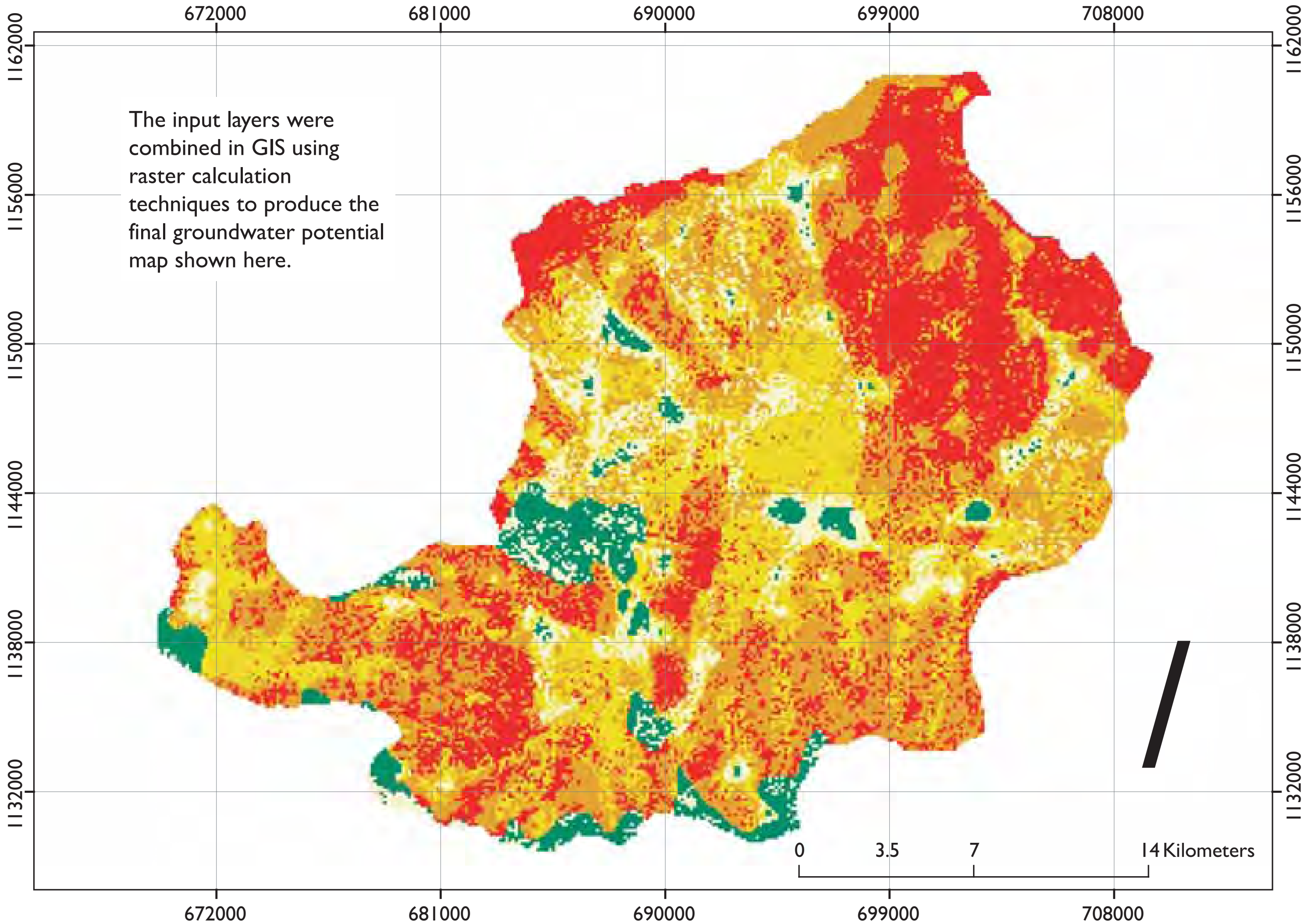
Mapping Groundwater Potential: A Guide for GIS Developers

This is one of three fliers produced to illustrate how, based on the same information, different types of maps can target different types of users. We have three different users in mind: map developers such as GIS specialists (this present map), deep users such as hydro-geologists who have a good technical understanding of the input data and shallow users such as planners who do not necessarily understand input data but need to use groundwater information for planning purposes.

This map shows the groundwater potential of upper Tumet catchment in Menge and Komosha woredas of Benishangul-Gumuz region, Ethiopia. The map was developed in a GIS environment using eight input parameters that indicate groundwater potential.

The parameters are shown and explained overleaf. A thematic map of each input factor was produced, derived from various sources including paper maps of topography, geology and hydrogeology, satellite images, water well records, and geophysical survey data. The input layers were ranked according to their relative importance in controlling groundwater potential. Each factor was divided into classes based on hydro-geological properties. The classes were then weighted according to their relative importance in controlling groundwater potential.



Legend

- Excellent groundwatwer potential
- Good groundwater potential
- Moderate groundwater potential
- Poor groundwater potential
- Very poor groundwater potential

This flier was produced by **Gezahegn Lemacha** based on his MSc work in Upper Tumet catchment, Menge and Komosha woredas, Benishangul-Gumuz region, Ethiopia for WaterAid Ethiopia and RIPPLE.

WaterAid

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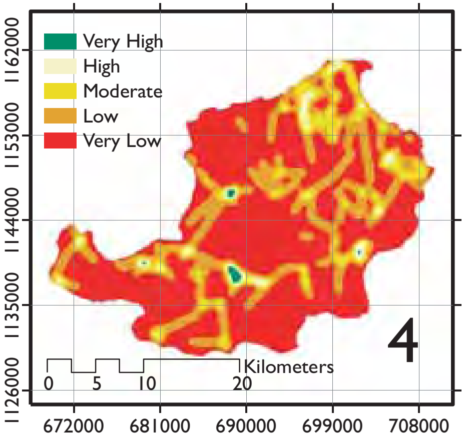
Groundwater potential input factor maps

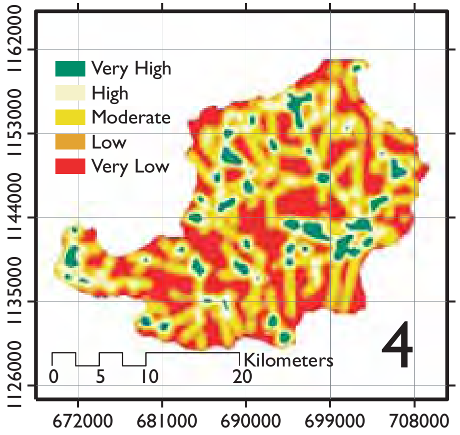
The eight hydrogeological input layers are shown in order of their ranked importance in controlling groundwater potential.

Thermal Lineament Density



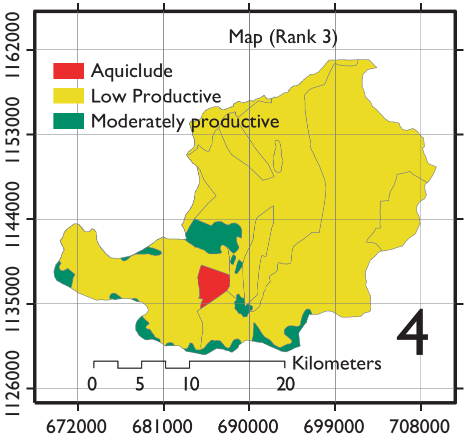
Rank 1: Thermal lineaments are lineaments that show the effects of evaporative cooling on thermal (bands) satellite images, which can be due to the presence of groundwater movement along the lineaments.

Lineament Density



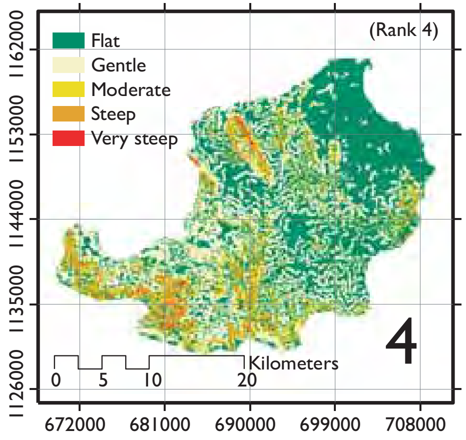
Rank 2: Lineaments are structural lines such as faults, which often represent zones of fracturing and increased secondary porosity and permeability, and therefore of enhanced groundwater occurrence and movement.

Lithologic



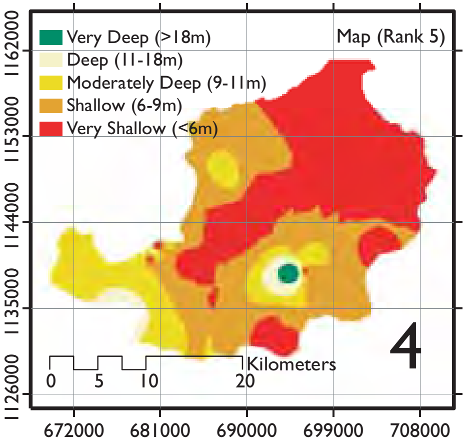
Rank 3: Lithology is the main control on the primary porosity and permeability of rocks. Higher porosity contributes to higher groundwater storage, and higher permeability contributes to higher groundwater yields.

Slope Map



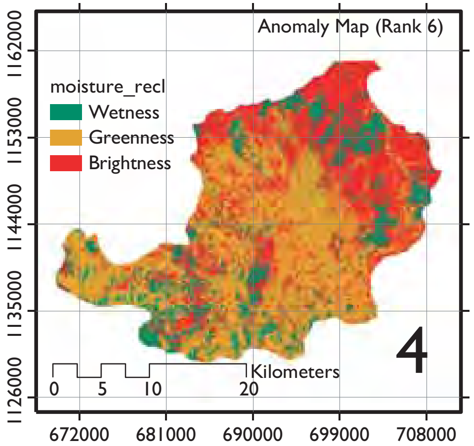
Rank 4: Slope determines the hydrological characteristics of a catchment: lower slope angles result in lower hydraulic gradients, which tend to enhance infiltration and therefore recharge by reducing the speed of surface runoff.

Depth of Weathering



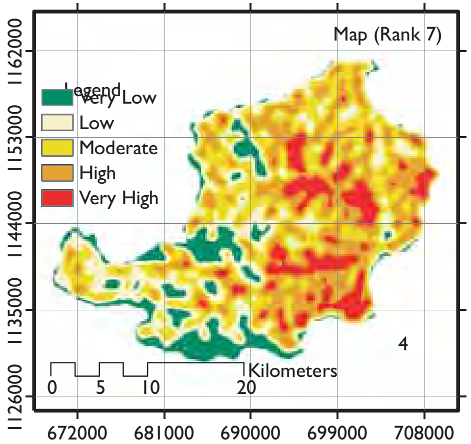
Rank 5: Zones of weathered rock near the ground surface are important areas of groundwater storage in hard rock environments.

Soil & Vegetation Anomaly



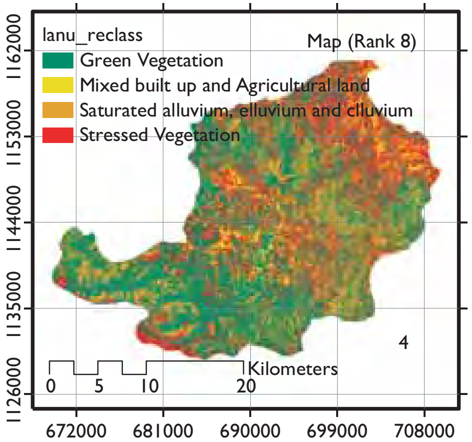
Rank 6: In semi-arid environments, the presence of soil moisture and green vegetation during the dry season can indicate the occurrence of groundwater.

Drainage Density



Rank 7: Drainage density indicates rock permeability and infiltration capacity, and therefore recharge capacity. Where rocks are highly permeable, infiltration to groundwater is high, and less water is transported in rivers as surface water; but where rocks have low permeability there is little infiltration and more surface water runoff. Low drainage density is therefore related to higher recharge and higher groundwater potential.

Land use/Land cover



Rank 8: Land use/ land cover determines the amount of precipitation that reaches the water table to recharge the groundwater (e.g. in urban areas or where there is dense vegetation, rain is intercepted above the ground and less is available to infiltrate the ground).

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