Improving the Functionality of Water Investments in the Drylands: Learning from Kenya's County Climate Change Fund

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Abstract
Kenya's County Climate Change Fund (CCCF) is financing public good investments focused on the water sector to increase the resilience of communities to climate change. In the drylands, investments in water are critical for water and food security, yet ensuring the functionality and sustainability of water investments remains an ongoing challenge. This paper assesses the functionality and sustainability of 62 CCCF water investments in five dryland counties (Isiolo, Wajir, Garissa, Kitui and Makueni) in Kenya through a functionality survey and stakeholder workshops. The survey was designed based on a review of studies assessing the functionality of water supply systems. Across the five counties, 62.9% of investments were functional compared to 37.1% non- or partially-functional. The main factors that contributed to non- and partially functional investments were poor siting, poor design and workmanship, damage due to vandalisation, and lack of repairs and maintenance. Exploring the underlying causes of poor functionality revealed a complex mixture of technical, social, institutional, environmental and governance deficiencies. To improve the functionality and sustainability of water investments, especially as the CCCF is scaled out further in Kenya, emphasis on the 'hardware' aspects and establishing new water points, should shift towards operation and maintenance (O&M), rehabilitation of existing water points, improved governance, monitoring and evaluation (M&E), and other 'software' aspects.

Introduction
Kenya's County Climate Change Fund (CCCF) mechanism is financing public goods investments focused on the water sector to increase the resilience of communities to climate change. In the drylands, investments in water are critical for water and food security, where access to water is essential for domestic and productive uses, including livestock production and rain-fed cultivation. Yet, ensuring the functionality and sustainability of water investments in the drylands remains an ongoing challenge, with evidence of approximately 20-40% failure rates of rural water supplies across East Africa and beyond (Banks and Furrey 2016; WBG 2018; MacAllister et al. 2020).

Despite global improvements in water coverage since the Millennium Development Goals, the functionality and longer-term sustainability of investments in water has lagged behind, often with a limited understanding on how and why investments in water supply fail (Bonsor et al. 2015). Achieving the ambitious goals for universal access to safe and reliable water for all by 2030 under Sustainable Development Goal 6 will depend on the functionality and sustainability of these water supplies.

This paper assesses the functionality and sustainability of a sample of CCCF water investments in five dryland counties in Kenya through a functionality survey and stakeholder workshops. The study was implemented by the Adaptation Consortium in collaboration with the BRECcIA project to better understand the challenges and opportunities in ensuring functional water investments for sustainable food and water security in the drylands. As the CCCF is further implemented and scaled out to other areas in Kenya, understanding the reasons behind poor functionality will enable existing and future water investments to become more sustainable and ultimately ensure water security.

Methods and Study Site
Study site

The study was carried out in five Kenyan arid and semi-arid (ASAL) counties: Isiolo, Wajir, Garissa, Kitui and Makueni. In these counties, the CCCF has financed a total of 109 investments with the majority (95) focused on increasing water availability and access through the rehabilitation and construction of water

infrastructure. The five counties in total cover approximately 29% of Kenya's land area and a population of over 3 million people. The dominant livelihood activities are pastoralism in Garissa, Isiolo and Wajir, and rain-fed agriculture and livestock keeping in Kitui and Makueni.

The ASALs are characterised by high rainfall variability in both time and space, and regular drought. Water resources are a mix of natural surface water sources (such as rivers, streams and springs) and developed surface water sources (such as water pans and earth/sand dams), and developed groundwater sources (such as well and boreholes).

Analysis of climate trends in the ASALs between 1977 and 2014 show an increase in the maximum temperature in all five counties: Isiolo (1.01^{c}), Wajir (0.85^{c}), Garissa (0.69^{c}), Kitui (1.01^{c}), Makueni (1.22^{c}), and a decline in rainfall (Abuya et al. 2019). Furthermore, climate projections for the ASALs show maximum temperatures may increase by a further 1.5^{c} by 2030, whilst rainfall will become more unpredictable (Abuya et al 2019). Investing in community prioritised climate change adaptation strategies and investments will therefore be important to reduce vulnerability and build resilience to climate impacts.

Functionality survey

Following a review of studies assessing the functionality of water supply systems, we designed a functionality survey to assess the functionality status of the CCCF water investments in the five ASAL counties. The survey was reviewed during a training workshop for the survey teams and tested at three water investments sites in Makueni County. Once finalised, the survey was applied at 62 of the 95 (65%) CCCF water investments. The survey teams comprised implementing partners and county water department officials from each of the five counties. Ethical procedures from IIED were followed and consent obtained from all respondents who assisted during the field work. Respondents were usually representatives from the Ward Climate Change Planning Committees (WCCPC), site management committees, area chiefs and beneficiaries. Respondents were asked questions about the management and use of the investments visited.

Drawing upon the findings from the review, the study used definitions of functionality status given in Box 1. The survey went beyond a binary assessment of functional/non-functional, to include partially-functional water points. The main factors that contributed to each of the non and partially-functional investments were determined from physical assessment of each investment by the survey team with input from respondents present at the investment sites. They were subsequently elaborated further during the stakeholder workshops to understand the underlying causes of poor functionality (see below). We also reviewed the functionality of the management committees responsible for managing each water point with respondents, through questions concerning; current status, membership and gender representation, training, and challenges and suggested solutions.

Box 1: Definition of functionality status as used in the survey

A **functional** water point is one that is operating as expected and serving the community well on the day of visit and within the last one month.
A **partially functional** water point is one where some of the components are absent, broken or damaged, but there is still some water available to the community.
A **non-functional** water point is one where some or all of the components are absent, broken or collapsed, with the result that water is not accessible or available to the community.
A **not-in-use** water point applies to those water points that may not be in use due to seasonality and low rainfall, but they are intact and functional during the wet season

Stakeholder workshops

Focus groups discussion were held as part of stakeholder workshops to understand the underlying reasons behind poor functionality of the investments and challenges related to their sustainability. The functionality survey teams presented findings from the survey, and through discussion and feedback from participants, the underlying causes behind poor functionality were deliberated. Participants also discussed broadly any technical and governance challenges associated to the CCCF water investments. Participants were divided into three focus groups: policy makers; women, including site committee members; and men, including site committee members. The focus group discussions lasted about two hours and were facilitated by staff from the county implementing partner supported by the Adaptation Consortium.

Results

Functionality status of investments

Across the five counties, just over half of the investments (51.6%) were functional and found to be operating well with communities able to access water. In comparison, 22.6% were partially functional, where some water was still accessible but usually in a limited capacity, and 14.5% were non-functional and the community unable to access any water (Table 1). Another 11.3% of investments, either water pans or sand dams, were assessed as not-in-use, as they are used seasonally and were dry during the time of the assessment, but were otherwise functional. If combining the functional and not-in-use investments, a total of 39 (62.9%) investments can be considered fully-functional, compared to 23 (37.1%) as either partially or non-functional. Functionality status was also considered according to the investment being a construction or rehabilitation (Table 5). In total across the five counties, slightly more construction investments (12 out of 27 or 44.4%) were either partially or non-functional compared to rehabilitation investments (11 out of 35 or 31.4%).

Table 1: Overall functionality status of investments across the five counties

County	Functional	Not- in-use	Partially functional	Non-functional	Total
Isiolo	5	1	1	2	9
Wajir	12	4	4	3	23
Kitui	6	2	4	0	12
Makueni	7	0	4	2	13
Garissa	2	0	1	2	5
Total	32 (51.6%)	7 (11.3%)	14 (22.6%)	9 (14.5%)	62

Main factors contributing to non- and partially functional investments

During the assessment the following factors were attributed to the non- and partially functional investments. The factors are overlapping, so that in many cases more than one factor contributes to an investment being non or partially functional.

1. Poor siting of the investments. Investments sited on rocky or sandy soil so unviable; or without considering floods so infrastructure is washed away; or too close to roads or wildlife routes so damaged.
2. Poor design and/or workmanship. Poorly designed or executed works resulting in faulty system or infrastructure and little to no water available or accessible.
3. Damage due to vandalisation or conflict. Infrastructure is damaged or stolen due to vandalisation or cross-border conflict.
4. Lack of repairs and maintenance. Water points breakdown or are damaged and are not repaired, often for long periods of time.

Underlying causes of poor functionality

Further examination of the main factors given above reveal a number of underlying causes of poor functionality. The underlying causes are a mix of technical, social, institutional, environmental and governance issues that are often cross-cutting and closely interlinked. These include:

- The inadequate use of climate or hydrological information in siting and design
- Lack of technical capacity in the county water department in investment siting, design and maintenance
- Poor supervision of contractors and service providers during construction
- Cross-border conflict
- Water investments distant from settlements
- Weak technical and management capacity of site management committees
- Unclear roles and responsibilities, leading to a lack of ownership of investments
- Lack of access and availability of spare parts
- Absence of a preventative maintenance schedule
- High costs of running investments and user's willingness to pay for water
- Absence of a monitoring and evaluation (M&E) framework

Sustainability drivers

A number of drivers of sustainability of the CCCF water investments also emerged from the study. These can be viewed as positive elements that contribute to the long-term functionality of the water investments and provide lessons on good practice in planning future sustainable investments in the drylands.

1. The majority of investments are rehabilitation of existing facilities
2. Separation of domestic and livestock water collection points
3. Locally prioritised and relevant water investments
4. Inclusion of women across all levels of the project cycle

Discussion and Conclusion

Water investments in the drylands are critical for ensuring water and food security. The CCCF investments are focused on increasing the availability and access to water for domestic, livestock and other productive uses. Investments are prioritised by communities so respond to their needs. Other studies show how the investments provide several benefits to communities including, reduced time and costs fetching water; increased water quality; improved livestock health; improved incomes and new economic opportunities; reduced conflict; improved educational opportunities, and strengthened customary management institutions (Crick et al. 2019).

Yet, achieving these positive outcomes will require functional and sustainable investments that allow access and use of water for which they were intended. The survey found that 62.9% of investments were fully-functional and another 22.6% partially functional, comparing positively to estimates given in previous studies (Banks and Furrey 2016; WBG 2018; MacAllister et al. 2020). Yet, 14.5% of investments were non-functional. The main factors contributing to non-functional investments were technical problems (poor siting, design and workmanship), while both technical and management problems contributed to the partially-functional investments. This suggests improving the management, and operation and maintenance (O&M) of facilities could help partially-functional investments regain their functional status.

Investigation into the underlying causes of poor functionality show that the techno-managerial failures are explained by a mix of governance, institutional, capacity, technology, and financial deficiencies. The range of interlinked issues captures the complexity underlying water provision in the ASALs. Many of these issues are systemic within the rural water sector in Kenya and are symptomatic of a wider governance system that is under resourced and lacks capacity. In Kenya's drylands, they also exist beyond the water sector as the ASALs have historically suffered from marginalisation and a development deficit compared to higher potential areas. To improve the functionality and sustainability of water investments as the CCCF is scaled out further in Kenya, emphasis on the 'hardware' aspects and establishing new water points, should shift towards O&M, rehabilitation of existing water points, improved governance, M&E, and other 'software' aspects.

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References

Abuya, R., Atela, J., Muhwanga, J., Said, M., Moiko, S., Atieno, F., Ndiritu, S.W. and Bedelian, C. 2019. *Contextualising Pathways to Resilience in Kenya's ASALs under the Big Four Agenda*. Kenya Country Synthesis Report 2019. Kenya Markets Trust.

Banks, B. & S. G. Furey (2016) *What's Working, Where, and for How Long.* A 2016 Water Point Update to the RWSN (2009) statistics, GWC/Skat, RWSN, St. Gallen, Switzerland.

Bonsor, H.C., Oates, N., Chilton, P.J., Carter, R.C., Casey, V., MacDonald, A.M., Calow, R., Alowo, R., Wilson, P., Tumutungire, M. and Bennie, M., 2015. A hidden crisis: strengthening the evidence base on the sustainability of rural groundwater supplies: results from a pilot study in Uganda. British Geological Survey, Nottingham, UK, 85 pp.

MacAllister, D.J., MacDonald, A.M., Kebede, S., Godfrey, S. and Calow, R., 2020. Comparative performance of rural water supplies during drought. *Nature communications*, 11(1), pp.1-13.

World Bank Group (2018). *Reaching for the SDGs: The Untapped Potential of Tanzania's Water Supply, Sanitation, and Hygiene Sector*. WASH Poverty Diagnostic. World Bank, Washington, DC.