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Identification of suitable landfill sites for solid waste disposal in the Matara District using Geographical Information Systems and the Analytic Hierarchy Process

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Improperly placed solid waste dumping sites have created numerous environmental and social problems in the society. Such impacts could be minimized by implementing proper landfills in suitable locations. Even though Matara is a highly populated district, it lacks properly planned landfills. The objective of this study was to select suitable sites for solid waste landfills in the Matara District using the Geographic Information System and the Analytical Hierarchy Process. Existing national and international landfill site selection regulations and guidelines were reviewed to prepare eleven landfill site criteria namely; surface water body, forest reserve, wetland, coastal zone, rainfall, town centre, residential area, important building, major road and railway, slope and soil. These criteria were divided into two parts, constraint criteria and factor criteria. Constraint criteria divide the district into suitable and unsuitable areas for landfill site placement. Factor criteria classify the suitable areas for landfill placement into high, medium and low suitable areas. Each constraint criterion was mapped using GIS. All eleven constraint criteria maps were overlaid to prepare the final constraint map. From the total area of Matara district, 1100.16 km² (85.7%) is unsuitable for landfill placement. The remaining 182.34 km² (14.2 %) land area of the district was further evaluated using factor criteria and was classified into three groups of high, medium and low suitability. When determining the relative importance of each factor criterion Analytic Hierarchy Process was utilized. The resulting final factor map revealed that 112.4 km² (8.8%) of land in the Matara District is highly suitable for placing landfills. Field investigations within the Matara Divisional Secretary Division were carried out to validate the data obtained from the final factor map. It was found out that one site at Thalpawila, one site at Parawahera and two sites at Kekanadura were suitable for landfills in Matara Divisional Secretary Division. The final decision for landfill site selection will require more detailed field studies.