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Research Article

Locate Urban Landfill Using Analytical Hierarchy Process and Geographic Information System (Case Study: City Sultanabad)

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ABSTRACT

Sltanabad city in Khorasan Razavi province, in the city of Sabzevar's Khoshab.With a population of 4987 people in 1385,36 tons of waste generated daily.The organized system for urban waste has not been equipped.And the current location of the landfill used the wrong environment and its environmental impact in the current situation has emerged.The aim of this study was to impose a variety of spatial analysis, with any of the Geographic Information System technology to locate the optimal range with minimal environmental effects of urban waste.Therefore, where waste information system was formed. Layers of information, including distance from the city, away from the roads, land use, distance from surface water area, the layer for air, soil, etc. Then, using the analytic hierarchy process model layers combined information, the location for the landfill was determined.

Keywords Geographic Information System (GIS); urban waste disposal; AHP.

1- INTRODUCTION

The city's waste management system is relatively far from the ideal situation is critical and that is not secret. Locate a suitable place to bury waste from the requirements of urban development plans. Today there is a system of automated, accurate, timely, one of the main pillars for the development of waste management in the city. Weaknesses in the systems of mechanized different and separate, their heterogeneity and lack of concentration [2] and the lack of correlation between the spatial effects are descriptive data, so in this case, research of a call for site-specific management [6],Locating appropriate landfill that the most important factors threatening the legal, environmental, operational management is carried out is. It is worth noting that it has good research and good value in relation to the location of buried waste in the context of studies have been conducted. Can be found in this connection, check Amini, the different analytical methods in GIS to locate a landfill in the city of Surrey has done with two Boolean Vfazy [1].Shah Ali also locate Zanjan urban landfill is done by using fuzzy [3].In 2002 Vastava and Naso on the location of the landfill using Geographic Information System and remote sensing and weighting systems have done [9].In 2004 the Geographic Information System for Solid Waste Management in Rome [5], urban Waste Services of Charlotte and North Carolina appliances using GIS [7], is presented.In 1381 as a research location and separate waste collection centers in District 22 of Tehran were a Geographic Information System.In this research the information layer urban equipment, slope of the land, ownership, use of public services in the region ... the information system urban waste produced Grddyd,And by using urban landfill was determined by weighting the appropriate option [4].This study is also using a Geographic Information System to organize the data in the study sample examined,Then using AHP model to locate a suitable site in the area of studies have examined urban waste disposal.

1- THE STUDY AREA

Sltanabad area in this study in a city in Khorasan Razavi province, the city of Sabzevar city is located in the juice. With a population of 4,987 people in 1385, is. (Table 1) at a distance of 42 km and 70 km from Nishapur and in the course of the past three way Sabzevar

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Sabzevar, turquoise and Quchan is located. View and shape of the region is as follows (Fig. 1)

Table 1: View of the city of Sultanabad sample basis, the country geographically, 1385]

The approximate height of the surface water	Latitude	Longitude	Population coverage
1200 meters	◌17◌59	◌54◌35	In the year 1385 (4987 cases)

2-1- Outline research

Waste disposal issue has detailed steps (such as site selection and preparation, and use of the site), which requires studies and good management practices, this research to choose the right place mainly carried out in three phases, respectively is. 1. collect data, organize and manage data 2-, 3- prepare a conceptual model that uses analytic functions Arc GIS, the combination of AHP, the three parts are in contact with each other . (Figure 3).

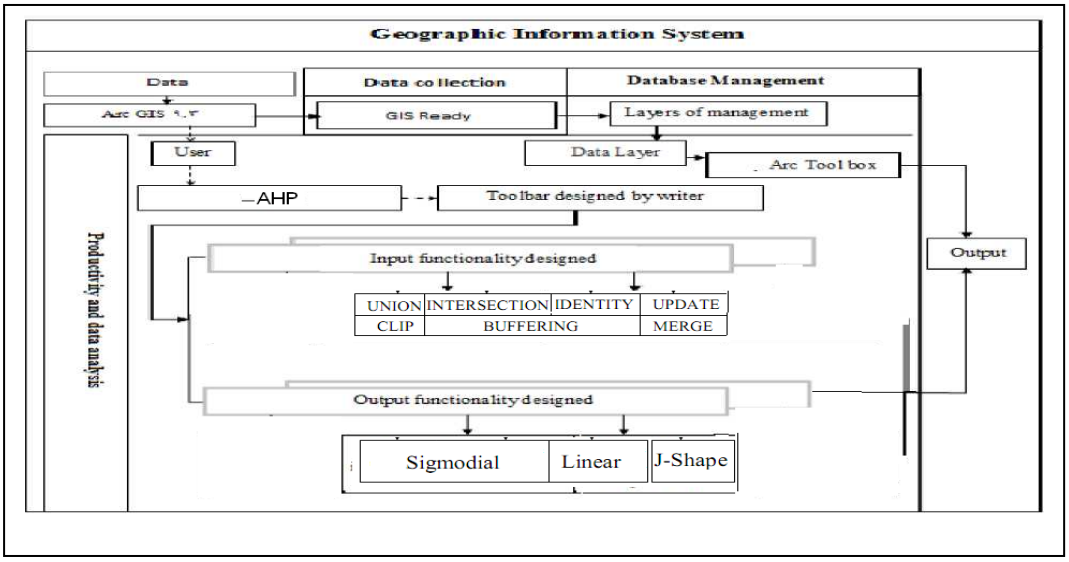


Figure 3: Outline study

2-2Data and requirements gathering

Data Fusion and compatibility with file formats, has more processing power of GIS for specific purposes. [10] The aim of this step is to complete the first spatial information and spatial information systems software is to use. For this purpose, a detailed examination of available data, information, system requirements specified. This data includes the list of basic data and technical information is available on the project plans. To implement the plan design is done. After preparing the data entry system to display information on a computer screen with standard system location. Prepare 2 data formats Shape - File [11] have been conducted.

2-3-Preparation of the conceptual model

The management, the direction of data flow to the productivity and analysis with a conceptual model of the pass. This toolbox using Arc GIS software Which includes a combination of functions defined in a model using AHP method The efficiency and analysis required to achieve the desired output location for landfill deals.

2-3-1- Criteria for the location of the landfill waste

In general, a landfill should be established in a variety of ways, including environmental, social and economic losses brought low. The question about the correct location can be a concern in a landfill more than half of the meet. In (Table 2) a list of issues that the location of a landfill has been proposed. Of course, these problems all their forms, trying to fix them in order to achieve the following objectives takes place.

1. To minimize the risk to public health in the

2. To minimize the negative effects on the environment desired location.

3. Place the highest level of service provided to users for convenience.

Table 1. Locate landfill issues

Route	Threat to	Concern (Thread)	Dilemma
Groundwater	(Human health)	wells	A water pollution
Surface water	(Human health)	streams, rivers, lakes, etc	
Surface ater.groundwater	Life aquifer		
Surfacewater.groundwater	Plant life		
Surface ater.groundwater	Animal life		
Barley	Man (aesthetics)	Smell	local air pollution
Barley	(Human health)	Chemical	
Barley	Plants	Physical (methane)	
Stone dust or barley	Human explosion	Noise	
Stone dust	Plants	Dust	
Barley	Man (aesthetics)	Smoke	
Barley	Man (Beauty and School of Health)	greenhouse gases	
Barley	Man (Beauty and School of ealth)		
Barley	Man (Global climate)		
Barley	Man (commuter aircraft, inter-ruptions)	Birds	conflict with wild-life
Contact	Man (commuter aircraft, inter-ruptions)	Animals	
Based transport	Man(Human health) Man (aesthetics)	Accident	transfer
Barley		Noise	
Barley		dust	
Reduced enjoyment of life	Adjacent landowners	The aesthetics of the site	community
Reduced enjoyment of life	Adjacent landowners	Coordinated land use	
Income	Taxpayers	transmission and a waste	economy
Income	Taxpayers	The total cost	

It should be noted that it is very unlikely that place, all concerns to meet, the result should be a better location than the location profile for the special tool for the detection of most significant, for the purpose advantage of the location, use the attributes desired by the use of special techniques to be prioritized. (Table 3).

Table 3. Evaluation of the priority groups and phenomena used to distinguish between places

Phenomena evaluated	Percent of	Group early	Row
Hydrology, Hydrogeology	4/33	Public health and safety	1
Services and Traffic Safety and Operational			
Biophysical	4/20	The natural environment	2
Agriculture	5/15	Social environment	3
Impact on communities			
Collective facilities			
Odor, dust			
A noise			
Visual effects			
Coordination of land use			
Historical phenomena			
Archeology	4/15	Cultural environment	4
USD (Dollar)	3/15	Economic costs	5

3- ACCORDING TO THE INFORMATION AND QUALITY TO THEIR HRLAYH

Numerous studies have been conducted in each of the layers of information, which are effective right to choose where to locate a landfill. Then all the layers using a combination of information and the value of each of the parameters involved in determining a suitable location was found. The following are some of the most studied areas of study mentioned.

3-1- Economic Analysis

Although economic studies and cost estimates are part of the most important steps in all engineering and design, But in the process of positioning the subject in the last degree of importance (Table 3), as compared to other factors, some of which can be ignored. Of course, the reason for the lack of economic studies at the landfill location, because in some similar options, the economic problems that the final choice possible. Much of the cost of buying land is the localization process and should be kept in mind that the best is not always cheap land, which may be further expenses such as Madhsary is high, so the valuation fee, all items must be costly be considered. Sometimes it is necessary to purchase rather than rent it for a while.Apart from the price of land Other costs include investment in physical and environmental factors landfill (such as topography, hydrology and Hydrogeology, Soil, mapping), as well as the cost of treatment and rehabilitation of the land (eg, clearing, excavation, construction drainage and minor roads, construction of facilities and water supply, electrification, telephone and fence). Also pay their wages and insurance workers, waste and soil cover transportation costs, administrative costs and, ultimately, the cost of repair and the construction of buildings, facilities and equipment, including significant investigation.

3-2 Beauty and the acceptance by the people

Efforts should be made to the extent possible the burial place away from the eyes and the visual appeal of a region not tainted. In some cases, various reasons, such as lack of land suitable for the landfill not far from residential areas, in which case it will almost certainly appeal to the residents. The people protest generally include: creation of odor, fire, insects, birds and ani-

mals, the dispersion of light waste, noise, dust and even reduce the price of land and homes around the landfill, which is partly through proper education can be solved.

3-3-Topography landfill

Determine the topography of the landfill, due to the influence of treatment, disposal methods, design Z•hkshyhay burial area, the type of equipment needed to determine the level of groundwater, determine the future use of the land, forecasting the development of future action and development of precious and important burial equipment is. Usually Highlands and flat (low slope) if you have other conditions, such as being impermeable soil, are the best places. Such as industrial areas and recreation grounds in the future can be used. Good background and posts Although the ability to accept larger amounts of waste are, because they are below ground level, and are more prone to flooding due to water flow, these lands are gradually worn down. For this reason, if for buried waste, areas of selected doors to prevent the flow of water erosion, surface Z•hkshyhay design is essential. It is worth noting that the bed of clay or shale mines Mtrvkhay are also suited for landfill waste (such as coal), other wetland areas and coastal landfill waste is not reasonable, because in addition to environmental issues, in disrupt the ecological system of the region. As noted by determining the topography of the land, can be used to determine the method of disposal. Burial methods may surface, or a combination of the two is Gvdaly-Transhhay. There are ups and downs to land a hybrid approach is appropriate in this manner is usually due to lack of adequate, ground cover must be provided from other sites.

3-4-Climate landfill

The most important climatic parameters that can be mentioned in the assessment of landfills. Wind, temperature and thermal fluctuations, and the rain. In general, as far as possible avoid windy locations should be selected because of the wind in these areas in addition to the dust from earthworks and embankment, to disperse the light objects such as paper and plastic back. In order to avoid such problems should be established with regard to the direction of prevailing winds Badshknhayy or fences to prevent the scattering of light in the form of fixed or moving objects created. The range of temperature fluctuations in the effective operation of winter ice conditions, to dig the ground is almost impossible. Therefore, taking into consideration the weather to dig trenches and landfills should always be prepared. The soil cover must be stored in special warehouses so it can be used in case of frost. Other important parameters of climate, topography and rainfall intensity is due to the relationship. In general awareness of the severity and duration of rainfall and calculate estimated, to prevent contact with surface water and landfill leachate would be helpful to also estimate. If the desired location can cover a steep slope and soil erosion, the occurrence of heavy rain can cause damage if the soil is very easy to wear, it must be flat or low slope is landfill. Meanwhile, drain the surrounding land would be somewhat reduce the problems caused by the heavy rain. It is worth noting that the flood-prone area and period of possible floods should also be considered.

3-5-Geology and Soil Science Place

Soil and Geology in addressing issues related to the design process and how to protect groundwater and surface water is considered a basic necessity. The most important issues that should be addressed in this regard include: characterization and depth, to determine the bedrock, thickness, recognition of gender and origin, determine the folds of the earth, flowers and stripes pattern earthquake, identifying weathering , the possibility of landslides and rock porosity and permeability of the soil, of particular importance are the two issues are discussed below.

3-6-View bedrock

Given the bedrock characteristics such as gender, thickness, fault location and leave Khvrdgyha be necessary to penetrate the latex and the middle distance and hence the biological and chemical treatment of leachate, the one planning it. For example, when the bedrock of limestone and has many faults is open, latex or any other contaminants and are easily able to pass without reducing the pollution of land and groundwater pollution is caused. It is worth noting that absolute impenetrable bedrock may also not desirable, because .vjvd no pollution of ground water, surface water pollution is possible that this problem should be solved with good management.

3-7- Soil Science

Soil formation is actually a mixture of clay, sand and silt, the choice of place is very important, because the relative percentages of the three defining characteristics of permeability of the soil itself. flow filtration is the underlying phenomenon that's happening within it. Therefore, any order that studied the soil (the soil cover and soil the bed and the floor of the landfill), the permeability of the features considered important. For example, if the landfill is above ground and the distance between the landfill and groundwater level of silt, sand and rock Cracking Soil is composed of high contamination risk, little as it passes through the rock Cracking Soil natural latex is filtered. In addition, contaminants in the rock Cracking Soil will play, if the residue town in the sandy ground and buried under layers of calcareous rocks have been inclined, there is the possibility of severe pollution of groundwater. Usually soil layer is a cover to bedrock that is so impenetrable rain water from entering further into the ground is prevented.If the dust cover can be provided from landfill. The cost will be greatly reduced. Because the soil is

used to cover the final day. The soil cover is a mixture of sand and clay with silt. On the other hand, to cover the final (or daily), such as clay soils with very fine particle size distribution alone is not ideal because the drying can create cracks and gaps where there are issues such as the creation of odor, water penetration and growth of the disease it will lead to the best soil cover soil with a mixture of coarse and fine particle size distribution.

3-8- Hydrology and Hydrogeology landfill

Apart from the Soil and bedrock characteristics at depth topics such as air conditioning and Hydrology and Hydrogeology landfill saturation region, the depth of the static level of ground water, underground water table seasonal fluctuations, hydraulic conductivity and porosity of the soil, the water and of ground water, and soil moisture holding capacity, should also be examined. Because most of the water flowing through the soil and bedrock, soil, land slope, vegetation and so on. So that, for example, the more vegetation, land slope, soil moisture, slow and steady is less rain, more water is leverage. In general, hydro-geological assessment landfill from the floor to the static line must be specified. For the best possible position to groundwater pollution occurs when the static line of groundwater near the landfill cell foam and latex is directly in contact with water, the potential introduction of groundwater by leachate depends a lot on the physical condition of landfill soil pores ventilated area (or unsaturated) and location of the groundwater table.is, as movement is a function of the hydrological flow. Studies have shown that the strength of leachate contamination, pass through layers of soil, vertically or side decreases. The amount of the reduction to the nature of the layer above the static line (the air) depends on a variety of processes, including process, mechanical filtration, chemical processing, ion exchange, adsorption and microbiological activities are relevant. Yet a certain amount of distance between cell floor buried water line stability is not certain and different sources ranging from 7 to 15 meters for at least suggest. Similarly the status of surface water and surface water pollution in some cases also have been buried in the 600 meters. It should also fluctuations in the level of ground water in different seasons (dry and wet) are also considered. The movement of groundwater should be noted that the direction and the stagnation of the waters can be found maps of underground water level. The curves of the stationary points relative to a base level (usually MSL) elevation are linked. To produce the map, the number of observation wells were used with good dispersion. These points in addition to the above, other useful information such as feeding and discharge areas, the relationship between the water table and rivers and lakes also provide good sites for wells. The maps can be buried underground water level through the General Directorate of Geology and organizations related to the groundwater supply. As mentioned above, other important cases investigated, hydraulic conductivity, porosity and holding capacity that closely together. On-holding capacity, soil evaluation should also be paid to the waste, since both are effective in penetration and make the runoff in landfill. In general, the density of matter (such as soil or waste material) is, the greater its capacity to hold less and less permeability, so the coefficient of runoff (water flow), it kept increasing in capacity addition density (soil particle size distribution is also important), such as initial moisture content of the waste and method is effective. The runoff also factors such as slope, vegetation and land cover are involved tissue (Table 6).

Table 6 . The effect of the slope and the type of ground cover both buried in the water coefficients

Approximately a factor of two water	Slope percent	Cover
0/5 -0/1	2	Sand covered with grass
0/1 -0/15	3	
0/15 -0/2	7	
0/12 -0/17	2	Clay covered with grass
0/17 -0/25	3	
0/25 -0/36	7	

The material can be used to estimate the amount of leachate as follows.

Zayd- liquid water absorbed by the material excreted in the influence + Pure = leakage of leachate (1)

Net penetration=(Evapotranspiration + runoff) – Rainfall(2)

Water absorbed by the matter= Zayd- of total moisture absorption capacity of waste water(3)

It is worth noting that the amount of water absorbed by the material waste also depends on the length of time the waste. In this case, should the dual role of microorganisms in the production of heat and humidity and thus more evaporation can be neglected. This

means that if at the start of disposal operations, waste water per kg of dry matter is about 35/0 kg, with the passage of time, the humidity is increased and the flow theory latex begins when compared to the 6 / 0- 5.0 kg the maximum saturation of waste produced at the time of latex (8.0 kg of water) is.

3-8- Hydrogeology buried classification

Division buried the first time in 1976 by Mather in three categories based on the detailed properties of the hydrology of the region and was in fact based on the latex.

3-8-1- buried degree 1

Where the ground water is not on the table, or the ability to influence them into this category is small. The structure of the Earth are usually made of clay, clay Hkdar, siltstone, shale, silt stone, as well as rocks and small size are compressed. In these fields due to low penetration, mobility and influence, and in landfill leachate remains locked. The land must be to a depth of 7 meters and a layer of clay. One of the major problems of the area, especially in moist, filling landfill cells and leachate overflow from the cell surface and the surrounding environment. In addition to the accumulation of methane gas, fire and explosion risk there is of the opinion that measures must be necessary engineering and technical measures. Do not limit the land for waste disposal. Given the nature of hazardous and solid waste, and the unavailability of, or lack of appropriate land for their burial places allocated to solid waste disposal is more desirable.

3-8-2- Burial ground level 2

The relatively impervious land and water on the table are enclosed or open. Because of the relative permeability, latex and move slowly because of the slow movement, as a result of physical processes, chemical and biological contamination of natural latex is significantly reduced during the move. In these lands, usually within the context of the landfill has a high level of stability and clay particles dispersed in reducing the impact of significant metal ions are latex. This places to bury industrial and domestic waste is non-hazardous nature.

3-8-3- Burial ground level 3

In this group, the permeability of the material is such that leachate waste or any rapid movement of water on it. This land is very small and so reduce pollution in surface and ground water contamination is very high. In order to bury the city or hazardous waste not suitable. In these places you can Khnsayy inert waste such as construction and demolition wastes, stone, glass, leather, fragments of steel, asphalt and asbestos boards to be buried.

4-COLLECTED FROM THE LANDFILL AND ACCESS ROADS:

On the other hand, in order to reduce transportation costs, time and other problems of distance, as far as possible should be located closer to the Landfill. Due to these facts, as well as lack of land suitable standard for the burial place of the city is not known. But generally a minimum distance of 2 to 3 km intervals of 10-20 km consider as the final estimate (of course, if one or more transfer stations is between 30-40 km is also acceptable.) It is worth noting that if you can instead of small trucks, through condensation of waste and the use of larger trucks with a cargo volume of more waste waste transfer distance will play the role of the slightly colored.

5- ACCESS ROADS

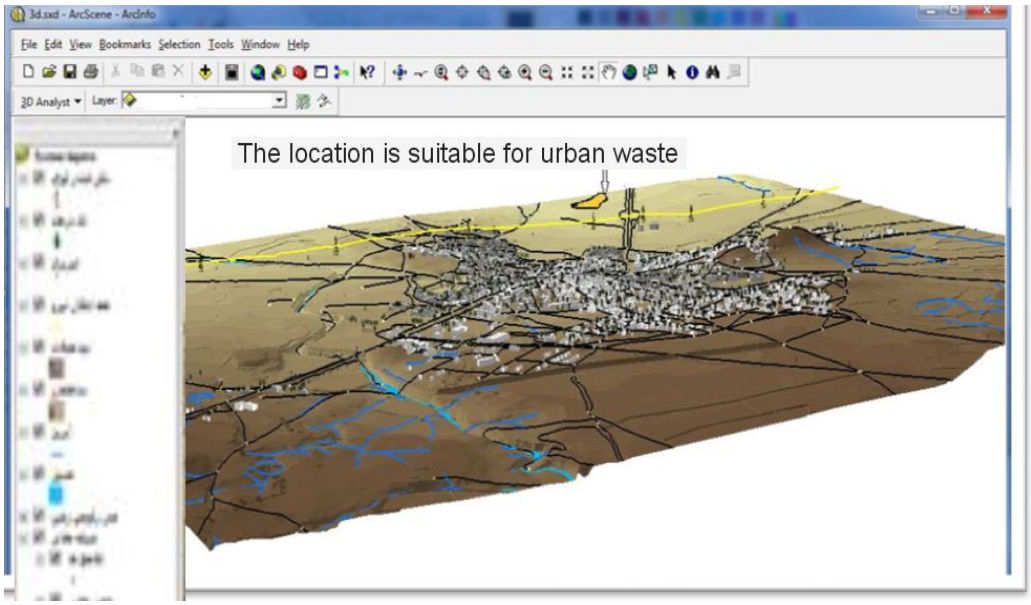
In general, for ease, reducing the time and cost of transportation, burial place as possible with the main road and is close to existing roads. Also be careful that a two-way road, and the width and curvature for passing trucks for appropriate disposal center. Permanent road usually 6 to 7 meters wide and if you consider the huge landfill not have the equipment, road width is 5.4 meters. Road entrance to the landfill must be at least 12 meters from the highway. Permanent and main roads need to be paved and flat. Optimal access roads in the uphill slope of less than 7% and in a state of less than 10 percent. Temporary roads landfill can be prepared with soil and press down. Usually in areas with high rainfall secondary roads covered with a layer of concrete or asphalt material to cover the wet ground, vehicles are not in trouble.

6- ACCESS TO FACILITIES OF ELECTRICITY, WATER AND SEWAGE SYSTEM

The positioning of the ground, buried, for the welfare of employees and facilitate the operation of facilities, electrification and access to the sewage system must be determined. Of course, this study, such as the use of portable generators in the absence of treatment and disinfection of water in the electrification system (springs and wells), followed by chemical and microbiological tests performed or transporting water from other regions.

7- CONCLUSIONS AND RECOMMENDATIONS

Based on the above discussion of selected locations for waste disposal in the study area (Figure 4) specified.



Due to the many factors contributing to the burial location, there is no standard defined and fixed. In order to correctly locate the burial place of a process can be considered a reasonable estimate of the following basic guidelines to be followed by the burial place of choice.

1-The drinking water supply wells be at least 300 meters (1000 feet)

2 of at least 100 meters from surface water is (a distance of 600 meters high is better)

3. The establishment does not comes in.

4 has a thickness of 10 meters of clay soil underneath (or similar device).

5. In order to not be the prevailing winds.

6. faults and fractures in the ground at least 80 to 100 meters away.

7 has the most prone to at least 100 years old.

8 of topsoil as possible of silty clay and silty sand is then made.

9. slope is less than 40%.

10 bed rock of igneous rocks is possible.

11 population centers, hotels, restaurants, food processing plants, schools and public parks have at least 300 meters away.

12. Network access roads at least 80 and no more than one kilometer away. (Lower is better).

13 towns at least 2 to 3 kilometers and a maximum of 20 km (in the case of a transfer station 40 kilometers) away.

14. The permanent roads transverse direction is at least equal to 6 to 7 meters.

15 is a more valuable land (agriculture, forestry, wetlands, pasture).

16. at least 8 kilometers from the airport away.

17. The ancient center (critical areas) have at least 700 meters (more than 3 km is better)

18. The price is less than 50% of the price of the most expensive places around.

19 -has a life of at least 20-15 years.

However, as noted above, the terms are fixed and unchangeable, and depending on the location and the physical, chemical and biological waste should be revised because the cases are designed based on the needs of other countries for use All are in need of reform and Reviews. The study also used the regional situation, and location is determined.

7. NOTES

1- Full Structure Data

2- GIS Ready

3- Geo database

4- Arc Tool box

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