Sustainable Geographic Information System-Based Map for Suitable Landfill Sites in Aley and Chouf, Lebanon

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Abstract : Municipal solid waste (MSW) generation is among the most significant sources which threaten the global environmental health. Solid Waste Management has been an important environmental problem in developing countries because of the difficulties in finding sustainable solutions for solid wastes. Therefore, more efforts are needed to be implemented to overcome this problem. Lebanon has suffered a severe solid waste management problem in 2015, and a new landfill site was proposed to solve the existing problem. The study aims to identify and locate the most suitable area to construct a landfill taking into consideration the sustainable development to overcome the present situation and protect the future demands. Throughout the article, a landfill site selection methodology was discussed using Geographic Information System (GIS) and Multi Criteria Decision Analysis (MCDA). Several environmental, economic and social factors were taken as criterion for selection of a landfill. Soil, geology, and LUC (Land Use and Land Cover) indices with the Sustainable Development Index were main inputs to create the final map of Environmentally Sensitive Area (ESA) for landfill site. Different factors were determined to define each index. Input data of each factor was managed, visualized and analyzed using GIS. GIS was used as an important tool to identify suitable areas for landfill. Spatial Analysis (SA), Analysis and Management GIS tools were implemented to produce input maps capable of identifying suitable areas related to each index. Weight has been assigned to each factor in the same index, and the main weights were assigned to each index used. The combination of the different indices map generates the final output map of ESA. The output map was reclassified into three suitability classes of low, moderate, and high suitability. Results showed different locations suitable for the construction of a landfill. Results also reflected the importance of GIS and MCDA in helping decision makers finding a solution of solid wastes by a sanitary landfill.

Keywords : sustainable development, landfill, municipal solid waste (MSW), geographic information system (GIS), multi criteria decision analysis (MCDA), environmentally sensitive area (ESA)
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