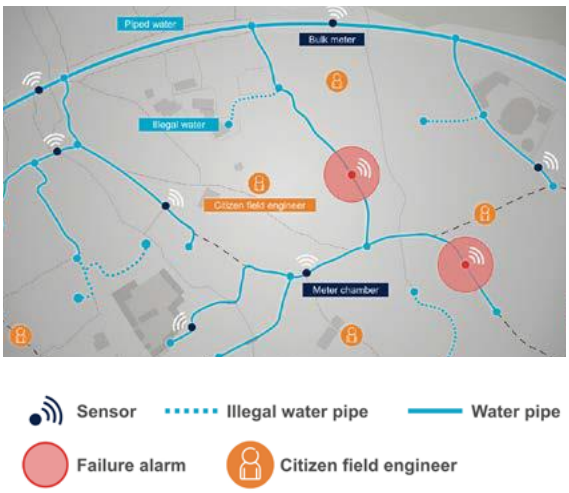
Research Brief

ICT for water - supporting urban sustainable development

Life can be improved in many ways by using ICT solutions, like the concept for improved water quality and accessibility investigated in this study. A social impact assessment of possible future implementations of this solution indicated the importance of collaboration and consideration of local context to get acceptance and appreciation, by involving both local citizens and governments. Hence, careful implementation is needed to achieve the full benefits of the solution.

ICT help improve human rights to water

Information and Communication (ICT) solutions are believed to help improving quality of life in many ways. A concept called Citizen Field Engineer was developed from the idea of using sensor networks to ensure water supply in an informal settlement in Nairobi, Kenya. This was a joint project together with the UN-Habitat and the first proof of concept took place in Kibera, Nairobi in 2014.



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The aim was to improve the monitoring and control of the water system to overcome the social consequences of poor water quality and accessibility. Within the concept existing pipes, meters and access points were connected through sensors. At the same time, the concept included a crowd-sourcing governance model. Local citizens could sign up to perform maintenance tasks which would minimize the cost of service delivery while generating income for the local field engineer and local participation.

The concept thus combined the technical solution with a community-based water management approach having the potential to improve both the water supply and the collaborative governance in informal settlements.

Many opportunities to improve life

In informal settlements, like the one in this study, more than half of the supplied water can be lost through burst water pipes, illegal connections, spills, and other forms of water waste. By improving the control of the water supply, the risk of polluted water will decrease, leading to a decrease of waterborne diseases and under-five mortality. In the long run, by improving people's health and making the water less expensive for families as less water is lost, it could lead to higher educational achievements and productive work. Hence, with safer, more accessible and affordable water supply there are many opportunities for an improved life.

Poor implementation might fail success

When implementing an ICT solution like the Citizen Field Engineer, it needs to be treated as part of the socio-technical systems, recognizing the interaction between human behavior, society and its institutions and technology.

For the social impact assessment, two future scenarios describing contrasting futures for the Citizen Field Engineer concept were created. These scenarios were meant to envision a span, where the true future probably lies in-between. Essentially, the difference between the scenarios is about involving the citizens from all groups in the society, leading to a collaborative implementation versus having a top-down implementation without stakeholder involvement.

A social impact assessment associated with human rights to water and service performance was made on potential future implementations of the Citizen Field Engineer for the two scenarios based on social science theories.

Indicator	Scenario 1: Collaborative implementation	Scenario 2: Top-down implementation
Safe water	+	=/-
Accessible water	=	-
Affordable water	+	-
Non-revenue water	+	+
Quality assurance	+	=

Indicators for safe water (bacterial organisms), accessible water (time-to-fetch water) and affordable water (price) were derived from the UN Declarations on Human Rights. Indicators related to service performance covered fulfilling quality requirements on the system and the amount of billed water volumes.

The results reveal that implemented in the wrong way, the ICT solution might not give all the benefits that it is capable of.

Important to anchor solutions among people

By involving the local residents, administrations and politicians there is a better chance that the implementation will become successful, also in areas with informal settlements. Residents in informal settings are often suspicious of outsiders and protective of their property, rights and income-generating activities.

Using a top-down implementation with the main purpose to reduce the amount of unbilled water (hence improve the non-revenue water indicator to increase revenue streams for the water provider) without considering the users could lead to worse performance in accessible and affordable water, making life harder for local citizens.

Wider societal impacts

Access to sustainable water supply improves health and reduces the under-five mortality rate. This opens opportunities for education, which in turn boosts economic development. Productivity is also hampered by the lack of accessible and affordable water.

The Citizen Field Engineer illustrates how ICT can support a balance between citizen action and city management. Local knowledge is combined with a technology platform for public and private service provisioning, enabling both local innovation and city-wide collaboration.

Solutions which include community participation may instill new values such as increasing the feeling of being included within society and fostering civic engagement also in other areas. This is important as civic engagement is seen as a basis for democracy.

Reference to full paper:
von Heland, F., Bondesson, A., Nyberg, M., Westerberg, P. (2015) The Citizen Field Engineer: crowdsourced maintenance of connected water infrastructure, Scenarios for smart and sustainable water futures in Nairobi, Kenya. 29th International Conference on Informatics for Environmental Protection/ Third international conference on ICT for sustainability. https://doi.org/10.2991/ict4s-env-15.2015.17