

Unlocking Africa's Groundwater Potential

UPGro Film Script with References - 2020

Script

Currently, hundreds of millions of people in Africa depend on groundwater for their basic needs (UPGro, 2017; Foster 2017). Farmers, communities, industries and towns will increasingly rely on this resource (Taylor *et al*, 2019). How groundwater is managed and shared in the future will be central to securing people's lives and livelihoods.

From 2013 to 2020 researchers, citizens, governments, the private sector and NGOs from Africa and beyond came together in a UK-funded research programme called UPGro (UPGro, 2020a). UPGro set out to Unlock the Potential of Groundwater for the Poor (UPGro, 2020b).

Groundwater is the water that is stored underground, in what are called aquifers. Some aquifers contain more groundwater than others. Some aquifers release groundwater more easily than others. Shallow aquifers are fairly close to the surface. Whilst deep aquifers are much further down (MacDonald *et al*, 2005). Groundwater occurs almost everywhere but in some places, finding it is difficult (MacDonald *et al*, 2012).

Groundwater in Africa

Countries in Sub-Saharan Africa have a highly variable climates, which affects rainfall, river flows, lake levels and groundwater (McMahon *et al*, 2007a; McMahon *et al*, 2007a; Boyd *et al*, 2013). Groundwater is recharged by rainfall and surface water such as lakes and rivers. Heavy rainfall events and flooding can lead to significant recharge (Taylor *et al*, 2019; Kolusu *et al*, 2019; Ferrer *et al*, 2019).

UPGro researchers investigated the age of groundwater. They also looked at historical groundwater level and rainfall data. They found that in wetter areas recharge happens every year, but in dryland areas substantial recharge takes place less regularly, often just once or twice a decade. Climate change is expected to make rainfall in sub-Saharan Africa even more variable (Myhre, 2019; Allan *et al* 2019). It is expected that there will be a greater number of heavy rainfall events (Myhre *et al*, 2019; Fischer and Knutti, 2016). The frequency and intensity of floods as well as the frequency and duration of droughts are expected to increase (Myhre *et al*, 2019). UPGro research shows that this intensification may favour the recharge of groundwater (Taylor *et al*, 2019; Kolusu *et a*, 2019; Cuthbert *et al* 2019).

Groundwater can provide vital year-round water supplies (Ferrer *et al*, 2019a). ...and is a lifeline for livestock when ponds and rivers are dry. In dry periods, handpumps are often the only water source available (MacAllister, 2020). People depend on them for different water uses. Handpumps used by rural communities do not withdraw a lot of water, and the shallow aquifers that they rely on, generally receive enough recharge. Groundwater needs protection from pollution and water quality needs to be monitored. UPGro research found that during the dry season in rural Malawi, Uganda and the Ethiopian Highlands, 72% of working

handpumps provided good quality water; 21% of the working handpumps were affected by bacteria and 9% by chemicals, including nitrate pollution and naturally occurring fluoride and arsenic (Lapworth *et al*, 2020).

In many African cities, groundwater is becoming polluted; in fact, many shallow aquifers are heavily polluted (Sorensen *et al*, 2015a; Sorensen *et al*, 2015b; Foster *et al*, 2018)¹. At the scale of the African continent, UPGro research has shown that there has been no substantial decline in the volume of water stored in the major aquifer basins over the last 15 years (Bonsor *et al*, 2018; Cuthbert *et al* 2019). However, local contexts do differ, and in some African cities, groundwater levels have fallen because of large scale localized pumping (Foster *et al*, 2018).

Groundwater and change

This century, Africa is projected to experience very high population growth (UN DESA, 2019; Gerland *et al*, 2014). Expanding cities, growing rural populations and economic growth will increase the demand for groundwater (UN DESA, 2018, Taylor *et al*, 2019; Bonsor *et al*, 2018). Changes in rural land use and the expansion of urban areas will continue to affect the quality of groundwater and its recharge (Bonsor *et al*, 2018; Favereau *et al*, 2009; Foster *et al*, 2018)^{2 3}.

Groundwater and the economy

In 2010, less than 4% of cultivated land in Sub-Saharan Africa relied on groundwater for irrigation (Siebert *et al*, 2010). Using more groundwater for irrigation, improves agricultural production, reduces the risk of crop failure and helps to increase household incomes (Villholth and Altchenko, nd)⁴. New industrial developments bring opportunities for growth but some of these require a lot of water; Africa also has significant mineral deposits, which have led to major investments (Ferrer, 2019b). A good understanding of groundwater and surface water resources can show where there are opportunities for agricultural and industrial activities, and the risks associated with these (Ferrer, 2019b). If we understand the resource, we can prevent environmental damage and conflict. If we do not, investments are a gamble.

Groundwater, society and technology

Across rural Africa, men and women need water for their differing livelihoods, their health and their wellbeing. When water becomes scarce, or water points don't function, tensions can arise (MacDonald *et al*, 2019). This can lead to competition, between men and women as

¹ Papers from Addis & Nairobi (GroFutures) and Tgroup are in preparation.

² IWMI Research Report - 2019 - Analysis of Land Cover Change in Two River Basins in East Africa: The Upper Great Ruaha and the Upper Awash will become part of a GroFutures paper.

³ BRAVE UPGro Wrap-up presentation Nov 2019 – needs to be put online somewhere by Kirsty/Ros?

⁴ Richard T_working paper in draft – Impact of groundwater access on agricultural production and household asset holdings: a comparative analysis from Ethiopia, Niger and Tanzania by Gebrehaweria Gebregziabher, Imogen Bellwood-Howard, John Thompson, Karen Villholth, Devotha Kilave, Yohannes Aberra, Ouassa Tiekoura, Andrew Tarimo, Mohammad Shamsudduha, and Richard G. Taylor

well as conflict in communities and even within families⁵. During such times, women often have less access to water, which limits their livelihood activities. Improved understanding and management of groundwater can help to reduce tensions and ensure that essential activities can continue, even when water is scarce⁶.

It is also essential to build trust and connections between local authorities and local people. Within UPGro, an approach called Transition Management has empowered people to engage in constructive dialogue with institutions, NGOs and private companies. Transition management has enabled sustainable solutions for water-related problems to be developed jointly⁷.

Elsewhere, weekly radio programmes were aired, covering topics such as rainfall, local market information and groundwater (Walker Institute, 2019). Farmers and community members determined the content of the radio shows, and experts responded to their questions (Walker Institute, 2020). As a result, people formed a better understanding of groundwater and its management. Communication, when done the right way, can reduce vulnerability.

UPGro researchers also developed a simple way to measure how many hand pumps are actually working properly. It was found that more pumps have problems than previously thought. Researchers forensically examined why so many pumps were not working by taking apart pumps, testing boreholes and learning about underlying political, social and economic issues. In some cases, it was found that pumps were located where it is not possible to withdraw enough groundwater. In other cases poor quality pump parts had been installed that rapidly corrode (Kebede *et al*, 2017; Mwachunga *et al* 2017; Owor *et al*, 2019). Ensuring that handpumps work is an interplay of what happens at the national and local levels (Whaley and Cleaver, 2017).

Groundwater and the future in Africa

Looking ahead, groundwater will play an ever-greater role in providing safe and secure water supplies (MacDonald *et al*, 2012). Groundwater will benefit future generations. Research shows that groundwater can contribute to people's resilience and their ability to adapt to climate change (Taylor, 2020). Understanding groundwater opens up economic opportunities and enables costly mistakes to be avoided (MacAllister *et al*, 2020; Ferrer *et al*, 2019b). However, the nature of groundwater recharge means that long-term thinking and planning are essential. With determination, perseverance and by working together groundwater, alongside other water resources can be understood and managed. The UPGro community believes that the potential of groundwater can be unlocked and its benefits widely shared.

⁵ BRAVE paper in progress authored by Luisa Ciampi

⁶ BRAVE paper in progress authored by Luisa Ciampi

⁷ Reference in the making by Jan Willem Foppen (TGroup)

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