

Developing Groundwater Resources

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Developing Groundwater Resources

More information on techniques for the successful and sustainable development of groundwater resources, with particular focus on Africa.

What does groundwater development involve?

Developing groundwater for water supply can involve many different activities. What needs to be done depends heavily on:

- the hydrogeological environment,
- how much groundwater is needed' and
- what the water it will be used for.

It is usually also important to develop groundwater sources **sustainably**, so that the groundwater resource is protected and maintained for the future.

The simplest kind of hydrogeological environment to develop is groundwater flowing naturally from a spring. This can be directly tapped with very little effort. However, protecting the spring, so that the water doesn't become polluted, is important and is not always as easy.

Another quite simple hydrogeological environment is where groundwater levels (the water table) are shallow and the aquifer is easy to dig through (e.g. sand or gravel). Here, hand dug wells can be quite easily constructed to allow groundwater to be abstracted - but again, protecting the groundwater in the well from pollution is important and has to be done carefully.

More complicated hydrogeological environments are where the aquifer and/or groundwater levels are deeper, or the aquifer can't be easily dug through by hand. Here, developing groundwater resources is more complicated. It is likely to need some kind of mechanical drilling - either manual drilling, or using a drilling rig. In areas where the aquifers are all permeable and productive, water boreholes can often be drilled just about anywhere. But in areas with low permeability and/or complex aquifers, or where there are groundwater quality issues, new boreholes and wells must be sited and designed carefully if they are to be successful. To do this, it's important to understand how groundwater exists and behaves in the area.

Atlas resource pages on groundwater development techniques

- [Groundwater source types](#)
- [Stages in a groundwater exploration and development programme](#) including the following:
 - [Siting Boreholes](#)
 - [Reconnaissance](#)
 - [Borehole Drilling](#)
 - [Manual drilling](#)

Borehole Testing:

- [Assessing source yield](#)
- [Assessing water quality](#)

Links to more information

RWSN: groundwater development for rural water supply

The [RWSN](#) (Rural Water Supply Network) has many resources to support sustainable groundwater development for rural water supply.

RWSN's [sustainable groundwater development](#) theme page contains very useful resources including:

- [Professional water well drilling](#)
- [Groundwater abstraction](#)
- [Groundwater management](#)

- Many publications with guidance on [hand dug wells](#) and [manual drilling](#) (see the Atlas section on [Manual drilling](#) for more information).

UNHCR: groundwater development in an emergency context

The [UNHCR](#) (UN Refugee Agency) has many resources to support water supply and sanitation in an emergency context, specifically in refugee camps. Some of these very useful resources are:

- [Reference Documents](#), which you can filter to look at only those dealing with groundwater aspects of water supply (e.g. boreholes, groundwater, water pumping and water quality testing)
- Sample [drilling contract and technical specifications](#)
- Terms of reference for [hydrogeological surveying](#) for new wells or boreholes
- Guidance on capturing information during [well construction](#)
- Guidance on hand dug [well cleaning](#)

Reports or books describing groundwater exploration and development in an African context

Danert, K. 2015. [Manual Drilling Compendium 2015](#). RWSN Publication 2015-2, Skat, St Gallen, Switzerland.

Danert, K. 2015. [Chad's Growing Manual Drilling Industry](#). , Skat Foundation, St Gallen, Switzerland.

MacDonald, A M, Davies, J, and Ó Dochartaigh, B É. 2001. [Simple methods for assessing groundwater resources in low permeability areas of Africa](#). British Geological Survey Commissioned Report, CR/01/168N.

MacDonald, A M, Davies, J, Calow, R, and Chilton, J. 2005. [Developing groundwater: a guide for rural water supply](#). ITDG Publishing, NERC 2005. *This book is a comprehensive manual for how to develop groundwater for rural water supply, based on extensive experience in Africa. Each chapter of the book can be freely downloaded from the [Practical Action Publishing](#) website.*

MacDonald, A M, and Calow, R C. 2009. [Developing groundwater for secure rural water supplies in Africa](#). Desalination, 248 (1-3), 546-556. doi: 10.1016/j.desal.2008.05.100

World Health Organisation. 2011. [Guidelines for drinking-water quality, 4th edition](#). ISBN: 978 92 4 154815 1

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