

Flood Vulnerability Mapping and Applications in Waste Management at the District Level - Case Study at the Tarkwa-Prestea Mining Areas of Ghana

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SUMMARY

Flood vulnerability (FV) is an important factor to consider in the location of appropriate sites for municipal waste disposal and other land uses due to its association with land flood hazards such as inundation, subsidence and collapse of structures; erosion and dispersion of waste materials, soils, contaminants and other loose materials from vulnerable sites into the environment and vice versa; as well as the destruction and loss of properties and life. To reduce these hazards and their negative impacts, appropriate preventive and mitigation measures must be put in place, and these require knowledge and understanding of the risk factors involved and the vulnerable areas to land floods within a given geographical region. This paper discusses the combined use of Remote Sensing, GPS, GIS, the 'DRASTIC' vulnerability modeling technique, the Analytical Hierarchy Process and Multicriteria Decision Analysis, to collect, process, analyze and evaluate the relative and combined influences of the risk factors involved and their application to map the susceptible areas to land floods in the Tarkwa-Prestea Mining Areas (TPMA) of Ghana. The relevant risk factors identified in the study area include rainfall, elevation and slope, soil, land use/cover, ground water depth, proximity to water bodies and hydrogeology. The relative influences of the factors were estimated and combined to generate land flood vulnerability maps (LFVM) which could subsequently be used as inputs in overlay and sieve mapping analysis in site screening and suitability assessment for locating landfills and other facilities. The LFVM show three main distinguished classes, namely, low, moderate and high flood vulnerability zones. Proposed landfill sites lying within the high FV zones are either not recommended for approval and development or flagged out for additional site specific investigations but those occurring within the low and moderate FV zones are recommended for approval and development. This approach is recommended as a further improvement in the landfill site screening exercise to reduce the potential environmental pollutions associated with it through land floods. It can further increase the environmental friendliness and social acceptability of landfilling as a suitable waste disposal method in TPMA and other regions where landfilling and incineration are prevalent practices

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