

Mapping of Ground Water Vulnerability for Landfill Site Selection Assessment at the Local Level— Case Study at the Mining Areas of Tarkwa, Ghana

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SUMMARY

Municipal solid waste disposal by landfilling, mostly by open dumping, is common in Ghana and other developing countries. These landfill sites are mostly chosen without due consideration for ground water pollution. This paper discusses and demonstrates the need for accounting for ground water protection using pollution potential vulnerability modelling and mapping in the selection of landfill sites. The Tarkwa Nsuaem Municipal Area (TNMA) of Ghana was selected as a case study area. Map overlaying, index-based DRASTIC modelling and other geospatial analysis were employed in a GIS to assess the intrinsic vulnerability and risk for groundwater contamination in the study area. The method uses the hydrogeological and topographical characteristics and factors that control the movement and contamination of groundwater to determine the natural vulnerability of groundwater resources in the study area. These factors were rated, weighted and overlaid to create vulnerability maps showing areas prone to groundwater contamination. The computed DRASTIC Index (DI) ranges between 93 and 154 and this was categorized into five vulnerability classes; "Very Low", "Low", "Moderate" "High" and "Very High". The last two classes occur at the northwestern part of the study area within a geology system (Tarkwaian) consisting of sandstones, conglomerates and quartzites. The first two classes constituting very low to low classes occur at the southern part of TNMA, within a geology system (Birimian) consisting of volcanic rocks. Based on the vulnerability assessment results, any landfill site situated in the northwestern part of TNMA or within the Tarkwaian system would have high potential of contaminating groundwater, while landfill sites situated at the southern part of TNMA or within the Birimian system, would have low to moderate potential of contaminating groundwater. It is recommended that this approach be integrated into landfill site selection analysis to help reduce the risk of groundwater pollution in the disposal of waste.

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