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Comparison of four Vulnerability Approaches to Mapping of Shallow Aquifers of Eastern Dahomey Basin of Nigeria

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Abstract
This study presents the outcome of mapping the shallow aquifers of the eastern Dahomey Basin of southwestern Nigeria vulnerability studies. The basin is a coastal transboundary aquifer extending from eastern Ghana to southwestern Nigeria. The study aimed to examine the most suitable method for mapping the basin shallow aquifers by comparing the results of four different vulnerability approaches. This is most important due to differences in vulnerability assessment parameters, approaches and results derived from most vulnerability methods on a particular aquifer. The methodology involves using vulnerability techniques that assess the intrinsic properties of the aquifer. Two methods from travel time approach (AVI and RTt) and index approach (DRASTIC and PI) were employed in the mapping of the basin. The results show the AVI has the least mapping parameters with 75% of the basin classified as very high vulnerability and 25% with high vulnerability. The DRASTIC mapping shows 18% as low vulnerability, 61% as moderate vulnerability and 21% reveal high vulnerability. Mapping with the PI method which has highest parameters shows 66% of the aquifer as low vulnerability and 34% reveal moderate vulnerability. The RTt method shows 18% as very high vulnerability, 8% as high vulnerability, 64% as moderate vulnerability and 10% reveal very low vulnerability. Further analysis involving correlation plots shows the highest correlation of 62% between the RTt and DRASTIC method than within any others methods. The analysis shows that the PI method is the mildest of all the vulnerability methods while the AVI method is the strictest of the methods considered in this vulnerability mapping. The significance of using four different approaches to the mapping of the shallow aquifers of the eastern Dahomey Basin will guide in the recommendation of the best vulnerability method for subsequent future assessment of this and other shallow aquifers.
Keywords: Aquifer vulnerability, Dahomey Basin, RTt method, PI method, Shallow aquifers.