ClimDev-Africa

Policy Brief 5

Management of Groundwater in Africa: Implications for Meeting MDGs, Livelihood Goals and Adaptation to Climate Change

Groundwater is one of the most important sources for drinking water, livestock water and irrigation in Africa. It is particularly important for arid and semi-arid countries in the northern and southern parts of Africa, since it is often the only source of water in these areas. Groundwater resources represent 15% of the continent's renewable water resources, yet its hidden presence under the ground has left it largely under-valued and under-utilised, with the exception of its use for potable water. While the availability of rainwater and freshwater from rivers and lakes will likely become more erratic and thus less reliable as a result of climate change, groundwater is likely to be less affected than surface resources by climate variability, higher temperatures, and evaporation.

Three major factors are driving the heightened interest in groundwater development in Africa. The first, and arguably the most pressing over the short term, is the UN Millennium Development Goal of providing improved access to safe and clean water supplies to all affected sub-Saharan African communities (MDG 7.C). To reach this goal, the delivery of groundwater through well-placed and appropriately constructed and maintained borewells has a vital role to play. Second, the amount of access to groundwater for livestock watering and small-scale and commercial irrigation is an important measure of poverty and livelihood potential. Groundwater can make a difference here, as it is still a largely untapped resource for agricultural development in Africa. Third, climate change affects precipitation and temperature dynamics on a global scale, and hence will impact water supply and demand in local communities. Enhancing water storage capacity, both above and below ground, is widely accepted as a coping strategy against hydrological shocks, such as floods and droughts.

Key messages

- Groundwater represents a vast untapped source of water in Africa, but technical, socio-economic, and institutional factors, have constrained its use.
- Groundwater management in Africa can be an essential component of climate change adaptation strategies.
- However, important gaps in knowledge of groundwater resources exist in Africa that must be narrowed if groundwater is to play a major role in assisting adaptation to climate change.

The challenge of developing groundwater resources in a changing climate

A significant impact on water resources from climate change is anticipated, with an increasing number of African countries likely to face greater water stress by 2025. Groundwater resources in Africa are broadly distributed, of generally good quality, and resilient to climate variability, including extreme climate events. They constitute the most important buffer and reserve of water during surplus periods as well as a source of water for streams and/or direct withdrawals in times of shortage, and thus are expected to play an essential role in adapting to

climate change. However, major gaps in knowledge of groundwater resources exist in Africa, with significant uncertainty regarding the impact of climate change on groundwater resources and groundwater-dependent ecosystems.

The distribution of renewable groundwater is highly skewed. Indeed, more than half of Africa's renewable groundwater is contained in just four countries, the Democratic Republic of Congo, the Republic of Congo, Cameroon, and Nigeria. Vast amounts of groundwater are stored in non-renewable reserves in sedimentary formations, such as the Nubian Sandstone, which is mainly in the northern sub-region. While groundwater resources represent just 15% of the continent's renewable water resources, when the total amount of water held in storage is taken into account, including fossil water, groundwater is in fact the most abundant water source in Africa.

While the resource availability is relatively well known at regional and sub-regional scales, at smaller scales where development is focused, knowledge of the resource-base is far from adequately understood, particularly in sub-Saharan Africa. Characterising the availability and distribution of groundwater resources is a vital and important first step in identifying the most prospective locations for groundwater development and for gauging the likely development potential. Lack of adequate information makes borehole drilling a risky business. In many regions, the complex nature of the hard rock or fissured aquifers, that may be heterogeneous and discontinuous in extent, leads to high rates of failure in drilling new wells.

Transboundary aquifers represent highly important groundwater resources in Africa. Most of the major aquifer systems in Africa are shared by two or more countries. Altogether, there are at least 60 known transboundary aquifers in Africa, the most significant of which are found in arid and semi-arid regions, but the total number (including non-shared aquifers) is unknown. Cooperation among countries to develop transboundary aquifer resources will be needed if such resources are to be effectively developed.

Needs and recommendations

There is a growing recognition that groundwater management in Africa can be an essential component of climate change adaptation strategies. Renewable groundwater resources in Africa are underutilised, yet groundwater can play a major role in assisting farmers to increase food production and to overcome threats to food security if climate change leads to greater rainfall variability. The following are some recommended actions for overcoming obstacles to groundwater development:

- Research is needed on how to overcome the high cost of well construction and the limited understanding of groundwater resources, which currently restrict development of groundwater for irrigation in many parts of Africa. At present, less than 1% of the area under cultivation is irrigated by groundwater in sub-Saharan Africa.
- An improved understanding is needed of the role of groundwater in sustaining the environment and supporting ecological services.
- More quantitative information regarding groundwater flow and storage is needed. Understanding the flow and storage properties of groundwater in various aquifer systems is key to their sustainable development and management. For example, the current understanding of the weathered- and fractured-bedrock aquifers is simplistic and largely conceptual. Specific knowledge gaps include circulation rates in aquifer systems and the response of aquifer systems to intensive abstraction.

- Further research is required to improve understanding of the interactions between various aquifers and to assess the sustainability of groundwater use in aquifer systems that may be affected by both climate change and increased pumping rates.
- Groundwater and meteorological monitoring systems should be established or expanded at country and basin scales to assess how groundwater responds to abstraction and climate variability.
- It is also important that countries sharing common groundwater resources devise institutional arrangements that will facilitate cooperation.

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