

Water Infrastructure Doesn't Begin with Concrete or Pipes. It Begins with Institutions.

Rethinking what makes rural water systems sustainable

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Sustainable drinking water services depend on institutions that enable infrastructure to function over time. Pipes and pumps are necessary, but they are not sufficient without effective governance and sustained operational capacity.



Figure 1 The Emukoye water-storage tower in Kakamega County. Visible infrastructure depends on governance, financing, technical capacity, and maintenance that continue long after construction.

Introduction

Many practitioners are familiar with examples of water infrastructure that deteriorated because institutions, resources, and operational capacity needed to sustain it were not in place.

I recently took part in a donor visit with Water 1st International (Water 1st) to rural western Kenya. Water 1st provides grant funding to local community-based organizations (CBOs), which work with communities to develop water, sanitation and hygiene infrastructure. More importantly, these organizations help build the capacity to install, operate, maintain and govern that infrastructure over time.

What was eye-opening to me was how much effort went into identifying communities most in need of support, centering women's needs and priorities, and building the local capacity required to sustain service.

While I observed challenges building out physical infrastructure, I also witnessed the less visible work of building the institutional capacity needed to govern and operate it. Governance here means more than establishing committees and policies. It includes defining responsibility and authority, ensuring accountability, financing operations, maintaining technical capacity, and adapting as conditions change. Unlike building physical assets, these capabilities depend on relationships and trust built over time. When communities can sustain them, the physical system is better positioned to remain resilient.

The infrastructure we usually see

During the visit I saw community water projects in Kisumu and Kakamega counties. Two projects in Kisumu County are managed by Kenya Water for Health Organization (KWAHO): the operating Nyatigo system and the Nyaburu Charo project, which was still under development. Nyatigo's well and solar-powered pump supply a storage tank and metered distribution serving over 120 households and Nyatigo Primary School. I also heard about plans to add backup power and develop another borehole. In an unpublished July 2026 Kenya impact report provided to me, Water 1st stated that additional pump testing confirmed the need for a second water source before more household connections are added. The community is now working to identify a suitable site for the new borehole.

In Kakamega County, we visited a project managed by Community Asset Building and Development Action (CABDA) that serves five villages near Emukoye Spring. Its physical infrastructure includes a protected spring, storage tanks, a solar-powered pump, chlorine treatment, and metered distribution lines. At the time of my visit, reliable backup power remained a challenge. The same report states that operational experience at Emukoye led to improvements incorporating grid electricity and backup generation.

Those physical assets were essential. Whether they deliver reliable service over time will depend on the institutions and operational capacity that support them.



Figure 2 Local technicians connect distribution piping at Emukoye. Skilled installation is one part of the operational capacity required to sustain reliable water service.

The infrastructure we rarely notice

The less visible institutional work begins long before any ground is broken. CBOs consider indicators such as poverty, cholera rates and water service coverage to find communities most in need. They meet with community leaders and residents to assess community needs and technical feasibility, with particular attention to the experiences of women, who are often responsible for securing household water.

Once Water 1st awards a grant, the CBO helps initiate a local water committee and establishes agreements with the participating community, local government authorities, and, when necessary, power utilities. The committees operate as nonprofit organizations, creating a formal structure for oversight and accountability. Their responsibilities are distributed among executive leaders and subcommittees responsible for functions such as operations and maintenance, procurement, and monitoring and evaluation. The CBOs train committee members on their roles and responsibilities and support the development of bylaws, policies, and procedures. Training also covers infrastructure installation, operation and maintenance.

Before distribution lines and household taps are installed, participating households must commit to the project by paying a connection deposit and contributing to activities such as digging trenches and clearing roads for equipment. Gaining and sustaining that participation is not always easy. Clear financial management and accountability may help build trust among residents, committee leaders, the CBO and Water 1st. Responsive operations and maintenance may likewise build trust between the system operators and the community.

The CABDA project near Emukoye Spring includes another community development feature. Savings and Internal Lending Clubs (SILCs) enable members to save money collectively and obtain affordable loans for household needs, including water bills. Because these are self-selected groups built on personal relationships and trust, continuing attention needs to be paid to ensuring no one is excluded.

Committee and SILC meetings, together with site visits by the CBOs and Water 1st, create opportunities for community engagement and leadership development. They also provide a setting in which communities can establish policies governing connections, household contributions, and ongoing system responsibilities.

Policy development comes with its own challenges:

- What constitutes an affordable connection fee, and how might affordability differ among communities?
- How should the system serve residents who cannot afford a connection fee or ongoing water service?
- How should in-kind contributions factor into provision of water and sanitation infrastructure?
- How can policies ensure that all parts of the community are included?

- What happens when households commit to shared work, such as trenching or road clearing, but do not participate?
- How should the system accommodate households that seek connections after the initial construction?

Questions of affordability, participation, and future connections were not peripheral administrative details. Addressing these questions early may prevent them from becoming impediments later. Their answers would shape whether the local organization could finance, operate, maintain, and expand the system over time.

Clear policies established at the outset put communities in a better position to sustain their water and sanitation systems and make future improvements. Equity must remain central to those decisions.

This institutional work continues after construction. The July 2026 report describes committees collecting tariffs, operators comparing water produced with water sold, financial reserves being built for future repairs, and continuing review of engineering, financial, water-use, and water-quality information. These are the practices through which governance becomes sustained service.



Figure 3 Sustainable water service depends on both physical assets and the institutional capacity required to govern, finance, operate, maintain, and adapt them over time.

A public health-informed systems perspective

As a long-time public health professional, I understood the health consequences of inadequate water and sanitation services. Participating in some of the work—collecting and carrying water, helping prepare septic-tank rings, and digging distribution-line trenches—made the daily burden more tangible.

I saw residents, primarily women, make repeated trips to collect water from streams, springs and other local sources also used for bathing and laundry. Water from these sources required treatment before drinking. Purchasing treated water from a vendor reduced some risks but introduced additional costs and transportation challenges. Inadequate sanitation presented its own health and safety concerns, including exposure to disease and risks associated with open defecation.

Improving these conditions requires more than installing wells, pumps, pipes, and toilets. Financial resources, capable and accountable CBOs, local leadership, community participation, technical expertise, and quality materials must work together. Governance does not replace physical infrastructure; it helps create the conditions for successful installation and sustained operation.

Community members described improvements in health, vitality, confidence, and household finances after water and sanitation services became available. The July 2026 report similarly states that no cholera outbreaks had been reported in communities historically affected by cholera, that local clinics reported fewer water-related illnesses, and that families consistently described healthier children. These findings are encouraging, but they remain reported observations rather than an independent assessment of population-level effects.

From a public health systems perspective, infrastructure both supports and is supported by the community around it. In these projects, local partners are building the governance and operational capacity needed to deliver safe water in sufficient quantities over time. Reliable service may improve health and well-being while strengthening a community's capacity to support and improve the system.

The longer-term question is whether these improvements endure, which institutional elements help explain that durability, and which can be successfully adapted in other settings.



Figure 4 Emukoye Spring and associated water-system infrastructure in Kakamega County. Protecting the source is one component of delivering reliable, safe water over time.

Why this matters beyond Kenya

The systems I visited were at different stages of development, and their long-term performance remains an open question. The July 2026 report records continuing monitoring and course corrections, including the incorporation of grid electricity and backup generation to address power interruptions and the need for another borehole before Nyatigo adds more household connections. This is evidence of adaptive management, although not independent confirmation of long-term sustainability.

Even so, in western Kenya I saw water and sanitation infrastructure being developed within a participatory institutional structure that addressed affordable access, local governance, system oversight and, at Emukoye, broader community development through SILC groups.

These observations led me to consider a familiar challenge in a different context: the operation, maintenance, improvement, and source-water protection needs for small systems in the Pacific Northwest. Many were built decades ago and now face aging physical infrastructure, limited capacity to finance capital improvements, and changes in population, climate, water quality, and water availability.

The organizations that operate and govern these systems also change over time. Operators retire, and recruiting qualified replacements can be difficult. Board members and other community leaders move on, sometimes taking institutional knowledge with them. Investing in the institutions that support safe drinking-water service can help systems retain knowledge, navigate leadership transitions, and adapt to changing conditions.

Conclusion

Small water systems need source-water protection and resilience plans that communities understand and help shape. Plans developed without meaningful local participation may struggle to earn trust or sustain engagement.

In western Kenya, I saw villages work with CBOs to define their needs, secure financial resources, and establish nonprofit organizations responsible for developing, operating, and overseeing small community water systems. The physical systems may not transfer directly to the Pacific Northwest, but the institutional lessons can.

These observations suggest one possible path: bring communities together to understand shared water-resource challenges and, with appropriate facilitation and technical support, develop plans to address them. Durable local organizations can sustain participation, retain institutional knowledge, and adapt those plans as water resources, infrastructure, and community needs change.

Looking back on my visit to Kenya, I realize that the most important infrastructure I saw was not the water source, storage tanks, power supply, or distribution lines. It was the institutions that made those assets meaningful: the relationships, responsibility, authority, accountability, and trust needed to sustain service.

We often measure water projects in miles of pipe, gallons pumped, or households connected. Those measures matter. We should also ask whether we are strengthening the institutions that allow water service—and the health and well-being they support—to endure.

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