Press release

23 August 2019

Study shows boreholes are key to drought resilience in Ethiopia

Installing more boreholes to tap underground water will improve rural Ethiopian communities' resilience to drought, according to a new report.

Research carried out by the British Geological Survey (BGS), the University of Addis Ababa and the Overseas Development Institute (ODI) showed that people who have access to groundwater from boreholes are much less affected by drought than those who rely on wells or springs for their water supply. The report also links the shortage of water to:

- conflict in local areas
- migration
- a decline in breastfeeding rates
- a rise in miscarriage rates
- more children missing school

Groundwater experts from the BGS monitored 19 hand-dug wells, springs and boreholes in two districts in northern Ethiopia over 18 months. They also held focus-group discussions with local people, including school and health centre staff, near each of the groundwater sources.

The team found that boreholes drilled to 50–100 m were the most reliable source of water during the extended drought of 2015–16 and through the dry season.

Prof Alan MacDonald, the BGS hydrogeologist who led the research, said: 'We found that boreholes equipped with hand pumps were more reliable than springs or hand-dug wells, and this reliability was not affected by drought or seasonal change. As hand-dug wells dried up and springs failed, the boreholes we monitored gave exactly the same flow throughout the year.

'Boreholes also had better water quality. As the drought ended and rain started falling many of the springs and hand-dug wells became grossly contaminated. The boreholes performed much better, with less than half of them showing any level of contamination.

'Our findings make a clear case for the installation of more boreholes to improve resilience to drought. If constructed carefully and regularly maintained, boreholes can transform the water security for rural villages and make them much more resilient to the effects of climate change.'

Dr Seifu Kebede, from Addis Ababa University's earth sciences department, said: 'A significant finding of our study is the length of time people without boreholes spent in water collection during the dry season and drought, and the very low volumes of water they were able to collect.

'People were routinely queuing for up to 10 hours, which led to tension and sometimes violence, and had wide-ranging impact across communities. Women breastfed less and experienced more miscarriages, meals were missed and farm work was reduced to help collect water. School attendance was down in all but one district, as children were involved in water collection. All health centres in the study area reported increases in diseases, and, in some cases, employees were paying for water collection to keep the centres functioning.

'We must look at how communities source water during a normal dry season to predict how they will cope during drought years. This study shows that boreholes, where they can be installed, could be the most reliable source of groundwater in these areas of northern Ethiopia.'

According to the BGS's African Groundwater Atlas, Ethiopia has a high potential for groundwater in the highland regions due to the mostly permeable rocks. A major challenge, however, is the rugged terrain, which can hinder the movement of drilling rigs.

The project was funded by the Natural Environment Research Council (NERC) and the Department for International Development (DfID). The full report is published on Thursday 23 August in *Environmental Research Letters*.

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Notes to editors

About groundwater

- Groundwater is the Earth's main reserve of fresh water and its sustainable development and management are critical to society.
- More than 40 per cent of the world's water use is from groundwater.
- Groundwater offers an excellent buffer to changes in climate.
- Not all groundwater is renewable and the main risks are pollution and overuse.
- Development and management require understanding of groundwater systems.

Where does groundwater come from?
In the Ethiopian highlands, rain water infiltrates through the underlying volcanic rock over decades and centuries to collect in fractures and cracks in the rock, forming aquifers. This groundwater naturally flows out slowly at springs and rivers, or can be accessed by drilling boreholes and installing hand or motorised pumps. Since it is replenished at a different time scale to rivers, groundwater is available when other sources dry out.

About the methodology
Research was undertaken within two woredas (districts) in the Ethiopian highlands: Lay Gayint, in the central highlands, and Kobo on the western escarpment, which includes part of the lowland plains of the Afar Basin.

Satellite-based rainfall estimates were used to provide an overview of seasonal rainfall conditions over Ethiopia. These were combined with rain gauge data from the Ethiopian National Meteorological Agency to examine the groundwater response to the 2015 rainfall deficit.

Ten hand-dug wells, five shallow boreholes (40–100 m) and four springs were fitted with pressure transducers to measure water levels every 15 minutes.

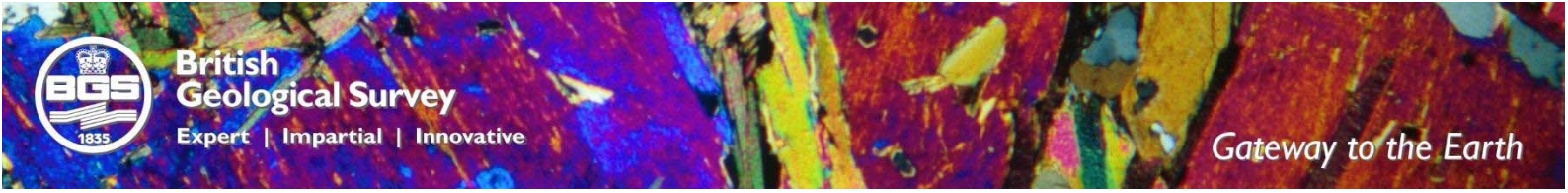
Data was collected from July 2016 to October 2017, capturing the water quality of the first rains and during the hydrological year after the drought.

Water quality was measured in 17 hand-dug wells, 15 shallow boreholes and 19 springs every two months.

Semi-structured interviews were carried out with focus groups in each Kebele (sub-district and lowest administrative group).

What is a borehole?
A borehole is a cylindrical hole, usually greater than 20 m deep and less than 0.5 m in diameter, drilled vertically to allow groundwater to be abstracted from an aquifer. They are less common in Ethiopia than in other African countries.

There is lots more information about boreholes here
https://www.developmentbookshelf.com/doi/abs/10.3362/9781780441290.002



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