International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 12 | Nov 2020 www.irjet.net p-ISSN: 2395-0072

Urban planning by using of geographical information system (GIS)

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Abstract *Since urban planning is to ensure the well-being of urban dwellers by creating a better, favorable, healthier, and more efficient environment, therefore, transferring and burial of urban wastes in appropriate places have a major role in the above issue. In this article the application of GIS and the used of satellite imagery in urban planning and management in the relation of obtaining suitable locations for conveying and disposal of urban wastes which have been examined in Kabul city is more accurate and convenient in comparison of other methods for determining of urban wastes location .For this study, first researcher has recognized and evaluated the standard and the selection of suitable criteria for Sanitary burial by examining different standards and then by providing of different layers of information including the area's slop map, land use, communication lines, densities map, surface water, residential areas, and amount of wind and rainfall area which these layers are digitalized in Geographical Information System (GIS) and also in this stage each layers based on influences which has on the location of the landfill is divided in to floors of (Perfectly suited, Suitable, Unsuitable, Completely inappropriate) and at the end of this research a map of suitable areas has been prepared for landfilling in Kabul.*

Key Words*: *Urban planning, GIS, Satellite imagery, urban wastes, sanitary burial, Kabul province.

1. INTRODUCTION

Since urban planning is constant based on the locative information and also the city is a complex environment that all its components are systematically in close contact with each other, so violation in each of the components of this complex causes problems in the whole system. Municipal waste is one of the components of the city that ignoring it can be influenced on urban landscape units. Increasing of urban development areas and excessive of population create a variety of urban waste; whatever today become a concern in the urban environment is disposal and extermination of municipal waste. It should be noted that different methods of disposal depend on many factors, indicators, and various methods such as incineration and composting are available for waste disposal [2]. The aim of this study is that many of the urban areas must be used the best method of disposal means the sanitary waste disposal methods. In this field extensive studies are necessary for planning, designing and location of urban waste and in these area effective factors must be taken in order to receive suitable place for landfill sites.

2. RESEARCH TOPIC

Urban Waste refers to solids, liquids and gases (other than sewage) that are directly and indirectly the result of human activity and also urban waste is called waste solid which is mainly produced by human activity in the agricultural, industrial and urban sectors [1].

Locating a suitable place for landfilling is one of the necessities of urban development plans, so in the last decade one of the most important problems due to urban development is the correct location of landfills. In locating the landfill some significant factors must be consider such as topography, inclination, hydrology of the area, climatic conditions, required land area, groundwater level, land position related to the city development, use of adjacent land, distance form town and pathway, and distance from water Surface areas of burials .

Since municipal waste by increasing of population become main threats for humankind life and causes major problems for citizens. Waste disposal is a complex and sensitive process and it is an important concern for city and state officials [3]. If a useful method is not used for waste disposal, it can become an environmental disaster and endanger for lives of humans, animals and plants and also it will incur irreparable costs .in order to, reduce these problems and get a suitable place for sanitary disposal of municipal waste so the best way is the used of GIS technology and satellite images which are the most suitable place can be obtained as soon as possible and at low cost by using them. Generally, landfill should be located in a place which causes least disadvantage in various areas such as environmental, social and economic. There is no standard and proven definition for many affecting factors in landfill locating but according to the given questions and criteria in order to get correct right place for landfills, rules can be set for each factor and also considered difference between various criteria in terms of its importance and impact .

The aim of this study is to found the most suitable place for landfill site by using of GIS .Thus, first the selection criteria for landfill sites recognized, evaluated ,and selected by examining the standards of the Environmental Protection Agency, the country's mayors ,international experience ,and others and then by providing of different layers of information including area's slop map, land use, communication lines, densities map, surface water, residential areas, and amount of wind and rainfall area that these layers are digitalized in Geographical Information System (GIS) and in this stage each layers based on influences which has on the location of the landfill is divided in to floors of (Perfectly suited, Suitable, Unsuitable, Completely inappropriate) in Table 1[4].

Table -1: Scoring different areas for landfilling municipal waste.

Number	Information parameters and effective criteria in locating landfills	Scoring the desired areas			
		Perfectly suited	Suitable	Unsuitable	Completely inappropriate
1	Scoring the desired area desire in percentage	More than 60 %	40to 60 %	15 to 40 %	Less than 15 %
2	Distance from roads (m)	Less than 100	600 – 100	2000 - 600	6000 – 2000
3	Distance from the airfield (Km)	5 – 6	4 – 5	3 - 4	Less than 3km
4	Distance from surface water (m)	More than 3000	3000 – 2000	2000 - 1000	1000 – 0
5	Distance to community centers	3000 – 2000	2000 - 1000	6000 - 3000	Less than 1000
6	Land use	Flat areas without vegetation	Rainy areas, protruding rocks and smooth agricultural areas	Agricultural areas that are cultivated intermittently	Wetlands, swamps, residential areas
7	Rainfall	Very little rain	Low rainfall	Full of rain	Very rainy
8	The amount of wind	Very low density	Low density	Full density	Very dense
9	Distance from residential areas	3000 -1500	4500 –3000	6000 -4500	Less than 1500

For detecting and removing unsuitable areas according to the various criteria of different organizations, regional condition, and also the researchers examined various methods to determine different Privacy complications of the City, village, communication lines, surface water sources, and etc.

For identifying appropriate locations for urban waste classification maps are weighted and evaluated by using (AHP) method based on the effect of each criterion for landfill, then, each of these weighted criteria is overlap with each other. In (AHP) method we have to used pairwise comparison method in order to perform this procedure, first compared each of the measures and the ratio importance of each pair according to the scoring system between one to nine assigned in one matrix and then calculated the weights and agreed ratio (CR), this ratio should be less than 0.1 and accepted the done comparisons and extracted the calculated weights .If the agreed ratio is more than 0.1, then making changes in pairwise comparison matrix of mention ratio are set to acceptable levels. Weights Operation agreement and the calculated ratio because of the low software ARC GIS are done by Expert Choice software, As if comparisons are acceptable, the result will be announced. The result announcement is if the CR ratio is less than 0.1 so this ratio for these data is 0, 02 and indicates that the results are acceptable.

Table -2: Weighing criteria using (AHP)

Criteria	Land use	topography	Access radius	Historical areas	Sliding areas	Flooded areas	Earthquake-prone areas	Fault	air square
Land use	1	3	4	5	5	4	4	6	5
Topography	0.33	1	3	5	6	3	3	4	5
Access radius	0.25	0.33	1	2	3	2	1	3	3
Historical areas	0.2	0.2	0.5	1	2	1	1	2	2
Sliding areas	0.2	0.17	0.33	0.5	1	0.5	0.5	3	1
Flooded areas	0.25	0.33	0.5	1	2	1	1	3	2
Earthquake-prone areas	0.25	0.33	1	1	2	1	1	3	4
Fault	0.17	0.25	0.33	0.5	0.33	0.33	0.33	1	2
air square	0.2	0.2	0.33	0.5	1	0.5	0.25	0.5	1

For providing suitable areas mapping for landfill, all layers in the weighted overlay, multiplied by the weight of each of the layers that can be obtained through the Software Export Choice and then output is taken to achieve appropriate areas, average and poor image for landfill siting Figure 1.

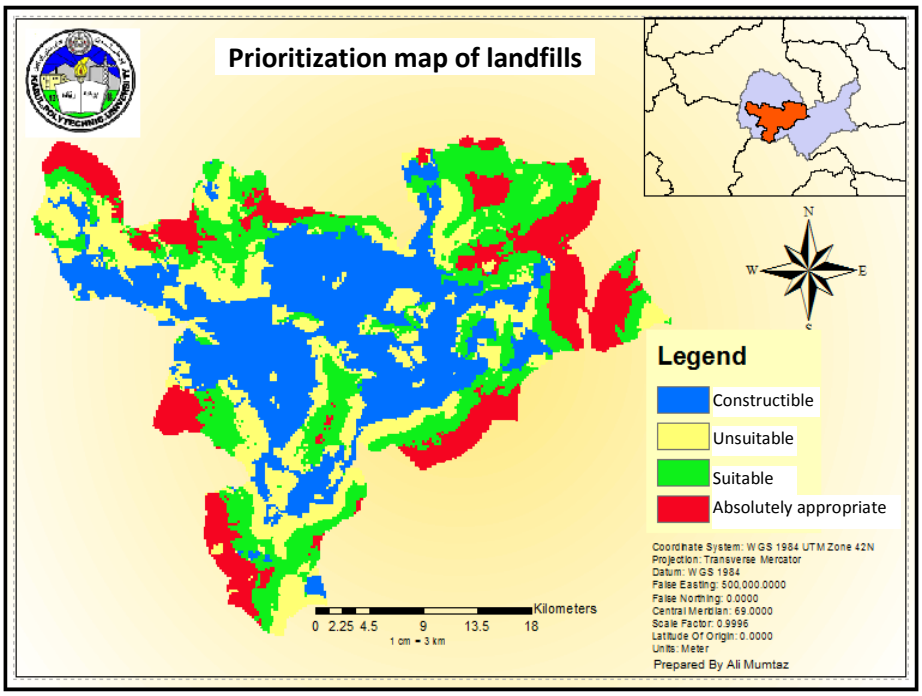

Figure- 1: Prioritization map of landfills.

3. CONCLUSIONS

Considering the criteria by AHP weighting method and also the obtained map, it was found that the municipal landfills in Kabul in the southwestern and southeastern parts are scattered in very suitable class. In Suitable class Northwest parts are the best places for landfills and it should also be noted that the AHP method in this study is one of the best methods for locating municipal landfills.

ACKNOWLEDGEMENT

I would like to express my gratitude to the municipality of Kabul and Department of Environment for providing materials and information for writing this article.

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BIOGRAPHY

I was born in 1972 in Kabul Province, Afghanistan. I defend my Masters dissertation in 1993 in "Kabul polytechnic University" I'm working as Assistant Professor of Geomatics and Cadastre Faculty in Kabul Polytechnic University.