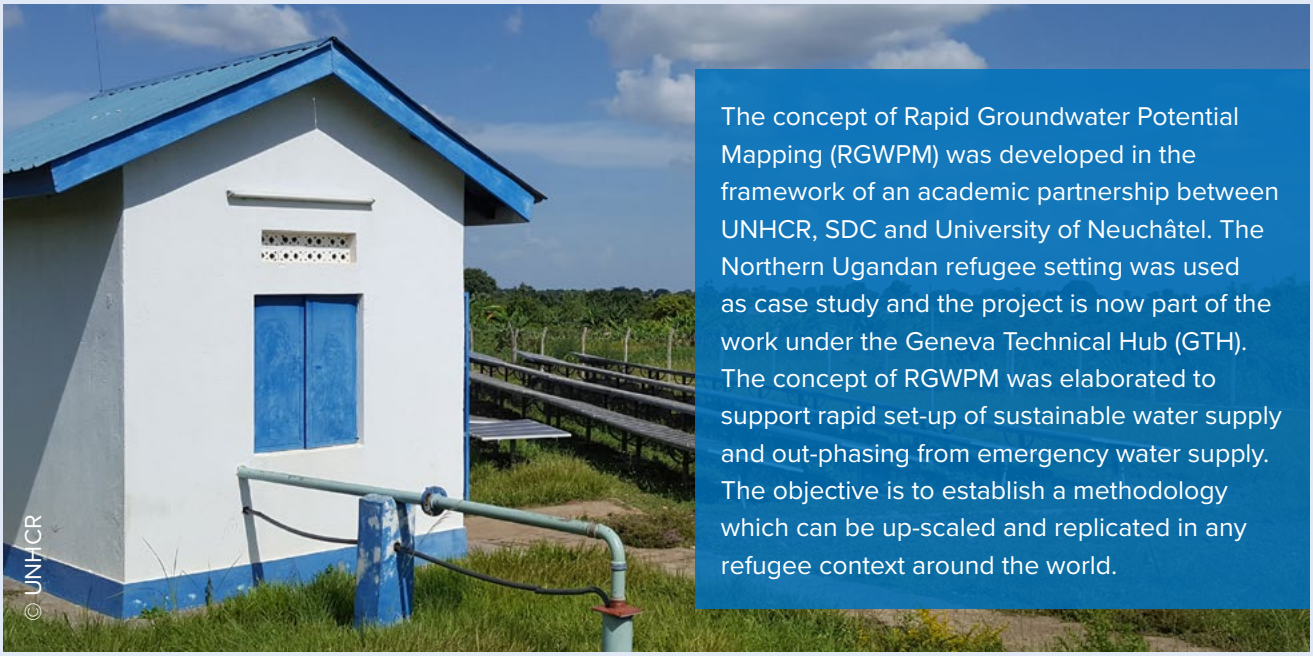
IDENTIFYING GROUNDWATER POTENTIAL MAPPING, UGANDA



The concept of Rapid Groundwater Potential Mapping (RGWPM) was developed in the framework of an academic partnership between UNHCR, SDC and University of Neuchâtel. The Northern Ugandan refugee setting was used as case study and the project is now part of the work under the Geneva Technical Hub (GTH). The concept of RGWPM was elaborated to support rapid set-up of sustainable water supply and out-phasing from emergency water supply. The objective is to establish a methodology which can be up-scaled and replicated in any refugee context around the world.

Solar-powered water supply system

Background & Context

The need for a tool for the rapid spatial assessment of “borehole yield range probabilities” associated to different water supply options was identified by the GTH hydrogeological expert after the major refugee influx from South Sudanese into Northern Uganda in 2017. During the emergency phase, it is crucial to rapidly identify areas, where drilling is most likely to be successful. The RGWPM methodology is based on fundamental hydrogeological processes, combining freely available satellite images, digital elevation models and geological maps, leading to a spatial overlay of the two main hydrogeological variables controlling groundwater potential, water availability (WA) and reservoir capacity (RC).

Objectives

To meet the sudden water demand in emergency contexts, it is key to quickly assess all possible water sources and plan sustainable water supply options in order to rapidly transition away from acute emergency responses, such as water trucking. Rapid groundwater potential maps (RGWPM) are a practical tool for humanitarian actors and decision makers to strategically plan and implement which water supply option is most adapted where. Since groundwater exploration campaigns are highly restricted in their coverage, the main operational objective of the high-resolution RGWPM is to guide the planning of geophysical investigations, which precede well drilling.

Intervention resulting in reduced production cost

Energy for improved solarisation

Providing context specific indicators

Significant increase in drilling success rates

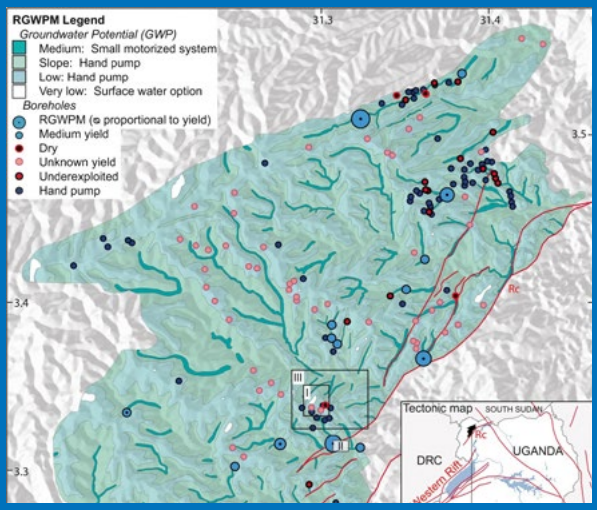
High-yielding borehole sited with RGWPM in Bidibidi. Photo: Cyrille Scherrer.

The use of RGWPM in the case study of Northern Uganda increased the average yield for boreholes by an order of magnitude, from an average of 3 m^3/hour for the boreholes sited 'without' RGWPM to 35 m^3/hour for the boreholes sited with RGWPM. These wells met UNHCR minimum standards and triggered the transition from emergency water supply (water trucking and hand pumps) towards sustainable solar systems. These results have shown that well-siting for motorised/solarised systems is significantly improved with the use of RGWPM.

The results also show, that RGWPM can identify hand-pumps which have a potential to be motorised / solarised, making these maps also useful in protracted situations.

From case study to generalisation of RGWPM methodology

Rapid groundwater potential maps were elaborated for thirteen refugee operations using data from the borehole data base to cross-validate the methodology. The analysis revealed that the maps have a high degree of predictability of yield ranges. The regional analysis of the applicability of RGWPM suggests that the method can be applied in a vast range of areas, particularly in sub-Saharan Africa, where similar geological conditions prevail. The methodology is available for replication by any hydrogeologist and is described in detail in Scherrer et al. (2021) in the Hydrogeology Journal (vol. 29, 2033-2051)[1].



RGWPM in Bidibidi, Uganda. Adapted from Scherrer et al. (2021)[1] under Creative Commons Attribution 4.0 International Licence[2]

Recommendations & Way forward

It is highly recommended to establish RGWPM in operations where major drilling-campaigns are taking place as well as in zones, where contingency plans are made. GTH will continue supporting RGWPM for COs that are in need of it. For RGWPM to be most efficient and useful as a water supply planning tool, they should be promoted as an inter-agency approach, since the same maps should be used by all actors involved in water supply in an area.

Impact

As shown by the case study in Uganda, the use of RGWPM can have a significant impact on the water supply, by optimising well siting and significantly increasing the yields. Complicated hydrogeological processes are synthesised in static and easy-to understand maps, which can be used as a planning tool amongst all actors and decision makers, thereby contributing to improved sustainability, while minimising operation and maintenance costs.

1 Scherrer, C., Schweitzer, R., Bünzli, MA. et al. Rapid groundwater potential mapping in humanitarian contexts: improving borehole implementation in basement environments. Hydrogeol J 29, 2033–2051 (2021). https://doi.org/10.1007/s10040-021-02352-w

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