

Identification of Suitable Areas for Hazardous waste Disposal in Chaharmahal and Bakhtiari Province using Geographic Information Systems and Analytic Hierarchy Process

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Extended Abstract

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Introduction

Hazardous waste (solid, liquid or contained gases) is a waste with properties that make it potentially dangerous or harmful to human health or the environment. Site selection and suitable conditions for hazardous wastes landfill is considered as the final stage of waste management that they have high sensitivity. The purpose of this study is to identify prone areas to hazardous waste landfill for Chaharmahal and Bakhtiari province using geographic information systems (GIS) as an important tool for the analysis of potential sites and the Analytical Hierarchy Process (AHP) and to provide solutions to optimize the positioning is executed. Firstly, criteria and limitations of environmental, economic, social and physical were determined, then layers of the criteria in GIS were prepared. In this study, the inappropriate areas were first removed from the model, and the suitability of remaining regions as a categorize criterion considered. Categorize criteria for paired comparison using AHP as an efficient tool for determining the relative weight parameters are used to measure and rank the expert choice

application imposed. Then the implement paired comparison of the relative weights of the criteria and sub-criteria and criteria for each category were determined. After calculating the net weight and normal weight, normal weight based on standard maps in the GIS environment has been classified. Finally, by combining maps and applying criteria FA map, the final map was extracted.

Material and methods

The purpose of this research is to identify and prioritize appropriate areas of special waste disposal using multi-criteria decision-making methods. In order to locate using the GIS, first, identifying, evaluating and selecting criteria and constraints for the construction of landfill, in order to reduce the economic, environmental, and health costs. In the multi-criteria evaluation method, criteria are the basis of decision making, so that a set of criteria is combined and combined to achieve a single combination. In this paper, a two-stage process was used to locate the landfill site. In the first stage, which is recognized as the identification stage of prohibited areas according to different criteria, the study area is divided into two appropriate and inappropriate classes that will be eliminated as prohibited areas for the construction of landfills. In the second stage, the various factors are ranked and weighted according to the relative importance and, finally, places that receive the appropriate points are introduced as areas susceptible to the dumping of special wastes. In order to obtain the digital data of the criteria in the GIS environment from the digital elevation map (DEM), the specifications of the piezometric wells information are available from the regional water organization of the province. The available data such as geological map of the province at a scale of 1: 250,000, satellite images of Landsat and map of land suitability of the province, rainfall data of the synoptic stations of the province and the data of the Environmental Protection Agency were used. In general, the following steps have been taken in the process of locating:

- Identification of effective locating factors (limitations and factors)

- Digitizing and providing the required layers of information using the GIS package
- Identify and eliminate prohibited and inappropriate areas for landfill construction
- Classification and weighting of the factors and layers of information sought
- Integration of layers and the provision of a mapped rate and talent to determine the appropriate areas.

Results and discussion

1. Set limits

In this study, in order to select suitable sites for landfill particular, the criteria and limitations were determined. The information layers for each of the criteria were provided in the GIS environment.

2. Classification and weighting criteria

In the second stage, which is the stage of weighting and rating, of 14 effective criteria were used in site selection. AHP is one of the most efficient techniques, multi-criteria decision. This method is based on comparing factors and to study various scenarios to give managers and decision makers. This technique is one of the most comprehensive system designed for decision-making with multiple criteria.

3. Editor hierarchy to locate

Hierarchical structure is a graphical representation of a real complex problem, which mainly target the problem and at the next general criteria, sub-criteria and options are the way in AHP is used to calculate points based on comparison test.

4. Shipping Weight Matrix Binary comparison and decision-making

After compiling a hierarchical structure, the next step is to evaluate the elements by comparing the test. In general, if the number of options and criteria respectively m and n are then paired comparison matrix of options for comparison matrix $m \times m$ and $n \times n$ matrix will be a couple of criteria.

5. After weighing and preparing the normal weight of the options, the normalized weights in the GIS environment were added to the criteria map

and the Raster and Weighted layers of each criterion were prepared. Due to the wide area of the studied area, the size of each pixel was 50 * 50 m. Then, using the Raster Module, the Criterion Map was combined and a zoning map was prepared for the special waste disposal site.

Conclusions

In the present study, according to various criteria influencing the Hierarchical Analysis Process for prioritizing the criteria in decision making, based on the results, the talent map of the area was prepared for special waste dumping, in which according to the final score of the layers, the area was classified into four appropriate, relatively suitable, relatively inappropriate and inappropriate classes. Suitable areas were 12.64%, relatively fairly 32.47%, relatively inappropriate 30.43%, and inappropriate zones 9.58% of the area of the talent map were included.

Keywords: Hazardous waste, site selection, Chaharmahal and Bakhtiari province

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