Groundwater quality in Africa

Introduction to Groundwater Quality in Africa

Groundwater quality can be influenced by both natural and anthropogenic processes. At present there are few studies on groundwater quality for Africa, and no regional or national assessments. Some of the key issues related to groundwater quality in Africa are described below, with some key sources of more information.

Drinking water guidelines


Groundwater quality fact sheets

The British Geological Survey collaborated with WaterAid to summarise the inorganic quality of groundwater in countries where WaterAid works.

Download fact sheets for groundwater quality for Burkina Faso, Ethiopia, Ghana, Madagascar, Malawi, Mali, Mozambique, Nigeria, Tanzania, Uganda and Zambia. These fact sheets aim to identify inorganic constituents of risk to health that may be present in groundwater.

Download water quality fact sheets by element for arsenic, fluoride, iodine, manganese and nitrate. These element sheets aim to explain the nature of the health risk for each constituent, the origin and occurrence in groundwater, the means of testing and available methods of mitigation.

Download fact sheets on the impact of agriculture, industry and urbanisation. These
complement the fact sheets on specific groundwater quality parameters and countries, and should be read together with these.

Geogenic contamination

Geogenic contamination refers to naturally occurring elements that are generally present in groundwater due to dissolution of the aquifer material. Geogenic contaminants in groundwater can have a negative effect on human health, particularly when consumed over prolonged periods of time. The most common geogenic contaminants are fluoride and arsenic. More than 300 million people worldwide are thought to use groundwater contaminated with fluoride or arsenic as a source of drinking water.

The British Geological Survey fact sheets give an overview of arsenic, fluoride, iodine and manganese, all of which can be geogenic contaminants in groundwater.

The Swiss Federal Institute of Aquatic Science and Technology (Eawag) has developed a method to assess the risk of groundwater contamination by fluoride or arsenic in a given area, using geological, topographical and other environmental data. The Groundwater Assessment Platform (GAP) enables users to upload their own data and generate hazard maps for specific areas. The Groundwater Assessment Platform also hosts a Wiki site where you can find and share information about geogenic contamination, associated health risks, and mitigation options.

Further information on the methodology used by Eawag can be found in these publications:


Salinity

Salinity is an important groundwater quality issue that can be driven by both natural and anthropogenic processes. Processes such as sea-level rise and intense evaporation can lead to naturally high salinity in groundwater, while overabstraction, irrigation and waste disposal can exacerbate groundwater salinity issues. Salinity has important consequences for human health and agricultural productivity.

IGRAC have compiled a global map of groundwater salinity by extrapolating documented cases into larger areas of high probability of saline occurrence.

Nitrate

Nitrogen occurs naturally in the environment and is essential for plant growth. Nitrogen-based fertilisers are therefore often applied to increase crop yields. Leaching from agricultural land can lead to high concentrations of nitrogen in groundwater, which can have a negative impact on both the environment and human health.

A British Geological Survey nitrate fact sheet is available giving an overview of nitrate in groundwater.

IGRAC have carried out a global assessment of nitrate contamination, working towards global scale maps of nitrate in groundwater.

Urban pollution

Urban and peri-urban areas are expanding in many parts of Africa, particularly across sub-Saharan Africa. Groundwater is often a very important source of improved drinking water in urban and peri-urban environments, but high population densities put pressure on urban groundwater resources, not only in terms of quantity but of water quality.

Groundwater quality can be influenced by a large number of contaminants in the urban environment, from microbiological pathogens and heavy metals to macronutrients, herbicides and pesticides.

Some of the key sources of urban pollution include:

- pit latrines, which are often located close to abstraction points, particularly in densely populated peri-urban or unplanned urban settlements
- sewer leakage and sewage effluent
- uncontrolled disposal of household and industrial waste
- peri-urban agriculture, which includes pesticides/fertilisers and livestock waste
- storm water runoff
- vehicle emissions, power stations and mine waste

There are few studies looking at urban groundwater issues in Africa and those that have been carried out mainly focus on large cities and include only basic chemical and microbiological parameters.

Some studies of urban groundwater quality in Africa are:


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