Effectiveness of Remote Sensing, GIS and DC Resistivity Techniques for Management of Scare Water Resources: A Case Study in Al Ambagi Basin, Eastern Desert, Egypt

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The scanty rainfall, poor ground water aquifers and conditions are the main problem facing the thriving in Wadi systems across the dryland. The strategic planning for securing fragile water resources for the communities in the Wadi system include runoff harvesting, pumping groundwater aquifers and desalinization of available saline water. In most cases the harvesting of runoff and exploiting groundwater resources are highly adopted techniques across the dryland catchments. The scarcity of in-situ hydrological data and measurements can be resolved by using remote sensing data indicating the active channels have been carrying flash floods during the past few decades. Since the DC resistivity methods are commonly used in the aquifer characteristics, the geomorphological and geological analyses provide the optimum site selections for groundwater exploration as well as runoff harvesting.

These multiple methods will be integrated to manage the available water resources in Wadi Al Ambagi, which is one of the key wadis in the Eastern Desert of Egypt as it hosts Al Qusier City into the outlet and the main asphaltic road of Qeft-Al Qusier. A hydrograph was estimated for the entire catchment based on a uniformly distributed designed storm of 10 mm effective precipitation, the estimated peak discharge is 231 m^3/s and the total discharge is 1.6 million m^3. The existing mitigation measures for flash floods include three gabion dykes and a retention pool, with a maximum capacity of storage reaching approximately 2701193 m^3 given the dykes heights and their upstream topography. Therefore, additional mitigation measures are certainly required to protect the city of Al Qusier downstream. As a result, the remote sensing analyses and field investigations including DC resistivity were carried out along one of the main tributary channels to explore the groundwater potentials. The constructed geoelectrical cross-sections delineated the general subsurface geology and groundwater potentiality confined by structural grabens. Further, the 2D imaging was carried out to indicate the suitability of suggested runoff water harvesting sites, as the alluvium thickness increases in this specific area. The overall results clearly reflect the importance of integrated approach for management of water resources, and show the potential replicability in other similar areas.