Series 2 – Social Pillar: Environment, Water, Sanitation and Regional Development

Sanitation challenges, groundwater perspectives and their intertwined relationships in Kisumu, Kenya

Japhet R. Kanoti, Prof. Daniel O. Olago, Prof. Nobert O. Akech, Prof. Christopher M. Nyamoi, Dr Simeon Dulo, Dr Richard Ayah, Prof. Richard Taylor

Key Messages

Groundwater is the preferred alternative water source during times of shortages and in areas not served by piped water supplies.

Pit latrines are the main sanitation facilities in Kisumu where sewerage extends over less than 20 per cent of the city.

Pit latrines contribute to microbial contamination of shallow groundwater in Kisumu.

The sub-surface can be used both as a source of water and as a repository of human waste.

Context

Groundwater constitutes a potential source of safe water in both rural and urban settings in Kenya. Both national and county governments are striving to realize the United Nations' Sustainable Development Goal 6: Access to safe water for all by the year 2030. Further, Section 43 of the Constitution of Kenya on economic and social rights, guarantees access to safe water and adequate quantities. The sub-surface is also used in most parts of Kenya as a repository of human waste through pit latrines and as a source of groundwater from shallow wells. Pit latrines are hand-dug with the depths of less than 30m. In localities with shallow groundwater tables, these pit latrines can intercept the water table.

Like the pit latrines, shallow wells are often hand-dug and commonly located close to or within household compounds. Wells provide a vital source of safe water to millions of people, in rural and urban Kenya, who are either not connected to a piped water supply or are where piped supplies are intermittent. Conjunctive use of the shallow sub-surface as a repository of human waste and a source of water poses a threat to groundwater quality. Often these water points and sanitation facilities are located close to each other.

This research under the AfriWatSan project assessed groundwater and sanitation challenges based on field surveys, sampling, analyses, and interviews as well as reviews of the literature and historical borehole data in Kisumu, Kenya. Previous studies in the area have shown that the number of shallow wells, buildings, unimproved pit latrines and sanitary risks have increased tremendously between 1999 and 2019. This study confirmed that the main water and sanitation challenges in Kisumu are: (1) inadequate, poor and deteriorating water quality, (2) poor waste disposal management systems, and (3) poor sanitation services. There is a need for the introduction of new and sustainable groundwater approaches supported by science and decision-making processes that involve all stakeholders. Current deficiencies in the provision of adequate water and dignified sanitation to the poor in Kisumu can be remedied through improved knowledge on shallow aquifer dynamics and innovative research. It was noted that apart from the donor agencies and multi-national NGOs, private investors are unwilling to invest in water projects in Kisumu due, in part, to government legislation that constrains the cost that may be levied on water.

A typical hallow well

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Approach and Results

Kisumu County is one of the 47 counties in Kenya. It is located between longitudes 33° 20'E and 35° 20'E and latitudes 0° 20'South and 0° 50'South (County Government of Kisumu, 2018). Total land area is 2086 km2 with ~567 km2 covered by water. Kisumu is situated on the shores of Lake Victoria, the second-largest freshwater lake in the world. Due to poor investment in the water sector, only a fraction of the city's water demand is met through the piped supply from treated surface water. The main water treatment works are situated in Dunga, on the shore of Lake Victoria. Massive pumps are used to lift water from Lake Victoria to the treatment plant. The second source of water is the Kajulu gravity water intake along River Kajulu. Alternative sources of water include shallow wells and boreholes constructed by communities and donor agencies. However, these alternatives have their challenges ranging from vulnerability to contamination, over-abstraction and depletion.

Water coverage in Kisumu is about 75 er cent (KIWASCO, 2017). The supply is, however, intermittent due to old and dilapidated water infrastructure, power outages, and the climate associated with high and low discharges of the River Kajulu. The shallow aquifer underlying Kisumu supplies water to large areas during supply shortages from the Dunga and Kajulu intakes. Secondly, 82 per cent of households in Kisumu are not connected to the sewerage system and rely on pit latrines and /or septic systems for faecal waste disposal (KIWASCO, 2017). Limited access to safely managed water and sanitation infrastructure and services compromises public health. Understanding the risks posed by these two practices is essential for expanding access to safe water and sanitation practice in low-income settings.

The AfriWatSan project, financed by the UK government (DFID) and The Royal Society (UK), sampled water from existing 22 sites in Otonglo, Obunga, Manyatta A and Manyatta B settlements and newly drilled six monitoring boreholes distributed randomly in these informal settlements. The results confirm the presence of faecal bacteria in groundwater at varying levels. Springs and shallow wells within Obunga and Manyatta were heavily contaminated with colonies exceeding 1000 in 100ml of water (Kanoti et. al, 2018). All sources of water were contaminated by faecal bacteria and thus, according to WHO, unsuitable for drinking (Figure 1). Such faecal microbiological contamination can lead to outbreaks of waterborne diseases that pose a risk to human health, especially for vulnerable members of the community that include children, elderly and sick people.

Pumping tests conducted on six newly drilled research boreholes further revealed that Kisumu shallow aquifer is not one extensive unit, but rather an aggregation of more localized aquifer units. Groundwater yields vary from less than 1 m3/hour near RIAT in the lowlands where the geology is dominated by volcanic rocks to 4 m3/hour in Manyatta B where the geology consists of sedimentary rocks (Kanoti et. al, 2018). Such heterogeneity in hydrogeological properties poses a distinct challenge when promoting the use of shallow groundwater to meet UN SDG 6 and Kenya's Constitutional obligation on human rights. It also poses a significant challenge for governance, requiring coherent management of the groundwater resource at the local scale and the engagement of local communities.

Policy Recommendations

Short-Term

- Provision of affordable and safe water is an international and national priority. Low-income consumers are dependent on shallow groundwater and other unsafe waters. Efforts are needed to provide safe water to all.
- Simple water treatment should be encouraged. Such measures include boiling water from wells and springs and storing it in safe containers for drinking
- Pit latrines are currently constructed without any regard to proximity to water points. Public health official in consultation with other professionals should advise on the suitable location of pit latrines
- Poorly constructed pit latrines present health risks, especially for children and vulnerable persons, due to their lack of cleanliness and safety at night.

Medium-Term

- There is a need for the introduction of a new water development approach that involves all stakeholders. The perception that water is a human right and free makes investors perceive that the government may interfere in the water business. This should be discussed.
- Kisumu suffers water shortages due to many causes that include inadequate and poor surface water quality, low investment in the water sector, high non-water revenue, poor waste disposal management and poor sanitation services. These short-comings should be addressed.
- Steps should be taken to arrest the environmental degradation that is evident in Kisumu and surrounding areas where deforestation and settlement on high gradient areas increase runoff, which has negative implications on recharge and flash floods.

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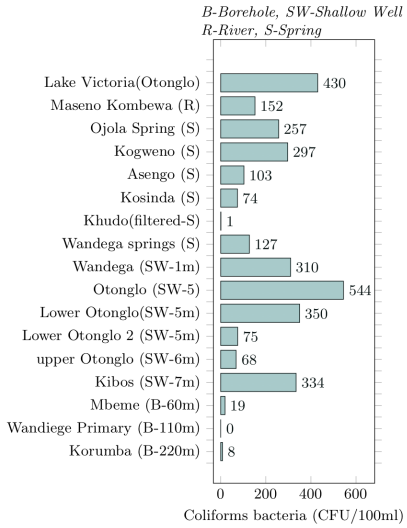

Figure 1: Contamination of water sources in the informal settlements in Kisumu. The bacteria values are reported as colony forming units (CFU) in 100 ml of water

Authors

Japhet R. Kanoti (jrkanoti@uonbi.ac.ke)
Prof. Daniel O. Olago (dolago@uonbi.ac.ke
Prof. Norbert O. Akech
(opiyo-akech@uonbi.ac.ke
Prof. Christopher M. Nyamaoi
(cnyamai@uonbi.ac.ke)
Department of Geology
Dr Simeon Dulo(sodulo@uonbi.ac.ke)
Department of Civil and Construction Engineering,
Dr Richard Ayah (ayah@uonbi.ac.ke)
School of Public Health
University of Nairobi, P.O. Box 30197 – 00100, Nairobi, Kenya

Prof. Richard Taylor(richard.taylor@ucl.ac.uk)
Department of Geography, University College London, Gower Street, London, WC1E 6BT, UK.

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