The Status of Domestic Water Supply and its Implications: A Case of Kondoa District Council, Tanzania

*Benedict A. Sulley
ORCiD: https://orcid.org/0000-0002-3599-1524
Department of Community Development, Local Government Training Institute, Tanzania
Email: benedictsulley@gmail.com

Joachim, J. Chisanza
ORCiD: https://orcid.org/0000-0002-3101-817X
Department of Community Development, Local Government Training Institute, Tanzania
Email: chisanzajoachim@gmail.com

Tatu, O. Lesso
ORCiD: https://orcid.org/0009-0009-3913-3496
Department of Community Development, Local Government Training Institute,
Email: tattulesso@gmail.com

*Corresponding Email: benedictsulley@gmail.com

Abstract: This study investigated about the Status of domestic water supply and its implications in Kondoa District Council, Tanzania. The study employed the descriptive cross-sectional design**.** The target population was 6126 households from two Wards (Kikore and Mnenia) in the Kondoa District Council. The study used the Yamane formula to determine the sample size of 376 respondents. Thereafter, 376 respondents (household heads) were drawn from the population through the systematic random sampling. Secondly, key informants (government officials from higher and lower LGAs) were selected purposely by virtue of positions they held. The study used a questionnaire survey, focus group discussions, in-depth interviews and observations as sources of data. Quantitative data was analyzed by using descriptive statistics. Data from in-depth interview, observation and FGDs was analyzed by the thematic method. The study concludes that physical access to water points was crucial as the majority of respondents received water beyond the target of 30 minutes specified in policy statements. Furthermore, there is inadequate water quality. Therefore, Kondoa District Council was not on course to meet the established standards outlined in the national water policy of 2002 and the overall target for water access set in Tanzania's development vision for 2025. One of key recommendations is the empowerment of the water users, water institutions and village leaders who can make huge contributions to improve the status of water service delivery in terms of physical access, quality and quantity.

Keywords: Physical access; quality of water; quantity of water; water supply.

Introduction

Provision of water services became a critical development agenda since water resource is termed among the basic human rights (Langford, 2005). As it is widely known, water is not only a vital resource for natural life but also a key resource that provides for various domestic and economic needs (Langford, 2005; Yildiz, 2017). Mankind is well aware that

water resource is limited and irreplaceable and it is only available if well managed.

In recent decades, water crises remained a major concern that attract attentions of researchers, academicians and policy makers (Akhmouch & Clavreul, 2016; Makoni et al., 2004). For example, it is reported that there are around 844 million people globally who do not have access to improved drinking water. Approximately, 1.3 million deaths in 2015 were said to result from drinking unsafe water. The WHO further continues to argue that in Sub-Saharan Africa, 53 % of the population does not have access to safe and clean water (World Health Organization and United Nations International Children's Emergency Fund, 2017).

In Tanzania, while 65% of households in rural areas have access to piped water services (Origa *et al.,*2020) Kondoa District Council has 57% of the population with access to piped water (URT, 2020). These statistics mean that Kondoa District Council has failed to achieve the set five years (2016/17-20/21) national development plan target of 85% of rural population with access to piped water.

While water crisis has received global attention, some strategies are put in place to address the water service delivery challenges. The United Nations established the Millennium Development Goal (MDGs) target seven (7) which specifically aimed to reduce by half the proportion of household that does not access to safe drinking water and basic sanitation by 2015 (Donoso & Cancino, 2010). Furthermore, water sector continues to receive special attention as it needed to fully achieve the target number six of the Sustainable Development Goals (SDGs) which focuses on ensuring availability and sustainable management of water and sanitation by the year 2030 (Loewe & Rippin, 2015). The SDGs six is compatible with the target of the Tanzania National Development Vision which focused on universal access to water supply in the country by 2025 (United Republic of Tanzania, 2017). Tanzania, like many other African countries, adopted the universal access to water standards with the aim to quantify and assess the progress of the national goal. Through National Water Policy (NAWAPO) of 2002, several standards were established to measure the water service delivery.

The physical accessibility to domestic water points is measured through distance or walking time from home to the source. This is often used to measure the level of proximity or physical access domestic water points. However, these measurements differ across nations and also between some international organizations. In the case of WHO, domestic water points or sources have to be within 1000 meters from home and fetching time should not be more than 30 minutes walking distance (The UN Special Rapporteur, 2014).

In Tanzania, NAWAPO set 400 meter to domestic water points or not exceeding 30 minutes time for going, waiting and returning (URT, 2006). Furthermore, Joint Monitoring Program (JMP) considered the quality of water based on the water source type either protected or unprotected (World Health Organization and United Nations International Children's Emergency Fund, 2014). In Tanzania, for example, the local service provider to final consumer is responsible to determine water quality   United Republic of Tanzania, 2013). They term 'improved' water source to mean the piped or protected water supply into the dwelling and 'unimproved' to mean unprotected sources of water. The current practice of the Ministry of Water (MoW) and National Bureau of Statistics (NBS) recognizes water source type as proxy indicator of water quality. In Tanzania rural areas, as stated in NAWAPO, the quantity of water is considered an optimal when a person access the minimum of 25 litres per day. Water quantity implies the sufficient water for personal and domestic uses such as drinking, washing clothes, personal hygiene and food preparation (The UN Special Rapporteur, 2014). This study adopted the Tanzania standards in measuring the quality of water.

Numerous studies have been conducted with the aim of establishing the level of household's access to domestic water supply. For example, United Nations Development Project (2013) reported that the time spent for collecting water represent heavy service burden to women and children in Uganda. In Eastern Uganda, it was reported that women and girls spent approximately 660 hours a year collecting water which represents two full month of labour.

In Tanzania, Masanyiwa *et al* (2014) found that more than half of the water users travel more than one hour to collect water during dry season. Likewise, Jimenez and Perez-Foguet (2010) studied a sample of 5921 water points by using Water Point Mapping (WPM) for the analysis of rural water supply plans. The study revealed that over 30% water sources do not properly functioning in the

first year of operation. Literature review further reveals that in measuring domestic water service delivery, some studies tend to use functionality of water points and physical accessibility based on time used to collect water (Jimenez & Perez-Foguet,2010; George, 2012; Masanyiwa, 2014) and disregard other dimensions such as quality and quantity of water reflected in NAWAPO, 2002. This study allows the dimensions to be measured. Therefore, it is from these conceptual and contextual gaps that this study aimed to establish the level of access to domestic water supply by using the set indicators to verify whether interventions made by the Tanzanian government have progressed towards the target.

Methodology

Research Design
This study employed the descriptive cross-sectional design. In cross-sectional surveys, independent and dependent variables are measured at the same point in time (Kothari, 2004; Kumar, 2011).This design allowed researchers to collect data from a larger number of population and to study the problem from multiple perspectives (Bhattacherjee, 2012).

Population and Sampling
The target population for this study was 6126 households from two Wards (Kikore and Mnenia) in the Kondoa District Council. To ensure accuracy, the study used Yamane formula to determine the sample size. Yamane (1967) suggested the following formula to calculate the sample size.

$$n = \frac{N}{1 + N(e^2)}$$

Where *n* is the sample size, N is the estimated number of households and e = 0.05(5%) is the desired 95 confidence level of precision (Yamane, 1967). Therefore, subjecting these statistics into the formula, the sample of 376 households was obtained as shown below:

$$= \frac{6126}{1 + 6126(0.05^2)} = 376$$

The study further employed both random and purposive sampling techniques. First, a list of all households of the selected Wards was established with the help of Wards Executive Officers by referring to the Households Register of 2018. Finally, 376 respondents (household heads) were drawn from the sample through the systematic random sampling. Secondly, key informants who are government officials from higher and lower LGAs were selected purposely by virtue of positions they held, either in the district administrative office or in lower LGAs level. This category of participants was used for in-depth interviews, except for the Village Water Committees (VWC), Village Executive Officer (VEO) and COWSO who participated through Focus Group Discussions (FGDs).

Data Collection Methods
This study employed four data collection methods, namely questionnaire survey, focus group discussions, in-depth interviews and observations. The questionnaire consisted of closed-ended items with response categories such as Likert scale and binary choices. Likert scale had responses which ranged from 1 (Strongly Disagree) to 5 (Strongly Agree). Anderson and Arsenault (1998) described Likert scale as an excellent means of gathering people's attitudes and opinions. This study also used of dichotomous (binary) type of items which required respondents to choose one out of two possible responses. The study further employed in-depth interviews. This was coupled with an intense probing for deeper meaning and understanding of the responses (Flick, 2002). Four focus group discussions, with an average of 8 participants, were drawn from Village Water Committee (VWC) and Community Owned Water Supply Organization (COWSO) from the 4 villages. These were involved in the study because they managed and supervised water services on the daily basis. Finally, the study used the observation method by visiting domestic water points that existed in the study area. This method is useful for complementing the information that was obtained through interviews and questionnaires.

Treatment of Data
The Questionnaire data was analyzed by using descriptive statistics in order to present data in the form of percent of respondents who answered the binary choices i.e. either physical access for those who used ≤ 30 minutes or otherwise, the quality of water is either improved for individuals using protected or otherwise, the quantity of water is either adequate for person who used ≥ 25 litres or otherwise. This type of questions is useful in measuring the customer satisfaction across different

disciplines (Saunders et al., 2012).The analysis were done by the aid of IBM SPSS. Data from in-depth interview and FGDs was analysed by the thematic method. At first, the qualitative data was transcribed from audio interviews and FGDs into word texts. The next stage of analysis involved data coding, using the Nvivo software version 12. In this stage, the transcripts were exported to the software and extracted through the Nvivo coding system. The Nvivo coding system involved identification of the key concepts, which formed the basis of identifying the key categories and sub-categories. Coding of the transcripts through Nvivo software led to the identification of key themes, which represented the highest level of the categories. Finally, the set of identified themes were then extracted into a codebook that described the summary of data outputs.

Validity and Reliability

The quality of the data can be challenged if some precautions are not taken to ensure its academic rigour. In order to ensure validity, the researchers triangulated qualitative and quantitative data sources to build a coherent in the findings. This was done by employing multiple methods of data collection to facilitate a critical analysis of the data. Reliability also refers to quality of measurement that provides accuracy and repeatability (Kumar, 2011). To ensure further reliability in this study, data triangulation was used in that, more than one source of data was employed as explained before.

Ethics and Consent

The researchers were keen to observe research ethics so as to uphold the authenticity of the study. The researchers openly explained the rationale of the study and assured the respondents the confidentiality of the information shared. For that reason, names of participants were not mentioned in any presentation of the research findings. Informed consent was obtained from the respondents prior to data collection. Furthermore, to ensure authenticity in this study, all the sources that had been used were duly acknowledged.

Results and Discussion

As presented in methodology section, the foregoing discussion sought to establish the level of household's access to domestic water supply by using three indices such as physical accessibility to water, quality of water and quantity of water received per day per capita.

Physical Access to Water Service

In measuring the physical access to water service, the NAWAPO and NBS recognize 30 minutes collection: time -go, wait, collect and return as benchmark in determining optimal access to water services. In this study, time used for fetching water was adapted to measure physical accessibility to water points. Therefore, water service is either accessible for those who used ≤ 30 minutes to collect water and not accessible for those who received the water service for > 30 minutes walking distance. The researchers administered questionnaires to collect citizens perception regarding time spends for round trips to collect water from the respective sources. Results indicated that the majority (68%) spent more than 30 minutes to collect water while 32% of the respondents spent lesser than 30minutes to collect water. In other words seven in ten households in Kondoa District took more than 30 minutes to collect water from the respective water points. This suggests that generally physical accessibility to water points was perceived by respondents to be critical because majority received water beyond the target of 30 minutes as presented in the policy statements.

The challenges of physical access to water has been addressed and discussed by other scholars. In Ghana, Gbedemah (2010) examined time spent by households to access water services. The study found that 35.5% of respondents spent lesser than 30 minutes for a round trip to gather water. This statistics implies that 65% of the population spent more than 30 minutes to collect water. Sarmento (2015) unveil that in Timor-Leste, people used more than one hour to get water because most of the sources were far from the residents. Likewise, Water Aid (2017) reported that women and children in developing countries in Africa particularly use over two hours in day to access water and sometimes they use up to seven hours in remote areas. The results obtained from these studies can be compared with this study in the sense that majority of the citizens received water services beyond the required 30 minutes. This is a serious problem identified in the surveyed villages.

The qualitative inquiry also yields similar results that majority of people in Kondoa District spent long time searching for water service. This concern was noted when researchers visited some water infrastructures at Mnenia and Itundwi villages. The researchers noted that people took long time to collect water due to the system of individuals using

several containers to queues that increased waiting time for others. The researchers further observed low pressure to some of the water standpipes. The low water pressure was contributed by pipe leakages which were noted by the researchers during field visit as shown in figure 1. The information from field work testimony was enriched with the information obtained through FGDs. The COWSOs members revealed that water accessibility problems in their village were primarily caused by old infrastructures but on other hand the problems were escalated by unfaithful citizens who frequently vandalized the water pipes for the benefits of their cattle. One of the COWSO members during discussion was quoted saying;

There are cases where some pastoralists vandalize water pipes for the benefit of their cattle. They do this during night hours, so it is very difficult to recognize them. For that matter security of water pipes is the responsibility of all the citizens, not a single person" (FGD with COWSO in Mnenia July, 2019).

This result shows that pastoralist sometimes vandalizes water pipes to cope with scarcity of water in their village. The result suggest that although water service is the top priority need to the citizens, unaccountability, lack of ownership, the poor management and insecurity of the available water points endangering future of water services in Kondoa District council. The message derived from the quotation above calling for the collective responsibility for all citizens in collaboration with government to ensure the security of water infrastructures in rural areas.

Figure 1: People collecting water from leaky water pipe at Mnenia

The result obtained from the interview with VEOs indicated that because of frequent breakdown of water infrastructure, it is very difficult to organize citizens to make timely contribution for the maintenance and repair of water infrastructures. According the VEOs, citizens do not timely respond to water source breakdown because they opt to seek out the service to the neighboring villages. The VEOs recommended that if possible, some bylaws need to be enacted by the government to stop citizens securing water service from neighbors so that they can quickly respond to their own sources. During the interview, a VEO was quoted saying; `"When the water pump broke-down in our village, there is tendency people follow service to nearby villages because no rule of stopping to use another source from neighboring village. This tendency makes them reluctant to contribute because they have options" (Interview with VEO, July 2019).

The interview with VEOs also added that some of the villagers sometimes opted to use poor quality water from ponds and traditional dug wells in case of water breakdown. This situation demoralizes the spirit of collective action in management of water infrastructures. The interview further reveals that it sometimes took up to three weeks to repair water infrastructures in case of breakdown. This result suggests that, citizens were still escaping some of their key responsibilities which was primarily established by water policy and laws guiding the water sector in Tanzania. For example, NAWAPO of 2002 (United Republic of Tanzania, 2002) provides pre-requisites for better rural water service delivery including management at village level, communities

achieving full cost recovery for operation and maintenance, protection of water sources, compatibility of technology and service level with capacity of the beneficiaries and considering women as the key players water service delivery. Moreover, NAWRMA, 2009 section 4 (i) directed that national water resources are protected, developed, used, conserved and controlled in the way that accounts; (e) promoting stakeholders involvement in water resource management at all levels by decentralization to the lowest appropriate. In rural areas, COWSO are legally authorized by the law to manage, operate and maintain the water points on behalf of the community.

The physical access to water supply contributes to economic development through reductions in productivity losses due to time wasted in looking water service. Searching water for long distances and waiting at water sources wasted the time mainly for women and children at the expense of family work, education and income generating activities. This implies that in Kondoa District council, if water accessibility challenges remained unsolved, citizens would continue losing time that could be used for other productive economic activities. This is in line with United Nations Development Project (2013) report which confirms that the time spent for collecting water in Uganda

represents heavy service burden to women and children. In Eastern Uganda, it was reported that women and girls spent 660 hours in the year collecting water, the time which is approximately two full month of labor. This study noted management and insecurity of the water infrastructure at the village level as the concerns that need much attention for future improvement of water service delivery.

Perceived Quality of Water Service Delivery
The source type was used as proxy indicator of water quality whether the citizens are collecting water from improved or unimproved water sources. The researchers administered the questionnaire to households to collect their perceptions regarding nature of water source they used for collecting water for domestic purposes. Results shown in figure 2 reveal that over a half (66%) of households in Kondoa District Council heavily depended on unprotected water sources while the rest 34% had access to protected water points. This result signifies that generally quality of water sources was perceived by respondents as critical as majority of the respondents received water service from unimproved sources that might not be comfortably used for domestic purposes.
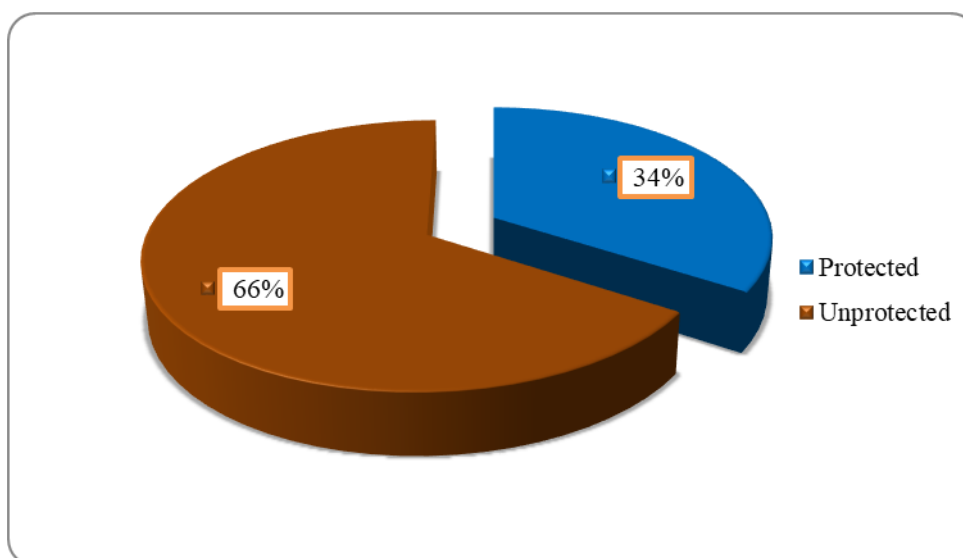

Figure 2: Protected and unprotected water sources

The results obtained were compared and contrasted with related studies presented in the literature. Jimenez and Perez-Foguet (2010) studied a sample of 5921 protected water points by using Water Point Mapping (WPM) in Tanzania and revealed that over

30% of water sources do not properly functioning in its first year's operation. This study suffers from methodological gap because WPM utilized the process of locating water infrastructure by the aid of Global Position System (GPS) technology. The use of

these methods cannot tell the reality on the grounds because the survey team only visited the improved water points located with the aid of Geographical Information Science (GIS) and assessed the status of water points on their own. These methodological deficiencies were addressed in this study by employing multiple methods of data collection and analysis. The current study used survey methods which have advantages of collecting fresh data from the households who are getting their daily service from those water points. The survey methods enabled the researchers to collect data from the households (water users) and corroborate it with interview and FGDs data, the procedure which is not possible if GPS methods were utilized. The finding generally mean that if the majority (66%) of the household relies on water service from unsafe and unprotected water sources, it heightens the likelihood of experiencing and suffering from water and sanitation-related diseases, leading to increased mortality rates.

This study went further by employing qualitative information regarding quality of water services. The FGDs conducted with VWCs members confirmed that majority of the people tended to use both protected and unprotected water sources concurrently due to unreliable functionality of the water points, heavy distance to reach improved water points, congestion at water points and seasonality. FGDs exposes that although some people are suffering from water related diseases, they are forced to use unprotected traditional water sources because water from protected sources were unreliable and took much time to collect due to long queues and distance from homestead. One of the FGDs members claimed that even unprotected water sources were getting worse because nobody is responsible for conserving the sources and there is lack of management in general where some people misuse that weakness to pollute water. During the discussion, one of the participant had this to say:

> The quality of water is deteriorating from day to day. The people do what they want at the water sources. Some wash their clothes beside the bank of the rivers, others watered their cattle while other bath in the water. Some bylaws are there but no anyone dare to warned or punish them seriously" (FGDs with VWC in Kikore, July, 2019).

Results imply that although dominance of community water management and WUAs management is strongly articulated in NAWAPO 2002, these institutions were still unable to deal with water challenges in rural Tanzania. The researchers further made field observations to triangulate the information collected through FGDs. The information collected by researchers are corroborated with collected information during FGDs in the sense that during field study, the researchers observed that some people washed their clothes along the river and some at unprotected water channels in Kikore (Figure 3). The researchers noted that water is dirty and polluted which is not recommendable for ordinary domestic usage apart from drinking water which has to be clean and safe. These findings mean that the institutions responsible to enforce water legislations were weak to execute their duties such as pollution control, water allocation and ensuring quality and quantity of water services.

Figure 3: People are fetching and washing clothes from unprotected water sources

Furthermore, the study results consistently indicate paucity in terms of water service coverage as the number of people using unprotected water sources surpassed the number of people using protected water points in the study area. The result is disappointing the effort of meeting the national goal of increasing rural water access from 53% in 2006 to 90% by year 2025 (URT, 2006).

Perceived Quantity of Water Service Delivery
Provision of sufficient quantity of water to citizens is the requirement of NAWAPO of 2002 so as to suffice day to day domestic needs. Water quantity means adequate water supply for personal and domestic usage such as food preparation, drinking, personal hygiene, washing clothes and house sanitation per day. This indicator (quantity) was measured by volume of water (liters) a person received per day. According to NAWAPO and NBS standards, quantity of water for rural people

considers an optimal when a person uses 25 litres of water per day. In that case, the quantity of water is regarded as either adequate for persons who are using ≥ 25 liters and inadequate for person who are using < 25 liters per day.

In this study, the researchers administered a questionnaire to measure perceptions of citizens regarding amount of water they received per person per day. The results indicate that 53% of the respondents reported that they had received adequate amount of water for their daily consumptions while 47% received lesser than 25 liters which is considered inadequate. This implies that closely to half of the population in Kondoa District received lesser than 25 liters per day (Figure 4).
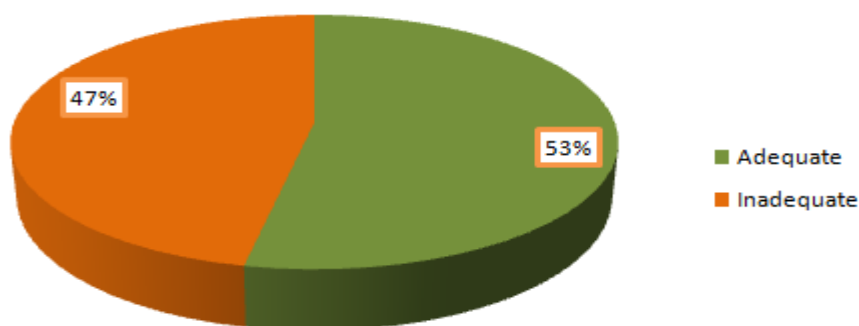

Figure 4: Shows quantity of water service delivered

The result further implies that quantity of water produced is below the amount of water needed for basic domestic requirement. It was reported that the physical distance of water points affect the quantity of water used in the household because carrying water from long distance is a heavy burden to women and children who are traditionally responsible for household work. This finding is in line with the work of Dungumaro (2007) in South Africa who studied water consumption patterns and established that there is relationships between quantity of water consumed and distance from the sources, household income and size of the household.

During the interview, one respondent explained that the quantity of water is very terrible such that the buckets of water fetched by individual household is recorded by supervisor at the water points. When the researchers requested the water point

supervisor to explain the rationale of recording those buckets, the interviewee explained that water crises in their area persisted for long time, where some conflict over water services were frequently reported and in most cases community were scrambling over water. The incident was reported at the Village office frequently and the village leaders together with citizens agreed to assign one person to keep daily record to ensure that each household collects water which does not exceeds 3 buckets and wait for two days. The number of buckets fetched did not consider the size of the family. One of the respondents bitterly explains that.

> My brother, water service is very poor; people have to wake up at midnight to avoid long queues. In that case, no one is allowed to fetch more than three buckets in two days' time. We use the three buckets for cooking only. We can't even

bathe or wash our clothes" (Interview with VEO in Mnenia July, 2019).

The researchers also visited water points to triangulate the information concerning the reported shortage of water.

Figure 5: Residents are queuing for water service in Itundwi and Mnenia Villages

The observations revealed the presence of long queues of containers at the water points and confirmed the practice of recording number of buckets collected per day in the household (Figure 5) This implies that water crisis at the household levels needs special attention from government and responsible stakeholders.

Conclusions and Recommendations
Conclusions
The study concludes that physical access to water points was crucial as the majority of respondents received water beyond the target of 30 minutes specified in policy statements. There is inadequate water quality. This was evident as the number of people relying on unprotected water sources exceeded the number of people utilizing protected water points. The available water falls short of meeting the basic domestic requirements. The reported physical distance to water points directly impacted the amount of water consumed in households. Carrying water over long distances posed a significant burden, particularly on women and children who traditionally shoulder household responsibilities. Therefore, Kondoa District is not on course to meet the established standards outlined in the national water policy of 2002.

Recommendations
The study suggests the empowerment of the water users, water institutions and village leaders who can make huge contributions to improve the status of water service delivery in terms of physical access, quality and quantity.   The study further recommends the integration of traditional self-designed institutions to enable the beneficiaries to

manage the use of water resources effectively. This will cause ownership of water facilities and will strengthen supervision of water systems by holding accountable those who sabotage water services.

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