



Many people in Africa depend on groundwater, but exploiting it effectively depends on accurate information about where to find it – and this information is expensive to obtain. Yet in many cases, researchers did the work years ago – it's just a matter of tracking down their results. Jude Cobbing and Jeff Davies describe a new initiative to make data from old studies more accessible – and in doing so, improve scientific cooperation and the availability of water in Africa.

# Groundwater - returning to the sources

What do a faded report on borehole drilling in Nyasaland written in 1952, an unpublished 1973 study of groundwater levels in northern Zambia and the field notes of a British geologist seconded to the Botswana Geological Survey in the 1980s have in common? They're all part of a sizeable archive of so-called 'grey data' on African groundwater held by the British Geological Survey (BGS).

Groundwater – the huge resource of underground water that keeps springs flowing and wells and boreholes working – is the main source of water for most Africans. Indeed, it is vital worldwide – for instance, groundwater makes up about a third of public water supplies

in England and Wales.

Understanding where to find it, and how to manage it, is the role of specialists called hydrogeologists. The trouble with groundwater is that you usually can't see it, and so hydrogeologists rely on records of water-level measurements and other data. The properties of the aquifer rocks that the groundwater flows through are also important.

It is usually time-consuming and expensive to carry out hydrogeological studies, especially in remote areas where we know little about groundwater. Boreholes must be drilled and tested, water levels measured and samples sent off to laboratories for analysis. To repeat such work because the results of the original surveys

are inaccessible, unknown or simply lost is very expensive – and in the context of providing water supplies in Africa, a huge waste of very scarce resources.

Hydrogeologists have always known the value of unpublished reports, databases and notes on African groundwater, plus specialist material published in small quantities but now long out of print and hard to find. The secondment of British staff to former colonial geological surveys, and more recently close cooperation between British scientists and African state organisations, resulted in a large and valuable archive of grey data held in the UK.

When British scientists finished their tours of duty in Africa, they would naturally take

home copies of reports produced and databases assembled during their stay abroad. Mostly these were fragile paper copies, since much of the work was done before computers and digital archives were common.

With the urgent need for better water supplies and sanitation in Africa, and interest in historical 'baseline' conditions for water resources to help us better understand the effects of changing weather and land use, grey data on groundwater has never been so important. Added to that, the capacity and resources of the public sector in some African countries have declined over the last two decades or so, leading to the loss of many important grey reports.

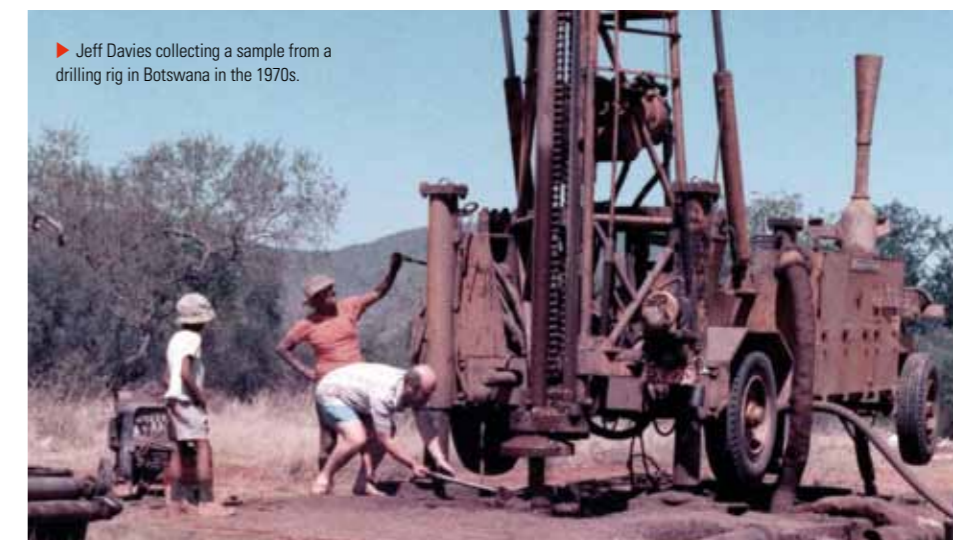
In some cases the material in the BGS archives in the UK may now be the only accessible copies remaining. Even where it is theoretically possible to access grey data on African groundwater, it is still very difficult to know what was done and what is available – it can be a nightmare trying to unravel half-forgotten endeavours in remote parts of the continent, and what reports and other documents they led to. There is no single catalogue of African groundwater grey data, and many crucial details now exist only in the heads of the scientists who originally did the work.

## Using the grey matter

The BGS estimates its archives contain many thousands of grey items on African groundwater, ranging from paper reports and hand-drawn maps to graphs and charts of water levels. Of course, some of this material is confidential, and some of it is subject to copyright or other restrictions.

However, a substantial proportion of the archive was always intended for wider distribution and was originally produced with no strings attached. In mid-2009 the BGS, in collaboration with South Africa's Water Research Commission (WRC), obtained EU funding to carry out an 18-month project entitled 'Groundwater Knowledge Sharing and Cooperation in the Southern African Development Community (SADC)', known as the Grey Data Project.

The Grey Data Project will catalogue and describe at least 2000 important grey items on groundwater in the southern African region held at BGS, in the process compiling a digital 'metadata database' or catalogue describing what has been produced over the years. The project will also digitise at least 500 of these items and make them available, together with the metadata database, via a web portal to interested



▶ Jeff Davies collecting a sample from a drilling rig in Botswana in the 1970s.

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researchers, service providers and policy-makers.

The project is already yielding practical benefits. Martin Holland, a South African student at the University of Pretoria, is working on a PhD which will unravel some of the reasons for varying yields of water from boreholes in different parts of the granitic 'basement' rocks that underly more recent geological formations in southern Africa. Distinct periods of stability over millions of years have established discrete 'weathering surfaces' on the ancient African basement rocks, of different ages and altitudes.

Research has shown that these weathering surfaces affect how these rocks hold groundwater, and therefore have implications for important qualities of boreholes in different places, such as how much water they yield and how they might respond to changes in climate. Using grey data from BGS and other projects – hard to obtain until recently – Martin is piecing together the evidence linking weathering and borehole characteristics.

This promises to make groundwater development in African basement rocks more predictable, letting us plan better. Millions of people in Africa depend on groundwater from basement rock aquifers, so that even small steps in our understanding of this resource can have disproportionately large benefits. Martin is planning to publish a joint paper with his BGS counterparts on the work in 2010.

Crucially, the project is led by a BGS scientist with a lot of experience in Africa and wide knowledge of potential grey-data material

– you need grey hair to make sense of grey data archives! Having worked in more than 30 African countries in his career so far, Jeff Davies took part in many of the projects which produced the grey data in the first place.

Mention northern Botswana to Jeff, or eastern Tanzania, and he can reel off a list of obscure projects and documents produced on the groundwater of the region – some of them little-known even in the countries themselves. Project partner the Water Research Commission, on the other hand, knows about information requirements and current research projects in southern Africa, and has secured the support of the SADC groundwater office.

Together, the BGS and the WRC are supporting the restoration of groundwater information and institutional memory across the region, with the aim of making it cheaper and easier to manage groundwater.

In the meantime, the BGS team are rolling up their sleeves and blowing the dust off the old material on African groundwater, which fewer and fewer people in the UK today really know their way around. The team aims to involve other European geological surveys in a later phase of the project, and in doing so to strengthen scientific links and encourage collaboration.

## MORE INFORMATION

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