



STUDY NAME

Resource limitations to sustainability of groundwater well-points in basement complex regions of sub-Saharan Africa

RESEARCH ORGANISATIONS

University College London (UCL) and British Geological Survey (BGS). University of Zimbabwe (UZ), University of Malawi (UM), University of Oxford (UO), Wateraid Malawi (WAM), Africa Groundwater Network (AGM), Zimbabwe National Water Authority (ZNSWA) and London School of Hygiene & Tropical Medicine (LSHTM), Ministry of Water Development and Irrigation, Malawi (MWDI).

RESEARCH TEAM

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UM: Geoffrey Chavula
UZ: Daina Mdimbu.

RESEARCH AIM / HYPOTHESIS

To provide the scientific justification and basis for supporting regional-to-local scale groundwater resources management in the basement complex aquifer regions of Malawi and Zimbabwe in southern Africa, and to develop a new interdisciplinary partnership for future collaborative effort towards wider investigation of resource-limited sustainability across sub-Saharan Africa (SSA) basement complex regions.

STUDY DESCRIPTION

35% of Africa, 40% of the sub-Saharan Africa land surface and almost 37% of the member states of the Southern African Development Community (SADC) is underlain by weathered and fractured 'crystalline basement complex' bedrock. This contains groundwater within its weathered mantle (most significant under the 'African erosion surface') and to a lesser extent within rock fractures. Achievement of the Millennium Development Goal for access to water is therefore fundamentally reliant on the long-term sustainability of groundwater abstractions from these crystalline basement complex aquifers.

This project comes from recent analysis of the sustainability of groundwater resources of the basement complex aquifers in Malawi. This analysis compares estimates of groundwater throughflow and storage depletion with actual abstractions at a coarse scale (100s km²). It raises concerns that groundwater abstractions exceed long-term recharge in 4 of the 15 'water resource areas' of Malawi. This controversial conclusion contrasts with the long and widely held view that resource development from basement complex aquifers is



limited by low transmissivity, hence through low yield of wells, compounded by widespread technological failure of the well-points themselves. Also, the 'Malawi analysis' provides a cautionary perspective on a continent-wide assessment of groundwater 'volumes in place' in Africa where there is an estimated the basement complex aquifer resource at 500,000 m³/km² on the basis of published geological maps and estimates of hydrogeological parameters.

Availability and sustainability of the groundwater resource require ground-truth measurements and process-based analyses. Cumulative groundwater abstraction has greatly increased across much of Sub-Saharan Africa over the past 30+ years following numerous rural water development and drought relief programmes. This project addresses the concern that the 'Malawi analysis' is indicative for groundwater in basement complex aquifers throughout Sub-Saharan Africa. If the 'Malawi analysis' is correct, more unrecoverable well-point failure will be expected in the affected regions.

The project will examine the implications for well-point failure using independent data on well-point occurrence and status (from WaterAid and the Malawi Ministry of Water Development and Irrigation). Concurrently, it will explore the links between well-point failure, health, poverty and gender issues. Field investigations will be carried out to refine the analysis of groundwater resource limitation over a smaller area and to develop a preliminary analysis for a selected region in southern Zimbabwe. A methodology will be developed for application to water-use policy and local resource/well-point monitoring.

Awareness and adoption of the methodologies will be stimulated at a regional Workshop to support national mitigation measures, and local management of groundwater use. The project will lead to new estimates of resource limitation in Zimbabwe, new collaborations, and form the basis for wider investigation of resource-limitation across sub-Sahara Africa basement complex regions.

WHERE?



Malawi
Zimbabwe

WHERE TO FIND OUT MORE:

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