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Geoenvironmental assessment of the SIWIA area Oasis, Western Desert, Egypt, using geographical and hydrological information systems

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Abstract

Overpopulation of Egypt has put pressure on the government for horizontal expansion for food security. Therefore, horizontal expansion in the desert for agricultural purposes is one of the solutions. Groundwater represents the main source of water supply in Siwa Oasis. The sedimentary succession comprises different water bearing formations. These aquifers bear groundwater ranging in its salinity from fresh water to brine one. These aquifers are the Quaternary deposits, the Miocene carbonate, the Eocene carbonate, the Upper Cretaceous, the Cretaceous Nubian sandstone beside Carboniferous, Devonian, Silurian and Cambrian-Ordovicean sandstone aquifers. The Paleozoic sandstone has brine water but the Mesozoic one (Cretaceous Nubian sandstone) has fresh one. The Cretaceous Nubian sandstone represents the source of exploited water in the area, where it recharges the overlying carbonate aquifers. Fifty seven wells are included in the present study to reveal the hydrogeologic conditions of the oasis. The fractured carbonate aquifers represent the main exploitable aquifers due to their availability for the farmers in spite the low water quality. The water of this aquifer has a wide range of salinity ranging from 2377 ppm to > 17000 ppm depending on the depth of aquifer and the nature of facies and fracturing of the rock. The Nubian sandstone aquifers represent the main source of water in the area where it bears fresh water (< 1000 ppm). The flow within the Nubian sandstone is directed to the area of high discharge, i.e. to the west. The groundwater of the Quaternary and the fractured carbonates reflects leaching processes (secondary salinity) and that of the Nubian sandstone reflects meteoric origin and recharge during the pluvial period. The groundwater resources are evaluated with respect to their suitability for different purposes. Depending on the present geomorphological and hydrogeological studies and the previous pedological studies a landuse map was constructed.