Geophysical Research Abstracts
Vol. 17, EGU2015-2912, 2015
EGU General Assembly 2015

Assisting Groundwater Exploration for Refugee/IDP Camps by Remote Sensing and GIS

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Refugee camps and camps of internally displaced people (IDP) often form spontaneously or have to be established rapidly in remote, rural areas, where little is known about the hydrogeological situation. This requires a rapid assessment of the availability of groundwater to enable humanitarian organisations like Médecins Sans Frontières (MSF) to supply the camp population with sufficient potable water. Within the project EO4HumEn, hydrogeological reconnaissance maps are produced for MSF by integrating remote sensing data like SRTM, Landsat, ASTER, optical very-high resolution (VHR) imagery, and SAR data. Depending on the specific situation of the camps, these maps contain topography, permanent and temporary water bodies, hard rock outcrops and their geological variability, locations of existing boreholes and wells (if available), potential contamination sources, roads and obstacles (e.g. swampland). In areas characterized by unconsolidated sediments, specific landforms like alluvial fans, meanders, levees, deltas or beach ridges are identified. Here, the reconnaissance map can be sufficient to plan drill sites for groundwater abstraction. In hard rock areas, the lithology is determined, if the vegetation cover allows it. Fractures, faults and karst features are mapped to resolve the structural setting. Anomalous vegetation patterns are interpreted in terms of near-surface groundwater. The maps provide an overview of the camp surroundings, and allow the field hydrogeologists to focus their investigations on the most promising locations. The maps are complemented by a literature review on geological maps, articles and reports available for the area of interest.

Assisting groundwater exploration by remote sensing data analysis is not a new development, but it has not been widely adopted by the humanitarian community as interfaces between humanitarian organisations and GI-scientists were missing. EO4HumEn fills this gap by a strong interdisciplinary cooperation between MSF, GI-scientists and geologists. This allows exploiting the potential of remote sensing and in particular of the freely available datasets (SRTM, Landsat, Sentinel 1+2) for the water supply of refugee/IDP camps, and to receive feedback on the validity of the delivered map products.

EO4HumEn is funded by the Austrian Research Promotion Agency (EO-based services to support humanitarian operations: monitoring population and natural resources in refugee/IDP camps; FFG, ASAP 9, Nr 840081). Besides hydrogeological assessments, further products and services developed in EO4HumEn comprise the estimation and monitoring of camp population numbers by semi-automatically extracting dwellings from VHR imagery using object-based image analysis (OBIA), and the monitoring of changes of the environment in the vicinity of camps.