

## Groundwater quality in Harare, Zimbabwe, and implications for urban community drinking water supplies

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## 2. Groundwater in the Anthropocene - Challenges and Solutions

### 1. 2.04. Groundwater and urban development

Zimbabwe's capital Harare has a population of c. 1.5 million with major challenges in treatment and supply of sufficient water to meet the city's demand, often leading to rationing and erratic periods of supply. In response to this, rampant drilling of public and private boreholes has taken place, and the crystalline basement aquifer now supplies c. 85% of the city's water. Installation of boreholes is often completed without professional drilling supervision, resulting in very limited sanitary protection. Continued population growth and poor sanitation has led to groundwater contamination and seasonal cholera and typhoid outbreaks. More recently, donor and government assisted programs constructed or upgraded communal boreholes with enhanced sanitary seals and in-line chlorination treatment.

We undertook a seasonal sampling of 21 water points (hand pumps and boreholes) that are local drinking water sources. A subset of the sampled boreholes included those with improved sanitary seals. Samples were analysed for ion chemistry, stable water isotopes, faecal coliforms and eDNA with a view to identify differences between handpumps and boreholes with varying sanitary seals.

Initial results revealed localised high values (exceeding WHO guidelines) for As, Fe, Mn, NO<sub>3</sub> and U, and sites with high faecal coliforms. The coliform counts varied substantially between the wet and dry season. Water isotope results broadly conform with rainfall signatures, but also show clear mixing with evaporative recharge sources (e.g. from surface or piped water). Fieldwork also revealed that chlorination of the water was inconsistent, raising concerns about the sustainability of treatment at community levels.

Our study shows the urgent need for monitoring groundwater quality and treatment to ensure safe water supply, and to better understand the local hydrogeology,

including surface water-groundwater interactions and hotspots of commonly geogenic pollutants such as As and U.