Unlocking the Potential of Groundwater for the Poor

POLICY BRIEF

SUSTAINABLE RURAL WATER SERVICES FOR ALL IN SUB-SAHARAN AFRICA

Context

About two-thirds of the rural population of Sub-Saharan Africa (SSA) depend on groundwater for their main drinking water supply. More than half of these households rely on water points (wells and boreholes) equipped with handpumps. It is estimated that 25% of handpumps in SSA are non-functional at any point in time (Foster et al, 2019), while many more are not working as they should (Kebede *et al*, 2017; Owor *et al,* 2017; Mkandawire *et al,* 2020).

Key Messages

Assessing water point functionality simply according to whether a pump produces water conceals deficiencies in water services. When yield, reliability and water quality are considered, functionality rates may be up to 50% lower than national assessments suggest.

Poorly performing water services seriously affect people's lives, with the burden falling disproportionately on poorer and more vulnerable citizens.

Public authorities need better information to assess the state of the water services within their jurisdictions.

A single approach to the management of rural water services is unlikely to be effective. Multiple options are needed.

Rural water services require adequate finance. Water users alone cannot generally cover the full costs.

Recommendations for policy and practice

Frame water policies to focus on sustainable and inclusive service, not merely first-time provision.

Establish robust monitoring systems for rural water services, together with clear procedures for acting on reports of excessive downtimes, low or variable yields and unsafe water quality.

Select and design context-appropriate management approaches which respond to real demand, and recognise variations of geography, economy, and capacity.

Avoid early-years failure and rapid deterioration of water points by paying full attention to siting, design, materials and construction supervision.

Find ways to combine financing streams from water users, government, donors, and investors and to cover the full costs of service, filling the shortfall created by inadequate tariffs.

Findings from UPGro

Poor services hurt poor people

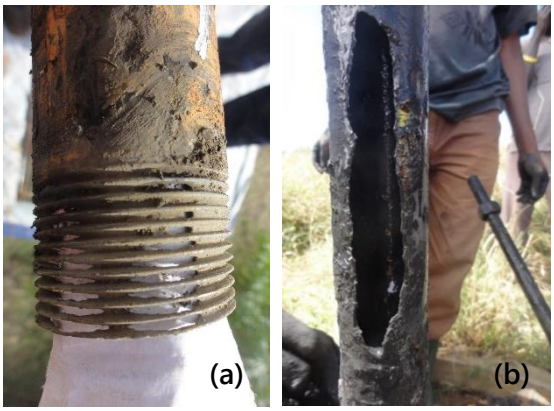
There is a high baseline demand on community water points across all seasons, with spikes in demand during specific events, such as funerals and festivals, and when other nearby sources fail. The effects of breakdowns or poor functionality are intensified during seasonally dry periods.

When other sources fail, there is a high impact on communities. Often it is the poorest who are unable to access an alternative improved source. As a result they become reliant on unimproved surface water supplies or hand dug wells, and many of the intended benefits such as better health are not realised by the poorest people when access to improved sources is discontinuous. The effects of long breakdowns are worse during seasonally dry periods.

There is a strong gender dimension to the clash between poor performance and high demand. Beyond the obvious problem of women having to expend time and energy (travelling further, waiting in queues for hours), UPGro researchers observed how women who are away from the household for long periods often raise suspicions in husbands (about infidelity or gossiping together about men). It is not uncommon for women to be beaten by husbands or other men for being away for long periods of time. There can also be increased tensions between men using water for livestock and women using it for domestic activities.

Reference: Whaley (2021).

From research to policy: handpump corrosion



During the UPGro research, hundreds of rural water supply handpumps were dismantled and examined. One widespread issue was evident, especially in Uganda: the parts of the pumps which were immersed in groundwater (cylinders, pump rods and riser pipes) showed serious corrosion, often resulting in perforation of the riser pipe threads (a), or in more extreme cases, perforation of the riser pipe itself (b), which prevents water reaching the surface. Since the replacement of riser pipes is often beyond the financial means of communities, this seriously affects the ability of communities to keep their services operating. Although groundwater corrosivity has been known about for many decades, UPGro research proved to be the tipping point which caused the Government of Uganda to prohibit the continued use of galvanised steel components, recommending that they be replaced with plastics or stainless steel.

Water use patterns matter

Use of improved water points can decrease significantly in the rainy season, with implications for public health.

It is common for households and communities to use multiple water sources, and for the relative importance of each to vary across the seasons. Improved water points may be used less in the rainy seasons, with a corresponding increased use of rainwater and surface water. In Kwale County (Kenya) only 6% of households reported handpumps as their sole source of drinking water in the wet season, compared to 86% in the dry season. Increasing rainfall variability due to climate change may impact seasonal water use patterns in ways that are difficult to predict.

The provision of community water points fitted with handpumps may not always translate to consistent use and associated health benefits. Failure to understand and account for actual water use behaviour may result in adverse public health outcomes and maladapted WASH policy and interventions.

References: Thomson et al (2019), MacAllister et al (2020).

Functionality matters to water users

The functionality of water points needs to consider (a) whether or not they are working, including the frequency and duration of downtimes, (b) whether the yield is adequate, and (c) their water quality.

UPGro has shown that there are many different combinations of reasons for poor functionality of water points. Two of the most common physical factors are the hydrogeological conditions (either being sited in low permeability rocks or where the water table is deep) and the condition of the rising main (an expensive part of the pump to repair and replace). Consequently careful siting and appropriate design and construction of boreholes to fit hydrogeological conditions are crucial to achieve high levels of functionality.

The forms of contract between drillers and implementing agencies and quality of construction supervision are also key determinants of functionality.

Binary (working / not working) reporting of functionality of water points often conceals deficiencies in water services, such as low yield, long down times, and poor water quality. UPGro has helped develop a more pragmatic and effective approach to defining and measuring functionality, which includes yield and reliability.

This approach has been applied and tested in three countries using efficient sampling techniques and field assessments, including pump discharge tests, water quality sampling, and detailed questionnaires. By applying this approach UPGro demonstrated the impact that these different definitions have on functionality statistics.

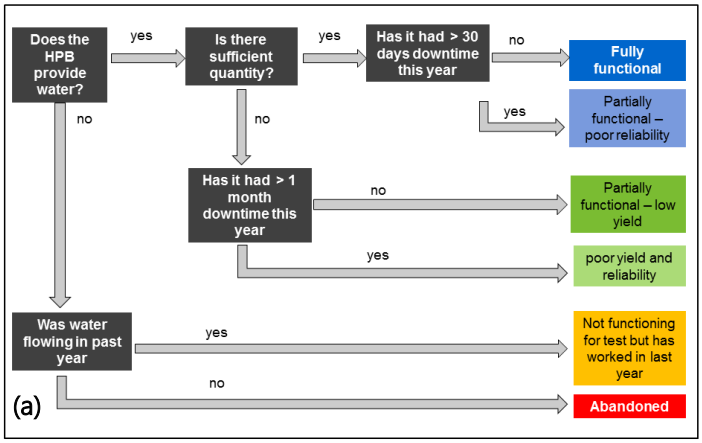
Typically, it was found that assessments which take into account yield and reliability of supply reduce functionality scores by 50%. UPGro also demonstrated that with careful statistical sampling design, these more detailed assessments can be undertaken in a cost-effective and feasible manner, and used to bring richer

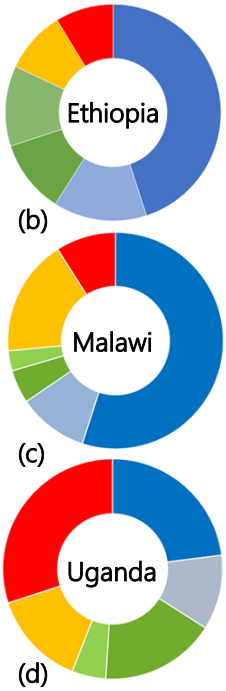
understanding to national monitoring statistics.

References: Bonsor et al (2018), Foster et al (2018), Kebede et al (2017, 2019), Lapworth et al (2020), Liddle and Fenner (2018), MacAllister et al (2019), Mwathunga et al (2017, 2019), Owor et al (2017, 2019).

Defining and measuring functionality: why it matters

National statistics on water point functionality may hide as much as they reveal. Detailed assessments of the functionality of handpump boreholes (HPBs) were undertaken in Uganda, Ethiopia and Malawi in 2016 using a tiered definition of functionality (Fig a). This moves from a simple working/not working definition to assess the availability, reliability, and quality of water provided by a HPB. In Ethiopia and Malawi, the surveys found that the number of HPBs working on the day of the assessment were comparable with national functionality statistics (Uganda was significantly lower due to the high number of abandoned boreholes); however, taking account of yield and reliability reduced the levels of functionality by 20-40% (Fig b-d). Water quality assessments were also undertaken at each HPB to assess inorganic and faecal contamination. In Ethiopia, Malawi, and Uganda, only 28%, 41%, and 18% of HPBs, respectively, passed the design yield, reliability and WHO standards for water quality.





Alternative management approaches are needed

Water management arrangements can be described in terms of four dimensions: the finance system; maintenance and repair arrangements; decision making, rules, and leadership; and external support. Regardless of the institutional and organisational structures for managing water points, these functions need to be in place.

Community management. It is very rare to encounter instances of a water user committee (within the community management model) operating according to external policy/practice guidelines. Even where there is a committee (even if only a few members who are actually active), its legitimacy is typically achieved through close relationships with existing sources of authority in the community such as the

chief in Malawi or the Iddir (traditional burial society) in Ethiopia.

UPGro found little evidence that strong water management arrangements are associated with high functionality. The strongest relationship between water management arrangements and functionality lies in the ability of communities to afford and access repair services.

In Kenya it was found that those communities that paid a caretaker to collect fees per bucket/jerrycan enjoyed faster repair times than those involving monthly fees and no caretaker. While access to affordable maintenance and repair is shown to be important, the effectiveness of community based water management approaches is heavily reliant on having access to good external local government support. UPGro has shown that local government capacity remains weak, and districts have limited resources to plan and spend on priorities specific to their areas. These deficiencies have a strong limiting effect on the ability of communities and district offices to maintain water point functionality and performance.

Alternatives to community management. A variety of rural water service management models is needed, ranging from self-supply, through community management (with varying degrees and types of external support), to more centralised management by professional operators and social entrepreneurs.

Professionalised service models. Where it is possible to group a sufficient number of water points under the management of a single professional entity, and to manage according to a performance contract with water users, downtimes can be reduced, and functionality can improve significantly. Such service models follow an insurance logic, pooling some of the operational and financial risks that individual communities face at larger scale. These professional service arrangements can significantly improve functionality and reduce down times.

In Kenya, the FundiFix model was established early in the UPGro programme. This model follows an insurance-based approach to the repair and maintenance of water points. Communities sign performance-based service contracts which guarantee rapid response in case of breakdown, in exchange for their commitment to provide regular user fees: trained technicians provide maintenance services; water points are monitored using sensors to improve repair speed and enable oversight; financing comes from water users, with a subsidy from government and external funders. Since introducing the FundiFix model, handpump down times have been reduced from months to a few days.

However, not all communities wish to sign up and the factors influencing user groups to contract the professional service model include water use factors, affordability concerns over previous arrangements, and operational factors including distance, as well as water quality. Operators continue to struggle to become financially viable and to win government support even though county governments increasingly recognise the limits of community management.

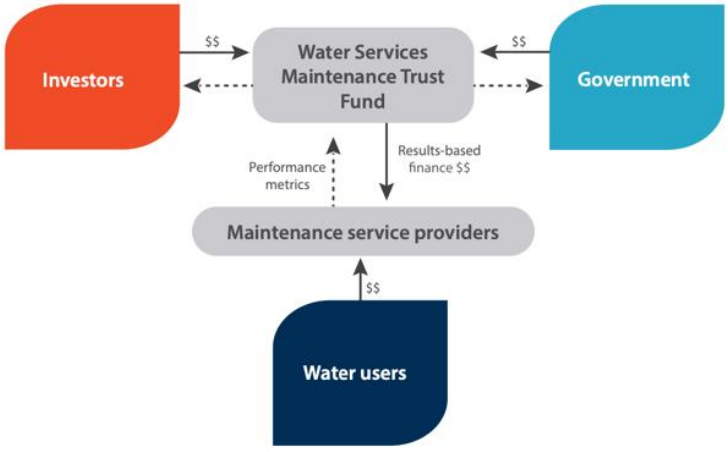
Blended financing mechanisms are needed at least for the short to medium term.

Sustainable water point management arrangements are contextual. Rather than imposing standardised management interventions, a more contextually appropriate problem-solving approach to management arrangements is preferable, incorporating the notion of "going with the grain" – working with existing beliefs and values about power, accountability and social morality.

References: Cleaver and Whaley (2018), Foster et al (2015), Foster and Hope (2017), Hope et al (2014), Kelsall (2010), Koehler et al (2018), Koehler et al (2020), Koehler (2018), MacAllister et al (2020), University of Oxford (2016), Whaley et al (2019, 2021).

From research to policy: financing sustainable services

Early in the UPGro programme, the social enterprise Fundifix was established in Kenya. Since the full operating costs of this professionalised service provider cannot yet be met by user tariffs alone, a Trust Fund was established in order to support maintenance of rural water services. The Fund receives contributions from Government and Investors. Based on agreed performance targets the Trust Fund can release funds to local companies such as Fundifix to improve or extend service delivery. Government and investors are able to support the sustainable delivery of services and have access to timely and objective financial and operational data.



Services must be financially viable

Some (but far from all) water users are willing to pay for well-performing and reliable services. In any particular community, or at least at any individual water point, it is difficult to envisage multiple, different, water management arrangements. And yet water users exhibit significant heterogeneity in their choices when offered alternative performance levels, management arrangements and payment options.

The choice of whether to remain with the status quo (community management) or an alternative way of implementing water management arrangements (by public or private sector) to reduce operational failures is complex and associated with education, wealth and gender.

For an insurance-based private operator model to work, down times of no longer than four days need to be assured (matching well with FundiFix's three-day target), but even then it

may be that fewer than half of eligible communities choose to sign up.

References: Foster and Hope (2016); Koehler et al (2015); Hope and Ballon (2019).

It is challenging for private or social-entrepreneurial operators to become financially viable in the long-run

Across five private / social enterprise rural water service operators in Africa, including FundiFix, rural water users paid some but not all of the costs. Rural water users paid the service providers a little over one quarter of their total costs of providing repair services in 2018. These revenues are insufficient to cover the full operating costs. In all five cases, user payments for maintenance of water points equipped with handpumps show a financial shortfall, despite remaining a common source of water in rural areas where service providers operate.

Reference: McNicholl et al (2019).

Recommendations

In view of the findings set out in this Policy Brief, we urge national Governments and their development partners to:

- Recognise the negative impacts of frequent and lengthy downtimes on water users, and so set high priority on water points that deliver enough water, of good enough quality, as reliably as possible. **Frame water policies to put sustainable and inclusive service at the centre – not merely first-time provision.**
- **Establish robust monitoring systems** for rural water services, together with clear procedures for acting on findings of excessive downtimes, low or variable yields and poor water quality.
- **Select and design management approaches** which fit the context, respond to real demand, and recognise variations of geography, economy, and capacity. Community management cannot function well without external support. Insurance-based models can only work if they are financially viable and professionally delivered.
- **Avoid early-years failure and rapid deterioration of water points by paying full attention to siting, design, quality of materials and construction supervision.** Good practice in these key aspects of water supply provision is well documented (particularly by the Rural Water Supply Network) and freely available.
- Recognise that the full long-run costs of even 'basic' rural water services are usually unaffordable by users, so **find ways to combine financing streams from water users, donors, investors and government to cover the full costs of service.**

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