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Determinants of sustainability for community based water projects: the case of *Hazina ya Maendeleo ya Pwani* in coastal Kenya

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Abstract

Sustainability of development projects is considered essential for the continued delivery of services to beneficiary communities beyond external financing. However, various factors cause community projects to fail the sustainability test. This study investigated the determinants of sustainability for community-based water projects implemented through World Bank and Kenya Government financing known as *Hazina ya Maendeleo ya Pwani*. Research was conducted using sustainability criteria comprising social, organizational, technical and financial aspects that were selected based on literature review and community perceptions. The research was conducted in Kenya's coastal region using data collected from 285 respondents. Frequencies, means and percentages were used to describe data while the Structural Equation Modeling technique determined factors influencing sustainability. Results illustrated that all the four indicators assessed predict sustainability. However, only the technical and financial indicators influence sustainability significantly. In conclusion, while it is important to incorporate all the four indicators during planning and designing of community-based water projects, special attention must focus on financial and technical aspects. The study recommends that building the capacity of Community Based Organizations in terms of technical competence and financial resources to support operation and maintenance is a requirement, rather than a choice, for sustainability of community-based water projects.

Keywords: Community Participation; Water Projects; *Hazina ya Maendeleo ya Pwani*; Sustainability; Kenya Coast

Introduction

Sustainability of development projects occupies a significant proportion of contemporary discourse on development. Of specific interest is the sustainability of donor-supported community projects that has captured the attention of researchers (Komives *et al.*, 2008; Akinbile *et al.*, 2006). The concept of sustainability is understood intuitively, and not easily expressed in concrete operational terms (Briassoulis, 2001). Originating from the term "Sustainable Development", it is essentially not a methodology but a thinking dimension (Jaafari, 2007). According to Blewitt (2008) all the definitions have to do with: (a) living within limits; (b) understanding interaction among economy, society and environment; and (c) equitable distribution of resources. The World Commission on Environment and Development (WCED, 1987) views sustainable development as the ability to make development continuous by ensuring that it meets the needs of the present community without compromising the ability of future generations to meet their own needs. The International Fund for Agricultural Development Strategic Framework (IFAD, 2007) defines project sustainability as the ability to ensure that the institutions supported through projects and the benefits realized are maintained and continue after the end of the project's external funding. Dale and Newman (2010) define sustainable development as a process that takes care of the ecological, social and economic imperatives of the local communities, while ensuring equitable access to resources under each facet of development. As such, a project is considered sustainable if the beneficiaries are capable on their own, without the

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assistance of outside development partners, to continue producing results for their benefit for as long as their problem still exists (Luvenga *et al.*, 2015). In this study we operationalize sustainability as the capacity of a development project to continue delivering the expected services to the targeted beneficiaries beyond the termination of external financing.

Significant amounts of government and donor funds have been channeled towards implementing development projects with a view to provide benefits and services to targeted communities. A large number of the development projects however, tend to experience difficulties with sustainability, and it is estimated that over 40% of all community-managed projects in Africa are not functional (Padawangi, 2010; Ademiluyi and Odugbesan, 2008). Besides, the manner in which projects are managed, measured and reported does not reflect the different aspects of sustainability that can be derived from the concepts of sustainable development (Goedknegt, 2012). Interestingly, while the connection between sustainability and projects was established by the WCED (1987), decades later the standards for project management still "fail to seriously address the sustainability agenda" (Eid, 2009). Worse still, the alignment between sustainability and project management is very rare (Grevelman and Kluiwstra, 2009) and the concept of sustainability has only recently been linked to project management (Gareis *et al.*, 2009; Silvius *et al.*, 2009). Consequently, poor sustainability of development projects deprives the targeted beneficiaries of the intended benefits and expected returns from these investments (Luvenga *et al.*, 2015). Within this context, it therefore becomes necessary to incorporate sustainability mechanisms into projects to ensure continuity of services beyond project timelines.

A number of factors have been considered to be essential for sustainability of development projects in the literature. One of the main factors is community participation. Major development organizations including multi-lateral agencies like the World Bank (WB) and the International Monetary Fund (IMF) have arrived at a near consensus that projects cannot be sustainable and long-lasting unless the community's participation is made central to the planning and management of those projects (Kumar, 2002). Various scholars recognize that when local communities participate directly in planning their own water supply systems, such systems are more likely to be sustainable than those imposed by the government or donor organizations (Barnes and Ashbolt, 2010). For sustainable development to be realized, the community must participate in project planning, budgeting, resource identification, procurement and allocation of resources through project implementation committees (Mulwa, 2008). Development experts at times treat communities as passive-recipient objects in quick fixing of pressing needs without directly involving them in decision-making (Mulwa, 2010). This has led to poor maintenance of community projects and misuse of public resources that threaten the achievement of development goals (Ibrahim, 2017). Development literature acknowledges that community participation in all phases of project planning is important in yielding community responsibility for operation and maintenance of community projects (Schouten and Moriarty, 2003; Sobsey, 2006).

Besides community participation, there are other factors that influence project sustainability. These include poor leadership, limited management capacity (Rutatora *et al.*, 2008) and lack of follow up of micro projects by the community (Ngailo, 2010). The limited sustainability of community-managed projects has been attributed to community management deficiencies such as weak cost-recovery mechanisms, inadequately trained project managers and technicians at grassroots level, and weak local institutions (Spaling *et al.*, 2014; Morris and Hieu, 2008; Datta, 2007). In addition, failure by individual community members to contribute maintenance fees usually leads to disillusionment among project committee members and often affects community cohesion that is critical for project sustainability (Kaunda *et al.*, 2012; Fonchingong, 2005). Communities may not always have the technical capacity on their own for extensive system repairs and maintenance (Kleemeier, 2000). Therefore, external technical support needs to be available to help communities maintain and monitor system performance (Lockwood, 2004). A number of studies suggest that unless communities are able to lobby for continued support for marginal inputs and training, their ability to sustain such projects may be limited (Mansuri and Rao, 2003).

Therefore, this study sought to investigate the sustainability of community-based water projects (CBWPs) implemented through the *Hazina Ya Maendeleo ya Pwani* (HMP) programme in the coastal region of Kenya. HMP is a community development initiative implemented under the auspices of the Kenya Coastal Development Project (KCDP). KCDP

was a World Bank (WB) funded project in which coastal communities were fully engaged in the entire process of identifying, developing and implementing projects of their choice (Aura *et al.*, 2015). HMP adopted a Community Driven Development (CDD) approach in the delivery of the community projects (Hassan *et al.*, 2018). CDD is a typology of participatory approaches popularly defined as a methodology that emphasizes handing over of planning decisions and investment resources directly to community groups and the local government (Wong, 2012). The focus on CBWPs was informed by the fact that Kenya is a water scarce nation and therefore access to water is a challenge to many people. A significant proportion of coastal residents (Government of Kenya, 2008) are especially vulnerable to water shortages (Government of Kenya, 2013a; 2013b; 2013c; 2013d; 2013e; 2013f). Additionally, in many rural households of Kenya (57%), women, who are already overburdened by multiple domestic chores, assume the responsibility of collecting water for the household (Mumma *et al*. 2011). Hence they spend much of their valuable time trekking for long distances in search of water. In the present context, understanding determinants of sustainability of CBWPs will inform strategies that will ensure continuous availability and reliability of water supply.

Ways of measuring project sustainability have been suggested by various authors in the literature. A "Sustainability Checklist" incorporating economic, environmental and social aspects was developed to assist in integrating sustainability into projects and project management (Silvius *et al.*, 2010). In their paper "A Maturity Model for the Incorporation of Sustainability in Projects and Project Management", Silvius and Schipper (2010) presented a practical model for the assessment and integration of the concepts of sustainability into projects and project management. Founded on the basis of the sustainability checklist, the model focuses on project resources, processes and products. In this context the model seeks to ensure that project resources provide the same functionality but are less harmful to the environment, and finally take into consideration the way the products or services are delivered in a sustainable manner. Ibrahim

Table 1. Multidimensional indicators for measuring sustainability of projects.

Indicators	Sub Indicators
Technical	Reliability
	Quality
	Accessibility
	Design and site suitability
	Functionality of the system
Social	Inclusivity
	Equity
	Public benefits
	Community participation in operation and maintenance
Financial	Payment for services rendered
	Fees collection system
	Book recording system
Organizational	Regular Community Based Organisation (CBO) meetings
	CBO functionality
	Existence of a trained project manager/operator
	Cooperation with external agencies
	Support from local authorities

Source: Modified from Ibrahim (2017)

(2017) designed a sustainability framework using a set of multidimensional indicators comprising technical, social, environmental, financial and organizational parameters to monitor community-based water supply management in Sudan (Table 1). With minor modifications, this study adopted this framework to assess the determinants of sustainability in the community projects implemented through HMP.

Materials and Methods

Study Area

Figure 1 shows a map of the Kenya coast indicating where the CBWPs and other HMP projects were located and implemented in all the counties.

The study was conducted in the six coastal counties of Kenya; namely Kwale, Taita Taveta, Mombasa, Tana River, Lamu and Kilifi (Fig. 1). The region covers an area of 83,603 km² constituting about 11.5% of the total area of the Republic of Kenya that has a coastline of approximately 600 km long (Government of Kenya, 2008; 2013a; 2013b; 2013c; 2013d; 2013e; 2013f).

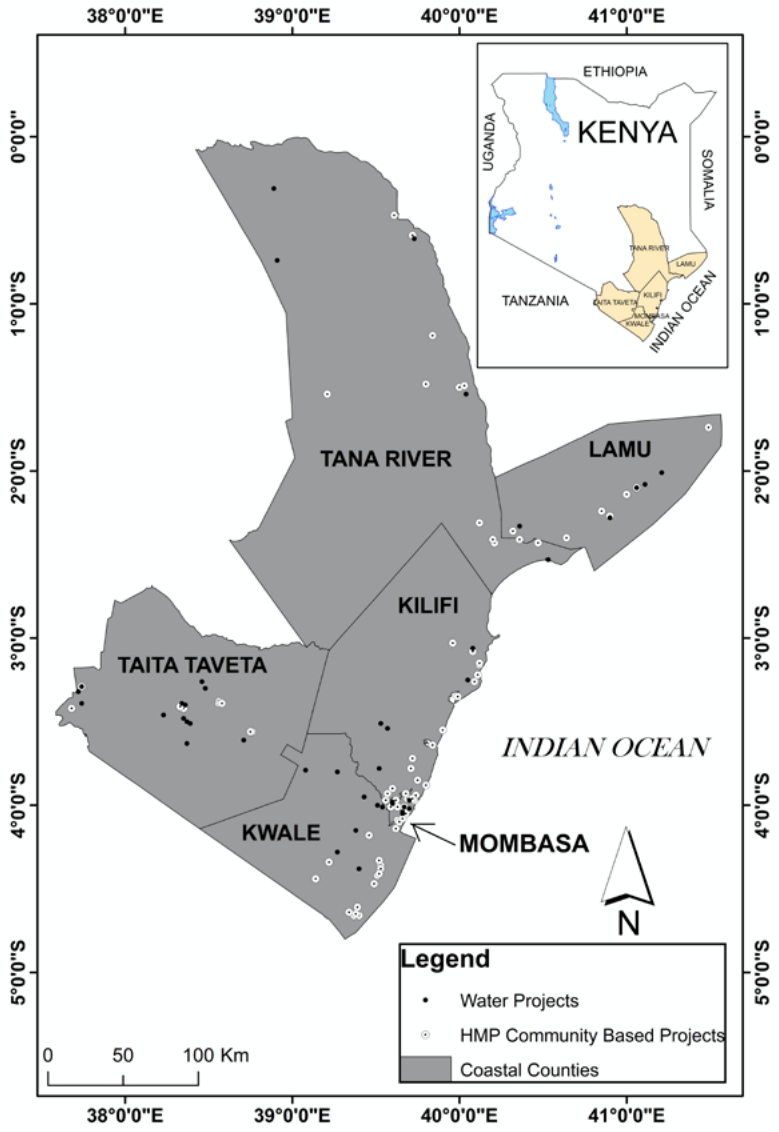

Figure 1. Map of the coastal region of Kenya showing the counties, locations of CBWPs and other HMP projects implemented under KCDP.

To assess the determinants of sustainability of CBWPs, their performance was rated using a set of qualitative indicators corresponding to technical, social, financial and organizational aspects of the project.

It is inhabited by a culturally heterogeneous population with the *Mijikenda* being the largest ethnic group. The region also hosts a large migrant population of different ethnic and racial origins (Government of Kenya, 2008). The region is endowed with a variety of resources that support livelihoods and economic development regionally and nationally in addition to maintaining the health and function of marine and coastal ecosystems (Ongoma and Onyango, 2014). The key economic activities and livelihoods in the region are small-scale fisheries, tourism, mariculture, agriculture and forestry, energy sector, ports and coastal transport and coastal mining (Hoorweg *et al.*, 2000).

The population growth rate of Kenya's coastal region reduced from 3.0 to 2.7% between 2009 and 2019 and the population currently stands at 4.3 million people, with each county population estimated as follows: Mombasa 1,208,333; Kwale 866,820; Kilifi 1,453,787; Tana River 315,943; Lamu 143,920 and Taita Taveta 340,671 (Government of Kenya, 2010; KNBS, 2019). The population is characterized by high poverty rates with about 69.7% of the coastal population living below the poverty line (Government of Kenya, 2008). Besides increasing poverty levels, the majority of the coastal residents have limited access to basic social services. The region is also characterized by significant disparity in literacy between men and women; with that of women being much lower in the counties of Kilifi, Tana River and Kwale (Government of Kenya, 2008; Hoorweg *et al.*, 2000).

Case Study

The study investigated the determinants of sustainability of different CBWPs distributed over the six coastal counties and implemented through HMP. Since 2013, a total of 58 community service projects covering sectors such as education, water, conservation, health and sanitation were implemented. Out of the 58 projects 38 were CBWPs implemented with the objective of improving access to water. This study therefore assessed the sustainability of the 38 CBWPs. The rationale for selecting the CBWPs was guided by the fact that access to water is one of the major challenges affecting Kenya's coastal communities. It was therefore not unexpected that water projects were implemented in all the six coastal counties. In addition, choosing projects from one sector, in this case water, makes it possible to apply uniform criteria for assessing determinants of sustainability.

Study population

The target study population comprised communities living in coastal Kenya. The accessible population included 1,392 community members drawn from the 38 CBOs that participated in the implementation of CBWPs and were beneficiaries of the same.

Sample Size

A sample size of 301 persons was computed using Ross *et al.* (2002) as illustrated in the Equation below. Simple random sampling techniques were used to obtain the study respondents using a sampling frame obtained from records of the HMP Manual (Aura *et al.,* 2015).

Equation: Computation of study sample

$$n = \frac{NZ^2 \times 0.25}{(d^2 x (N-1) + (Z^2 \times 0.25)}$$

Where: n = sample size required
N = Total population size (known or estimated)
d = precision level (usually 0.05 or 0.10)
Z = number of selected standard deviation units of the sampling distribution corresponding to the desired confidence level

To compute the study sample the following formula was used:

$$n = \frac{1{,}392 \times 1.96^2 \times 0.25}{(0.05^2 \times (1{,}392 - 1) + (1.96^2 \times 0.25)}$$

Therefore n = 301

Data Collection

Primary data was collected using semi-structured questionnaires that had two sections. The first section requested demographic information of the participants while the second was used to assess the sustainability of the community projects. Enumerators were engaged to administer the questionnaires in order to improve the response rate and also avoid the possibility of bias. Desktop review of previous published and unpublished research that also included internet materials was used to obtain secondary data pertaining to the research topics.

Data Analysis

The Structural Equation Modeling (SEM) technique was used to analyze the data through R Statistical Software. The choice of the SEM technique was informed by its suitability for measuring latent constructs using

observable indicators. In this model, the latent variables were sustainability and the multi-dimensional indicators used for measuring sustainability comprising of technical, social, financial and organizational aspects. The general model syntax in as follows:

- *latent variable* =~ *indicator*1 + *indicator*2 + *indicator*3 + *indicator*4

For example, to measure technical sustainability the following model was used.

- *Technical* =~ *quality* + *realiability* + *accessibility* + *funtionality* + *design*

The other latent variables comprising social, financial and organizational aspects were modeled in the same way. Descriptive statistics were used to report on the demographic characteristics of the respondents while SEM was used to examine the determinants of sustainability of CBWPs implemented through HMP.

Results and Discussion

Demographic characteristics of respondents

The majority of the respondents (n = 211, 74%) were female, while 26% were male (Table 2). This indicates that unlike men, women are more likely to participate in CBWPs, probably because they are the most affected when there is no water in the household as many house chores depend on the availability of water. Most of the respondents (n = 191, 67%) were in the age range of 31 to 50 years, while 28% were over 50 years and 5% were 20 to 30 years.

A negligible percentage of the respondents were below 20 years of age. As for educational level, most of the respondents (n = 256, 90%) had primary education, while 6% had high school education. College

Table 2. Socio-economic characteristics of respondents.

Variables	Frequency	Percentage %
Gender		
Male	74	26.0
Female	211	74.0
Age		
<20 Years	1	0
20 - 30 Years	14	5
31 - 50 Years	191	67
>50 Years	79	28
Level of Education		
Primary School	256	90
High School	18	6
College	8	3
University	3	1
Household Size		
1-5	115	40
6-10	157	55
10-15	11	4
Over 15	2	1
Economic Activity		
Farming	239	84
Fishing	1	0
Trading	35	12
Employment	8	3
Other	2	1

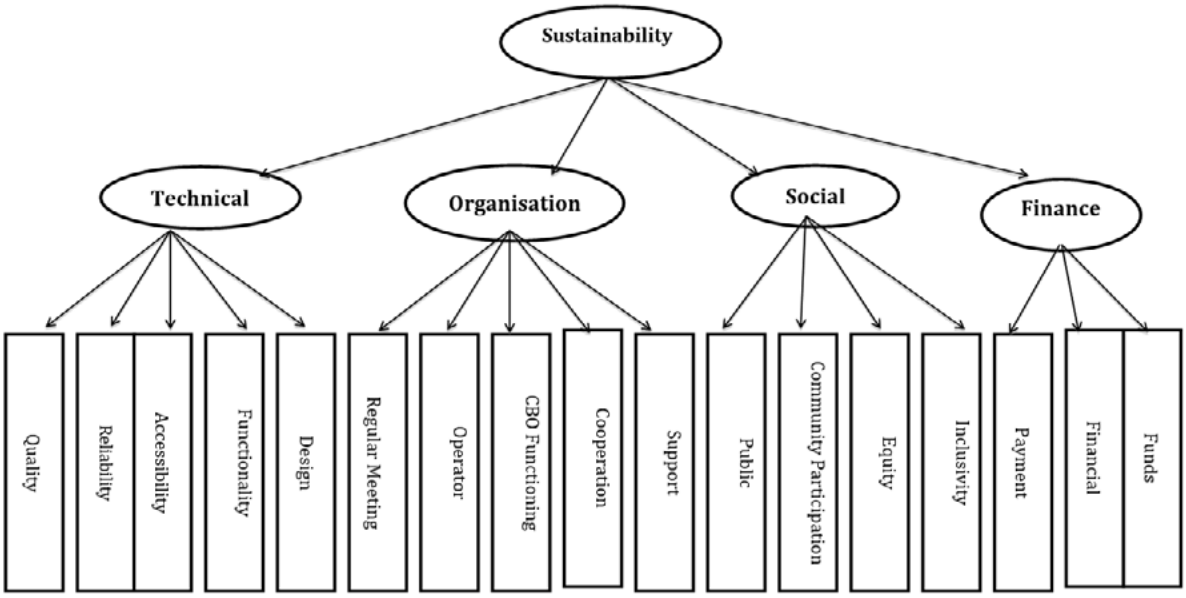

Figure 2. Relationship between the latent variables and measured parameters.

and university education comprised 3% and 1% respectively. The majority of the respondents (n = 157, 55%) had a household size of 6 - 10 persons followed closely (n = 115, 40%) by a household size of 1-5 persons. Very few respondents had household sizes of 10 - 15 (4%) and above 15 (1%) persons. With respect to occupation, the majority (n = 239, 84%) of the respondents were farmers, while 12% were traders, 3% were formally employed, and a negligible percentage were fishermen.

Sustainability of community projects

Using a SEM technique, the study assessed the sustainability of CBWPs implemented through HMP. Figure 2 shows an output from the SEM (Table 3) depicting the relationship between the latent variables and the measured parameters.

Table 3 shows the output of the SEM model from the relationship between latent variables and measured parameters presented in Figure 2. The study results revealed that the quality of service and functionality of the CBWPs seemed to impact positively on this technical indicator of sustainability with β_1 =1.000, β_4 = 0.013. On the contrary however, parameters comprising reliability, accessibility of service and design of the CBWPs seemed to negatively impact on the Technical aspects of the water project, with β_2 = −0.058, β_3 = −0.073, β_5 = −0.023. The implication of this finding is that the quality of service and functionality of the water systems contributed positively to the technical indicator of the CBWPs. On the flipside however, parameters such as accessibility, reliability and design of the water system negatively influenced the technical sustainability of the CBWPs and therefore need to be carefully checked and corrected during project implementation. During focus group discussion sessions, most of the respondents pointed to the fact that there were still issues around reliability and accessibility of the water service. Instances where communities could remain for weeks without water were reported in the counties of Taita Taveta, Kwale and Tana River. This is especially in cases where the CBWPs rely on supply of water from County-managed water service companies. It was also reported by some of the respondents that insufficient consultation was carried out regarding the choice of the water supply technology. This led to choices such as investing in a water pan or boreholes that ended up drying during the dry season, therefore undermining the sustainability of the water projects. Such cases were mostly reported in the counties of Lamu, Kilifi and Tana River. The study results agree with those of U-Dominic *et al.* (2015) who recommended that for sustainability to be achieved, successful community participation needs to go beyond mere consultation, and should include dialogue on technology options.

The social indicators of sustainability were measured in terms of inclusivity, equity and public benefit. The study results revealed that public benefits had a positive impact with β_1 =1.000. The remaining parameters comprising community participation in operation and maintenance, equity and inclusivity, seemed to have a negative impact on the social construct with

Table 3. Output of the SEM Model.

Optimization method	NLMINB
Number of free parameters	36
Number of observations	285
Estimator	ML
Model Fit Test Statistic	171.640
Degrees of freedom	117
P-value (Chi-square)	0.001

Parameter Estimates:

Information	Expected
Information saturated (h1) model	Structured
Standard Errors	Standard

Latent Variables:

	Estimate	Std.Err	z-value	P(>|z|)
Technical =~				
quality	1.000			
reliability	-0.058	0.088	-0.655	0.512
accessibility	-0.073	0.094	-0.773	0.439
functionality	0.013	0.094	0.143	0.886
design	-0.023	0.092	-0.248	0.804
Organisational =~				
regular	1.000			
operator	0.109	0.078	1.402	0.161
cbo	-0.016	0.058	-0.284	0.777
cooperation	0.038	0.083	0.455	0.649
support	0.005	0.084	0.063	0.950
Social =~				
public	1.000			
com.participtn	-0.010	0.279	-0.037	0.970
equity	-2.340	1.681	-1.392	0.164
inclusitivity	-1.212	0.594	-2.041	0.041
Finance =~				
payment	1.000			
financial	-0.023	0.245	-0.094	0.925
funds	-0.363	0.569	-0.639	0.523
sustain =~				
Social	1.000			
Technical	2.999	3.005	0.998	0.318
Organisational	0.557	1.499	0.372	0.710
Finance	4.434	5.537	0.801	0.423

Variances:

	Estimate	Std.Err	z-value	P(>|z|)
Social	-0.108	0.087	-1.244	0.213
Technical	1.000			
Organisational	1.000			
Finance	0.151	0.560	0.269	0.788
.quality	0.569	0.167	3.408	0.001
.reliability	1.575	0.132	11.923	0.000
.accessibility	1.781	0.149	11.917	0.000
.functionality	1.795	0.150	11.937	0.000
.design	1.734	0.145	11.935	0.000
.regular	0.243	0.105	2.316	0.021
.operator	1.372	0.115	11.912	0.000
.cbo	0.776	0.065	11.936	0.000
.cooperation	1.584	0.133	11.935	0.000
.support	1.641	0.137	11.937	0.000
.public	1.551	0.158	9.817	0.000
.com.participtn	1.675	0.140	11.937	0.000
.equity	2.068	0.495	4.180	0.000
.inclusitivity	1.574	0.184	8.574	0.000
.payment	0.947	0.551	1.719	0.086
.financial	1.714	0.144	11.935	0.000
.funds	1.767	0.165	10.732	0.000
sustain	0.009	0.015	0.610	0.542

$\beta_2 = -0.0100$, $\beta_3 = -2.340$, $\beta_4 = -1.212$, respectively. The study findings imply that when the community is able to receive benefits from a community project, its social sustainability is likely to be enhanced. However, keen attention needs to be paid to parameters such as community participation in operation and maintenance, equity and inclusivity, which have a potential to undermine the social sustainability indicator, and by extension the overall sustainability of CBWPs. Adequate training of community members to enhance their preparedness in operation and maintenance of CBWPs is therefore necessary for sustainability. This corroborates the findings of Ademiluyi and Odugbesan (2008) who noted that lack of community training is one of the important factors that could lead to breakdown and non-sustainability of water supply projects in developing countries. The study findings correlate with those of Whittington *et al.* (2009) who reported that for community-managed water projects to be sustainable, they require meaningful community participation in all stages of the project cycle and ongoing external support long after project commissioning. Similar results were reported by Olori and Okide (2014) who identified factors constraining sustainability of community development projects in Rivers State, Nigeria. These factors included a lack of transparency and accountability among community leaders, especially on funds made available for development projects, poor leadership, poor involvement of community members in development projects, corruption and a lack of maintenance culture. Results from the present study however contradict those of Barnes *et al.* (2011) and Spaling *et al.* (2014). Barnes *et al.* (2011) cautioned that participatory approaches do not automatically produce sustainable solutions because decisions made by a community are influenced by the community's perception of the issues involved. For example, Spaling *et al.* (2014) reported that local knowledge may conclude that there is ample water supply without awareness of aquifer drawdown or the effect of catchment deforestation on stream recharge, and as a result the sustainability of the water project becomes questionable.

Table 4 summarizes the results of the SEM model output by highlighting the impact of each sub indicator on the four main indicators of sustainability.

Table 4. Summary of the impacts of sub indicators on main indicators of sustainability.

Indicators	Sub Indicator	Impact
Technical	Reliability	-
	Quality	+
	Accessibility	-
	Design and site suitability	-
	Functionality of the system	+
Social	Inclusivity	-
	Equity	-
	Public benefits	+
	Community participation in operation and maintenance	-
Financial	Payment for services rendered	+
	Fees collection system	-
	Book recording system	-
Organizational	Regular CBO meetings	+
	CBO functionality	-
	Existence of a trained project manager/operator	+
	Cooperation with external agencies	+
	Support from local authorities	+

Using financial parameters as a lens to measure sustainability, the study found that payment for services rendered positively impacted) the financial construct. Sound management of financial records and availability of funds for undertaking operation and maintenance of the CBWPs negatively impacted the financial sustainability indicator with $\beta_2 = -0.023$ and $\beta_3 = -0.363$. This implies that in order to enhance financial sustainability of CBWPs, more attention needs to be paid to these two parameters. These results concur with the findings of Ngopa (2012) who demonstrated that lack of financial resources led to poor implementation of CBWPs approaches in some parts of Tanzania.

In terms of organizational indicators, parameters measured comprised regularity of meetings held by the CBO, general functionality of the CBO, existence of a project manager to provide the requisite leadership, cooperation with external agencies, and support from local authorities. Of these parameters, regularity of CBO meetings, existence of a project manager, cooperation with external agencies and support from local authorities had a positive impact on the organizational construct with $\beta_1 = 1.000$, $\beta_2 = 0.109$, $\beta_4 = 0.038$ and $\beta_5 = 0.005$. The implication of this finding is that these parameters need to be strengthened further for purposes of enhancing sustainability of the CBWPs. An interesting observation made during the focus group discussions was that throughout most of the CBWPs, the operators were basically volunteers and did not receive any payment for the work, which in many cases appeared demanding in terms of time and level of attention. While most CBOs did not have a problem with this status, a few of the operators felt that if a small stipend was offered to them as a token of appreciation, it would boost their level of motivation. This finding is similar to those of Moriarty *et al.* (2013) who observed that under community based management, paying those individuals carrying out non-technical duties critical for sustainable management of water supply facilities may need to be considered, because voluntarism may only work to a certain extent. General functionality of the CBO (comprising aspects such as quality and timely communication among CBO members, attendance of CBO activities, and making contributions where required) scored

β_1 = −0.016 implying a potential negative impact on the organizational indicators of the CBWPs. The implication of this finding is that investing in building the capacity of the CBO to improve its functionality may positively enhance the organizational sustainability of the CBWPs. This finding corroborates those of Rico *et al.* (2009) who argued that communication within the CBO team can be a factor that influences team management and overall cohesiveness.

Sustainability of CBWPs

In the present study, sustainability of CBWPs was measured from the latent variables comprising technical, organizational, social and financial aspects. The model used is shown below:

Sustainality =~ Technical + Organisational + Social + Financial + funtionality + design

On this basis, the full model taking into account the covariance between the latent variables was:

Organisational =~ regular + operator + cooperation + support
Social =~ public + com.participation + equity + inclusivity
Finance =~ payment + financial + funds
Social ~~ Social
Technical ~~ Technical
Organisational ~~ Organisational
Finance ~~ Finance
sustain =~Social + Technical + Organisational + Finance

The study used the Maximum Likelihood estimator and from the results the model was statistically significant at the 5% level of significance (χ^2 = 171.640, degrees of freedom = 117, p – value = 0.001). All the four constructs, namely Social, Technical, Organizational and Financial, had a positive influence on sustainability since the standard estimates were all positive with β_1 = 1.000, β_2 = 2.999, β_3 = 0.557, β_4 = 4.434 respectively. Finance and Technical indicators however seemed to impact heavily on sustainability (β_2 = 2.999, β_4 = 4.434). The implication of this finding is that while social and organizational aspects are important, more attention needs to be focused on financial and technical aspects as these two factors have a relatively stronger influence on the overall sustainability of CBWPs. The study findings are similar to those of Spaling *et al.* (2014) and Binder (2008). Spaling *et al.* (2014) reported that water projects established under community management should not need heavy financial investments during operation and maintenance. If the operation costs are higher than the community's capacity to meet, then such water projects can easily stall. On the same note Binder (2008) observed that the financing process that involves raising and maintaining adequate funding for water facilities is of critical importance for sustainability of CBWPs. Similar observations were made by Campos (2008) who argued that training on issues like operation and maintenance empower communities to take care of water supply systems, thus aiding sustainability.

Conclusions

This study has demonstrated that all the four indicators comprising Social, Technical, Organizational and Financial aspects have a positive influence on sustainability, which means that they are essential determinants of the sustainability of CBWPs. However, the study also revealed that among the four indicators, technical and financial aspects have a stronger influence on the sustainability of CBWPs. The study concludes that while it is important to ensure that all the four criteria are well taken care of during the planning and designing of CBWPs, special attention should be given to their financial and technical aspects. In this context, the study recommends that building the capacity of the CBO in terms of having adequate technical competence and reliable financial resources to support operation and maintenance of the CBO is not a choice but a requirement for sustainability of CBWPs.

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