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RESEARCH ARTICLE

Location and Capacity Assessment Disposal Sites Municipal Waste Using a Hybrid Model of AHP and Boolean Case Study: City of Boukan

Dr Hassan Houshyar
Assistant Professor of geography and Urban Planning Payame Noor University, Iran.

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Abstract

Today, the management of municipal waste is in the process of Iran rapid urbanization, the environmental concerns. In a recent study based on data reported to hysteresis city of Boukan are inevitable need to locate sanitary landfill perishable leftovers that based on a daily production of 179 tons of waste separation are: (70% perishable materials - paper 5% - 11% Rubber and Plastics - Fabrics 2.6% - 2.2% metal and glass, and 8% other materials). Because the volume of hysteresis while not buried the right and proper place, would be associated with environmental damages. Location and capacity assessment landfill is appropriate using standards.

Such as environmental conditions geological, hydrological, population and considering the limitations area were searched such as natural protected areas, water resources and agricultural lands, locating waste sites in order to achieve the best locations. Finally, due to the breakdown of waste management disposal sites was devoted the three burying, industries of recycling and composting factories. For this study the spatial layers reviewed and accuracy were measured in the environment (GIS) and the overlap were fully matched And was placed in the image system, the same geographic coordinates (zone 38 Mercator reverse global system). This study is applied a combination of Boolean location and hierarchical models (AHP) The method of AHP was used to the weighting of criteria, in the form of paired comparisons and worth giving layers. After the score of each layer using the overlap model were located hysteresis disposal sites.

Introduction

One of the basic principles the survival of life and the use of God-given gifts is regarding the environment and human health and all the creatures on earth That at our disposal is in abundance and according to the geographical position and climate Iran cities and barren lands abundant in the surrounding towns and special features of urban waste which constitute more than 70% of the organic matter is important Methods of incineration composting and sanitary burial that is, the first implementation of recycling systems is accompanied by origin of production. Location for sanitary burial of municipal waste, the necessity of planning and urban management is accelerated process of urbanization in Iran. Because municipal waste would be associated with environmental waste if not buried the correctly in a good place (Parhizkar, 2007). Effectively Covering materials and sanitary burial of waste will be prevented of contacts insects, rodents, birds and other animals the waste. Problems and issues induced from the disposal of solid waste at the places, led to some of the world's garbage and open, quickly replaced their sanitary landfill (majlesi, 2010, 436-441). But in among these it is important to choose an appropriate landfill. Because it inappropriate location for burial leads at a later stage many problems of economic, environmental and health (Abdoli, 2004, 29). Several models and methods for are involved the selection of suitable burial sites, each of which are important in turn. The ultimate goal of these models is to find a suitable location the least adverse environmental impacts to the natural environment around the landfill area had

to be (Khorshiddoust, 2010, 63-64).it is necessary aware of the problem and the criteria for selecting a disposal site. These criteria are: Public health and safety, the surface requirement, topographic, hydrological stations, geology, availability of cover materials, proximity to residential areas and industrial Collected from site to landfill near roads and main roads, economic criteria, beauty and acceptance by the public, climatic conditions, current and future use of the land (Majlesi, 2010, 436-441) One of the criteria on the basis of scientific fields have been built in such a way that the location of identity is multi-dimensional and interdisciplinary structure (Shamsaei,2009, 25). Also, AHP can help improve the decision-making process. Hierarchical structure, in AHP takes shape all members of the evaluation team enables to systematically observe the criteria and sub-criteria, and determine priorities, (Tam, 2001, 171-182).

Material and Methods

In this study, using local topographic maps to be prepared geological, satellite images of the study area the information layers is the proper location of the landfill For example: layers of geo-hydrology, distance from drainage and waterways, slope and topography, distance from residential areas and urban centers, the rural road network and gas network communication and so on, Layers after preparation, processed and analyzed in "ArcGis". And the weight and importance of each of the layers analyzed and evaluated with "AHP" the location of the landfill. And the desired location identified and introduced as the primary location of the landfill in the form of thematic maps.

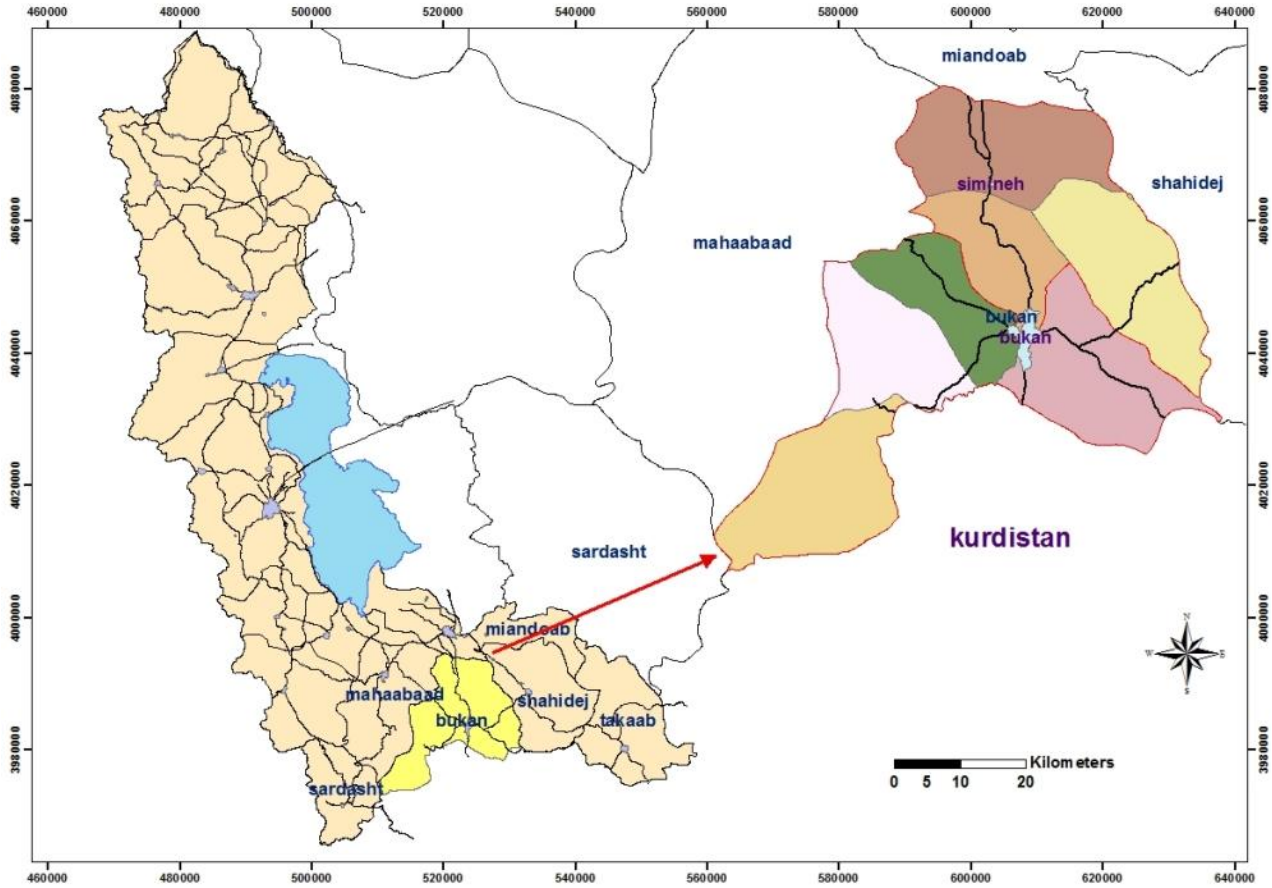


Figure (1): layout of case study (Boukan City in the west Azarrbaijan in Iran)

Criteria of locating compost factory

Locating operations, and RESULTS: AHP method starts with the identify and prioritize the elements of decision making these elements include the objectives, criteria, or specifications and possible options that can be used to prioritize (Bowen, 1993, 153-158) Choosing a suitable disposal site, is an important step in a comprehensive management plan for hazardous wastes Environmental engineering point of view is the main goal of the process of location, The best use of land resources, ensure equipment and new facilities are located at sites that are potentially superior to the natural characteristics of land use guarantee that the protection of public health and the environment disposal against malicious issues (McNally, 2002, 103) Finding the appropriate location of hazardous waste landfills depends on, natural and legal conditions of each region (LaGrega, 2002, 303). Because of the earthquake-prone country, appear to be essential respect for boundary of the faults in this study, it has been used, according to the global criteria, choose the location of buried hazardous wastes that Is offered from prestigious organizations such as UNEP, WHO, and environmental organizations in developed countries, such as Japan, Australia, New Zealand and so on, and they were provided using viewpoints of experts familiar with the city of Boukan, collection of criteria for the Choosing the city's landfill.

These criteria were divided into two categories: First: essential criteria (primary) the result are invalidate, the probability or their existence in the study area, (Boolean analysis). Second: secondary parameters are the presence or absence and the severity or lack of them, can have positive or negative effects of strong or weak is the final decision for site selection (analytic hierarchy). Several factors, technical, economic and political influence in the selection Location. Some of the most important factors in site selection are: 1 - To minimize distance transport of waste to produce compost Location. 2 - Ensure there is an intermediate zone between the plant and nearby residential areas. 3 - Suitable topography and soil properties. 4 - Existence enough land for the compost production (Database divisions, city search, 2012, 55).

Hierarchical structure of allocation targets, landfill

It is necessary construction and maintenance of an access road to the landfill, and a communication system within the site, with the ability to move all the trucks that carry garbage to landfills during the period of operation, the system created to prevent dust and debris from leaving the site required. Overall, for convenience and to reduce shipping time and cost, burying place, it should be possible to close major roads and existing roads also In this regard carried out, a study on road traffic and travel safety . Care must be taken that the two-way road and usually consider permanent road width of 6 to 7 m. If the landfill is not a huge facility, is also suitable road width of 5/4. The entrance road to the landfill must be is located at least 12 meters from the highway. Permanent and main roads is necessary be asphalt and smooth. Optimal slope, access roads is on an uphill less than 7% and the slope is less than 10%. The city Boukan was received the information required by the Bureau of Statistics and of Governor. Layers reviewed and carefully were surveyed in GIS. Layers were perfectly matched due to overlap Image and geographical coordinate system was placed zone 38, the Mercator reverse system. Finally, the analysis of output maps was obtained according to the analysis of the Boolean and the hierarchy of AHP . The following are the types of maps.

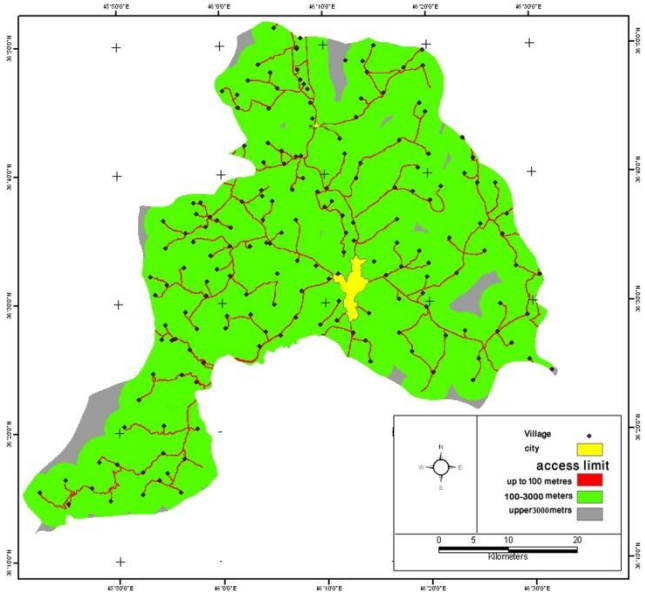


Figure (2): Map of access limitation of roads

Figure (2): map of access limitation of roads: a- up to 100 meters is too near so it not good place , b- between 100- 3000 meters is good place and C- upper 3001 meters it’s so far and cost infrastructures such as road are very much, so that’s not suitable place.

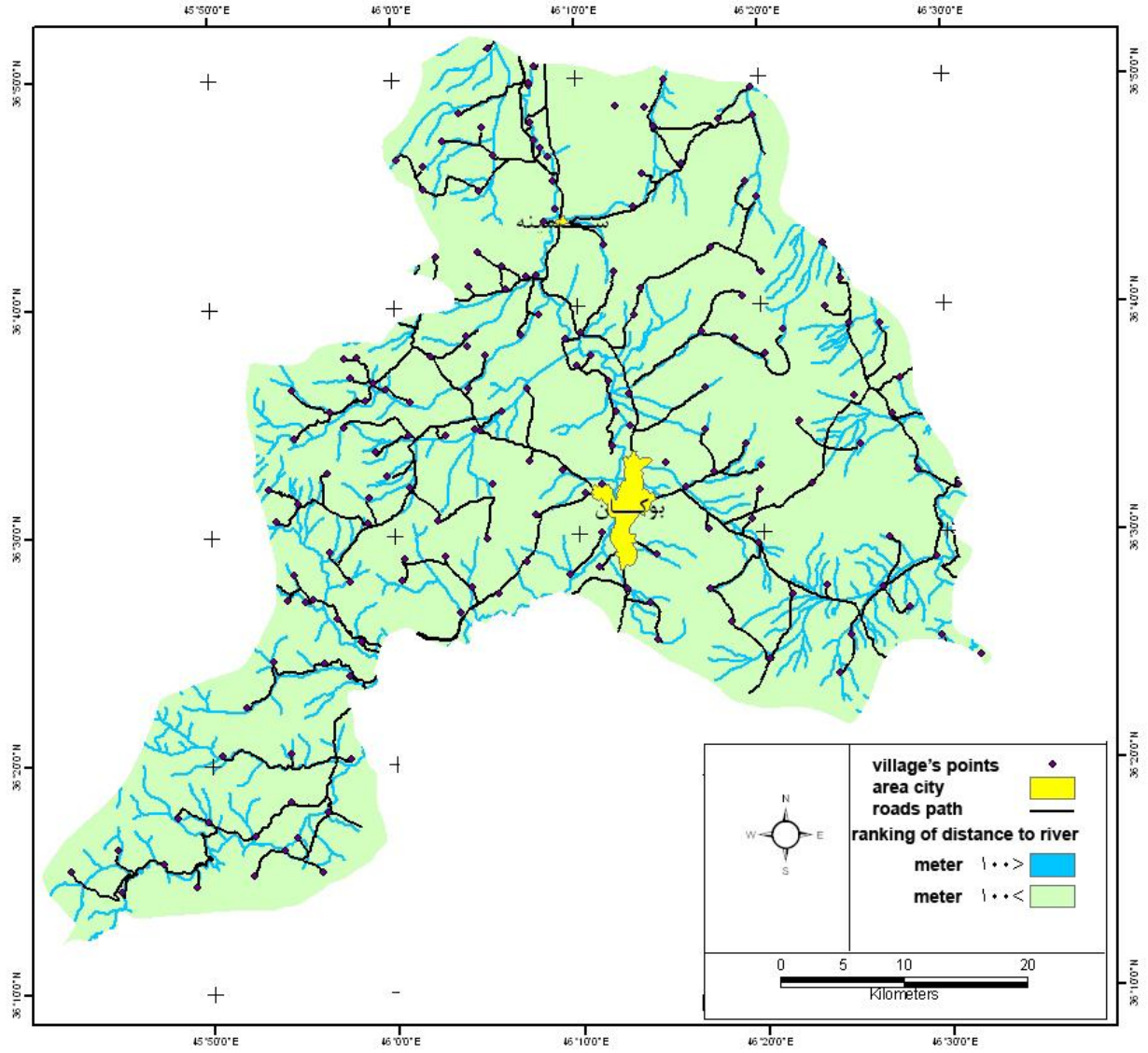


Figure (3): Ranking of distance to river

Calculate the space requirements for municipal waste

To calculate the area of land required for a burial should, be considered factors, such as the rate of waste generation, the population density of the compacted material, burial place.

Hence it is essential to be reviewed population growth and an annual production of waste, as well as the height and shape of landfills needed. Plan period is the time interval between the start of operation of a project until the end the exploitation of its. The calculation of the landfill is considered the project period fifteen to twenty-five years that in this paper has been considered plan period of 25 years.

One of the important factors is in selecting a site, as a place of burial, ensure the availability of adequate land until, to be able is satisfy the long-term needs of the city (Takdastan, 2002, 73).

Table (1): Physical analyze of solid waste in Boukan Township at different season

Season	density	Corruptible elemet's ratio	paper ratio	Rubberratio	Fabricratio	glass ratio	Crucible ratio	wood ratio	others
winter	385.23	73.74	7.58	9.56	3.61	1.40	0.81	0.48	2.82
spring	364.27	74.90	7.90	9.50	1.68	1.67	1.01	0.87	2.22
summer	371.95	80.00	0.73	13.20	1.43	1.23	1.3.	0.72	2.69
fall	379.05	74.64	6.30	10.67	3.15	0.48	1.20	0.54	3.02
average	**375.12**	**75.82**	**5.63**	**10.73**	**2.47**	**1.20**	**1.01**	**0.65**	**2.69**

Table(2): Tonnage of component of waste solid in the Boukan Township (the unit of digit is Kg)

location	density	Corruptible elemet's ratio	paper ratio	Rubberratio	Fabricratio	glass ratio	Crucible ratio	wood ratio	others	Tonnage
bukan'scity	375.12	116005	8610	16421	3775	1828	1540	998	3825	153003
simieh'scity	386.38	778	73	120	37	12	12	21	86	1140
village	386.38	11763	1738	2849	802	268	276	740	6190	24626
township	377.33	125845	10557	19472	4688	2098	1838	1984	12285	178768

Table (3): Estimate area for cover of solid waste

place	year	population	population's ratio	Tonnage of yaer	density	density ratio	deep (meter)	required area(hectare)
Bukan	1391	168720	2	55841	375kg/m3	0.2	3.5	3.00
	1415	264408		89174		0.2	3.5	4.24
	1391-1415	5493744		1852820		0.2	3.5	88.00
Simineh	1391	1104	2	423	386kg/m3	0.2	3.5	0.02
	1415	1729		663		0.2	3.5	0.03
	1391-1415	34870		13364		0.2	3.5	0.64
Villages	1391	58906	2	1011	286kg/m3	0.2	3.5	0.05
	1415	92402		1585		0.2	3.5	0.07
	1391-1415	1827837		31950		0.2	3.5	1.52
township	1391	228730	2	57275	353kg/m3	0.2	3.5	3.07
	1415	358539		91422		0.2	3.5	4.35
	1391-1415	7356451		1898134		0.2	3.5	90.16

Conclusions

Location of the proposed landfill is shown in the following figure

Among the areas of location should be selected the place or places suitable for landfill Hence is recommended the expected areas, the two areas, as a first priority and second priority areas suitable for landfill Prevailing wind direction is one of the things that influence site selection. As mentioned in the first stage, the Golbad Location demonstrated low wind speeds in the North East of the city Boukan. The second factor in site selection is a centrality location in terms of distance, the two city Boukan, and Simineh, and surrounding villages. The next item is, low elevation the gravity of the population.

All factors caused the range choices should be in contour the city Boukan, and Simineh and in the south, the village of Kane Sheghagh. Desired location enjoys the proper size and other than the two towns cover the villages with population above the Selected Location shown on the map below. As mentioned before if landfills have to be far more than 20 to 25 kilometers with population centers, certainly is needed the middle station. Hence has been the following map the distance from the landfill. Boukan town, located 10 km from the landfill, thus is not requiring the middle stations. As is visible the Simineh town is located at the boundary 15 kilometers from landfill. The between-city villages, 88 villages, located with a population of about 30,000 people, 20 km in privacy of landfills and 120 villages located with a population of 38,000 people 25 km in privacy of landfills. That taking into account 53,000 people rural population is covered about 70 percent of the rural population. This show the suitability of location bury, for the rest of villages the city is provided the possibility locating a new location. But with this interpretation, in the south, Boukan, 8 villages is located with a population of 3100 people at a distance over 25 km.

For a small population and proximity to the Boukan Dam, there is no the possibility layout landfills around and in case, having the waste transportation system should be brought to the proposed waste Location. There are in the north and the output Boukan towards Miandoab three villages with a population of less than a thousand people are located in the distance above 25 km, landfills, also the villages should transfer their waste to landfill proposed however lack of transport would not be a problem due to their small size and low population density. But in the West city Boukan are 48 villages with a population of approximately 12,000 people, That is, it has a population of 26 villages under 200 people, and only 22 villages, is capable of a population over 200 people.

Direct transfer waste the villages is not feasible the proposed location and should be considered a place to burial or at least a temporary depot waste to the villages. The burial place proposed for the village, mentioned, elected in a range between the villages Pashblagh, Kokeh, Hashy Abad, gharehli and the Char Divar, The reason for this selection are, a gravity position, relative to other villages. The location selection is priority and second, and covers an area of approximately 10 hectares. That's form enough space for the village. However, due to the low population density in the desired range, rural inhabitants can use of local conditions with regard to its ownership.

Figure 4: map of, superimposed layers, and prioritize, landfill sites

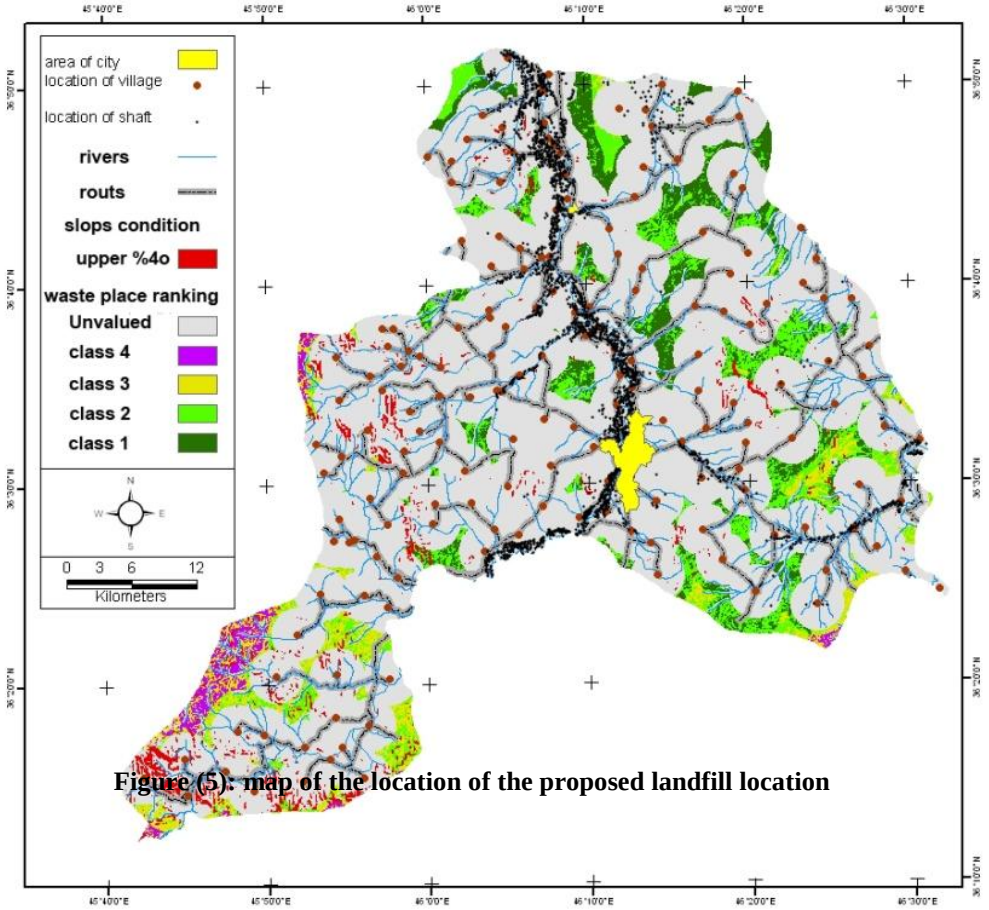
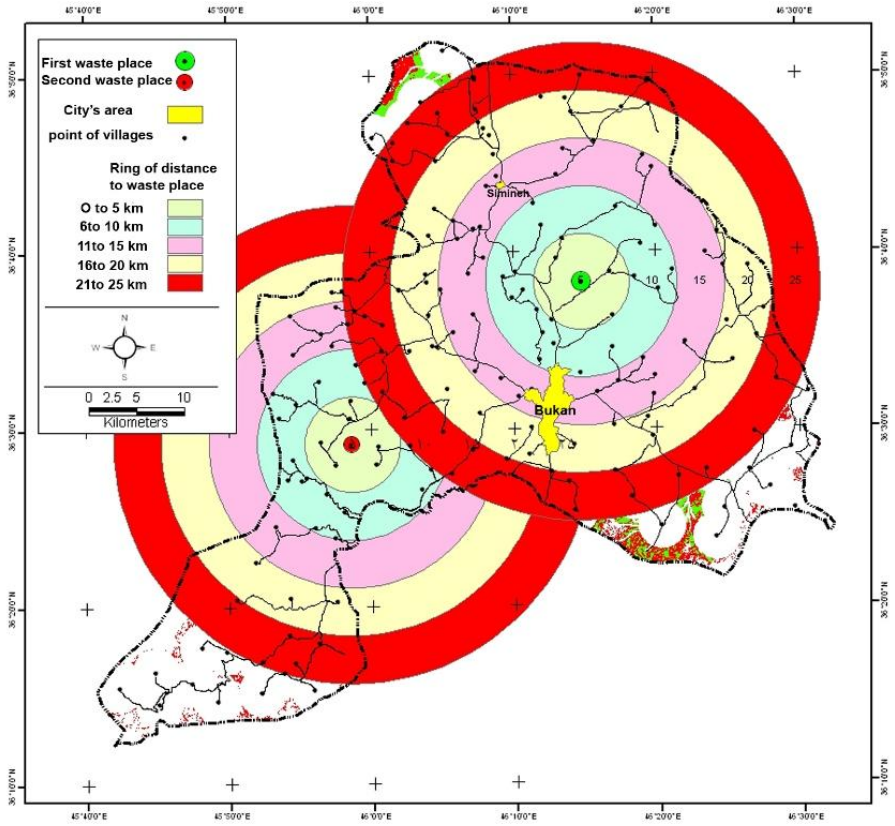


Figure (5): map of the location of the proposed landfill location



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