Assessment of static water level and overburden pattern for sustainable groundwater development and management in Ilorin City, Nigeria

Ashaolu Eniola Damilola¹, Omotosho Olumide¹

¹Department of Geography and Environmental Management, Faculty of Social Sciences, University of Ilorin, PMB 1515, Ilorin, Nigeria

Correspondence: Ashaolu Eniola Damilola (email: damash007@yahoo.com)

Abstract

Basement aquifers are usually developed within the weathered, overburdened and fractured bedrock of crystalline rocks which can provide a sizeable amount of groundwater if the overburden is relatively thick enough to store percolating water. This study assessed the static water level and overburden pattern for sustainable groundwater development and management in Ilorin city, Nigeria. The data on depth of boreholes, depth to water, water level of 100 boreholes and the Vertical Electrical Soundings (VES) data conducted before the borehole were drilled, were collected from Kwara State Ministry of Water Resources and Lower Niger River Basin Development Authority, Ilorin. All the Vertical Electrical Soundings (VES) data collected were conducted with ABEM SAS-1000 Terrameter using the Schlumberger electrode configuration, and the electrode spacing (AB/2) varied from 10m to 200m. From the manual interpretation of each VES curve, we estimated the overburden thicknesses. Field work was embarked on to get the coordinates (locations) of the sampled points using handheld GPS. Pearson Moment Correlation Coefficient was applied to determine the level of association between borehole parameters and thickness of overburden. The static water level and contour map were computed with the data on depth to water and the coordinates to show the pattern of water level in Ilorin, using ArcGIS 10.2 and Surfer 12 GIS software. The depth of overburden and the point location collected were also used to plot the overburden map using IDW interpolation. This study classified Ilorin into poor (overburden <10m), marginal (10m-19m overburden) and good or high zone (overburden ≥ 20m) of groundwater potential. The spatial pattern of overburden depth revealed that the majority of Ilorin city was underlain by marginally thick overburden. The study concluded that sustainable groundwater development and management in Ilorin city could only be attained by controlling the indiscriminate drilling of boreholes (wells), continuous mapping and regular updating of the available records on groundwater resources.

Keywords: basement complex, groundwater development, groundwater management, Nigeria, overburden pattern, sustainable management