Strengthening capacities of selected

town water utilities

in Ethiopia 2023–2025

People in Need

Bridging the gaps in:

- Institutional arrangements
- Financial management systems
- Workforce and capacity for operation and maintenance
- Management of non-revenue water and leakage
- Information flow, data management and monitoring systems
- Coordination and collaboration among stakeholders

Despite abundant annual rainfall-rich aquifers, improper source utilization, poor management, excessive groundwater extraction, and contamination of freshwater sources have contributed to economic water scarcity in Ethiopia.

To support the increased demand of the rapidly growing population for functional water services in the country, People in Need Ethiopia has launched the second phase of its project focusing on assistance to 9 town water utilities in 2023.

The first phase was implemented in 2019 – 2021 and showed some promising trends, for example, the self-sustaining financial situation of utilities increased from 35% to over 60% in 3 years.

In the context of intensifying climate change, the ultimate goal of the program is balancing an increasing water demand with constant water availability, i.e. optimized use of limited water resources. We believe that strengthening the professional capacities of selected urban water utilities in sustainable water management systems leads to water conservation and efficient use. The program also aims to increase utilities´ accountability and transparency, and streamline communication between the different actors involved in the management of water supply systems.

Project activities center on training, experience sharing, solid data collection and analysis, as well as strengthening linkages and cooperation. People-centred approach is ensured by the establishment of customer forums linked to functioning water boards.

Structure of the project

Results

- **Increased professional capacities**
- **Increased transparency, accountability, sense of ownership, and communication via functional water governance structures in targeted towns.**

Indicators

Indicator 1: Improved utility performance (measured by scoring matrix KPIs)

Utility KPIs:

- Proportion of population served
- Average hours of water supply
- Water quality compliance
- Metering ratio - connections with operating water meters
- Non-Revenue Water
- Revenue collection efficiency
- Proportion of operational expenses to operational revenue
- Personnel expenditure (to total revenue)
- Staffing level
- Customer satisfaction

Utility training modules

1. Understanding policies, strategies
2. Strategic planning
3. HR management
4. Business planning + accounting + tariff setting + billing
5. Asset management
6. GIS and pasportisation + database management
7. NRW + leak detection (active leakage control)
8. O&M (Water safety plans (WSP)
9. Water quality
10. Customer relations + pro-poor approach

Indicator 2: Customer satisfaction increase

Satisfaction with

1. Services provided (Water quantity and quality)
2. Request responsiveness (time and content)
3. Information provided (i.e. tariff composition, investment plans + works on the network…)

Needs assessment results

Nine towns in southern regions (former SNNP and Oromia) take part in the project. The population of towns ranges from 30 000 to 90 000 inhabitants. Even though general access to water reaches 65–70%, only 40 % of the total population has access to adequate water services provided by utilities. This means that as many as 30% of the towns' population accesses water from alternative sources not provided by the utility which presents several risks for the consumer, such as water quality not being ensured.

The water distribution network combines household connections (75%) and public water collection places (35%). Revenue collection figures reveal gaps in collection efficiency from contracted consumers (private houses or business), as opposed to collection at public water points, where collection rate is almost 100%. This is because people collecting water from water points pay attendants directly whereas paper based invoicing faces many procedural gaps. This is despite the fact, that water collected at public water points is more expensive than water distributed by the pipeline network. It is a paradox situation, as water must be manually carried to homes and is prone to contamination during transportation and storage.

Even though utilities are able to keep limited track of the financial flow and balance (income vs expenditure) via a single entry accounting system, there are huge gaps in measuring and recording water production and distribution rates. Due to a lack of functional water metering devices, utilities only estimate production and consumption volumes. The nonexistence of such information raises governance questions about transparency and accountability of utilities for the public. Furthermore, the lack of data does not allow for strategic planning for future demand and plans for appropriate supply solutions. Tariff levels are politicized and, along with high staff turnover present highest threats to proper functionality and operability of the utilities

Financial figures show that more than 50% of revenues are allocated to salaries, whereas operation and maintenance fund constitutes only 10% of revenues and leave little funds for any investment in infrastructure.

Consequently, utilities fulfil less than 40% key performance indicators[1] and only 55% of customers are satisfied with the services provided.

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1 KPIs measure parameters such as proportion of population served, levels of intermittent supply or share of non revenue Water.

Greenhouse gas emissions provide a key indicator for optimizing water delivery: a case study from southern Ethiopia

Greenhouse gas emissions should become a part of utilities' key performance indicators. Energy used to produce water affects carbon footprint of utilities. The data from studies indicate that water scarce regions use more energy to abstract, treat and distribute water. Rising water demand means rising energy consumption. Efficient energy consumption can be achieved by optimizing water delivery and reduction of non-revenue water.

Energy used to produce water affects carbon footprint of utilities. Efficient energy consumption can be achieved by optimizing water delivery and reduction of non-revenue water. The cleanliest energy is the one which is not produced and reduction of Non-Revenue Water (NRW) will reduce pressure on increased water production. Reduction of energy used for abstraction results in lower greenhouse gases (GHG) production and contribute to climate change

Although the application of the Water-Energy Nexus concept and its influencing factors for water supply in utilities in Africa lacks sufficient research, several studies show data of energy consumption calculated amount of kWh per 1m^3 of abstracted water. In Kenya for example, nation-wide study on energy use for drinking water supply estimates 1.1–2.4 kWh/m^3 while utilities in South Africa use between 0.30 to 0.47 KWh.[1] The study results from China showed that the energy use per cubic unit of water supply in Beijing increased from 1.80 kWh to 3.65 kWh from 1979 to 2017.[2] Whereas Stillwell et al.[3] estimated that in the United States producing 1 m^3 of surface water requires 0.06 kWh of energy and producing the same amount of groundwater from 40 m and 120 m depth requires 0.14 kWh and 0.5 kWh, respectively. The data from studies indicate that water scarce regions use more energy to abstract, treat and distribute water. Rising water demand means rising energy needs in unstable supply environment and leads to intermittent water delivery.

A comparison study to assess energy consumption was conducted in two out of 9 utilities targeted by the project. The objective was to assess the amount of GHG produced by water production and (in long term) propose steps to increase effectiveness of water services and energy savings.

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1 Pauline Macharia, Norbert Kreuzinger and Nzula Kitaka: Applying the Water-Energy Nexus for Water Supply – A Diagnostic Review on Energy Use for Water Provision in Africa (2020)

2 Jiahong Liua,c, Dong Wanga,b, Chenyao Xianga, Lin Xiaa, Kun Zhanga,b, Weiwei Shaoa, Qinghua Luanb: Assessment of the Energy Use for Water Supply in Beijing, (Applied Energy Symposium and Forum 2018: Low carbon cities and urban energy systems, 5–7 June 2018, Shanghai, China)

3 Stillwell A S, King C W, Webber M E. Desalination and Long-Haul Water Transfer as a Water Supply for Dallas, Texas: A Case Study of the Energy-Water Nexus in Texas[C] (2010)

Halaba Kulito town and Shone population is about 90000, and 67000 people respectively. Both utilities struggle with reliable and systematic data collection and management. Energy is used for abstraction only. There is no raw water treatment (water is pumped directly to reservoirs and further transported to distribution system and end users) and neither of the towns has sewerage system. Information about water transportation/distribution volumes to the end user is not known.

An operational indicator was set in kWh/m^3 for water abstraction. Calculations of energy consumption confirmed that it takes between 1.42–1.96 kWh to abstract 1m^3 of water with average total dynamic head (TDH) of 90–180m. The figure confirms the assumption that decentralised water supply in African small cities exceeds average water production energy needs. In order to get information about GHG production, Energy Performance and Carbon Emissions Assessment and Monitoring Tool (ECAM)[4] was used. The table below shows set baseline GHG production benchmark of the two targeted utilities and the project has an ambition to reduce utilities´ CO_2 production.

Water utility	Population served	Service coverage in %	Monthly volume produced in m^3	Energy consumed in kWh	kWh/1m^3	Monthly GHG emissions kg CO_2	NRW ratio in %
Shone	24 120	36.00	12 550	23 850	1.96	1 873	15.95*
Halaba	43 250	49.49	76 350	108 814	1.42	2 278	1.15*

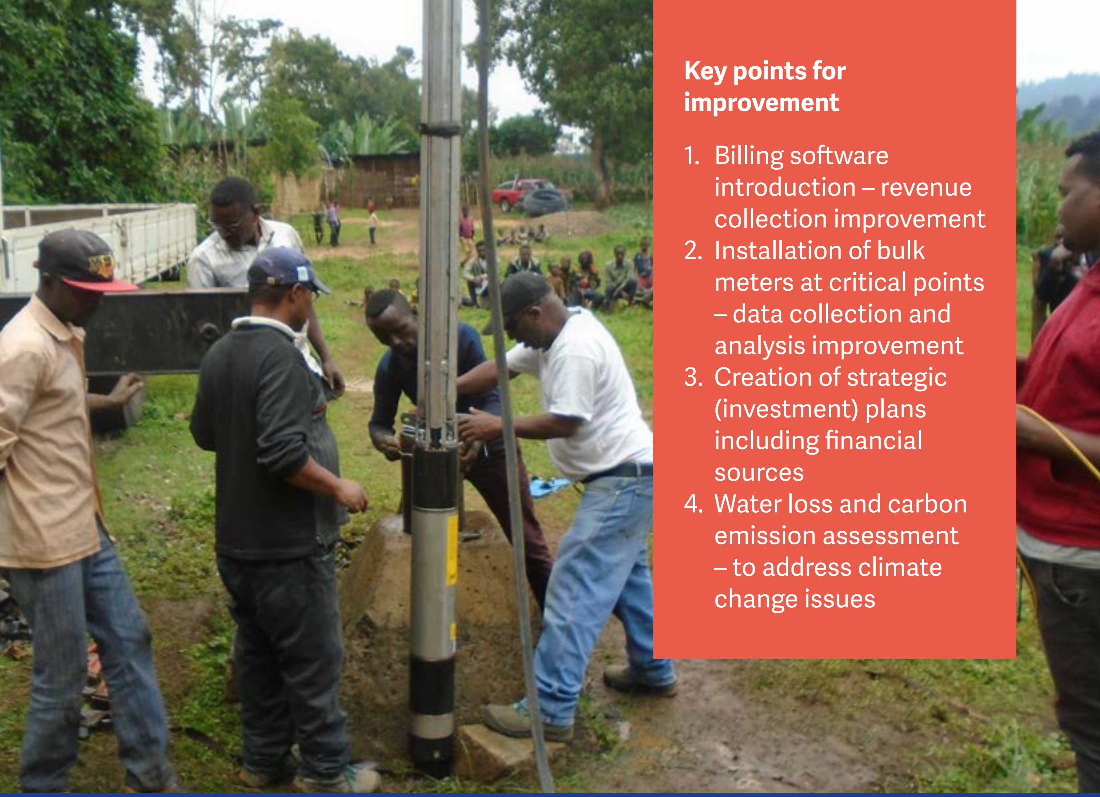
*Reliable data not available

Conclusion and discussion

Conducted study confirms the importance of water-energy-carbon nexus. Linking energy use and associated costs to water losses can inform water utilities on how much energy is lost with NRW and the revenue loss at each water supply process. Consequently, share of NRW is proportionally equal to the amount of energy that is wasted and reduction of NRW will reduce emissions of GHG. Energy use can be included in utility KPIs and set as a benchmark for optimisation of water production costs.

Recommendations for further research include addressing the questions: how to increase service to the population while keeping GHG emissions on similar levels? What are the priority actions: replacing certain ineffective energy sources (especially diesel generators) with clean energy source (principle of build-back-better), reduction of NRW or focus on increased abstraction while keeping in mind sustainable use of available water resources?

4 https://climatesmartwater.org/ecam



Key points for improvement

1. Billing software introduction – revenue collection improvement
2. Installation of bulk meters at critical points – data collection and analysis improvement
3. Creation of strategic (investment) plans including financial sources
4. Water loss and carbon emission assessment – to address climate change issues

People in Need is a Czech non-governmental organisation (NGO) that has been providing aid in troubled regions and supporting human rights since 1992. Since then, People in Need has grown into one of the largest NGOs in Central Europe. Today, its work focuses on humanitarian and development aid, advocacy for human rights and democratic freedom, field social work, and education, awareness and information.

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