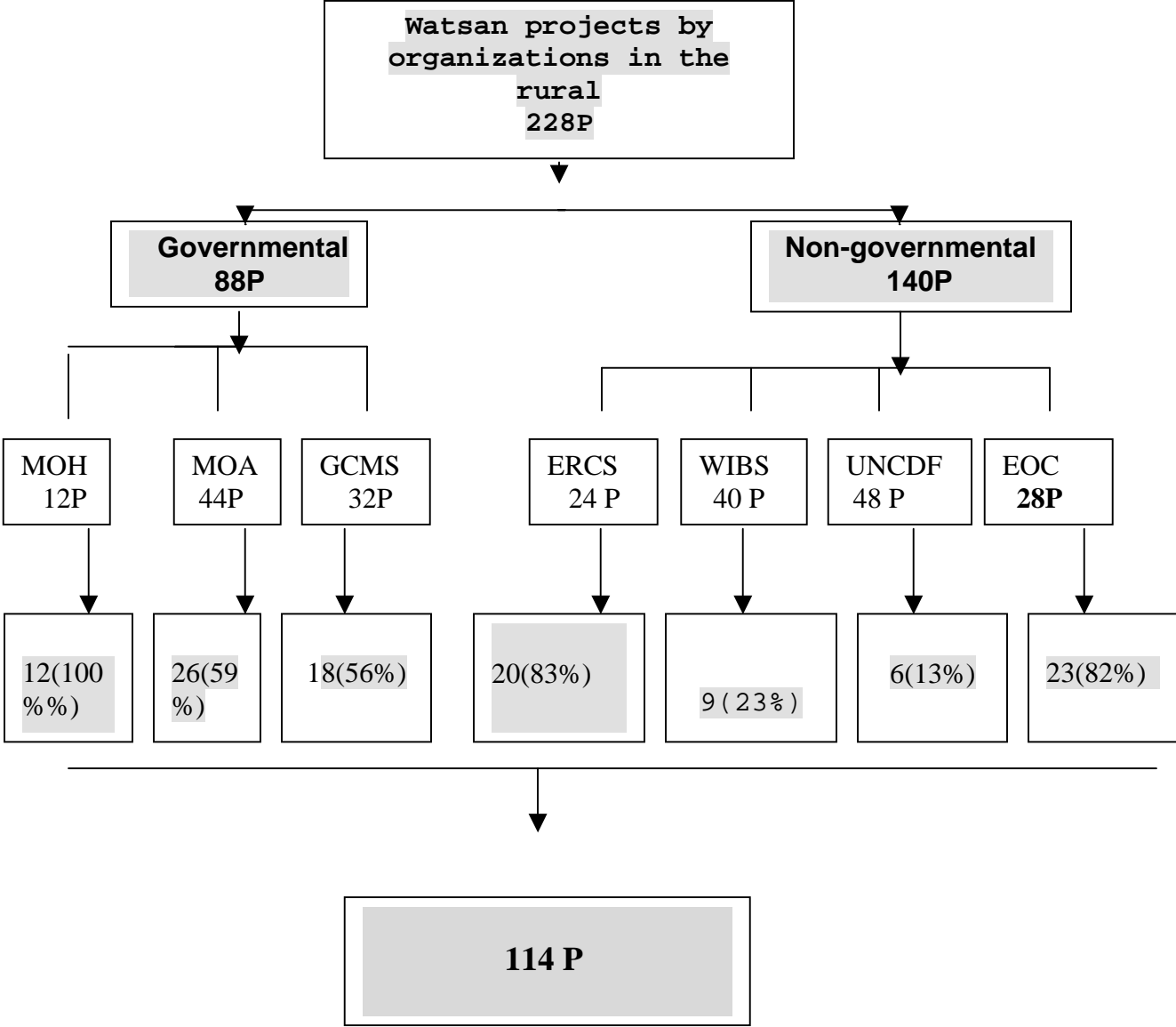
Key:

P- Watsan projects

V- Villages

HH- Head of the households

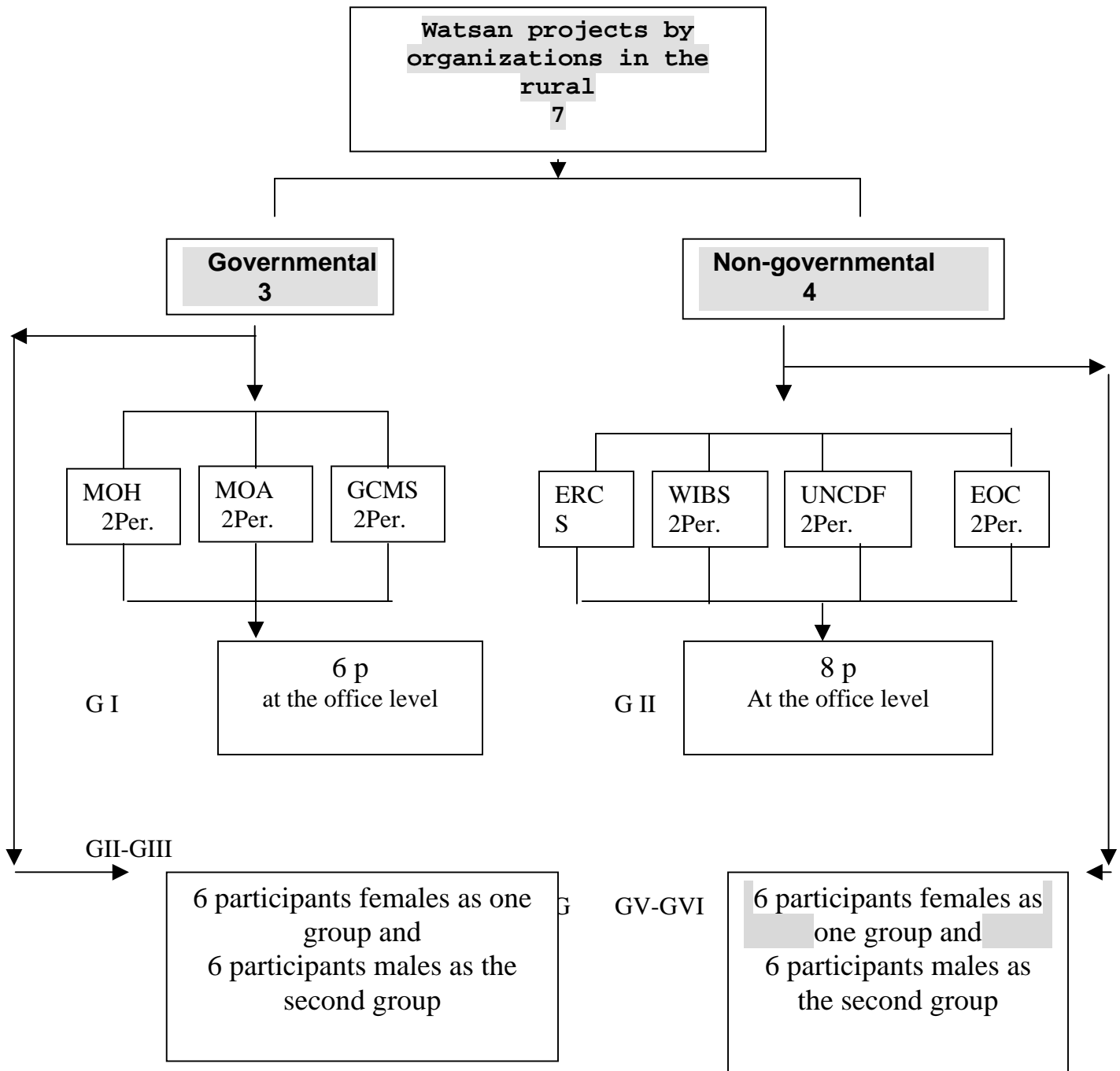
Figure 3:- SAMPLING ON WATSAN PROJECTS FOR OBSERVATION CHECKLIST & SLIDE PICTURES, NORTH GONDAR, JANUARY 2002.



Key:

P- Watsan projects

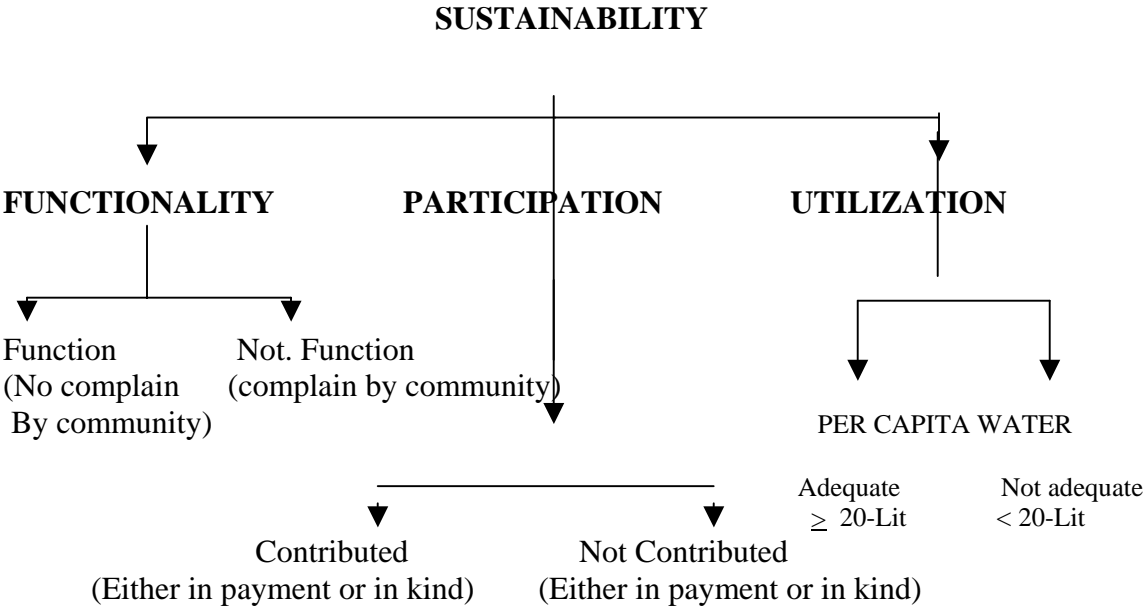
Figure 4:- GROUPING FOR FOCUS GROUP DISCUSSIONS, NORTH GONDAR, JANUARY 2002.



Key:

- P – Number of participants
- G I- Group from governmental organization at the office level
- G II- Group from Non-governmental organization at the office level
- G III-G IV- Two groups of males and females at governmental project site
- G V-G VI- Two groups of males and females at non-governmental project site

Figure 5: - Elements of water and sanitation sustainability, North Gondar, January 2002.



Data Collection:

The methods used to collect data were structured into: 1/ Structured Questionnaires 2/ Qualitative method (FGD) 3/ Observation methods (checklist, pictures, slides)(Appendixes A, B and C). The questionnaire was addressed to females as household respondents, observation checklist and mechanical evidence for Projects and focus group discussions with stakeholders were conducted.

Outcome measurements: In this study the outcomes, of interest is functionality, participation level and utilization of the projects (figure 3). Functionality of the project was taken, complaints by the respondents such as: when there was no shortages of water, less time to wait for at water source point (not more than 5 minutes), and project was not stopped to give service because of defects since of a month time and above. With the presence of all or two out of three would taken as functionality, if not and less would be considered as non-functionality.

Utilization of the project was considered water per capita: 20 and more liters as an adequate and less than 20 liters as inadequate (36). The total amount of water collected per day was calculated as water collection frequency multiplied by the capacity of container they usually used to collect water.

Participation was considered any contribution of the respondents to the development of the Watsan projects taken as "yes" and absence of any contribution was taken as "no".

The study examining socio-demographic and economic variables, selected environmental health related factors (Time, Distance, frequency of collecting water, duration of service) as an exposure variables and associated with the outcome variables.

Ten interviewers who had completed grade 12 and speak the local language were trained for four days. Two sanitarians that were acting as research assistants supervised the interviewers and completed observation checklist of the Watsan projects. The principal investigator took pictures for slide films and computer printout. Training was given to the data collectors using a pre-prepared manual and questionnaire. Pre-testing was conducted in similar area to the study localities.

DATA QUALITY

The Questionnaire was structured and standardized. Questionnaire relevancy to the objective of the study was addressed to professionals, for further comment. Translation of questionnaire from English into Amharic and back to English was made by people who are able to do and checked by the principal investigator. Training guidelines was prepared on households' questionnaire, observation checklist, and focus group discussion. Training was conducted for supervisors and interviewers. Pre-test was conducted on 20 respondents and 3 Watsan projects. The supervisors reviewed every questionnaire for completeness and logical consistency and counter checked by the principal investigator. Data coding and data entry was checked at the beginning and in-between of the work. Data cleaning was conducted at the end the data entry.

Ethical considerations

The necessary amendments were then made before the actual data collection took place. Interviews were carried out only with full consent of the person being interviewed. Before each interview, the study's objectives were clearly explained mentioning that the aim of the study was neither to evaluate the performance of the individual nor to blame anyone for weakness, but to gather information and opinions that might lead to eventual improvement in the situation. Each respondent was assured that the information provided would be confidential and used only for the purpose of research.

Data Analysis

All questionnaires were first checked for accuracy and data entries coded. The data were entered, edited, and analyzed using EPI-info version 6 and SPSS version 10 statistical packages. The steps followed in analysis of the results of this study were the following:

- 1) A baseline descriptive analysis
- 2) Bivariate analysis of socio- demographic, socio-economic and selected environmental Health related variables (time, distance, and frequency of water collection and duration service In relation to functionality, utilization and participation).
- 3) Further bivariate analysis for associations of elements of sustainability
- 4) A multivariate analysis for the prediction of factors related to sustainability
- 5) Percentages and proportion for observational checklist of the projects, successful and Unsuccessful stories of the projects organized by pictures of the slide films and computer printout. Findings of the focus groups were also included in the result and discussed.

Operational Definitions

Sustainability of the projects means with continued use of a new practice. The effect should be reflected with their utilization, functionalities and presence of any contribution of the respondents to the water and sanitation project development.

Functionality: functionality of a project was taken the respondents complaints such as: when there was shortage of water, when it takes less than five minutes to wait at the water point and fill water, and when the project was not stopped to give service because of some technical and administrative defects for a month time and above. One-month duration was taken as a minimum because at least traditionally there is a market day once in a week that most formal and informal communications (reports) could be addressed to concerned individuals and institutions at the woreda level. On the other hand the importance of safe water supply and the possible risk of water borne diseases should not be given more days without marinating the water projects. With the presence of all or two out of the three were taken as functionality if not and less were considered as non-functional.

Utilization: Utilization of the project were considered water per capita: 20 liters and more as adequate and less than 20 liters as inadequate (36).

Participation: Participation was considered any contribution of the respondents to the development of the Watsan projects taken as 'Yes' and absence of any contribution was taken as 'No'

Protected spring: a spring water source, which was properly constructed by qualified people, and the source of water was protected from any possible contaminants.

Protected hand dug wells: a hand dug well which was properly constructed by qualified people and the source of water was protected from any possible contaminants.

Ventilated improved pit latrine (VIP): Latrine constructed by skilled people and convenient to use, gives privacy while using and should be prevented from causing a bad odor to the immediate people who were using it and living nearby.

Domestic animals: animals living within the households who do have economical benefits by selling and buying such as: hens, sheep's, goats, horses, donkeys, mules, oxen and cows.

Watsan projects: water supply and sanitation projects at small scale level like: protected springs in the rural villages, protected hand dug well with an average depth of 15 meters but not deep wells having more than 30 meters depth. Ventilated Improved Pit latrines either at household level or group, communal, and even at the public level in rural urban settings.

Time/distance: one kilometer takes 15 minutes of walking distance

Results

A total of 768 females were interviewed. One hundred fourteen water and sanitation projects (52 protected hand dug wells, 52 protected springs and 10 ventilated improved pit latrines (VIP) were observed by observation checklist and pictures for slides and computer printout. Six focus group discussions for stakeholders (Two at the organizational level, two female and two male groups at the community level, where household survey was conducted) were also conducted.

Almost all water and sanitation projects were constructed and located nearby the transport accessible areas (Figure 1). Distribution of respondents by socio-demographic, socio-economic and selected variables is seen in Table 1. The mean age of female household respondents was 37.09 with the SD \pm 13.52 years. Six hundred ninety eight (91%) of the respondents were illiterate. Those who are married were 632 (82.3%) of the total respondents. Of these 365 (57.8%) the respondent's husbands were illiterate. Mean family size's was 5.31 people per households and it ranging from 1 to 12 persons.

Respondents who were using water from protected sources were 442 (57.6%) and of the total households only 5 (0.7%) were having proper pit latrines (Table 2). Of these 10 (2.2%) used to drink 20 liters and more, while 432 (78.2%) were used to have less than 20 liters per capita. The water collection frequency, twice and more per day was found in 359(81.2%) of the households. The total time took to collect water was found in 359 (81.2%) households more than 15 minutes. The mean time/distance from house to water source, waiting for at the water point and from water point to the house were; 6.11, 5.65 and 8.76 minutes respectively (Table 3), making a weighted mean of 20.5 minutes for one frequency of water collection.

Table-1:- **Distribution of respondents by socio-demographic variables in the in North Gondar, January 2002** (n = 768)

Variables	No.	%
AGE (in years)		
15-19	23	3.0
20- 24	106	13.8
25-29	113	14.7
30-34	112	14.6
35-39	90	11.7
40- 44	96	12.5
45- 49	55	7.2
50 +	173	22.5
Mean \pm S.D	37.09 \pm 13.52	
RELIGION		
Christian	760	99.0
Muslim	8	1.0
ETHNICITY		
Amhara	729	94.9
Kemant	39	5.1
EDUCATION		
Illiterate	698	90.8
Only read or/and write	15	2.0
Grade 6 and below	40	5.2
Above grade 6	15	2.0
MARITAL STATUS		
Married	632	82.3
Unmarried	7	0.9
Divorced	49	6.4
widowed	80	10.4
OCCUPATIONAL STATUS		
Farmer	150	19.5
House wife	618	80.5
HUSBAND'S EDUCATIONAL STATUS*		
Illiterate	365	57.8
Grade 6 and below	253	40.0
Above grade 6	14	2.2

* Husband education was taken a total of 632

Table 2: - **Distribution of respondents by family size, family income and type of projects in North Gondar, January 2002.** (n = 768)

Variables	No.	%
FAMILY SIZE (in number)		
1-4	289	37.6
5-8	430	56.0
9 and above	49	6.4
	Mean ± SD	5.31 ± 2.06
FAMILY INCOME (in Birr per month)		
49 and below	382	49.7
50 - 99	292	38.0
100 and above	94	12.3
	Mean ± SD	60.72 ± 55.29
DOMESTIC ANIMAL OWNED		
Yes	673	87.6
No	95	12.4
PROTECTED WATER SOURCES		
Yes	442	57.6
No	326	42.4
PROPER CONSTRUCTED PIT LATRINE		
Yes	5	0.7
No	763	99.3

Table 3:- Characteristics of water utilization in North Gondar, January 2002. (n = 442)

Variables	No.	%	Mean \pm SD
TIME/distance FOR COLLECTING WATER			
(in minutes)			
15 and less	83	18.8	
16 - 30	287	64.9	
30 and above	72	16.3	20.51 \pm 7.89
WATER COLLECTION FREQUENCY			
PER DAY			
Once	83	18.8	
Twice	273	61.8	
3 times and above	86	19.4	2.04 \pm 0.69
PER CAPITA WATER CONSUMPTION (in liters)			
8 and less	357	80.8	
9 - 19	75	16.9	
20 and above	10	2.3	6.68 \pm 4.36

Three hundred thirty nine (76.7%) of the respondents have contributed either in cash or in kind for their water development. Of these 273 (80.5%) participated during construction, 8 (2.4%) during planning and 6 (1.8%) during maintenance works. Two hundred eighty (52.04%) labor and 144 (26.77%) Financial, contributions were made during construction phase (Figure 4-6).

Three hundred twenty six (42.4%) of the households did not use the protected water sources, due to some reasons. Some of the reasons were: complaining frequently breakage of the project, long distance, expensive fee, too many people are at the water point to collect water, water taste was not good; 157 (48.2%), 72 (22.1%), 34 (10.4%), 23 (7.15%), 19 (5.8%), respectively (Table 4). As a solution of the existing problem, they have suggested that the need of: better maintenance at a regular base, additional water projects and the importance of users active participation to the project development; 32%, 29% and 10% of the households, respectively (Table 6).

One hundred three (23.3%) of the households using protected water projects did not make any contribution to the development of the project. The reasons explained were: was not the work of females, no body told them to participate, too busy at home and husband refused; 50 (48.54%), 35 (34%), 14 (13.59%), and 4 (3.89%), respectively (Figure 5).

The study results showed that water per capita (Utilization) had a significant association with; the family size (OR=8.56, 95% CI (1.56,77.91) and marital status. Complaints of respondents about projects functionality conditions had significant association with; time taken to water source (OR=10.62, 95% CI (4.80, 24.22), time taken to fill water at the water source point (OR=0.18, 95% CI (0.08, 0.39).

Contribution of the respondents (Participation) had significant association with; time taken to fill water at the water source point.

Table 4: - **Reasons of respondents for not using the protected water sources in North Gondar, January 2002** (n = 326)

Reasons for not using protected water source	Water projects	
	No	%
Most of the time it is broken or pipe stolen	157	48.2
Water source is too far (more than 500 meters)	72	22.1
Too expensive (any amount in cash)	34	10.4
Many people are using water	23	7.1
Water taste is not good	19	5.8
Is not good for health	5	1.5
Most of the time it is locked	5	1.5
The Guard is not good	3	0.9
Others	8	2.5

Figure 6:- Distribution of respondents by their types of contribution to the development of the water and sanitation projects in the rural setting of North Gondar, January 2002 (n=486)

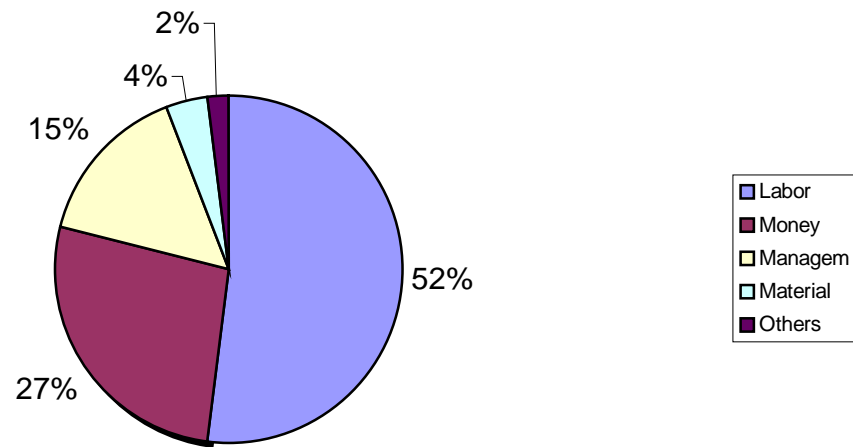


Figure 7:- Participants who were using the protected water source and their reasons for not having any contribution to the watsan projects in the rural setting of North Gondar, January 2002 (n=103)

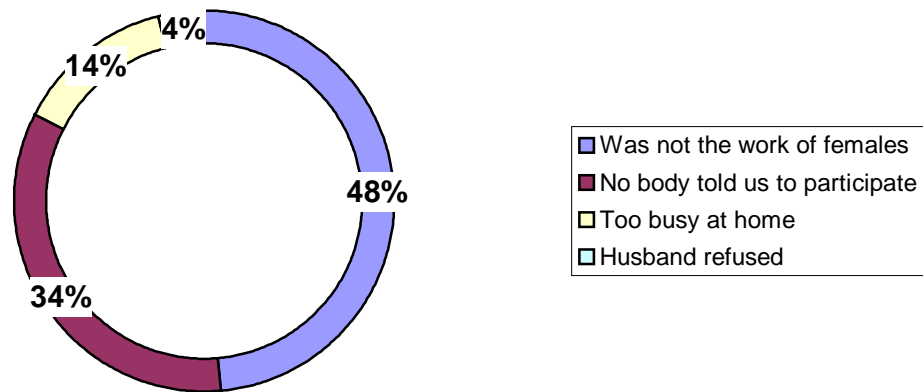


Fig. 8:- Distribution of participants in the development of the watsan projects in the rural setting of North Gondar, January 2002(n= 339)

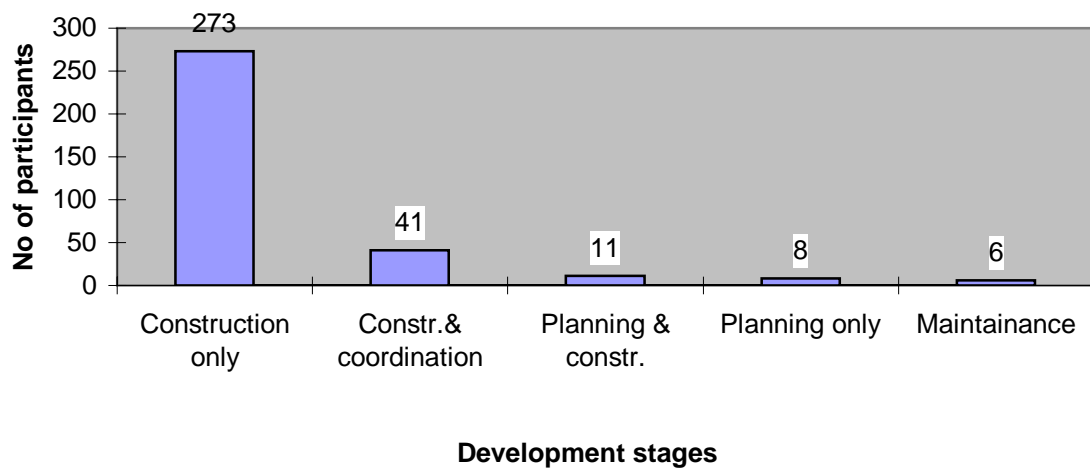


Table 5: - Suggestions of respondents to improve the water project sustainability in North Gondar, January 2002 (n = 442)

Suggestions	Water projects	
	No	%
Better maintenance	145	32.8
Need on additional water		
Project	126	28.5
Users participation is very important	46	10.4
Increasing the capacity of the collection box	40	9.0
The need of trained skilled person	30	6.8
There must be faucets	20	4.6
There must be a guard	19	4.3

Households who have family members of four and less people had adequate water per capita 8 times more likely than those families who have 5 people and above. A significant positive association of adequate water per capita was found with the family size four and less number of people ($p = .009$). A very significant positive association with the respondents complains of projects functioning (function, not function) ($p < .00001$) was found time waiting at the water point (mean \pm SD 5.65 \pm 2.24). Significant positive association with the participation of respondents contributed, contribute ($p < 0.05$) was found with the type of water projects (protected springs) than Protected hand dug well.

Results on qualitative study of the Watsan projects by observation checklist were as follows: A total of 114 watsan projects were checked by observation checklist and having pictures of slide film and computer printout supported the evidences. Of the total observed projects 104 were water projects (52 protected hand dug wells and 52 Protected springs) and 10 are properly constructed of ventilated improved pit latrines. Water projects that have a monthly paid water point guard were 12 (23%) protected springs and 19 (36.5%) protected hand dug wells.

Table 6: - Respondents complaint about functionality condition of water and sanitation projects associated with time waiting at the water source point, duration of service and financial contribution in North Gondar, January 2002. (n = 442)

Variables	Condition of Functionality		OR	95% C. I
	Function (n = 390)	Not function (n= 52)		
TIME WAITING AT THE WATER SOURCE TO FETCH WATER (in minutes)				
≤ 5	180	43	0.18	(0.08,0.39)
≥ 6	210	9	1.00	
*PRESENCE OF MONEY CONTRIBUTION (n = 339)				
Yes	280	43	2.96	(0.76, 9.76)
No	11	5	1.00	
SERVICE DURATION OF THE PROJECTS (in years)(n=768)				
< 5	387	53	1.46	(0.03, 13.40)
≥ 5	5	1	1.00	

* Those who contributed money were only 339

Table 7: - Contribution of respondents to the water and sanitation projects associated with selected variables in North Gondar, January 2002 (n = 442)

Back ground Characteristics	Presence of any contribution		Crude OR (95% CL)	ADJ. OR (95% CL)
	Yes n= 339	No N=103		
Time for collecting water(in minutes)				
≤ 15	65	18	1.12 (0.61, 2.09)	0.87 (.49, 2.26)
≥ 16	274	85	1.00	1.00
Time waiting at the water point (in minutes)				
≤ 6	155	63	1.00	1.00
≥ 5	184	40	0.53(0.33,0.86)	0.39 (.31, .96)
Water frequency (per day)				
Once	61	21	1.00	1.00
Twice	278	82	0.86 (0.48, 1.55)	0.66 (.639, 2.02)
Service duration of the project (in years)				
< 5	1	5	0.06 (0.00, 0.67)	0.49 (.00,15)
≥ 5	340	100	1.00	1.00
Water per capita (in liters)				
≥ 20	6	4	0.45 (0.10, 2.20)	0.15 (.70, 9.46)
< 20	333	99	1.00	1.00

Animal trough and cloth washing compartments were in 11(21% protected springs and 9 (17%) protected hand dug wells near by the protected water point. None of the 10 latrines belonged to a household. Most of them were at the schools level and as a public for a small rural town.

The focus group discussions were organized by SWOT (strength, weakness, opportunities and threats) analysis:

One of the common strengths by all stakeholders was: forming of water committee and Contribution of money to the project, providing that there would be better skills of financial management.

Insufficient thrust to management, lack of financial skills and the absence of gender sensitivity were discussed as their weakness.

Some of the opportunities were: increase of the number of users and constructing of VIP latrines at the institution level of the localities would give the communities to increase their awareness.

Insufficient water during dry season and lack of regular refreshment training were discussed as the threats.

At the community level two groups of males and two groups of females were discussed as their strength cheap labor, as weakness lack of awareness and poor participations (Table 8).

Table 8: - SWOT analysis on FGD of the Watsan projects stakeholders in the rural setting of North Gondar, January 2002

Stakeholders		Internal		External	
		Strengths	Weaknesses	Opportunities	Threats
Common for all stakeholders		Forming of a water committee Contribution of money	Insufficient trust to management Lack of financial skills Not gender sensitive	Increase of the number of water users Constructing of VIP latrines at the institution level would give to increases awareness of the community	Insufficient Lack of training and appropriate information
At the organization level		Providing safe water quality for the vulnerable groups Promoting community participation and capacity building	No guidelines Lack of integration and collaboration Poor coordination of the zonal planning offices and DPPC Water and mining energy	A big challenge and responsibility of management for water and mining energy office to handle the handovering projects.	Lack of strong coordinating agent at the zonal level Lack of documentation for handling
At the community level	Females	Cheap labour Willingness to contribute	No participation in planning	Importance of a guard and fence to water and sanitation projects Importance of latrine at household level	Effects of equaleptes tree by reducing the yield of water Lack of awareness and knowledge about pit latrine
	Males	Cheap labour	Low participation	Proper construction of water projects will reduce problem of leeches and promote better health	Effects of equaleptes tree by reducing the yield of water Lack of awareness and knowledge about pit latrine Lack of regular supervision

As Important opportunities, if water and sanitation projects existed would have advantages of reducing the problem of leeches, having clean water and better health, which will be more and sustain with the presence of a guard and fence.

Poor coordinating organizations of the funding organizations at the zonal level, lack of documentation to handover of the completed projects, ongoing plantation of equaleptes tree nearby the water source are having an effect in reducing water yield, and Lack of awareness was mentioned as the threats.

One most important emphasis on the need of handover documentation and a must providing of spare parts and tools for maintenance before the funding organizations leave (phase out) the project areas were discussed at the zonal organizations level.

The issue of better coordination and proper financial management of the contributed money were raised and discussed at the community level.

Discussion

The literature regarding sustainability of watsan projects in Ethiopia is scanty. Therefore, the present study was done to assess factors related to sustainability of water projects in the rural community of the Northwestern Ethiopia. Most of the study areas were following the watsan project availability and accessibility to transport.

Water and sanitation project sites were selected by having more projects and assuming that they could have high potential of resources. The households, which have VIP latrines, were very low, the reasons could be: Most of the houses were constructed in very scattered places and used open field defecation in which bad odor from feces was not a problem. If the households use shelters while defecating, it was only from the privacy point of view, but not from the prevention of contamination. This was due to their poor knowledge and low awareness of about their health.

In 81.2 % of the households, the time taken to fetch water as > 15 minutes (Table 3), which was higher than that of the findings in Lesotho (26), in Zambia (32), and in Ethiopia (35) using protected sources. This finding is also beyond the limit of the recommended time by WHO (36), which is in 15 minutes of walking distance. Of the total time taking to collect water, time taken waiting at the water source has a significant association with non-functionality of the project (OR=5.57, 95% CI (2.53,12.65) and with the participation of the respondents.

More than eight percent of the households were used to have 8 liters of water per capita per day, which was very low comparing with at least 20 liters per capita per day in reference to the WHO

limits. The low amount of water by the households could be: more time taking to collect water, they used to collect water with an average of two times only per day, the mean family size was high, this study was focused on these households who only used protected water source, and also the small size number of households might have an effect for the observed low coverage of water utilization.

Seventy seven percent of the respondents were had contributed either in collecting money or in kind to the water and sanitation project development. The observed results of the participation level are higher than that of the estimated fifty percent of the community. Therefore we could say that participation of the households possibly had a positive association with the sustainability of water and sanitation projects. This result revealed that communities understand reasons for their participation: aimed at efficiency, building a sense of ownership and capacity building for purpose of sustainability (25).

Most NGOs (five out of six of them) allow for participation of women in making decisions concerning activities they participate in 73%, especially Kyoto and Red Cross where all respondents indicated that women make the decisions (7). More than fifty percent of the respondents contributed labor and money. This was supported by contribute labour, money and materials (7). Protected springs were more likely to have respondents than hand dug wells. This may be due to that protected springs were more convenient to organize communities participation than hand dug wells.

Results from the qualitative study also showed that there were more protected springs, which had fences, and guards that could attribute to sustain the Watsan projects.

The study found that a very high (95.2%) of the respondents of the participants was paying money for further operation and maintenance of the projects. This supports and strengthening the statement that most governments cannot assume complete responsibilities for the provision of satisfactory water and sanitation systems (6).

Households who were supposed to use but not ever used the protected water sources were gave reasons that it was too expensive. The reasons were, they believe that they should not pay for water as it is the gift of nature, some preferred to contribute in-kind than in-payment, even not the least payment.

Forty eight percent of the households said the reasons for not using protected water source were frequently breakage of projects. This result revealed that the basic definition of sustainability is " Whether or not something continues to work over time " (28).

In the observation of the projects, the number of guards and fences to the protected water sources were higher in protected hand dug well than spring, this could be that a hand dug well on site at one point but springs have different boxes on sited at different points in which to fence all at the point was difficult.

More number of animal trough and clothes washing facilities were observed in protected springs than protected hand dug wells, this may be explained that protected springs have an overflow water, which could be wasted during the night, but could be stored in the animal trough. Providing these facilities still the total cost of the project is less expensive comparing with the hand dug well.

There were very small sanitation projects found during the study time. Even the existing sanitation projects, most of them were at the institution level (Schools, Clinic, and some governmental offices). This could be due to lack of awareness and less area of priority by the stakeholders, especially the community.

The households took more time to collect water comparing with standards given by WHO, this could be due to more people at the water point to collect water, therefore it would take long time to waiting for. Other reason could be that even when the distance of the water point was physically not far from the house but because of terrain steep of the landscape would take long time. It was observed in the study that an average time taken to the water source was 6 minutes and time taken from the water source to the house was 8 minutes, in both cases time taken was high, the difference could be explained that carrying a container filled with water need to walk slowly for prevention of accidents.

Utilization types of the watsan projects were, collecting water for drinking, cloth washing, animal using facilities, stand for easily carrying containers filled with water. The presence of animal trough facilities was having advantages to prevent animals from leech's problem. As disadvantages the households complained shortages of water because of animal shared the water yield.

Evidences from the pictures of the projects like high need vs. poor care explained that the communities need to use a protected water sources regardless of how long it takes, how many people waiting for at the water point and the presence of inconvenient. With the contrast even the water projects which were partly damaged and they used to collect water, which were not safe, but were not even trying either to maintain or not made any efforts to improve, could explained the poor awareness and management of the communities. The possible factors related to sustainability of the

projects, as revealed through field observation, were positive and negative. The positive indicated that projects were having fences, guards and closing faucets at the distribution points. The negative indicated projects with poor site clearing of the immediate surrounding of the water points, had no fences, no guards and no closing faucets, that could let water to be collected in the collection boxes during the night time for prevention of water shortages.

Focus group discussions were organized by SWOT analysis among the stakeholders. The zonal planning and DPPC (Disaster Prevention and Preparedness Commission) were not actively and responsibly coordinating and supervising the project funding organizations for which they were responsible. These poor conditions affected the possible integrations and collaboration among the funding organizations that would have provided better knowledge and shared experiences for better achievements.

Communities at the projects sites were complaining of poor coordination and financial management of the contributed money. As the threats, decreasing yield of water in the driest seasons and the ongoing plantation of eucalyptus tree would have an effect in reducing yield of water and damaging constructions. The females groups had a positive attitude to have pit latrines at the households level if they would have a better knowledge and increased awareness.

Other very hot issue raised by the governmental and non-governmental organization was the issue of handover projects. There was no formal and uniform documentation during handover of the completed Watsan projects. Therefore projects had in problems being maintained due to lack of tools and spare parts. It was also very recently that the water and mining energy offices took the responsibility of having handover Watsan projects. Unfortunately the water desk agents at the

woreda level were not yet skillful and resourceful to manage the existing projects. A further limitation of this study was that it dealt with the project sustainability, rather than identifying which organization have better contribution to the sustainability of the project and degree of efforts to the capacity building of the community, which would be another area of interest to encourage and adopt better strategy to the promotion of the project sustainability.

STRENGTHS & LIMITATIONS

STRENGTHS:

1. Methodology strengths

- Slide and computer printout pictures have been made to realize the current conditions of the watsan projects.
- The focus group discussions made us understand the role and responsibilities of the water desk agents, who are newly established at the woreda level.
- The pictures could be used as teaching material.

2. The study itself tried to shed data for the consumption of water and sanitation projects managed in Ethiopia filling the gap as to why watsan projects failed or succeeded to serve the community.

- In respect to the country needs
- Indicate who are the stakeholders

LIMITATIONS:

- Transport inaccessibility and difficulties to reach to some of the project sites.
- Financial limitations had made some influences not to reach to some of the possible watsan project sites.
- Identifying the organizations that were responsible for the funding and constructing the watsan projects was challenging.
- Guides orientation and understanding to the project sites were had unimaginable estimation when compared with the actual distance and how long it took. For example a 10 minutes distance informed by the guides took an hour.

Conclusions and recommendations

This study has demonstrated the importance of the respondent's participation to the sustainability of the watsan projects, which is consistent with other studies done in Africa and Asian countries.

- The important point revealed in this study was that total time to collect water found to be beyond the standard by WHO, and this was affected by time taken to wait for at the water point. The possible reasons could be less number of faucets, more people of the villagers, lack of schedule when to fetch, and small yield of water.
- A large proportion of the communities, 42.2%, of the households were not using the protected water sources. Despite the deep roots of lack of knowledge and awareness, the reasons cited were the issues of sustainability.
- The weak capacity of local water Committees to manage the limited financial contributions made by users was found to discourage further the community participation and affected the sustainability of Watsan projects.
- Lack of a resourceful agent at the woreda level has showed that when projects faced defects in the middle of services, timely response to maintain was not practiced. This needs to be corrected starting from on time reporting by the community to the positive response of the woreda water desk agents.

- The integration efforts towards achieving a common goal between the local government institutions and Watsan projects funding and implementing agencies was found to be unsatisfactory.

Therefore, based on the basis of this study it is recommended that:

1. In areas where there are more people, planning to construct additional projects would prevent the long time spent at the water point. If the yield of water is enough installing a number of faucets at the distribution point would also prevent the unnecessary time spend at the water point.
2. To let the community and especially females to participate in identifying problems, priority setting, in all stages of the project development and made effort to increase their awareness in order to promote high participation and utilization of their project.
3. The community members could feel a confidence and successful in the capacity building if the management body and system are transparent by doing a palpable work.
4. The newly established of the woreda water desk agents need to be responsible, skillful with having the necessary, resources, guidelines and training.
5. Creating a mechanism to strengthen the responsiveness of all stakeholders, to exchange Experiences, by conducting a forum sometimes in a year. This would have been better to be

Facilitated by the Collaboration and integration of the Planning and the DPPC Offices at the Zonal Level.

6. Providing that the ethical consideration would be undertaken by the will of each funding /constructing organizations and the coordinating agent of the governmental organizations shall focus on studies on: Project sustainability by different organizations and developing guidelines to update the ongoing projects are technically sound and objectively addressed.
7. It is also important to have further study that would address in depth the issue of sustainability, as it is delicate and difficult to identify reasons.

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DECLARATION

I, the undersigned, declare that this thesis is my original work, has never been presented in any other University and that all resources of Materials have been duly acknowledged.

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

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