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# Potential landfill sites selection using GIS-based multi-criteria decision analysis in Dodoma capital city, central Tanzania

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## Abstract

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Solid waste management is a global challenge, especially in developing countries due to the rapid increase in population and urbanization where the availability of sanitary landfills is inevitable. Determining suitable landfill sites is a fundamental aspect for new and rapidly growing cities. The current study is aimed at selecting potential landfill sites using GIS-based multi-criteria decision analysis in Dodoma capital city. Fifteen criteria including proximity from built-up areas, surface water, boreholes, sensitive sites including social service areas, episodic water channels, protected areas including historical sites, faults, land use/land cover, geology, soil type, elevation, slopes, airport, roads, and earthquake epicentres were integrated with the help of analytical hierarchy process (AHP). The landfill sites' suitability map was produced based on the weighted linear combination method and assigned suitability classes as highly suitable, suitable, moderately suitable, less suitable, and unsuitable. The overall suitability results show that 41,177 ha (14.7%) of the study area is determined as highly suitable for landfills site location. The remaining 83,930 ha (30%), 84,305 ha (30.2%), and 53,508 ha (19.1%) of the area are suitable, moderately suitable, and less suitable respectively while 16,683 ha (6%) is under the unsuitable zone. From the highly suitable area, eleven candidate landfill sites were selected and prioritized using the AHP technique. The final results show landfill site 3 (10,361.94 ha), 5 (3717.85 ha), and 2 (3535.86 ha) were found to be the most highly suitable sites with eigenvector weight of 0.147, 0.122, and 0.121 respectively. Landfill sites 8, 7, and 6 were lastly considered. Field observation involving expertise from geology, hydrogeology, geophysical, and environment confirmed the suitability of selected sites. Thus, these techniques can be employed in developing countries to locate suitable landfill sites to minimize health and environmental impacts.