

Accessing Sustainability of Water Supply Cooperatives as Sustainable Options for Rural Community-Managed Water Supply in Kenya

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Abstract: *Water access in rural Kenya, and generally in Africa remains low despite the evidence of its importance for livelihood and economic development of all its nations' societies. Sustainability challenges of rural community-managed water supplies leading to high failure rates of up to 60% have been a major deterrent to closing this gap on water access.*

The aim of this study was to establish the sustainability of water supply cooperatives as suitable alternatives for rural community managed water supplies. As such, the study focused on key informant interviews on resource persons in the water services and cooperatives sectors and a survey of seven water supply cooperatives in Kenya to establish their sustainability by applying sustainability indicators that covered the broader economic, technical, social and environmental objectives of sustainability. The selection of the water supply cooperatives narrowed to only those that are registered as cooperatives and thus operating within the universally set cooperative principles.

The study established that water supply cooperatives in their very operation present attributes suitable to establish economically, technically, environmentally and socially sustainable water service provision in Kenya. Up scaling of the water supply cooperatives' operational model to rural community-managed water supplies with mitigation of the challenges would propel achievement of Kenya's national goals on water access.

Key words: *water supply cooperatives, rural water supply, water sustainability indicators*

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I. Introduction

This study focused on sustainability of water supply cooperatives as a suitable alternative for rural water service provision considering the sustainability challenges faced especially by rural water supplies in Kenya and generally in Africa.

Water is one of the most valuable component of life and development. The importance of water has always been self-evident for human beings; its uses are so diverse including drinking and cooking, washing, irrigation, fishing, recreation, industry, transportation and a myriad other uses. In antiquity, technology related to water constituted a central part of craftsmanship. Complicated irrigation systems were in some areas the genesis of entire civilizations. Shipbuilding was the basis of merchant fleets, fishing fleets, and navies[1]. Administrative centers and big cities, such as Mombasa, Kisumu, Naivasha in Kenya and others built around water bodies continue to flourish largely because of the waters. Access to water resources is therefore critical for livelihoods and for economic development of all nations' societies.

While this is so, the proportion of the rural population with access to improved drinking water remains low. In 2015, the rural water access in Kenya was at 57% with the rest relying on other unimproved water sources and surface water[2]. The Water Act, 2016 of Kenya [3] vests the responsibility of establishing water service providers to county governments and for rural areas considered not commercially viable, to put in place measures that include development of point sources, small-scale pipe systems, and standpipes that meet standards set by the Water Services Regulatory Board. Community associations, public benefits organizations or private persons under a contract with the county government will manage the water services [4].

Small-scale, community-formed and managed water service providers (WSPs) have however been dominating in that space by provision of water services for the majority of the rural population of Kenya with over seven hundred and sixty nine of them spread in rural areas. This is based on thesis findings on contribution of water supply cooperatives to sustainable water supply in Kenya [5]. These rural WSPs are however largely unsustainable reporting high failure rate.

1.1 Sustainability issues of rural water service providers in Kenya

Studies conducted through many projects in Kenya and Africa wide indicate that many projects have been failing. A water audit of 48 piped water systems in Kitui County, Kenya that had been developed since

2006 indicated that 55% of them were functional and 10% partly functional [6]– 45% were either not functional or partly functional. A study by Rural Water Supply Networks[7]indicates for instance a failure rate of 30% on hand pump projects in Kenya while the United Nations Joint Monitoring Programme estimates a failure rate for most water points in Africa at anywhere between 30-60%[7].

According to a 1998 study by Kenya Rainwater Association,the failures are attributed to lack of technical interventions by communities who do not have capacity to finance or repair faulty parts [8].

Other challenges to sustainability are with regard to governance. Governance issues hinder water service provision. Part of this is because the board of directors for the WSPs merely represent stakeholders and not shareholders as is common for a typical private company, potentially compromising accountability (Water and Sanitation Program, 2008). Then there is the challenge of non-reflective tariffs that inhibit cost recovery. Cost-reflective tariffs form the basis for the sustainability of the water services sector, allowing WSPs to sustainably operate and maintain their assets and enabling Water Service Boards to do asset development [9].In the case of Kitui County community water projects, there is low and variable revenue collection seventy five percent of which they spend on staff and fuel costs and fourteen percent on minor repairs[6].

1.2 Water supply cooperatives

Water supply cooperatives comprise of a group of community members or homesteads who, brought together by a common need for water e.g. domestic or irrigation water, join and register as a cooperative under the Cooperatives Act-these operate within universally set cooperative principles.

Several other models for management of rural water supplies exist, this study, however focused on such that have registered themselves as cooperatives and operate within the cooperative principles.

1.2.1 Governing Principles of Cooperatives

The main principles that govern cooperatives and thus water cooperatives include [10]:

- **Voluntary and Open Membership:** Cooperatives are voluntary organizations, open to all persons able to use their services and willing to accept the responsibilities that come with their membership.
- **Democratic Member Control:** Cooperatives are democratic organizations controlled by their members who make decisions and actively participate in setting their policies, serve as elected representatives, and have equal voting rights (one member, one vote).
- **Member Economic Participation:** Members contribute equitably to the capital of their cooperative while receiving limited compensation, if any, on capital subscribed as a condition of membership. At least part of that capital is typically the common property of the cooperative. The cooperative usually allocates surpluses to the development of the cooperative.
- **Autonomy and Independence:** Cooperatives are autonomous, self-help organizations controlled by their members.
- **Education, Training, and Information:** Cooperatives provide education and training for their members, their employees, managers and elected representatives so they can contribute effectively to the growth and development of their cooperatives.
- **Cooperation between Cooperatives:** Cooperatives work together through local, national, regional, and international structures.
- **Concern for Community:** The cooperatives' goal is the sustainable development of their member communities.

1.2.2 Sustainability in water supply

The water cooperative is considered as a sustainable development if its practices in water management are sustainable. Water sustainability is the dynamic state of water use and supply that meets today's needs without compromising the long-term capacity of the natural and human aspects of the water system to meet the needs of future generations [11]. This will include practices such as water conservation practices and water efficiency. Water conservation encompasses the strategies, policies and activities to manage fresh water as a sustainable resource to protect the water environment and to meet current and future human demand[12]. Water efficiency is reducing water wastage by measuring the amount of water required for a purpose and the amount of water used or delivered[13].

The concept of sustainable development was described by the 1987 Bruntland Commission Report as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [14] Sustainability is key in any current developments all over the world. It is a paradigm for thinking about the future that involves balancing of environmental, societal and economic considerations in the pursuit of improved quality of life. For example, a prosperous society relies on a healthy environment to provide food and resources, safe drinking water and clean air for its citizens. Sustainable development is the overarching paradigm of the United Nations[14].

1.2.3 Indicators of sustainability

In assessing sustainability of water supply cooperatives, indicators for economic viability, technical feasibility, social acceptability and environmental sustainability are considered. Table 1 indicates a compilation of indicators derived from documentation from Water and Sanitation Program of the World Bank [15], a technical report from The Nature Conservancy [16] and Water Services Regulatory Board service level indicators [17]

Table 1 Summary of sustainability indicators applied in the research

Parameter	Indicator	Description
Financial	• Cost reflective tariffs	Does the tariffs reflect the cost of operations and maintenance?
	• Growth in size of water users served	Is the number of water users growing to reflect growth in financial strength of the provider?
	• Strategic and financial planning	Will the financial planning enable achievement of the provider strategic plan? Does the cooperative appropriately plan for their finances?
	• Income diversification	Does the provider have diverse income sources to reduce its financial risks?
	• Sound administration and finance	Does the provider have sound accounting system and an active administration?
	• Own income generation	Does the provider carry out other activities to raise funds?
	• Cost recovery	How does the amount of money collected compare to the cost of operations and maintenance?
Technical	• Operations and maintenance planning (preventive, reactive, rehabilitation)	Does the provider plan for maintenance of the water supply infrastructure?
	• Personnel for O&M	Does the provider have personnel for O and M?
	• Training and capacity building for O and M personnel	Does the provider have trained O&M personnel?
Environmental	• Compliance to Kenya Water Resource Management Regulations	Does the provider have a water abstraction permit?
Social	• Coverage of service area	What is the percentage of people served in the providers assigned service area?
	• Drinking water quality	Does the provider supply water of stipulated quality?
	• Service hours	How many hours in a day does the provider supply water?
	• Billing of services	How many times does the provider take meter readings? How often does the provider issue water bills?
	• Customer contact	How does the provider relate with users?
	• Unannounced interruption of water supply	Does the provider give adequate notice before interruption of water supply?

II. Study Methodology

2.1. Inventory of water service providers in Kenya

The study involved establishing the number and proportion of water supply cooperatives in Kenya by first generating an inventory of water service providers with their registration details through data obtained from the Water Services Regulatory Board (WASREB) who receive information of all WSPs operating under the regional Water Service Boards and additional information from desk studies. Additionally, the study applied both quantitative and qualitative techniques including in-depth interviews and structured questionnaires.

2.1.1 In-depth interviews

In-depth interviews on resource persons representative of WASREB, who is the Government water sector regulator, the Cooperatives Directorate and a non-governmental organization, actors that are majorly involved in the water cooperative sector were conducted. The interviews were to answer the below listed questions;

- 1) The influence of cooperative organizational structure on sustainability of water service provision.
- 2) Whether the cooperative organization structure has served to improve sustainability and in what ways it has served.
- 3) The challenges facing water supply cooperatives

2.1.2 Structured questionnaires

The study measured Economic viability, Technical feasibility, Social Acceptability, and Environmental sustainability aspects of sustainability through indicators tabulated in Table 1.

Two sets of questionnaires were administered:

- 1) **Structured Questionnaire 1 (management committee):** This was administered to the management committees of the water supply cooperatives (Kiamumbi Water Trust, Kiruki-Kiende Farmers’ Cooperative Society and Rumwe Farmers’ Cooperative, Ena irrigation multi-purpose cooperative society, Nthamari/Gachichori Irrigation Water Cooperative Society Limited). It sought to establish economic viability and environmental sustainability of the water supply cooperatives. The information required for these two aspects would not be comprehensively available with the water users.
- 2) **Structured Questionnaire 2 (water users):** This was administered together with in depth interviews to water users who are the recipients of the water supply cooperative services, in Kiamumbi Water Trust, Ena Irrigation Cooperative Society and Rumwe Farmers’ Cooperative. The questionnaire sought to establish the how socially acceptable the cooperatives are as an aspect of sustainability.

2.2 Sample size selection

2.2.1 Number of Water supply cooperatives

The criteria of selection was to have domestic water supply cooperative, irrigation water supply cooperative, to have both large established and small, urban and rural locations and those facing failure.

Due to limited availability of information on existing water supply cooperatives or their locations, the research study sought to identify seven water supply cooperatives that fit in the above highlighted criteria. In addition, due to the homogeneity of operations of cooperatives as a result of the widely accepted and applied cooperative principles, and with the diversity of them selected based on the aforementioned criteria, the research satisfied the number of water supply cooperatives as representative in Kenya.

Table 2 shows a list of the sampled water supply cooperatives and their characteristics.

Table 2 List and characteristics of sampled water supply cooperatives

	Water Supply Cooperative	Characteristics
1	Kiamumbi Farmers Multipurpose Cooperative Society (Kiamumbi Water Trust)	<ul style="list-style-type: none"> i. Domestic water supply i. Established water supply with over 900 connections i. Ranked as best private water service provider (2014) by Water Services Regulatory Board v. Located in an urban area
2	Kiruki-Kiende Farmers’ Cooperative society	<ul style="list-style-type: none"> i. Irrigation water supply i. Located in a rural area
3	Ena Irrigation Cooperative Society	<ul style="list-style-type: none"> i. Irrigation water supply i. Located in a rural area
4	Nthamari/Gachichori Irrigation Water Cooperative Society Limited	<ul style="list-style-type: none"> i. Irrigation water supply i. Located in a rural area
5	Rumwe Farmers’ Cooperative	<ul style="list-style-type: none"> i. Domestic water supply i. Low number of connections (26) i. Located in a rural area
6	Ng’ati Farmers’ Cooperative	<ul style="list-style-type: none"> i. Domestic and livestock water supply i. Water project troubled by conflict among members i. Located in a rural area v. Has both pastoralist and farmer population v. Water supply accessible through a water booth next to their borehole. No water distribution system.
7	Christian Impact Mission (CIM)	<ul style="list-style-type: none"> i. Members construct water pans and acquire water tanks together i. Located in a rural area i. Groups created under CIM use cooperative principles but informally, they are not registered as cooperatives

2.3 Number of Water Users

The sample size selection for the in-depth interviews is based on Shari L. Dworkin [18] publication on Sample Size Policy for Qualitative Studies Using In-Depth Interviews that indicates as adequate a number of between five and fifty interviewees where the population being studied is homogenous or heterogeneous. This is the case with water users for the individual water supply cooperatives; the conditions are homogeneous for all water users.

Table 3: Sample size of water users interviewed

Water supply cooperative name	Location	Consumer connections (Number)	In depth interviews (Number)
Kiamumbi Farmers Multipurpose Cooperative Society (Kiamumbi Water Trust)	Nairobi	900 connections open for any applicant but 600 cooperative members most of whom are non-resident	20
Rumwe Farmers' Cooperative	Njoro	26	10
Ena Irrigation Cooperative Society	Embu	400	10

2.4 Data Analysis

Data collected through interviews and administering of questionnaires was first compiled and tabulated. Based on the sustainability indicators in Table 1, the performance of water supply cooperatives as indicated in the data was analyzed and discussed and an analysis of descriptive responses from the data performed.

III. Results And Discussions

3.1 Sustainability of water supply cooperatives

This section provides an analysis of the responses from key informant interviews and questionnaires administered to the management committees and water users from the selected water supply cooperatives categorized into the four aspects of sustainability: economic viability, technical feasibility, social acceptability and environmental sustainability.

3.1.1 Economic viability

The indicators for economic viability of water supply cooperatives were cost-reflective tariffs, growth in size of water users served, strategic and financial planning, income diversification and sound administration and finance. Five of six indicators of economic viability indicated that water supply cooperatives are economically viable.

Water supply cooperatives members agree upon tariffs that are cost reflective. This they often set based on the debts on loans that they need to repay and cost of operations and maintenance and adopt during annual general meetings. The water fees paid by water users therefore ensure sound operations and maintenance. The mechanisms for cost recovery make them viable WSPs; besides prompt payment of monthly water bills, members pay agreed extra fees to repay loans for water infrastructures. After completion of payment, the members have the water distribution system as capital investment and benefit from accrued interest and efficient water services.

The sampled water supply cooperatives also had financial and strategic plans which reflected high levels of organization and which has made the cooperatives attract financiers including banks and donors. The water supply cooperatives in Kenya are also established within larger cooperative societies that are engaged in additional forms of enterprise e.g. farming cooperatives, their incomes are therefore highly diversified. They have sound administration and financial management. However, possibilities for increasing number of water users are low since they design the systems for the initial contributing members with expansion not technically feasible. This came out in three of the five sampled water supply cooperatives.

3.1.2 Technical feasibility

The main parameters that the study tested to establish technical feasibility as an aspect of sustainability were presence of an operations and maintenance plan, personnel for operations and maintenance and training received on operations and maintenance for the personnel.

Two of the three indicators indicated attributes that affirm water supply cooperative's sustainability; water supply cooperatives employ personnel for operations and maintenance of the water supply systems, the personnel had all received technical training. However, only one of the five sampled had a scheduled maintenance schedule, many still maintaining reactive maintenance.

3.1.3 Social acceptability

The study applied parameters outlined in WASREB's service provision agreement to measure the social acceptability of water supply cooperatives. These included coverage of service area, drinking water quality, service hours, billing of services, customer contact and unannounced interruption of water supply

On social acceptability, the study established that services provided are acceptable in respect to service hours, billing of services, customer contact and announcement of interruption of water supply though unofficially. Water quality and cost of water services was however, a deterrent to their social sustainability but annual general meetings provided an avenue to discuss the challenges and to determine the solutions; the

members, who are also the customers, establish common understanding of the weaknesses in the system are therefore solve or tolerate them through the meetings.

Dominant issues of dissatisfaction to water users were the rising costs of operations and maintenance (which reflected directly in their tariffs), poor water quality and a WSP clustering strategy by the regulator. Electricity and treatment costs were the most outstanding expenses for the management committees while water quality and rising tariffs were the major issues raised by the water users. This makes the water supply cooperatives sustain themselves longer and resist collapse. Lack of this kind of system is also the cause of collapse of privately owned WSPs, water users will be quicker to disown and seek alternative WSPs where they are not owners.

Despite the dissatisfaction in above highlighted aspects of service provision by water supply cooperatives, the respondent water users expressed satisfaction in response on reporting of interrupted water supply and services from their offices.

3.1.4 Environmental sustainability

The key indicator for environmental sustainability was the compliance to Water Resources Management Authority's water rules requirement for water abstractors from natural water sources to obtain a water permit.

The water supply cooperatives comply with the government requirement to obtain permits for water abstraction from the Water Resources Management Authority. This ensures that achievement of environmental sustainability through proper allocation of water resources to meet environmental and human needs.

Each of the respondents had a permit to abstract and use water. Through this compliance level, the water supply cooperatives contribute to sustainable management of water resources and biodiversity in Kenya and thus environmental sustainability.

3.2 Challenges to water supply cooperatives in Kenya

Six major limiting factors emerged from the study. These included stringent conditions on loans advanced to the cooperatives, management challenges, soaring electricity costs, water regulatory requirements, sabotage by non-members and suspicion of cooperative movements.

IV. Conclusion

Water supply cooperatives in their very operation present attributes suitable to establish economically, technically, environmentally and socially sustainable water service provision in Kenya. Up scaling of the water supply cooperatives operational model to rural community-managed water supplies and mitigation of the challenges would propel achievement of Kenya's national goals on water access.

References

- [1]. T. Katko and P. Juuti, Eds., "From a Few to All - Long Term Development of Water and Sanitation Services in Finland," Tampere: KehräMedia, 2005, p. 7.
- [2]. WHO/UNICEF, "WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation: Updated June 2015," 2015.
- [3]. GoK, Kenya Water Act, 2016, vol. 164, no. 164. 2016.
- [4]. GoK, Kenya Water Act, 2016. Kenya: Kenya Law, 2016, p. Chapter 94, Subsection (2).
- [5]. J. K. Koros, "Contribution of water supply cooperatives to sustainable water supply in Kenya," University of Nairobi, 2016.
- [6]. S. Goodall, A. Trevett, and J. Mutua, "Maintaining Africa's water infrastructure: findings from a Water Audit in Kitui County, Kenya," 2016.
- [7]. RWSN, "Handpump Data, 2009," St Gallen, Switzerland, 2009.
- [8]. A. Ruthrauff, "Clean Water Projects: Fixing the Cycle of 'Break-Down & Repair,'" 2012. [Online]. Available: <http://www.actionagainsthunger.org/blog/clean-water-projects-fixing-cycle-break-down-repair>.
- [9]. WASREB, "IMPACT: A Performance Review of Kenya's Water Services Sector- 2010/11," Nairobi, 2012.
- [10]. F. Ruiz-Mier and M. Van Ginneken, "Consumer cooperatives: an alternative institutional model for delivery of urban water supply and sanitation services?," *Water*, vol. 5, no. 5, pp. 1–25, 2006.
- [11]. F. Shilling, A. Khan, R. Juricich, and V. Fong, "Using Indicators to Measure Water Resources Sustainability in California," in *World Environmental and Water Resources Congress 2013: Showcasing the Future*, 2013, pp. 2708–2715.
- [12]. F. & R. A. United Kingdom Department of Environment, "The Environment," 2012. [Online]. Available: <http://webarchive.nationalarchives.gov.uk/20130123162956/http://www.defra.gov.uk/environment/quality/water/conservation/>.
- [13]. A. Vicker, *Water Use and Conservation*. Amherst: MA Waterplow Press, 2002.
- [14]. UNESCO, "Sustainable Development," 2017. [Online]. Available: <http://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd>.

- [15]. A. Adams, "Financial sustainability of rural water supplies in Western Kenya: comparing technology types and management models," 36th WEDC Int. Conf. Deliv. Water, Sanit. Hyg. Serv. an Uncertain Environ., no. August, 2013.
- [16]. P. León, "Four pillars of financial sustainability," Resour. Success Ser., vol. 2, p. 29, 2001.
- [17]. WASREB, "IMPACT: A Performance Review of Kenya's Water Services Sector 2011 - 2012," no. 7, p. 92, 2014.
- [18]. S. L. Dworkin, "Sample Size Policy for Qualitative Studies Using In-Depth Interviews," Springer US, vol. 41, no. 6, pp. 1319–1320, 2012.

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