UP Gro Unlocking the Potential of Groundwater for the Poor

POLICY BRIEF

URBAN DOMESTIC GROUNDWATER USE IN INFORMAL SETTLEMENTS IN SUB-SAHARAN AFRICA: A CALL TO ACTION

Context

From 1990 to 2018, the urban population in sub-Saharan Africa (SSA) grew from 135 to 423 million, while the percentage of the population living in slums remained constant at around 55-60%. By 2050, it is expected that 1.25 billion people in SSA will be living in urban areas, of which 723 million will live in slums (UN-DESA, 2019).

Groundwater plays a significant role in urban water supply, through piped water, vendor-supplied or packaged water, and self-supply. Groundwater self-supply is used by many urban dwellers where public water utilities are absent, insufficient, or unreliable.

Key Messages

Urban aquifers are vulnerable to chemical and microbiological contamination and groundwater monitoring is often absent.

Many inhabitants of informal settlements in SSA obtain groundwater outside a public network. Of those, the poorest generally have more limited access to groundwater, face high prices per jerry-can, and spend a higher percentage of their income on water.

Small domestic groundwater users are more reliant on shallow groundwater, and therefore more vulnerable to groundwater level declines and groundwater quality deterioration.

Formal and informal groundwater governance in urban SSA is often ill defined, politically motivated and subject to power dynamics. As a result, many urban dwellers have limited trust in formal actors.

Recommendations for policy and practice

Characterise aquifers and establish robust monitoring systems to collect data on urban groundwater quality, quantity and self-supply to inform groundwater policy and management.

Recognise domestic groundwater self-supply as part of the urban water supply system, and include it in policies, approaches and interventions aimed at equal access to good quality groundwater for the poor.

Develop public participation in groundwater management and build trust between formal water sector institutions and communities via structured community development.

Acknowledge and account for power dynamics when developing and implementing pro-poor policies and approaches in order to increase their impact and success.

Findings from UPGro

Groundwater self-supply in urban Africa

In the period 1990-2010, the proportion of the urban population in sub-Saharan Africa (SSA) served by mains water piped to their dwelling decreased significantly from 50% to 38% (Foster et al., 2018). Garcia-Silva et al. (2020) calculated that around 32% of the urban population in mainland Africa use self-supply groundwater.

Self-supply is defined as the construction of, or incremental improvement to water supplies by households and small groups, largely using their own means (Sutton & Butterworth, 2021). Self-supply can be unsupported (all resources are provided by consumers) or supported (some or all resources are provided by Government, NGOs, or the private sector).

The ways households obtain groundwater vary, as does the type of groundwater source (Komakech & de Bont, 2018; Gronwall, 2016; Okotto-Okotto et al., 2015; Okotto, et al., 2015; Olago, 2019).

Groundwater self-supply is practised by inhabitants of informal urban settlements, who often lack access to piped supply; it is sometimes also practised by more affluent urban dwellers in order to safeguard continuous supply. In the future, groundwater will remain an important part of the domestic water source mix; on-site sanitation will also continue (Price et al., 2018).

Small groundwater users, including those in the poorest communities, will increasingly rely on springs and shallow wells, while more affluent users will use deeper boreholes (Komakech & de Bont, 2018). As a result, the poor may become increasingly vulnerable to groundwater-level changes and groundwater quality deterioration, with associated safety risks.

Modes of domestic groundwater use: the 'mixed approach'

Groundwater is used by urban populations in many different ways. In Arusha, Tanzania, we found 23 different water supply strategies, of which most included the use of groundwater (Komakech & de Bont, 2018; Abas, 2016). More than 10 strategies were based on groundwater self-supply, tentatively defined as: 'whereby the Arusha Urban Water Supply and Sanitation Authority (AUWSA) was not involved'. These strategies ranged from borehole use as a primary source of water, to purchased groundwater from a nearby dug well as a secondary source of water, to free (without payment) spring water as the sole water source.

Public dug well

Protected spring

Water kiosk obtaining water from nearby borehole

Vulnerable aquifers, unsafe groundwater

Many urban areas in SSA are situated on, and abstract groundwater from low storage, basement aquifers, which are vulnerable to chemical and microbiological contamination (MacDonald et al., 2012; Lapworth et al., 2017; McDonough et al., 2020). On-site sanitation and inadequate waste collection systems pollute aquifers and deteriorate groundwater quality (Sorensen et al., 2015a; Velasquez-Orta et al., 2017; Lutterodt et al., 2018, van de Vossenberg et al., accepted.; Lapworth et al., 2017; Foppen et al., 2020; Olarinoye et al., 2020). Shallow groundwater, most often accessed by the poor, is more vulnerable to pollution than deeper groundwater.

Many urban centres are also located in coastal regions, where groundwater may be impacted by saline intrusion. Fragile coastal aquifer systems are particularly vulnerable to changes in sea level and over-abstraction, which may compound issues of groundwater salinity (Comte et al. 2016).

Development of a tryptophan sensor

The World Health Organisation (WHO) and UNICEF have outlined the need for simple, rapid methods to detect faecal contamination in drinking water, compared to traditional incubation methods. UPGro researchers have explored using tryptophan-like fluorescence (TLF) as an effective instantaneous indicator of faecal contamination in groundwater. They have shown that in many cases it provides a significant improvement over traditional in-situ parameters, such as turbidity, and can distinguish sources with a higher risk of faecal contamination (Sorensen et al., 2015a, 2018, 2020; Lapworth et al., 2018; Nowicki et al., 2019; Ward et al., 2020).

Limited knowledge on groundwater and groundwater use

For most urban areas in SSA, groundwater monitoring, data, and information systems are insufficient (Taylor et al., 2019; Olarinoye et al., 2020). Knowledge of long-term groundwater recharge, aquifer storage, sustainable borehole yields, and groundwater quality, which are critical for managing and assessing the resilience of a resource, are lacking (Olarinoye et al., 2020; Foppen et al., 2020; Garcia Silva et al., 2020; Foster and MacDonald, 2014; Olago, 2019; Gronwall and Oduro-Kwarteng, 2018). Aquifer knowledge is lagging behind aquifer development, and development decisions are therefore being made based on insufficient evidence (Olago, 2019).

Current national surveys and census data generally underestimate use of groundwater point sources for domestic purposes so the true scale of groundwater self-supply in urban areas remains unknown (Danert & Healy, 2021). Best available information comes from case studies of a limited number of cities that have focused on water access dynamics in specific peri-urban or informal settlements (Garcia-Silva et al., 2020). Beyond these, local spatial or temporal information on urban groundwater use – both public and private – does not exist.

Formal groundwater governance is often lacking or ineffective

Formal groundwater governance and access responsibilities are often ill-defined, partly overlapping, poorly managed, and not well communicated (Gronwall, 2016; Nastar et al., 2018). Groundwater decision-making can be influenced by financial negotiations between authorities, which commonly do not prioritise the water needs of urban dwellers, with negative consequences, particularly for the poor (Nastar et al., 2018).

Informal groundwater governance is important

Due to the inadequate performance or absence of formal actors and institutions, there are a wide range of informal actors playing a role in urban groundwater governance (Nastar et al., 2018, 2019; Silvestri et al, 2018; Schipper et al., 2019). Informal actors, who have power or control over access to groundwater, are often influential individuals or groups with the necessary resources to mobilise communities. They may include traditional community leaders, chiefs, elder committees, youth committees, landlords, street chairpersons, or local council chairpersons. When issues arise, communities will usually contact one or more of those informal actors with the power to broker between community and formal actor, between different communities, or between two tenants.

Brokering of groundwater issues by informal actors can also be politicised and subject to power dynamics. This was observed by UPGro researchers in Kampala, Uganda, where elected local council chairpersons are heavily involved in environmental issues, including those related to groundwater access (Nastar et al., 2019).

Problems for the poor

The effects of formal and informal groundwater governance arrangements and access issues are manifold and mainly felt by the urban poor. They are often the victim of local power dynamics and have a lack of trust in formal actors. They have more limited access to groundwater, and often only access shallow groundwater sources, which are more vulnerable to contamination and drying-up when groundwater levels decline (Olarinoye et al., 2020). The poor face high prices per jerrycan (20 L), and spend a higher percentage of their income on water.

Pro-poor policy frameworks need to address local power dynamics and the politics of land rights in order to improve water access for the urban poor (Nastar et al., 2019; Schipper et al., 2019). Simply increasing the number of water connections is not enough.

Building trust through Transition Management

UPGro took an 'action research' approach to foster sustainable transitions towards improved access to safe water for informal urban communities through Transition Management (TM). The TM process was implemented in Dodowa, Ghana, and Kampala, Uganda.

TM empowered communities to better understand their local problems, develop their own vision and develop actions to fuel behavioural change (Silvestri et al., 2018; Twinomucunguzi et al., 2020).

Community members started to develop and raise a voice in relation to their local problems, becoming more aware of their right to clean water. TM enabled trust building among various local actors, for example between community members and local authorities, so that communities were able to engage in a constructive and participatory dialogue with local institutions and other actors to advocate for improved water and sanitation facilities.

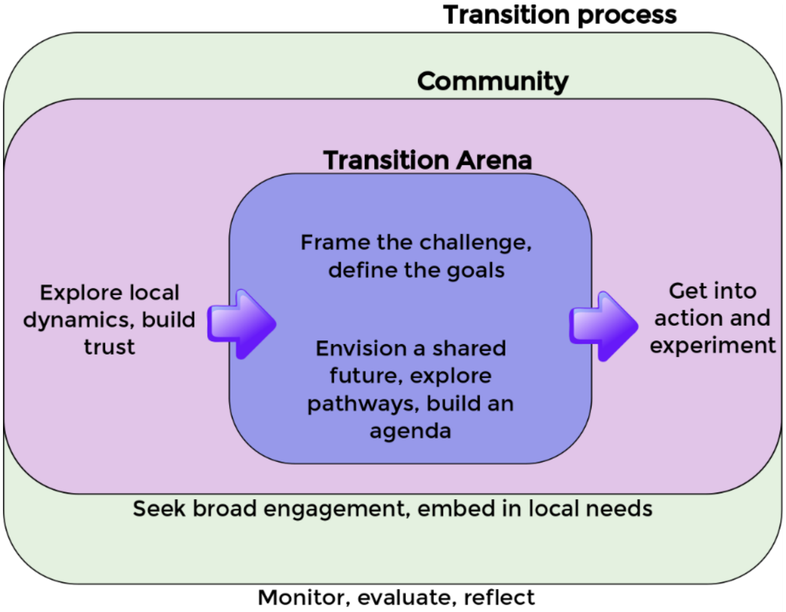
Participants of the TM process established community-led organisations to run and maintain different pilot projects and activities (transition initiatives) related to the sustainable management of water, sanitation and waste, as well as environmental protection. These included sensitisation activities, such as theatre, music, radio and sports, micro-enterprises, and environmental campaigns to clean up specific parts of the community.

Through TM, women were empowered to share their opinions and take a more active role in decision making, as well as in the design and execution of activities. As a result, women felt more self-confident, which contributed to the promotion of gender equality.

Transition Management: how to design the process?

UPGro implemented a context-sensitive, multi-level transition management process, as illustrated, in urban SSA.

Besides exploring local dynamics and building trust, a key element was the Transition Arena in which the goals of the process were collectively defined and a shared future was developed (Silvestri et al., 2018).



The adaptation of TM to informal settlements in SSA required a context-sensitive system and actor analysis. TM should not be solely about supporting collective empowerment and impulses for action, but should also strengthen democratic processes by building capacity for participation, by raising awareness on human rights and gender equality, and by addressing power imbalances. TM needs to be both functional and emancipatory, in its design.

An illustration of the TM process, as implemented in UPGro, can be seen in this video documentary.

Recommendations

We call on policy makers to **recognise domestic groundwater self-supply**, and to include it in policies and governance approaches aimed at equal access to good quality and safe groundwater for the poor.

Our most important recommendations are:

- **Characterise strategic urban aquifers** in order to reverse the current situation, whereby groundwater development proceeds with insufficient knowledge of an aquifer system. This knowledge will not only benefit the poorest inhabitants of informal urban settlements, who generally rely on shallow groundwater resources, but can inform wider groundwater development and management across the entire urban area.

- **Monitor and map groundwater self-supply** in addition to existing survey instruments: Where is it practised? Who is practising it? What are the main modes of self-supply? Why is it practiced? What is the quality of the (shallow) abstracted groundwater? Such knowledge can assist in understanding local self-supply practices, in estimating its magnitude, in planning future (public) water supply initiatives, and in interventions that reduce risks associated with using unsafe groundwater, such as increased awareness and treatment (e.g. filtration boil-water advisories), improved community hygiene and environmental management, and provision of alternative sources.

- **Develop public participation and build trust via structured community development and empowerment initiatives**. The UPGro programme used the Transition Management approach with promising results to strengthen public participation in groundwater management through decentralised management approaches. Again, this will not only be beneficial for the urban poor, but will benefit all urban dwellers.

- **Underpin pro-poor approaches and community development with a good understanding of local power dynamics** in order to increase the success of pro-poor interventions.

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