

# **Urban Landfill Site Selection Using AHP and SAW in GIS Environment**

## **Archival Case Study: Kohkiluyeh-o-Boyer-Ahmad Province, Iran**

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### **Introduction**

Environmental conservation and optimal utilization of natural resources, is considered as the requirements of sustainable development at all levels, including regional levels. Sanitary urban landfill like any other engineering project needs basic information and accurate planning. Today, geographic information system (GIS) is widely utilized in environmental planning and engineering problems. Selecting a suitable location for a landfill requires considering several factors. Thus, the necessity of using spatial information technology and its integration with other planning and management issues will be inevitable.

Multi-criteria decision-making systems include models and methods that have been provided by different people to make the process of planning easier for planners. These systems gradually improve their performance by others. Analytical Hierarchy Process (AHP) and simple Additive weighting (SAW) are systems of multi-criteria decision making that have been used in this paper.

### **Materials and Methods**

Criteria to this case were selected based on existing resources and environmental principles. These criteria include: distance from city, main roads, faults, main waterways and villages, rainfall, slope, elevation, land cover and Geology. Based on the weight that was assigned to layers in each of the two methods 10 weighted layers were created using GIS. In the next step, constraint map of the burial areas was prepared. Finally, the prepared maps were incorporated and multiplied in constraint layers in GIS, according to acquisitive weights in both AHP and SAW. Fig. 1 shows this process simply.

### **Results and Discussion**

According to the results of this process and classifying output maps, the priorities of areas for landfill was identified in Arc GIS. Given that in this study, two models were used to compare the quality of the output map, it is normal that the results obtained from these two models are different.

After combining layers and their integration with the constraint map, output maps (Figures 2 and 3) were prepared for each of the two methods. Final map were classified in five categories based on the current classification as follows:

1. Restrained
2. Relatively poor
3. Relatively good
4. Appropriate
5. Perfect

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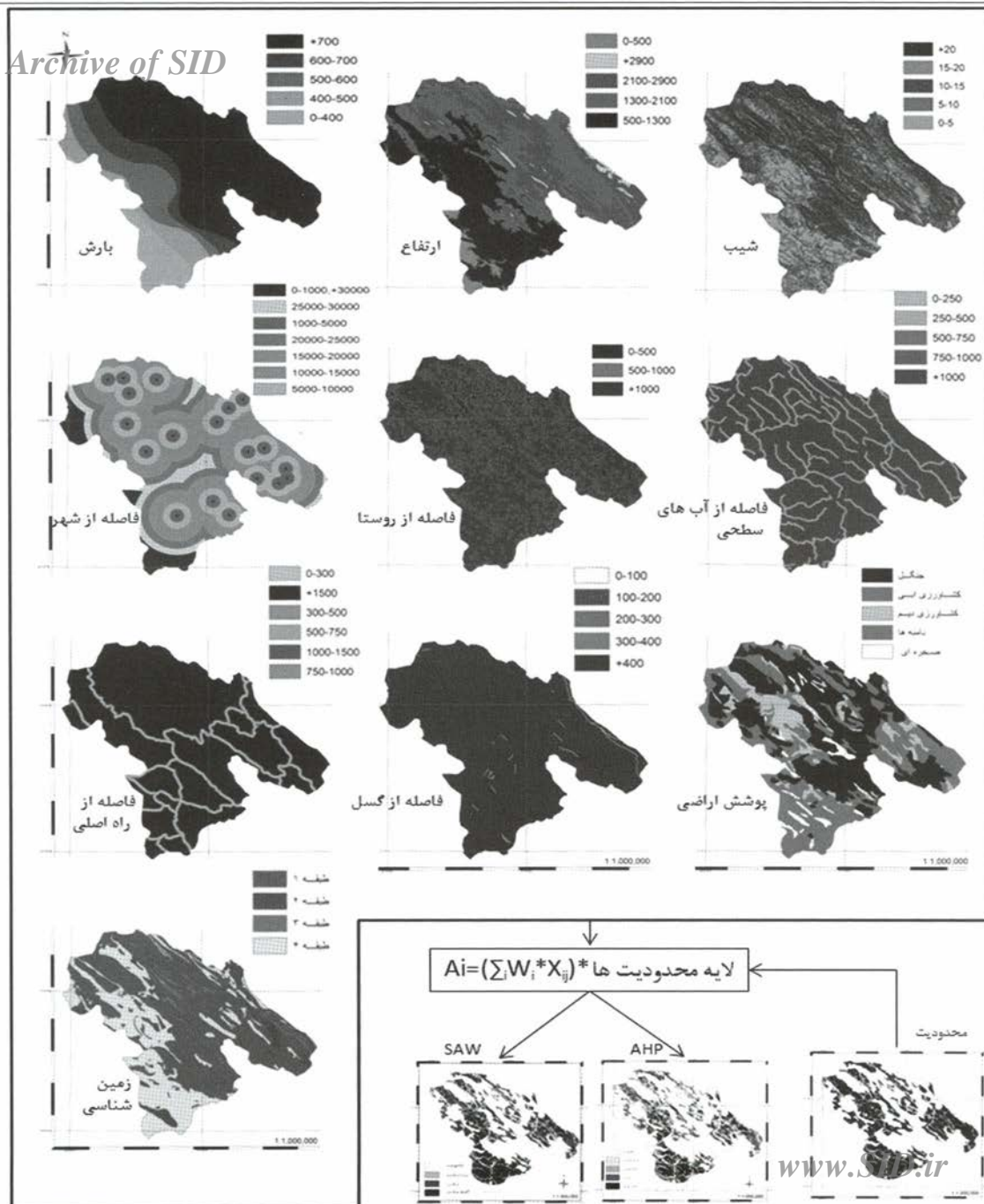


Fig. 1: Process of integration of layers and obtaining final maps

Due to differences in methods of weighting of criteria and alternatives, the outcomes of AHP and SAW are to some extent different: In AHP method, perfect, Appropriate, relatively good and relatively poor Priorities respectively are 19%, 18%, 2% and 1%. While in SAW, perfect, Appropriate and relatively poor Priorities respectively are 22%, 18% and 1%. The restriction in both methods was 59%.

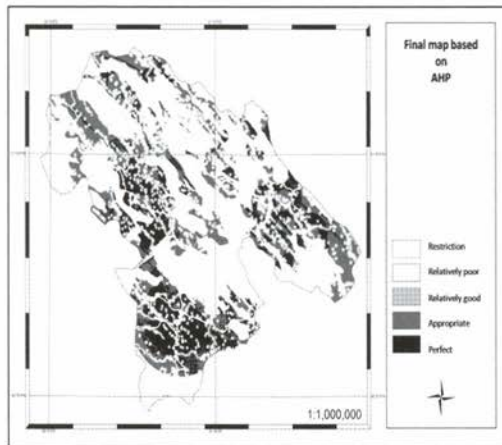


Fig. 2: Final map based on AHP

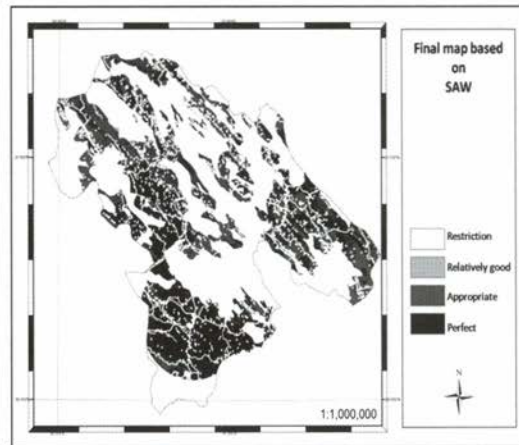


Fig. 3: Final map based on SAW

## Conclusion

Pair-wise comparison is more appropriate for determining the weight than their direct determination (SAW), because in the pair-wise comparisons (AHP) classes' weight for each criterion is obtained based on a class priority rather than all classes of the criterion, but this process is not done in the direct determination of weight (SAW).

After the production of output layers by the two methods, can be concluded with a superficial analysis that the AHP model presented more conservative results than the SAW. Finally, it can be claimed that the integrated system of GIS and multi-criteria decision-making can be a useful tool for environmental planning.

## Key words

Site selection, AHP, SAW, Landfill, Kohkiluyeh-o-Boyer-Ahmad province