WITH FUNDING FROM
AUSTRIAN DEVELOPMENT COOPERATION

Inventory and Performance Assessment of Water Supply Schemes in East and West Belesa of Central Gondar in Amhara regional state

July 2018

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Acronyms

ADA: Austrian Development Agency
ADC: Austrian Development Cooperation
ES: East Belesa
FGD: Focus Group Discussion
FHH: Female headed households
IGA: Income Generating Activities
MHH: Male headed households
PQL: Program Quality and Learning
SWEEP: Water for Food Security, Women's Empowerment and Environmental Protect
WASHCo: WASH Committee
WS: West Belesa

Summary of Major Findings

- The total number of water schemes is 1,168, of which 627 are in East Belesa and 539 are in West Belesa.
- 96.7%, 1.8%, and 1.5% of the water schemes were constructed to serve the community, individual households and institutions respectively.
- 40.8%, 38.8%, 6.8% and 13.6% of water schemes are currently functional, non-functional, partially functional and abandoned respectively.
- From currently functional water schemes, 84.4% and 90.2% satisfied community demand and worked throughout the year respectively.
- From the currently non-functional water schemes, 84.1% can be functional if properly maintained/rehabilitated, but the remaining 15.9% are non-maintainable and should be replaced by a new source.
- The major reasons for non-functionality are poor scheme management (68.4%), poor construction quality (22.3%), water shortage (5.1%) and natural hazards (4.2%) including land sliding and flooding.
- Currently, only 26.5% of the total population have access to protected water sources regardless of distance from functional water schemes. In the SWEEP intervention areas the percentage is even lower with 19.7%.
- Of the total existing WASH management committees (WASHCos), only 15% were functional during the time of the assessment, whereas the remaining 85% were either non-functional (59%) or partially functional (26%). Only 26% have a maintenance budget (regardless of the amount), 3% have bylaws and 20% of the WASHCos participated in capacity training.

I. Introduction

The Government, user community and international donors have constructed a number of water schemes in the last two decades in Africa. However, a significant proportion of the population still does not have access to safe and sufficient water services, which is mainly a result from unequal distribution of investments, high failure rates, low service reliability, over-extraction, climate change, and pollution[1]. Studies in developing countries showed that 30% - 60% of existing rural water supply schemes are inoperative at any given time[2]. Study in South Africa found that 70% of the boreholes in the Eastern Cape were not functional[3] and in Tanzania from 7,000 surveyed boreholes wells only 45% were in operation and only 10% of systems that were 25 years or older were still functioning[4]. In Ethiopia 33% of rural water schemes were non-functional at any time, due to lack of funds for operation and maintenance, inadequate community mobilization and commitment and a lack of spare parts[5]. The national water inventory result (2012, Ethiopia) indicated that 25% of the constructed water schemes stopped functioning after a year[6].

To overcome the above challenges, researchers argued that implementation of water supply should improve governance[7]. Good governance requires the involvement of a wide range of institutions and non-state actors in different or overlapping aspects of enabling access to water, including resource management and demand for better services and accountability[8].

Information helps to solve challenges, demonstrate for higher levels of planning and policymaking, monitor progress, and better governance[9]. Most of the implementing agencies and funders do not allocate a budget for post-monitoring. Governments often lack information on planning and budgeting of resources for new construction or

[1] Misha T. Hutchings, Anurupa Dev, Meena Palaniappan, Veena Srinivasan, Nithya Ramanathan, and John Taylor mWASH: Mobile Phone Applications for the Water, Sanitation, and Hygiene Sector, 2012

[2] Brikké, F. and M. Bredero, 2003. Linking Technology Choice with Operation and Maintenance in the Context of Community Water Supply and Sanitation. Reference Document for Planners and Project Staff. Geneva: WHO and IRC.

[3] Mackintosh, G., and Colvin, C. (2003). Failure of rural schemes in South Africa to provide potable water. Environ. Geo. 44, 101.

[4] Haysom, A. (2006). A Study of the Factors Affecting Sustainability of Rural Water Supplies in Tanzania. Bedfordshire, UK: Cranfield University, p. 54.

[5] MoWR, 2007. Water Sector Development Program (WSDP) Reports. Addis Ababa: MoWR.

[6] Debela, T.H., (2013) Monitoring Water Supplies and Sanitation in Ethiopia. Addis Ababa: Ethiopian Ministry of Water and Energy

[7] UNDP Water Governance Facility Stockholm International Water Institute, SEPTEMBER 2014

[8] UNDP Water Governance Facility. 2009. "Issue Sheet No. 4. Water and Sanitation Governance." Accessed April 9, 2012

[9] WaterAid. 2010. "WaterPoint Mapping. Methodology." Accessed April 9, 2012

rehabilitation of facilities. Therefore, in the implementation of water supply all stakeholders lack information on better implementation of the facility and on ensuring the sustainability of its service. Collecting, aggregating, and analyzing data from remote regions and making the data available in a transparent way can help identify where investments are most urgently needed and can improve the long-term project monitoring.

To realize this, CARE in collaboration with the government conducted a water inventory using the information and communication technology application called mWater in East and West Belesa. The objective of the water inventory was to give baseline information on current water supply schemes status and evaluate sustainability of the water supply systems.

This assessment was conducted in the framework of SWEEP, a project supported by the Austrian Development Agency (ADA), with funds from the Austrian Development Cooperation (ADC).

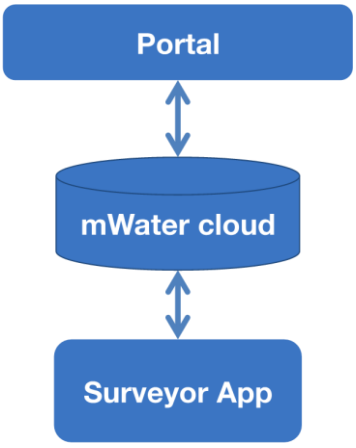
II. Materials and Methods

a) Description of study area

East and West Belesa are located in the northwestern part of Ethiopia in the Amhara regional state of central Gondar. The livelihood of the community depends on crop production and livestock rearing. Both of the woredas are located in the Tekeze basin, which is categorized under arid agro-climatic zones. Both woredas have low annual rainfall and poor surface and ground water potential. West Belesa has better groundwater and surface water potential as compared to East Belesa. On average, 55% of the two woreda communities access water from unprotected springs and rivers. Due to frequent drought because of low and erratic rainfall, water rationing from November to June is common, particularly for East Belesa woreda.

b) Data collection and analysis

Due to limited information on all existing schemes, this cross-sectional survey covered the whole water supply schemes in both woredas from July 15-25th, 2018. Eighteen government staffs were engaged in data collection. Data collection was done using the mWater application. The mWater platform/application helps reduce the probability of errors, saves time and money and improves data quality. The mWater tool has three components, which includes the portal, survey and mWater cloud. The Portal is a website that allows managers and administrators to access data on the mWater Server. The Server also communicates with the two mWater apps, Surveyor and Mapper. There is an automatic back-up of all the data to the Server and any updates from other users are downloaded to their device. The Portal is intended to be used with an internet connection on a desktop or laptop computer but also works on smartphones or tablets and enables its user to record data at field level either offline or online. Finally, the mWater cloud is a server which stores the collected data and connects the survey's results to portal parts of the mWater tools (Figure 1).



III. Findings

a) General-distribution and coverage

The inventory result revealed that 1,168 water schemes were constructed so far in both woredas (627 schemes in East Belesa and 539 schemes in West Belesa). The water systems are use publically by the community (96.7%), by public institutions such as schools, health facilities and farmers training centers (1.54%) and privately by individual households (1.8%). The inventory result also showed that about 26.5% of the population have access to protected water sources from currently functional sources - 35% and 22% for East and west Belesa respectively. The current coverage for the SWEEP intervention kebeles (19.7%) is lower than the entire woredas's coverage. Moreover the coverage is higher in East Belesa (21%) compared to West Belesa (15%).

Table 1: Access to protected water source by intervention kebeles

Kebele	Kebele population	# people access to protected water	% access to protected water source	Woreda
Aderarua	5428	0	0%	East Belesa
Akita	5888	350	6%	
Arba Tseguar	3963	175	4%	
Bursa	5714	3675	64%	
Chamakorach	5039	1575	31%	

Denegora	6058	4375	72%	
Hamusit	11166	1575	14%	
Tatarwa	5421	700	13%	
Tili	6597	1400	21%	
Average, East Belesa	**55274**	**13825**	**21%**	
Diquana	6246	1575	25%	West Belesa
Gabzi	5322	1750	33%	
Gulana	7431	1400	19%	
Jandab	6288	350	6%	
Kalay	5259	1225	23%	
Menti	8397	1050	13%	
Shura	7258	700	10%	
Tala	6510	525	8%	
Wareb	6345	350	6%	
Wurara	3957	525	13%	
Average , West Belesa	**63013**	**9,450**	**15%**	
Average for all intervention Kebeles	**118287**	**23275**	**19.7%**	

b) Institutional water schemes

The survey results revealed that only 18 (1.54%) water systems are located in public institutions such as schools (10), health institutions and farmer training centers. Hand dug wells fitted with afridev hand pumps are the main source of water (66.7%) and the rest use rainwater harvesting and springs (Table 1). Only 55.6% of the schemes were functional and the rest were either abandoned (16.5%) or non-functional (27.8%) (Table 2). Generally, more than 93% of public institutions/schools do not have access to protected water sources.

Table 2: Water scheme distribution by source type, 2018

Type of technology/source	East Belesa	West Belesa	Total
Hand dug well	3	9	12
Rain water harvesting	3		3
Shallow Drilled well		1	1
spot spring development	1	1	2
Total	7	11	18

Table 3: Status of institutional water schemes, 2018[10]

Current status	East Belesa	West Belesa	Grand Total	Rate (%)
Abandoned		3	3	16.7%
Functional	6	4	10	55.6%
Nonfunctional	1	4	5	27.8%
Total	7	11	18	

c) *Community and private water supply schemes*

From the total 1168 water schemes, 1149 (98.4%) had been constructed for community and individual households. The main source of water for both area comes from shallow ground water (78%), either hand or machine drilled, and the remaining sources are springs. The main water drawing mechanism in both area is the afridev hand pump (76%) and the remaining are gravity (21%), rope pumps (1.7%) and submersible pumps (1.3%). Moreover, East Belesa has better potential with spring sources than west Belesa, whereas West Belesa is relatively richer in shallow ground water than East Belesa (figure 2).

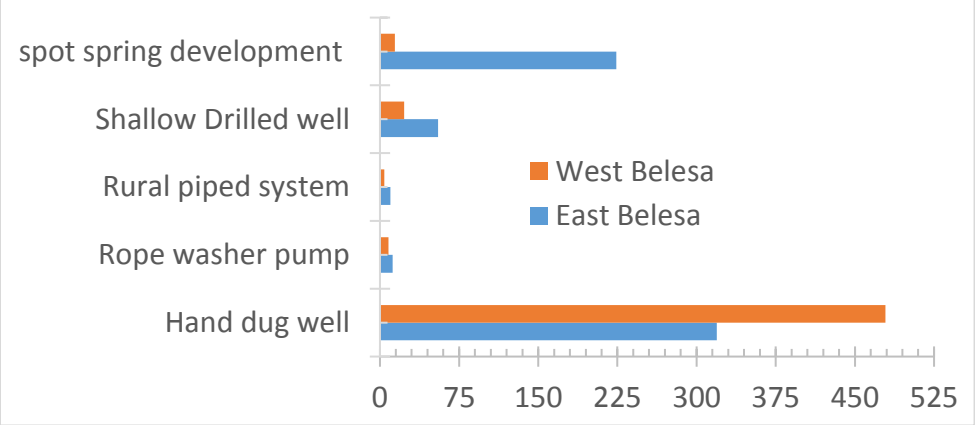


Figure 1: Existing source and Technology type, 2018

As indicated figure 3 below, nearly 90% of the total schemes were constructed in the last 10 years starting from 2009 and the remaining had been built before that. The number of schemes constructed significantly increased in 2015-2016 but also decreased in 2017 and 2018. Therefore, the construction trend is not generally predictable and it does not seem that the government has a long-term tangible plan for construction (Figure 4). Rather, it seems that the construction has been done randomly based on budget availability. This shows the need for the Government to develop a long-term water provision plan with an indicative annual budget.

[10] Functional: getting water at any time, with the needed amount; partially functional: getting water intermittently-in terms of both time and amount; and non-functional: inability to get water

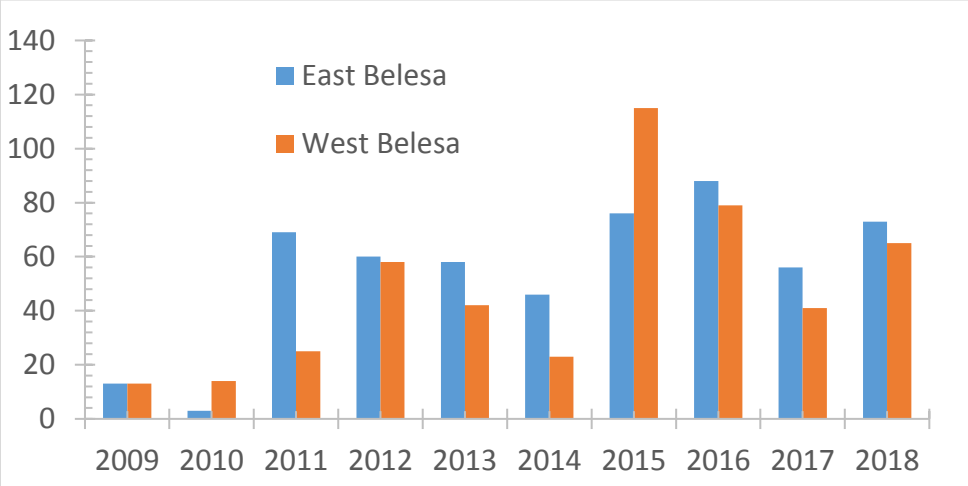
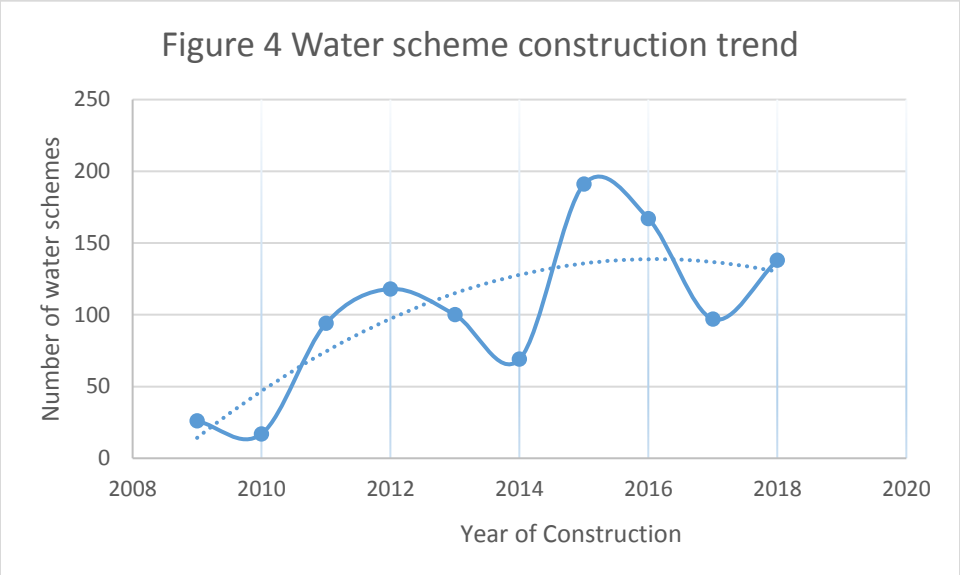
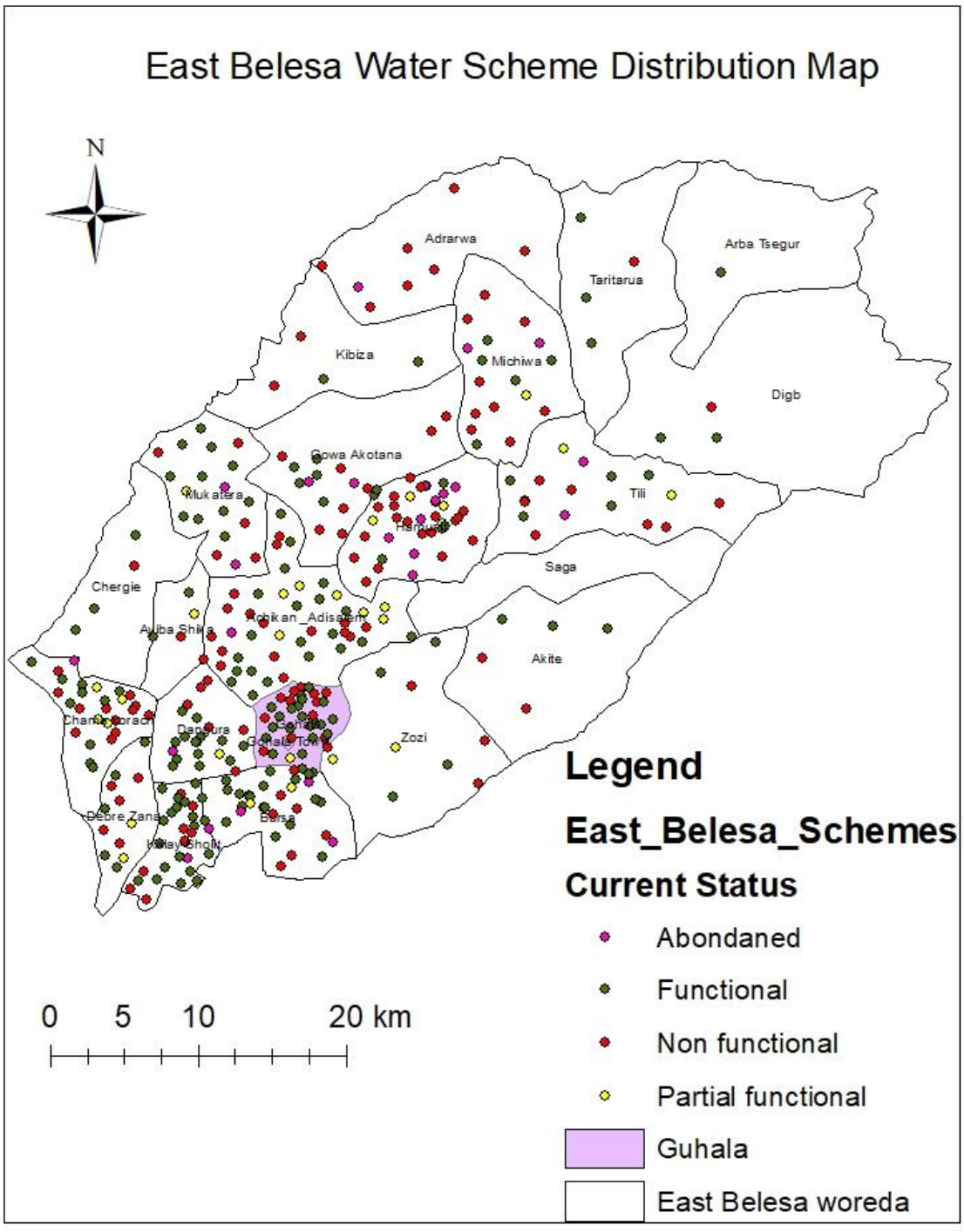


Figure 2 construction of water schemes per woreda per year



The scheme distribution map (figure 5) shows that most of the water schemes are concentrated around limited areas, especially near the woreda towns. And as the distance increases from the woreda center, access to protected water sources dramatically decreasedsand in some cases reach zero/near to zero, which is the case for Sega, Arbatsigua and Adrarwa kebeles in East Belesa and Koza, Sami, Shura, Ashakule and Fakiki kebeles in West Besela woredas (see maps below).


East Belesa Water Scheme Distribution Map
N
Adrarwa
Taritarua
Arba Tsegur
Kibiza
Michiwa
Digb
Gowa Akotana
Mukatera
Tili
Saga
Chergie
Akite
Zozi
Debre Zana
Bersa
0 5 10 20 km
Legend
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Current Status
Abondaned
Functional
Non functional
Partial functional
Guhala
East Belesa woreda

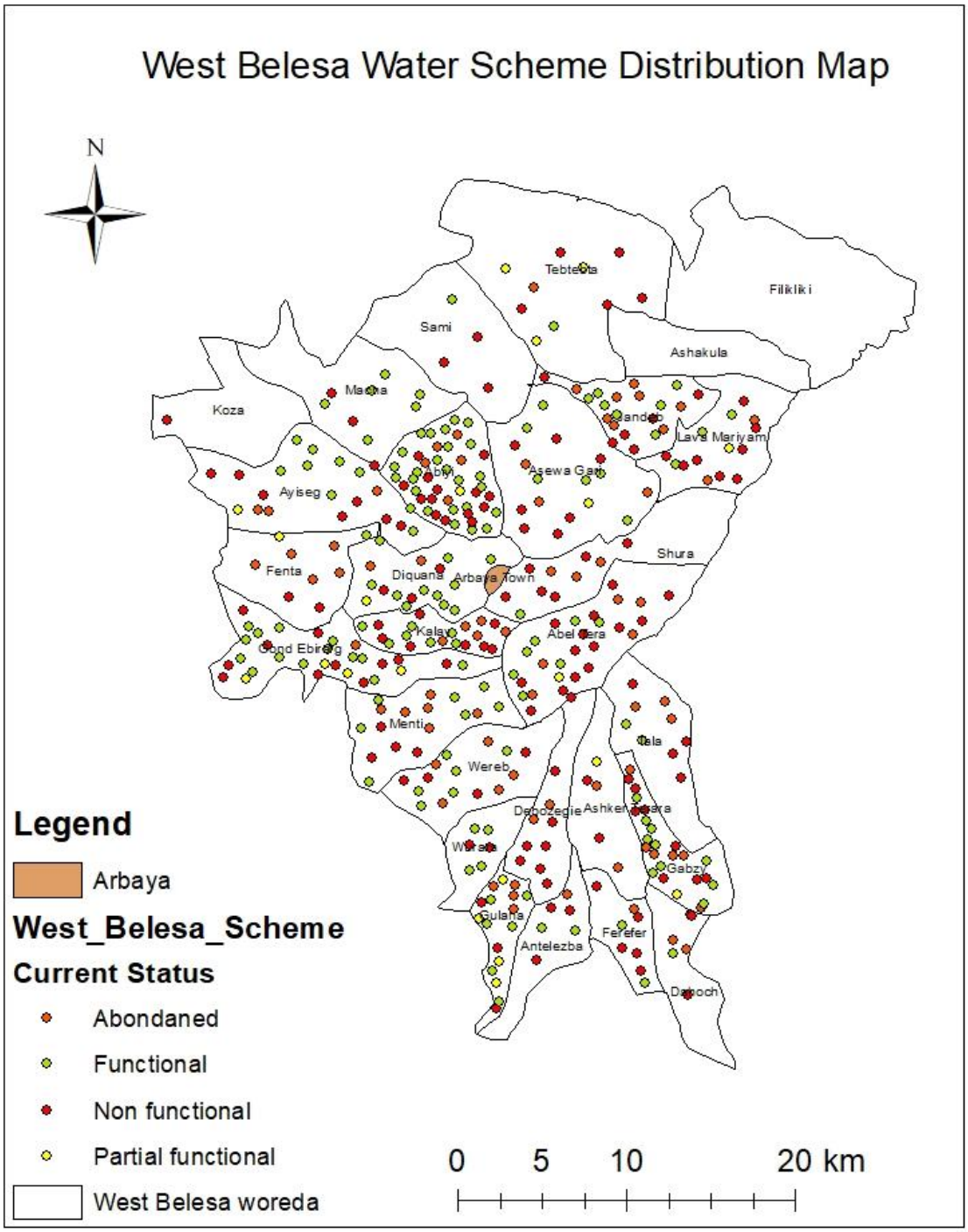


Figure 5: Water scheme distribution by kebele and status for both woreda

As indicated below (Figure 6), 40.8%, 38.8%, 6.8% and 13.6% of the water schemes were functional, non-functional, partially functional and abandoned respectively during the time of the assessment. The functionality for East Belesa (44%) is relatively better than in West Belesa (36%). The functionality rate for SWEEP intervention kebeles is much lower as compared to their respective woredas, that is 25% and 36% for East and West Belesa intervention kebeles.

The functionality of schemes constructed before 2017 ranges from 18% (2010) to 38% (2011) and 53% and 86% for 2017 and 2018 respectively (figure 7). The findings revealed that about 64%, 47% and 14% of water schemes constructed for the last three recent years (2016, 2017 and 2018 respectively) are nonfunctional today.

The major reasons identified for the schemes' failures included poor management (69%), poor construction quality (22%), water shortage (5%) and natural factors (4%). This finding makes it clear that improving community and government capacity development in water scheme management and administration could improve water system functionality and effectiveness to a great extent. The study also revealed that about 86% of currently non-functional water schemes are repairable.

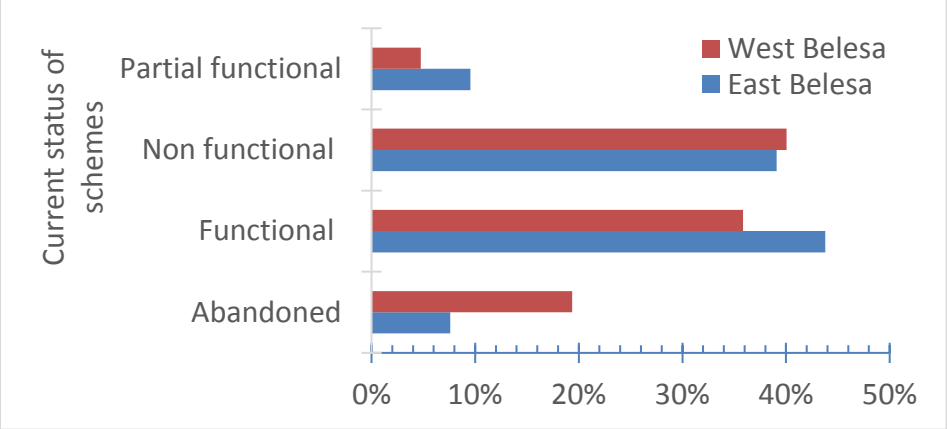
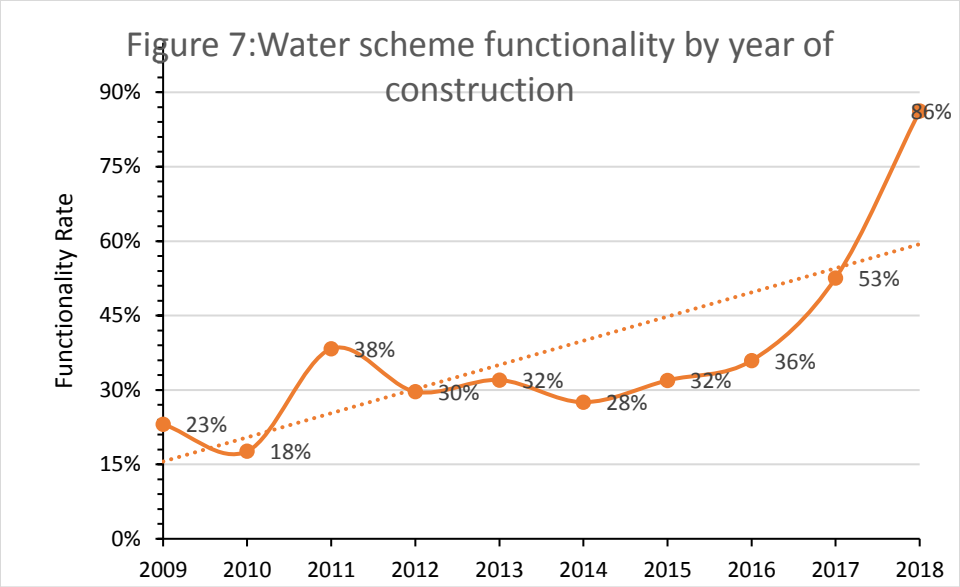


Figure 6: Water scheme status by woreda



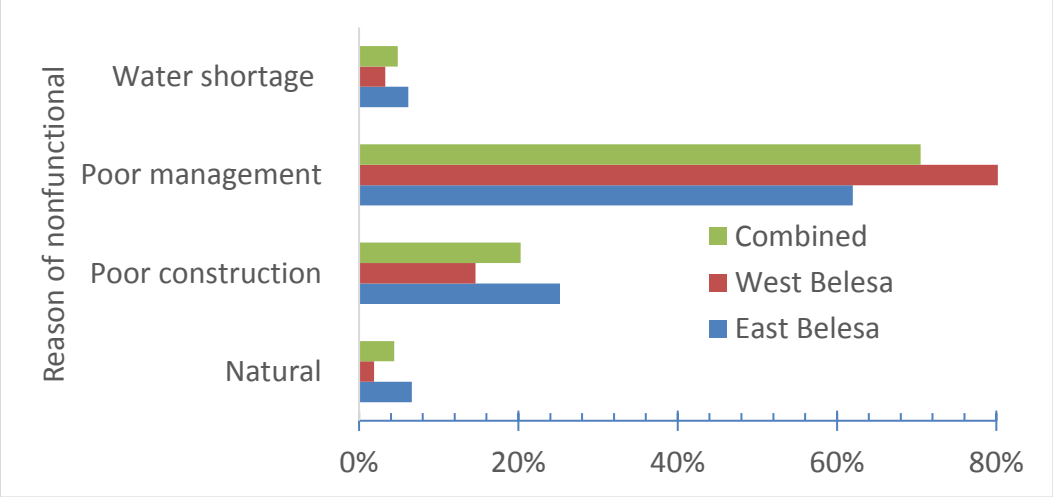


Figure 8: Reason for non-functionality

The construction of all water schemes was followed by the establishment of WASH committees, but only 15% were properly functioning at the time of the survey. The remaining WASHCos are either partially functioning (26%) or nonfunctional (59%) - see figure-9. From the total WASHCos only 26% had an “operation and maintenance” budget, of which about 51% had less than ETB 1000 available per year- figure 10 & 11. The budget availability status is relatively better for east Belesa (35%) than West Belesa (17%). This may be a reason why a greater number of water schemes are non-functional in West Belesa.

Preventive maintenance is not only key to reduce non-functionality of the water schemes but also contributes to reducing unplanned repair and maintenance costs and extended time for rehabilitation. According to the survey's results, only 8% of the WASH committees undertook regular maintenance service for their respective water schemes.

Finally, the survey showed that the WASHCos in general are not well organized. Of the total WASHCos, only 3% had bylaws and only 5% hold regular meetings. In addition, the capacity of the committees was found to be very weak- only 20% received capacity training at the time of their establishment and only 9% had trained pump attendants/caretakers, of which only 6% had the capacity to maintain the water schemes.

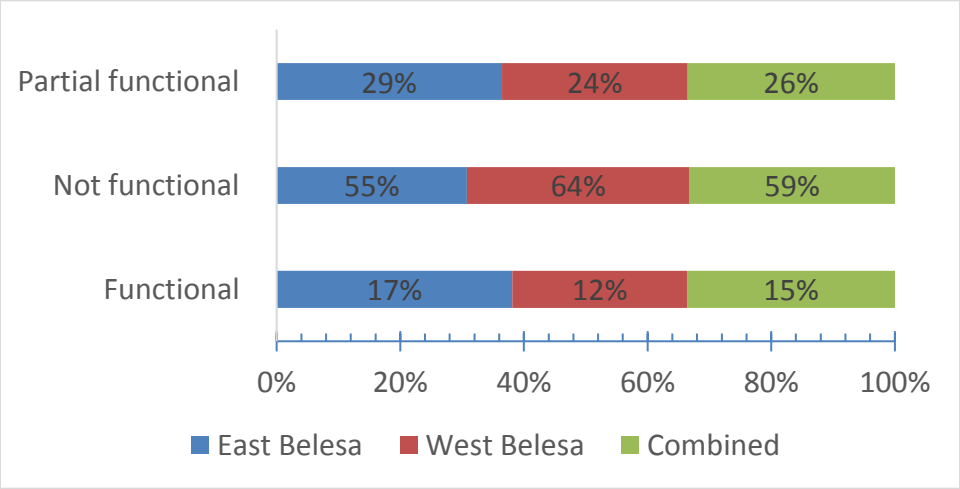


Figure 9: WASHCo status by woreda, 2018

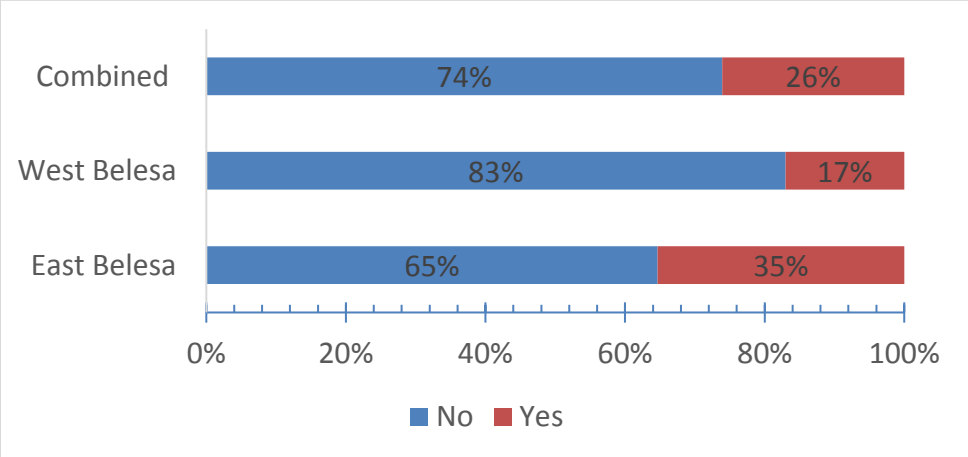


Figure 10: Operation and maintenance budget status by woreda, 2018

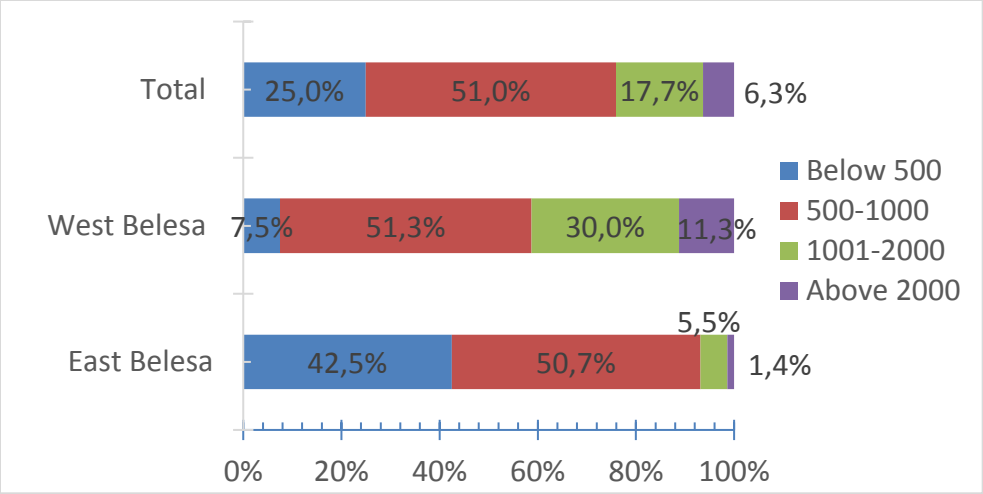


Figure 11: Available budget (ETB) status by woreda

Table 4: Water supply scheme management committee, overall sanitary condition and upstream watershed of constructed water schemes in East and West Belesa in 2018.

List of Variable	Response	East Belesa	West Belesa	Total	Rate
Has there been preventative maintenance carried out in the last year?	No	566	488	1054	92%
	Yes	55	40	95	8%
Does the WASHco have bylaws i.e. clear rules and procedures that are known and updated as required?	No	592	518	1110	97%
	Yes	29	10	39	3%
Does the WASHco conduct regular meetings?	No	589	506	1095	95%
	Yes	32	22	54	5%
Did the WASHco management receive training?	No	426	492	918	80%
	Yes	195	36	231	20%
Does the water scheme have a trained caretaker attached to it?	No	555	493	1048	91%
	Yes	66	35	101	9%
Does the caretaker have the capacity to maintain the scheme?	No	525	419	944	82%
	Yes	32	36	68	6%
	do not know	64	73	137	12%
Overall scheme sanitary condition	Bad	146	203	349	30%
	Fair	254	251	505	44%
	Good	221	74	295	26%
Is your water treated with chlorine	no	197	217	414	36%
	Yes	424	311	735	64%

Is the watershed above the scheme protected and vegetated?	No	440	444	884	77%
	Yes	181	84	265	23%
Does scheme serve for other purpose?	No	540	434	974	85%
	Yes	81	94	175	15%

To ensure water quality at source level, periodic water source treatment and proper protection of the source from any pollutants are necessary. However the sanitary condition of about 74% of the water schemes are not good and 77% are highly exposed to flood and pollutants- areas above the source are degraded and no conservation measures. The practice of treating sources with chlorine is good (64%) even though consistency is a problem. Regarding the frequency of treatment, 70% of the schemes had been treated within the last three months. In fact, up to 22% had been treated within the last 3-6 months interval, 3% of them within 6-9 months, 4% within 9 month- 1year and the remaining 1% of schemes treated above the year (Figure 10).

The overall sanitary condition of the water supply schemes was assessed and categorized into three categories, namely (1) “good” which includes having a drainage system, fence, and diverting ditch; (2) “fair”, lack either of drainage system, fence and/or diverting ditch;(3) “bad” with no fence and inadequate drainage systems and where splash water may stagnate. Based on above classification, only 26% of schemes are categorized as “good”, 44% were categorized as “fair” and 30% as “bad” (Table 4).

Finally, to maximize the utilization of water supply schemes, the government policy clearly states that water resources should be used for domestic *and* productive purposes. However, in this regard, only 15% of the schemes are serving for multiple purpose in addition to domestic water uses (Table 4).

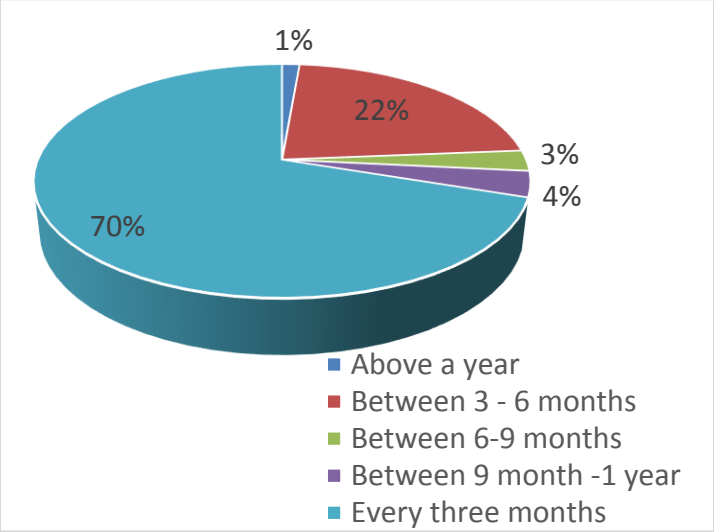


Figure 32: Water treatment frequency in East and West Belesa in 2018

IV. Conclusions and Recommendations

The following are some of the important conclusions drawn from the detail analysis of assessment results:

- The use of mWater application and/or similar softwares for such type of assessment not only save time ,energy and money but also improve data quality and long term information management;
- Government and community water scheme management and monitoring system is below the usual standard as compared to other parts of the region particularly other areas where CARE is currently operational;
- The construction quality, including initial site selection and required monitoring, is very low in both woredas and keeps getting worse the further away the sources are from the woreda centers;
- The operation and maintenance budget is almost non-existent for most schemes; the communities' capacity to manage and operate water systems is weak; and no system for operation maintenance and ensuring the supply of spare parts is in place;
- The water scheme distribution among kebeles is unfair- mostly concentrated around the woreda centers;
- The sanitary condition of water schemes and water quality needs to be improved;
- The Government is aware and understands the severity of the actual situation, which is a good prerequisite to improve the situation;

Recommendations from Survey Team

Strategies	Importance	Challenges to current strategies	Recommendation
Rehabilitation of nonfunctional water schemes	Increase water access	Lack/shortage of spare parts. Unavailable of maintenance budget. Poor scheme management.	Reinstate WASH committee and support bylaw development including use of water fee collection Support rehabilitation of non-functional schemes Support enhancement of spare part supply and private sector involvement Improve community scheme management capacity and structure
Water treatment	Improve quality of water	Lack/limited resources on water treatment chemicals Limited human resources for water treatment at woreda level Lack awareness of the community on its importance	Strengthen water quality treatment at local level through discussion with health extension workers Improve knowledge on water treatment alternative (available treatment chemicals at woreda level) Enhance availability of household level water treatment at local level through job creation Incorporate/strengthen water treatment systems at local level and available water treatment chemicals in the project
Improve water scheme management	Improve functionality, reliability and quality	Lack of knowledge on scheme management Poor institutional set up at local level/systems to manage schemes like inventory No proper community system established	Establish /strengthen WASHcos Train WASHcos Facilitate WASHco legalization
Improve maintenance skill at local level	Improve functionality	Lack of trained person at scheme level Lack of hand tools at scheme level	Trained care taker at scheme level to manage minor maintenance Available hand tools at scheme level
Improve monitoring and evaluation systems of water schemes	Improve functionality and coverage	Limited budget allocated by the government for monitoring and evaluation Knowledge gaps on water inventory systems	Train government staffs on monitoring and evaluation Conduct monitoring and evaluation Share information to government