



Africa Groundwater Atlas

Making African groundwater information and data more available



B Ó Dochartaigh, K Upton, A MacDonald, J Talbot,
A Mckenzie, C Tindimugaya, T Abiye and S Adelana

Aim

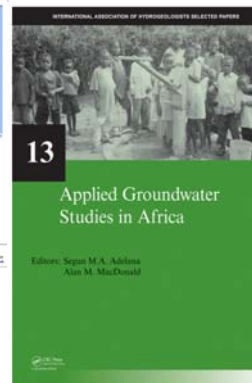
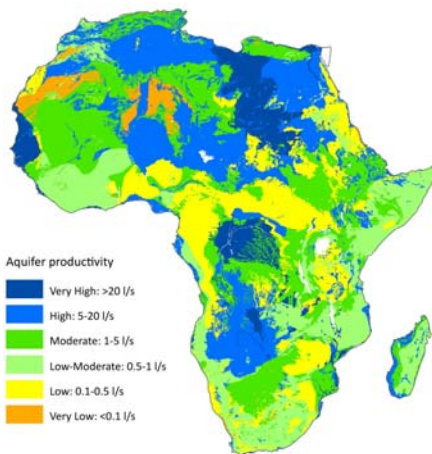
- more accessible groundwater data & information for Africa
- a systematic, country-level summary of groundwater in Africa

Outputs:

1. Open access, web-based, searchable index of groundwater literature for Africa
2. Web-based atlas of groundwater in Africa
3. Companion hard copy groundwater atlas (IAH book)
4. Collate long term (>10 year) groundwater datasets
5. Ensure long term maintenance of online resources

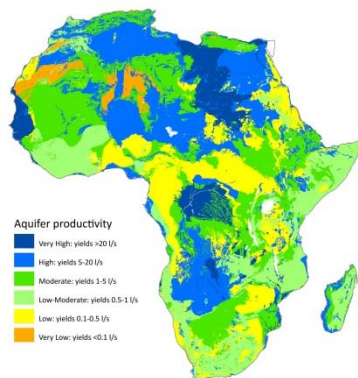
Why is this needed?

- A lack of **available, accessible**, good groundwater data & information often constrains groundwater development in Africa
- Recent groundwater resource maps (*ERL 2012*) provide **continent scale** summary, & highlight the need for better **country scale** information
- To cover all Africa; provide consistency; & complement other data/information initiatives (e.g. SADC/BGS, WRC, IRD)

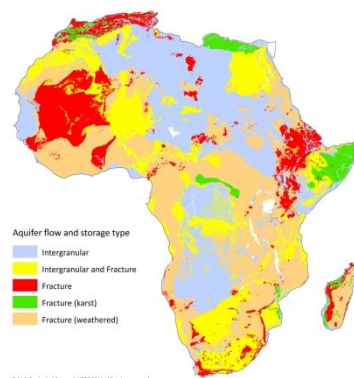


Building on earlier work

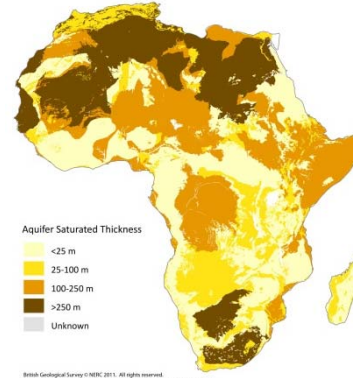
- Continental-scale, quantitative maps
- Indicate aquifer productivity, flow/storage type, saturated thickness & storage capacity
- Based on hydrogeological maps and site-specific studies



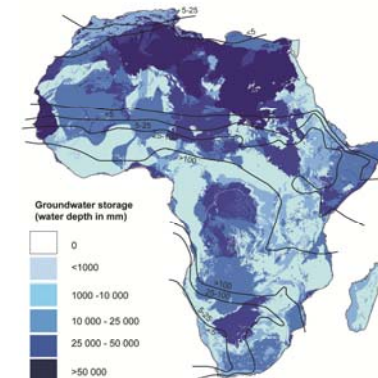
British Geological Survey © NERC 2011. All rights reserved.
Boundaries of political geography of Africa, courtesy of the U.S. Geological Survey.
Country boundaries sourced from ArcWorld © 1995-2010 Esri. All rights reserved.



British Geological Survey © NERC 2011. All rights reserved.
Boundaries of political geography of Africa, courtesy of the U.S. Geological Survey.
Country boundaries sourced from ArcWorld © 1995-2010 Esri. All rights reserved.



British Geological Survey © NERC 2011. All rights reserved.
Boundaries of political geography of Africa, courtesy of the U.S. Geological Survey.
Country boundaries sourced from ArcWorld © 1995-2010 Esri. All rights reserved.



British Geological Survey © NERC 2011. All rights reserved.
Boundaries of political geography of Africa, courtesy of the U.S. Geological Survey.
Country boundaries sourced from ArcWorld © 1995-2010 Esri. All rights reserved.
Median annual recharge data from ArcWorld © 1995-2010 Esri. All rights reserved.

Timetable

Project started **September 2013**

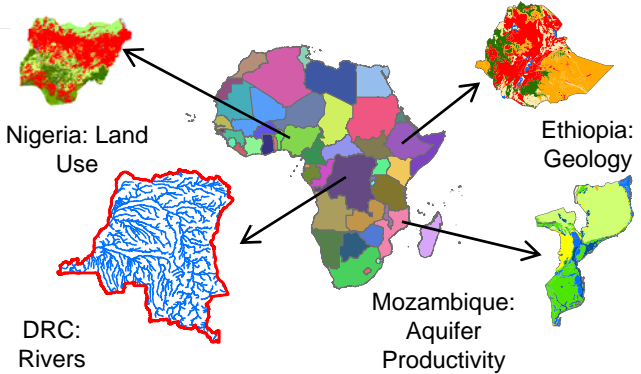
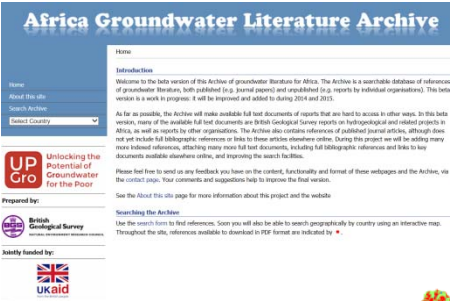
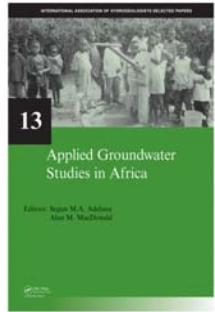
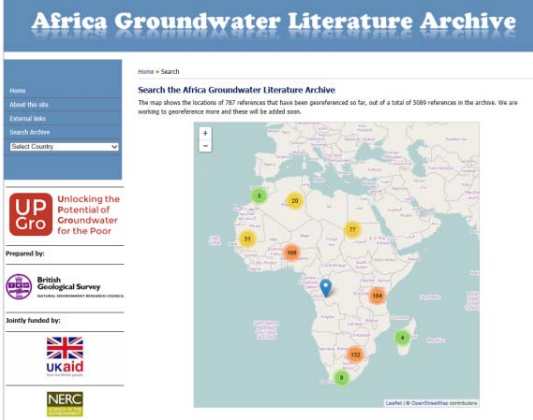
Africa Groundwater Literature Archive (AGLA) beta version online **January 2014**

AGLA further developed throughout **2014**

Africa Groundwater Atlas in development throughout **2014**

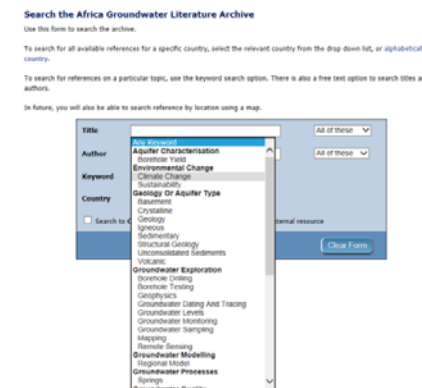
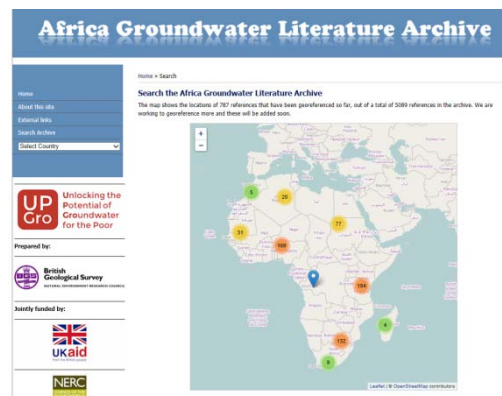
Atlas online **March 2015**

Printed (hard copy) Atlas after **March 2015**



Africa Groundwater Literature Archive (AGLA)

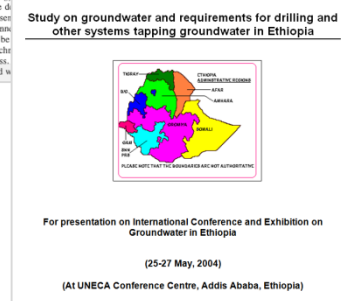
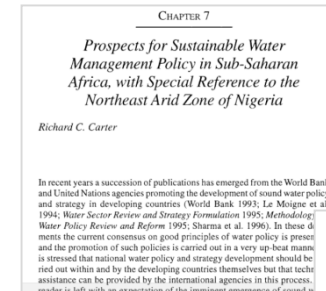
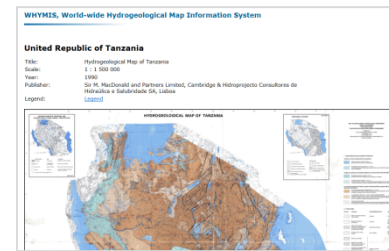
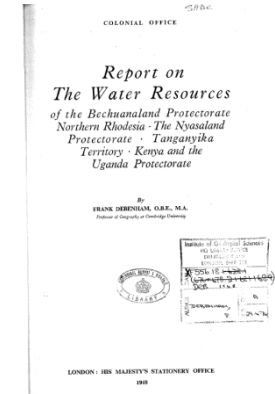
- Most comprehensive yet index of African groundwater literature
- >5000 entries (so far)
- Full bibliographic references
- Full text download if available (or for copyrighted documents, link to online abstract if available)
- Includes unpublished, hard-to-access reports
- Searchable by location (geographic) and themed keywords



AGLA Content

Over 5000 references, including:

- Unpublished reports, many full texts available, 1897-2014 (organisations like BGS, IWMI, geological surveys; outputs from large projects, e.g. HAP Ghana)
- Journal articles, 1927-2014 (URL to online article if available, including abstract)
- Conference papers, academic theses, books & book sections (URL to online resource if available)
- Hydrogeological maps (pdf or image files)



Searching AGLA

Powerful search options:

- By **themed keyword**: over 200 keywords
- **Free text**: title, author
- **Geographically**:
 - Every relevant reference tagged by **country**
 - As many as possible **georeferenced** with coordinates
- Full bibliographic reference output

Search the Africa Groundwater Literature Archive

Use this form to search the archive.

To search for all available references for a specific country, select the relevant country from the drop down list, or alphabetically by country.

To search for references on a particular topic, use the keyword search option. There is also a free text option to search titles and authors.

In future, you will also be able to search reference by location using a map.

Search Results
The following 6 results are available for your search.

Click a report title to view full details. Reports marked with have a PDF available to download from this site. Those marked with have a link to an external resource.

Nigeria

- MacDonald, A.M., 2001. *Report on visit to a Watershed Project, Nigeria, to carry out workshops and assess geology of Borno State*. British Geological Survey. (IR/01/18)
Keywords: Crystalline, Geology, Geophysics, Geology Or Aquifer Type, Groundwater Exploration, Borehole Testing, Igneous, Borehole Drilling

Not Country Specific:

- Davies, J.; Herbert, R., 1994. *Improving water yield from shallow alluvial aquifers (Project summary report)*. British Geological Survey. (WC/94/64)
Keywords: Borehole Yield, Unconsolidated Sediments, Borehole Development, Geology Or Aquifer Type, Borehole Testing, Borehole Construction, Groundwater Resource Development, Volcanic, Borehole Drilling
- Hosain, P., 1994. *Unconsolidated Sedimentary Aquifers: Review No 2 – Borehole Performance Maintenance*. British Geological Survey. (WC/94/44)
Keywords: Unconsolidated Sediments, Borehole Development, Geology Or Aquifer Type, Groundwater Exploration, Borehole Testing, Borehole Construction, Groundwater Resource Development, Volcanic, Borehole Drilling

Tanzania, United Republic of

- Maurice, L.; Taylor, R.; MacDonald, A.M.; Sanga, H.; Johnson, P.; Darling, G.; Gooddy, D., 2010. *Case study notes: Resilience of intensive groundwater abstraction from weathered crystalline rock aquifer systems to climate change in sub-Saharan Africa*. British Geological Survey. (IR/10/105)
Keywords: Crystalline, Groundwater Sampling, Sustainability, Geology Or Aquifer Type, Groundwater Exploration, Groundwater Levels, Borehole Testing, Environmental Change, Groundwater Resource Development

Improving water yield from shallow alluvial aquifers (Project summary report).

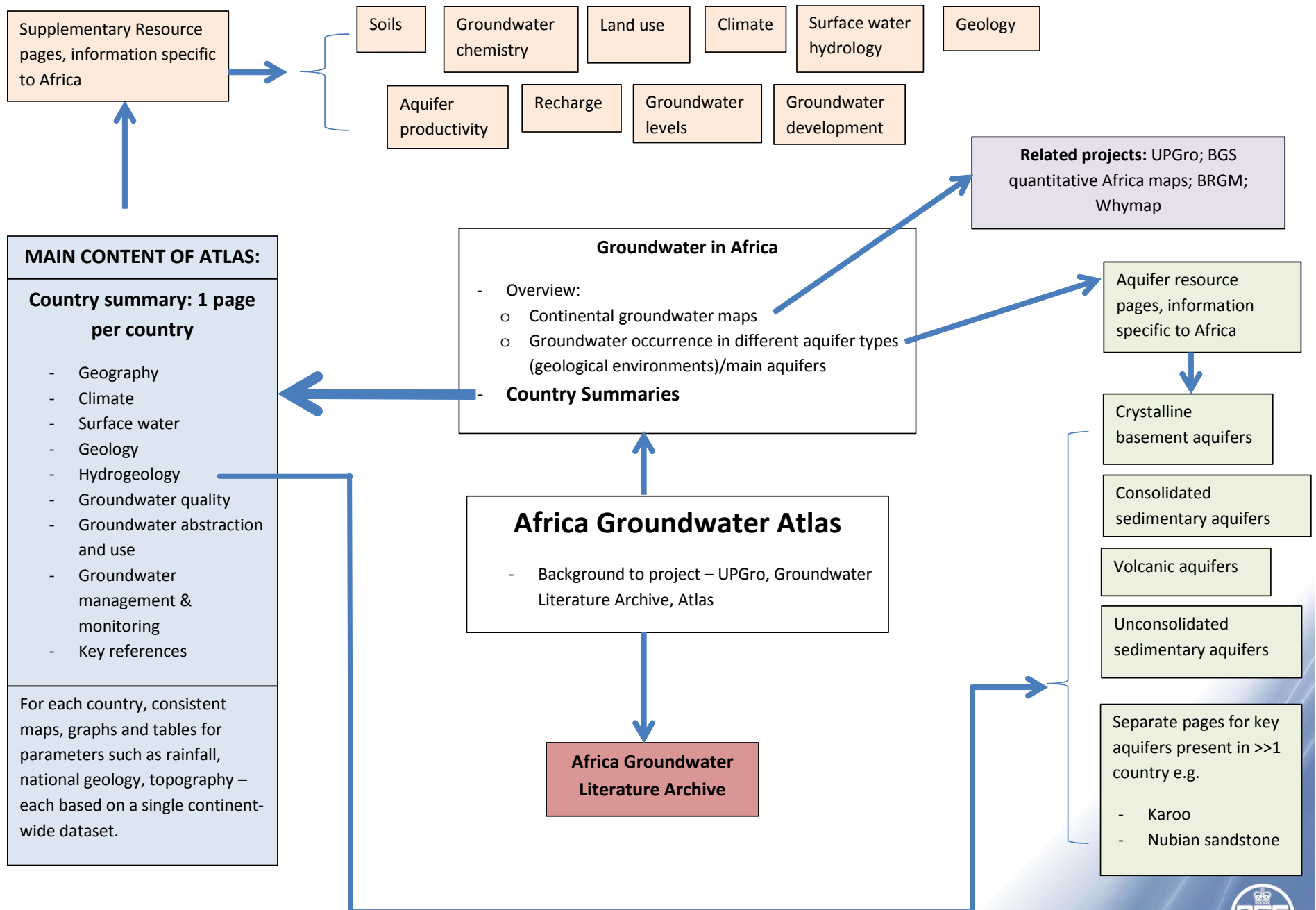
Davies, J.; Herbert, R., 1994. *Improving water yield from shallow alluvial aquifers (Project summary report)*. British Geological Survey. (WC/94/64)

Item Type:	Publication - Report
Language:	English
Keywords:	Borehole Yield, Geology Or Aquifer Type, Unconsolidated Sediments, Volcanic, Borehole Drilling, Borehole Testing, Groundwater Resource Development, Borehole Drilling, Borehole Construction, Borehole Development, Borehole Yield
Country:	Not Entered
URI:	http://nora.nerc.ac.uk/505069/



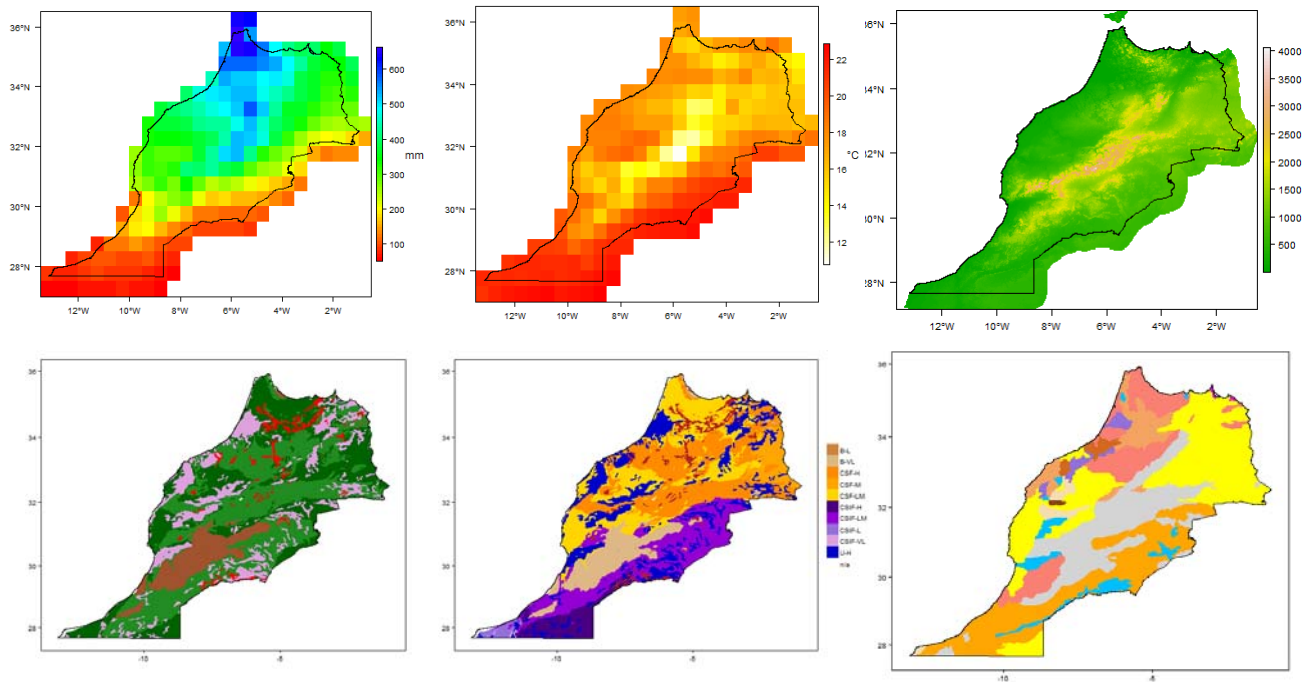
Africa Groundwater Atlas

- Systematic summary of groundwater resources at country scale
- New country-scale hydrogeological maps
- Online, encyclopedia-style (think Wikipedia)
- Co-written with African hydrogeologists
- Including consistent information on key aquifers, aquifer properties, recharge and groundwater quality, groundwater management & supplementary resources (e.g. climate, soil, land cover)
- Linked to AGLA, with key references highlighted



Africa Groundwater Atlas

- A series of thematic country-scale maps based on robust data (hydrogeology, geology, surface water, land cover, soil)
- Robust climate information (1960-2010)
- Maps edited by hydrogeologists using best available information



Groundwater in Africa
From Geoscience

An overview of the occurrence of groundwater in different environments across Africa provides the background for a summary of groundwater resources in each Africa

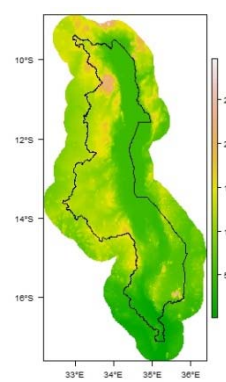
Geoscience

Overview of groundwater in Africa

Key hydrogeological environments and aquifers

Africa can be divided into four main hydrogeological environments, seen on the map below. In each environment, groundwater is stored and flows in different ways. The hydrogeological environment also affects the character of groundwater.

- Crystalline basement (includes gneiss and/or metamorphic) aquifers, also known as Basement Complex
- Consolidated sedimentary aquifers
- Unconsolidated sedimentary aquifers
- Volcanic aquifers



Geoscience
ENCYCLOPEDIA

Navigation

- Main Page
- Community portal
- Current events
- Recent changes
- Random page
- Local help
- MediaWiki help

Search

page discussion edit history move watch

Hydrogeology of Malawi

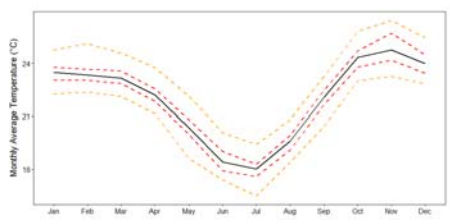
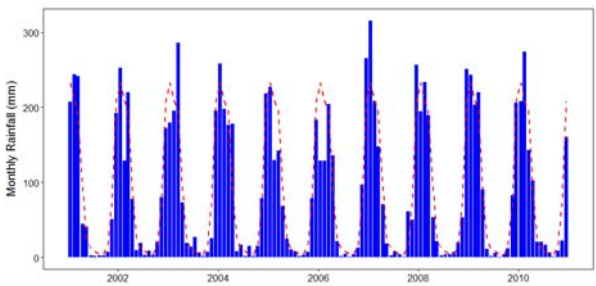
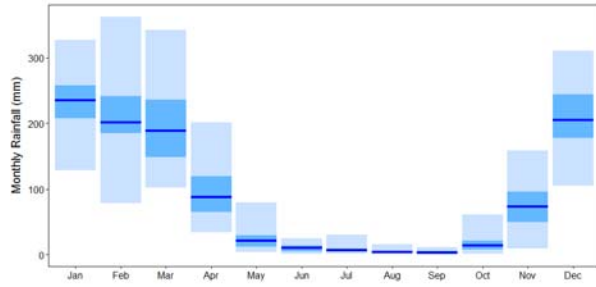
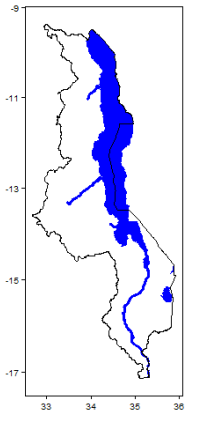
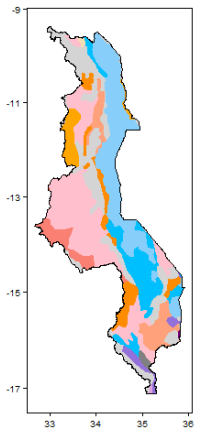
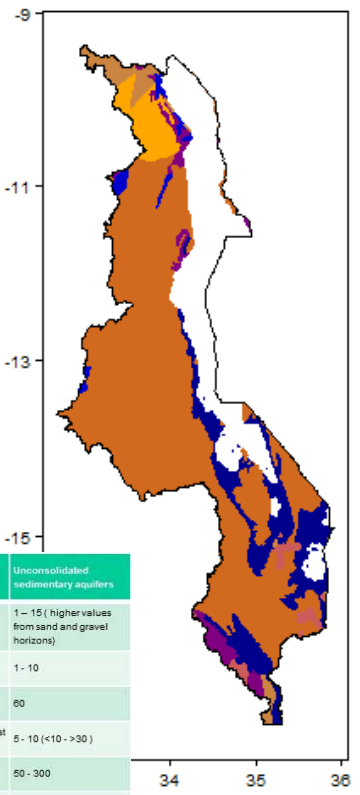
From Geoscience

This page provides an overview of the hydrogeology of Malawi.

Back to Africa Groundwater Atlas home page.

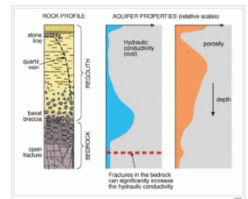
Contents [hide]

- Geography
- Climate
- Surface Water
- Geology
- Hydrogeology
 - Summary
 - Precambrian weathered basement (Basement Complex) aquifers
 - Unconsolidated sedimentary aquifers
 - Igneous aquifers
 - Consolidated sedimentary aquifers
 - General
 - Key hydrogeological references?
- Groundwater Quality
 - Overview
- Groundwater use and management
- References



	Precambrian weathered basement aquifers	Unconsolidated sedimentary aquifers
Borehole yield (lit/s)	0.25-2, with 0.25-0.5 most common	1-15 (higher values from sand and gravel horizons)
Hydraulic conductivity (m/d)	0.5-15	1-10
Typical borehole depth (m)	45-60	60
Water table depth (m)	0-30, but 5-15 most commonly	5-10 (<10 - >30)
Transmissivity (m ² /d)	5-35	50-300
Storage coefficient	5 x 10 ⁻² - 1 x 10 ⁻²	1 x 10 ⁻² - 5 x 10 ⁻²

Circulating groundwater is a very important reagent of chemical weathering. It provides a source of hydrogen ions and removes the soluble products, which would otherwise build up to an equilibrium condition, inhibiting further chemical breakdown. The depth of the weathered zone and extent of decomposition is thus also related to the amount of rainfall which infiltrates.



Fractured basement
Deeper fractures within basement rocks are also an important source of groundwater, particularly where the weathered zone is thin or absent. These deep fractures are tectonically controlled (MacDonald et al 2008).

Groundwater potential of basement aquifers
Crystalline Basement Complex rocks have very low primary porosity and permeability, and in an unweathered state contain very little groundwater, except where they are extensively fractured. Boreholes intersecting well connected fractures may show high yields initially, but groundwater storage in fracture zones is typically low, so that initially high flows may decline over time because of poor storage and un dependable recharge. Fracture zones are also often infrequent and discontinuous (Smith-Carrington & Chilton 1983).

The groundwater resources within the regolith (weathered zone) and deeper fracture zones depend on the thickness of the water-bearing zone and the relative depth of the water table. In general terms, the deeper the weathering, the more sustainable the groundwater. However, due to the complex interactions of the various factors affecting weathering (as in particular the presence of clay in the weathered zone), waterbearing horizons may not be present at all at some locations.

In highly weathered basement, typical borehole yields are between 0.1 and 1.0 lit/s. Analysis of over 2000 records of yield data from successful basement boreholes across Africa - predominantly in seasonally wet or wet climate zones - showed that most values lie between 0.1 and 5 lit/s, with a geometric

- Igneous - largely volcanic
- Precambrian Craton
- Precambrian Metasedimentary
- Precambrian Mobile/Orogenic Belt
- Sedimentary - Cretaceous-Tertiary
- Sedimentary - Mesozoic-Palaeozoic
- Surface water
- Unconsolidated sedimentary



More information

Africa Groundwater Literature Archive

<http://www.bgs.ac.uk/africagroundwateratlas/index.cfm>

Africa Groundwater Literature Archive

Home » Search

Search the Africa Groundwater Literature Archive

The map shows the locations of 787 references that have been georeferenced so far, out of a total of 5089 references in the archive. We are working to georeference more and these will be added soon.

Prepared by:
British Geological Survey

Jointly funded by:
UKaid
NERC

Project webpage

<http://www.bgs.ac.uk/research/groundwater/international/africaGwAtlasArchive.html>

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Gateway to the Earth

Home » Our data | Our research | Our services | Our people | Discovering geology | News & Events | Hosted sites

Home » Our research » Groundwater science » Research areas » International groundwater research » Africa Groundwater Atlas and Literature Archive

Africa Groundwater Atlas and Literature Archive

The development of groundwater resources in Africa could underpin the future economic growth and food security as well as providing a safe source of water for the many people who currently struggle with unreliable and poor quality water supplies. However, much of the data and information that already exists about groundwater in Africa is not available to the people who could make use of it. This project aims to address that problem.

The two main strands of this project are:

- Africa Groundwater Literature Archive
- Africa Groundwater Atlas

Putting information into the public domain

The Africa Groundwater Literature Archive (AGLA) is available online in a 'beta' version, with over 5000 references to date, of which many are available to freely download as full text documents. This is the most comprehensive catalogue yet available of groundwater literature for Africa. It includes unpublished reports, manuals

Organisational programme

- Groundwater

See also

- Groundwater data and information

Link to the archive

- Africa Groundwater Literature Archive

Funders

- UPGro
- DFID
- NERC UPGro
- ESRC