

The role of geomorphic parameters in Selection of Solid Waste Landfill Site (Case Study: Firooz Abad City)

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Expanded Abstract

Introduction

Urban population is increasing day by day and consequently the amount of waste produced in the world has a rising trend. Thus, each day the management of this important issue is becoming more complex and at the same time more urgent. This is important because nowadays landfill development without regarding environmental issues is a serious threat to the survival of living things including humans. Therefore, selection of the suitable place for Sanitary landfill is essential. In this regard, the utilization of urban waste can be performed by a variety of methods such as cumulative, burning outdoors, compostion, use as animal nutrition, the use of tooling incinerator and so on. However, sanitary burial is still the most common method to landfill. In Iran, Solid Waste Landfill Site selection is often performed in the comprehensive urban plans, but systematic and environmental approach of issue is partly disregarded. These sites are just determined by relying on one or more indicators of burial place. High population growth and physical development of Firuzabad in Fars province leads to the production of about 100 tons of solid waste daily in the city. On the other hand, the current inappropriate location of the landfill in this city caused pollution of water and fertile ground resources; this research is trying to determine the optimal sites for burial of waste in this city. The selection criteria are geomorphological, hydro-climate, land use and the distance from communication lines.

Methodology

Firozabad city in southwestern Fars province is located within a hundred kilometers from the city of Shiraz. This city is limited from the north to the cities of Shiraz and Kazeroun, from West to Farashband, from south to the city of Ghir and Karzin and from the East to the city of Jahrom. The average height of Firozabad Plain is 1320 meter and an average slope is five percent. This research is conducted by descriptive-analytic method and was examined using field and library data (documents, maps, and satellite images) in the study area. Then, to determine the values and weights of various criteria in the location of landfill, we have used fuzzy logic in ArcGIS to design a model for choosing the landfill. Fuzzy logic is capable to formulate many concepts and variables and the systems that are vague and provide the basis for reasoning, controlling, and decision making under uncertainty conditions. The degree of membership, union and intersection, complementation, multiplication, addition, and gamma are

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the basic powers of this combined model. In the process of suitable land for waste disposal, conceptual model and influencing variables in the model are identified. The variables are the communication network and privacy, infrastructures and equipment, production, consumption, and recycling. The models are defined and explained after definition the information layers including topography, slope, geology, soil science, fault obstacles to the development, communication network of rural settlements, and surface water. These layers in the form of topology, correction and editing, geometrically corrections of images and maps have been performed. After definition, the proper method for integration functions was identified and after tabular analysis the database has been detected and evaluated for the landfill site.

Results and discussion

Slope, aspect and topographical features of the study area are the most important geomorphic parameters affecting optimal areas for landfills in different areas. The location selected for the landfill must have the correct distance for permanent and seasonal rivers. In addition, the position of groundwater, aqueducts and wells should also be examined for the purpose. In general, for convenience and reducing transport time and costs, the landfill should be located near the existing roads and paths. The landfill should be in adequate distance from all lands for special user. It should be noted that without the use of a powerful system as a secure tool that have the ability to use multiple layers of information and analysis, the possibility of solving this problem will not be possible. In decision-making problems and GIS due to the vast capabilities of the ability to integrate and overlay layers, the best appropriate and reasonable choice to find the perfect place and related technology is use of GIS for landfill. That is why after standardization of the maps the steps of combining the layers begins to access an appropriate place for the landfill. At first, the obtained maps from the previous step are re-weighted, and all the maps are converted into a single map that shows the location. At this stage, the impact of each of the obtained maps is determined by their impacts on the location. The total weight of study layers should be 100 and to prepare eventually the final map.

Conclusion

In the present study, the fuzzy logic is used to determine the values and weights of different criteria to select optimized areas for solid waste disposal site in Firozabad so that it has the ability to responds to future needs. Different layers of information have been combined and appropriate and inappropriate areas have been identified for landfill. Final map shows the different areas according to their ability of creating the landfill. There is the possibility to use the proximity to other areas. Thus, the base of installation and related equipment for recycling and compostion plant is also provided. Finally, after the evaluation and overlay of the weighted layers, the best option is located in the East and North East, and partly the northwest region. In this place, many environmental parameters for solid waste landfill are appropriate and there are possible current and future investments in this field. There is the evidence that some places are determined as inappropriate places mainly on the fertile plains with high permeability and good areas. The areas are mainly in the foothills that have the required thickness of the soil and far from population centers. This is suitable land for agricultural uses which are sensitive. According to the research results, the central part of the Firoozabad City has the most difficult places to make the landfill.

Keywords: landfill, site selection, Firoozabad, urban waste management

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