ABSTRACT

The process of organizing the redundant residues is referred to as the Solid Waste Management (SWM). The refuse process includes frequency of collection, transportation, waste segregation, compacting, recycling and landfilling. Among all, the transportation and landfilling is most important. The proper landfill site selection has always been a difficult task for the Municipal Corporation, due to the necessity of open sites away from residential area and considering environmental and political consideration. Conversely, the economic routes for waste transportation need to be considered.

The objective of the present research is to solve the above complexity through sophisticated GIS and decision making systems. The following are the significant components: 1. Identifying the practical difficulty in existing solid waste planning particularly, waste transportation and landfilling. 2. Inferring the socio-environmental factors for landfill site selection and route optimization. 3. Employing the GIS based MCDA model for inferring potential landfill sites around the Coimbatore Municipal Corporation 4. Implement GIS based Fuzzy- Analytic Hierarchy Process (AHP) model for route optimization.

The major step involved in the landfill site selection process is to define the landfill site selection criteria. In present work, maps like Population, Groundwater table, Landuse/Landcover, Slope, Drainage density, Soil texture, Lineament density, Geomorphology and Geology are considered. A GIS based Multi Criteria Decision Analysis (MCDA) is employed to estimate weight factor for each criterion. The in-depth view of the decision making is done by categorists each criteria (parameter) into sub-criteria and assigning weights. The weight of sub-criteria is helpful for comprehensively

analyse the criteria. The MCDA approach integrated with GIS based overlay analysis provides 5 suitable sites around the Coimbatore Municipal Corporation namely, Kurumbapalayam, Vellalore (site 1), Vellalore (site 2), Onappalayam and Chettipalayam. In Kurumbapalayam the coverage of landfilling area is high (2.5052 sq. Km) while others sites have less than 1 sq. Km. These sites has secured higher rank and is chosen as the most suitable landfill sites for discarding Coimbatore Municipal Solid Wastes. The results implies that GIS-MCDA analysis provides the landfill sites mostly of wasteland that are away from cultivated land, forest, settlements and hazardous zones.

In waste transportation, the short travelling time can be achieved by drivers through route optimization. Consistently, the method suggests the shortest path in accordance to the traffic, road type and elevation. Therefore it is necessary to consider the key parameters namely road network, land use patterns and traffic in order to achieve the higher efficiency in route optimization. The Fuzzy set theory permits a component to have multiple memberships to one or more sets, while in the case of the classical set theory the set membership is specified as elite. The fuzzy AHP weight derivation can be categorized into two. One is to derive a set of fuzzy weights from a fuzzy pair-wise comparison matrix, whereas, other is to derive a set of crisp weights from a fuzzy pair-wise comparison matrix.

The proposed methodology is a Triangular Fuzzy Preference Programming (LFPP) for fuzzy AHP priority derivation, which derives crisp priorities from fuzzy pair-wise comparison matrices and devises the precedence of a fuzzy pair-wise comparison matrix as a non-linear programming, in order to provide a practical priority method for fuzzy AHP. The Fuzzy Network analysis is provides efficient solution to solve the path finding problems. It finds a shortest path or locates a series of places of visit

in a network, with least cost. The validation of the fuzzy-AHP shortest path algorithm was done with the use of existing routes.

From the research, it is found that present results will facilitate the municipalities and government sectors in the selection of the dumping sites as wells as waste transportation. Apart from this scientific contribution, the municipal and other social welfare societies should consider Solid Waste Management as a serious issue and initiate more public awareness programmes for an appropriate discard of solid waste.

Keywords: Geographic Information System, Solid Waste Management, Coimbatore Municipal Corporation, Fuzzy Analytic Hierarchy Process, Multi Criteria Decision Analysis, Landfilling.