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Hydrogeological investigation to protect the Itawa Spring in Ndola, Zambia

Karen, M.[1], El-Fahem, T. [1] and Kolala, M.[2]

[1]BGR – Bundesanstalt für Geowissenschaften und Rohstoffe, Stilleweg 2, 30655 Hanover, Germany, Tobias.El-Fahem@BGR.de
[2]DWA – Ndola District Water Officer, Copperbelt Province, Zambia
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The Itawa Spring in Ndola, Zambia, is an important water resource for the city's development. It is found close to the city centre and has been, for decades, used nearly exclusively for beverage production through the Zambian Breweries; it is also an important clean water source for the informal settlement that has grown around the spring. In recent years the spring has come under threat due to land use changes and aging infrastructure.

In order to improve the knowledge about the hydrogeology of the Itawa Spring and to support the delineation of protection zones around it an extensive field assessment was conducted during the year 2015. The assessment combined an intensive field reconnaissance for the mapping of the area; groundwater elevation measurement campaign covering greater parts of Ndola; borehole data collection and also a hydrochemical sampling campaign of groundwater for inorganic, organic and stable isotope investigation.

The collected data and the interpretation of the samples reveal a rather complex hydraulic environment around the Ndola dome due to tectonic history and changing geological facies. Different origins of the groundwater flowing from the spring were identified and also a conceptual model explaining the general hydrogeological and local hydrogeology, which included artesian boreholes and multiple spring flow zones, was developed.

A number of contamination sources and land use changes were identified during the study which pose a significant threat to the groundwater quality and structural integrity of the spring. The sources of contamination were analysed within the hydrogeological conceptual model and the key contaminant pathways were identified in order to assist the stakeholders with prioritising the most urgent threats to the spring.

The current initiative by the International Water Stewardship programme (IWaSP) in collaboration with local community, Zambian Breweries, Water Resource Management Authority (WARMA) and other stakeholder needs to be implemented urgently to protect the spring. In order to decide on any sustainable development measures it was necessary to have a clear picture about the size of the protection zones. The key results of the project have been used to assist with the demarcation of protection zones around the spring which include an inner protection zone with a physical barrier around the upper section of the spring.

This study has served as a pilot for groundwater resources investigation, evaluation and protection as a field of activity for Water Resource Management Agency which was created in 2013 in order to introduce Integrated Water Resource Management to Zambia.