Urban Dry Residue locating interchange stations in Mashhad city using GIS

Mahdi Vatan parast[1], Hamid Sadeghi Hesar[2], Ali Reza Koch Gani[2], Abas Ghorbani[2] and Hamid Saremi[1]

[1]Quchan Branch, Islamic Azad University, Quchan, Iran.

[2]Department of Geography, Shirvan Branch, Islamic Azad University, Shirvan, Iran.

ABSTRACT

Population Increasing, garbage producing and land decreasing for burial is problems and issues of today's big cities that the need for recycling and waste reduction techniques in production and landfill and is increasingly considered Day-to-day accordingly. One of the most useful methods in the field of reuse of dry garbage is to segregate from origin by Citizenries and create incentives for their participation increases. For example, the daily productions of 15 tons of paper in Mashhad shows more and more need to review and develop appropriate strategies to encourage citizens and separation of garbage. one of the activities of Mashhad ' municipality is in the field of solid waste transfer station so that in addition to encouraging citizens provide the receive possibility of suitable use of municipal Incorruptible substance solid waste . Thus the present paper is discussed the locating of the stations with respect to the criteria of population, their accessibility, physical analysis of garbage and determine distance to other stations in municipality 's zooms by using GIS software. The results of this research suggest the 1,11,9 and 8 zones as appropriate places to create new stations to collect dry waste.

© 2013 Elixir All rights reserved

Introduction

Rapid population growth and increasing usage material that has been the result of development and advancement in recent years thereby cause of urban garbage daily increases. Industrial development and urbanization expansion, has been faced the municipal collection, disposal or reuse of municipal garbage as tricky issue (Rafii &others, 2011).

The fact that the system of municipal waste management in Iran is critical proportions and is far from the ideal situation is obvious to all (Poor Ahmad&others 2008).

One of the most desirable method of waste management is recycling existing dried and useable material in garbage that In addition to saving the cost of reproducing of these usage materials and bury them, usually follows the reducing environmental pollution and revenues due to recycling. In fact waste management and recycling due to size and weight reduction of existing garbage and to facilitate the process of collecting, disposal and reuse of waste materials into useful form, is important. (Karim zadegan &others, 2005).

Among the methods of recycling, reusing segregated dry waste from origin by citizens is one of the most useful methods in the field of dried garbage reusing.

Segregation plan from origin has been started since 1998 in Mashhad city the process of growth and development during the recent decade has been started with collecting the dried garbage from citizens 'houses since 1998 and at present includes the activities such as collecting office waste paper collected through the installation of special container, to create Transfer station waste paper or bon to buy books and stationery , to change dried garbage with goods in schools , exchanging dried garbage Fixed stations in the city, organizing and controlling the exchange of dry garbage recyclers and traditional pollen (Kazemi,2011).

According to statistics, of 2011 about 650 thousand tons of garbage have been generated in Mashhad city of which about 76% includes household garbage and out of this amount makes up only 2.5% of separated from the origin. This problem indicates to low level of recycling activities in Mashhad city and pointed out to the need for better management of municipal waste makes up more than ever before.

One of the methods of separation from origin dried waste transfer stations, which was implemented by the city of Mashhad waste management in 2008. The implementation of this method, in addition to encouraging city residents to separate waste production, provide the possibility to receive and appropriate use of incorruptible urban waste, and Preventing recycling unsanitary of these materials by traditional factors. Given that the development of this project and its success requires precise locating station waste bank on the basis of cultural, social and economic characteristics of each zoom or reign , the present study is to locate the dry residue exchange stations in Mashhad city using the system GIS .

The Studies show that waste bank locating stations, , has been less considered despite the importance of these stations in the matter of separation and recycling urban waste and most of studies have been paid attention to determine the appropriate landfill sites .

In this context can refer to studies that have been done by Moein &others (2012), Matkan and colleagues (2009), Poor Ahmad&others (2008), and khorshid dost& Adeli (2010), Syhany porshoko and colleagues (2012) ,Neeknam & Hafezi Moghads(2011) and Ali AKBARI & Jamal Lyvani (2012) regarding the location of a landfill towns of Karaj, Tabriz, Babolsar, Bonab, Haji Abad, Golpayegan ,Behshr. Also Rafii and colleagues (2011) assesses to participating Mashhad 's households in plan of separating garbage from origin.

Given the importance of municipal waste bank stations in collecting recyclable urban garbage is expected performing this study be as a prelude to better planning and more precise locating of fixed stations of collecting these materials and development of separating municipal waste from the origin and segregated culture improvement of urban garbage among people.

Materials and Techniques

In this study, the first in the exchange dried waste fixed station, separately in different areas of the city of Mashhad was marked on the map in 2012. Also Income level of the station and the amount of people visit is considered as an indicator of success in attracting popular participation .

In order to get information of the relationship between understudy measures with participation in delivery of dry waste to the station, the various layers of information have been created based on indicators such as level of education , population, development level of zooms the ratio of dry residues to total wastes (as index people's welfare of a region), Network access, the traditional sector, the distance between the existing stations and the willingness of the people involved in the project and the influence extent of these components in participation and 1 income earning of the waste stations in order to locate new stations were considered. of

The stations distance from each other were considered by Tyson Polygons using GIS to determine the effective radius of each station and locate in the required spaces with minimum density. In this regard, after creation of the database and made assessments, all indexes that have direct relation with the increase of people's participation level were determined and their influencing extent also weighted by experts using analytic functions of GIS, the suitable locations to create a new station have been determined.

The information used in this research is collected in form of library study and interviews with experts of separating waste management scheme of Mashhad city in 2012.

In this regard the information relating to indicators in various areas such as literacy level and zooms population from Mashhad statistics, the level of development of the research conducted by Shahnvshy et al (2007), physical analysis of dry waste recovery organization and also activities of the traditional section and the tendency of people to participate in the implementing breakdown of the origin plan obtained of the study conducted by Rafii and colleagues(2011).

Discussion and conclusion

In this part the relationship between defined criteria and existing dry waste exchange stations in the city in order to locate these stations are presented separately for each index.

Population Amount

By comparing the amount of revenue obtained from the city of Mashhad stations with extent of population nearby areas can be concluded that the overall by increase in population also the amount of waste delivered to stations increases. For applying population criteria of statistical areas layers Population and Housing Census 2007 statistics were used.

For classification of Population amount, Natural Breaks method was used with the number 5 class problem. Then the first category that includes most of the population, scoring the number 5, and the minimum number of category 1 and category 2, 3 and 4 are similarly scored and rated. The general score of population index among other indicators according to experts is considered equal to 14. The Map no.1 shows the of population amount and success of waste bank stations in suction rate of dry residue .
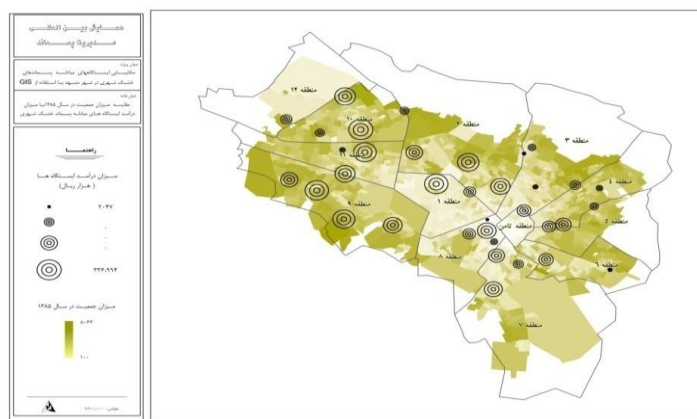
Map 1. The Relationship between Population Density and Success of waste bank Stations

The Ratio of Iterated Individuals in the Total Population of each Area

To prepare this layer also practiced as pervious par. in cooperation of this layer with the success extent of the existing waste bank satiations also can find out direct relation between amount of literacy ratio with the success of waste bank stations , the areas with the highest ratio of literacy was assigned the number 5 . So in similar way the score of the next batches in form of decreasing and till number1 was The overall ratio of literate among other indicators, according to experts were considered number 10. The Map no. 2 show the ratio of literacy rate and success of these stations in adsorption of the dried waste. According to this map can be seen that a positive relationship between literacy and success stations there. It should be noted that this inconsistency stations of Shariati , Danshjo, and Majad colonies in the Mashhad city with the obtained results is because they are newly established.
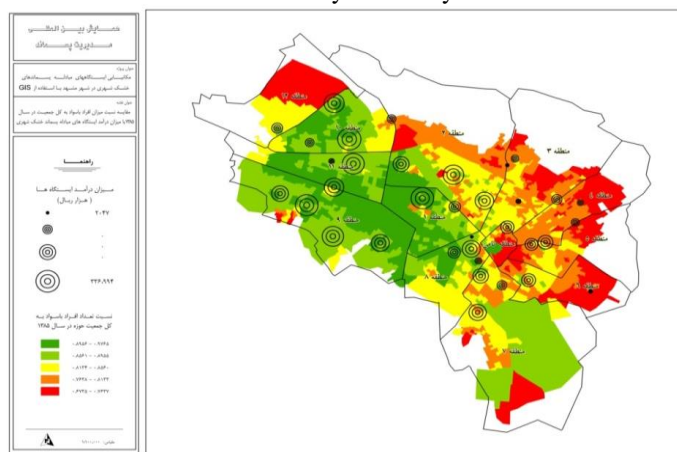

Map 2. The relationship between Rates of literacy and success waste bank stations

The Distance between the Stations

It is evident that to observe the distances between existing and proposed stations should be in such way that the establishing new station do not have negative effect on other stations In fact, the station being close to each other in the event of unjustified economic aspects of infrastructure, etc, can cause inefficiencies of stations. To reduce the effect of this factor in new proposed area, two methods were used. In first method with study of distance between existing stations and obtained income between them by using of experts authorities' point of view in this regard was observed that usually the stations should not be in minimum radius of 1000 m of each other . According to this number the stations distance layer each existing from each other was defined by creating a zone with a radius of 1000 m from the

center stations. The weight that was given to existing areas in this zone Range in this area was equivalent to 1 and the area beyond of it was assigned by 2. Overall score indicator of the distance between stations also considered by experts equal to 12.

In the second method for applying the indicator of the distance between stations the Tyson networks function) was used from the set of tools available in Arc Toll Box of GIS software. This function is used to find the range of effects among several hypothetical sources. In more clear expression this function states which the nearest station in the desired area is ,. The magnitude of these polygons represents the lack of stations and their small also stating the existence of   more stations say there is a close distance apart   of each other . Overall indicator of the distance of stations also among 12 other indicators was considered according to experts.

Map no. 3 shows the extent of the 1000 meter zone for each station, and the map no. 4 present Tyson   stations for each station and the success of the waste bank in rate of dried waste suction**.**
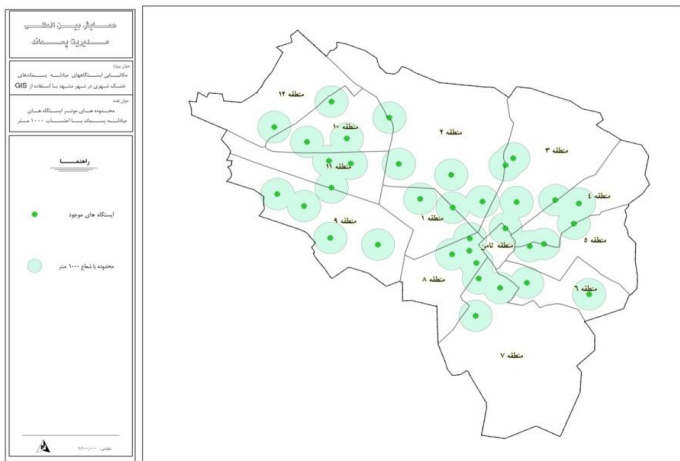
Map 3. 1000 meters of space each site waste bank
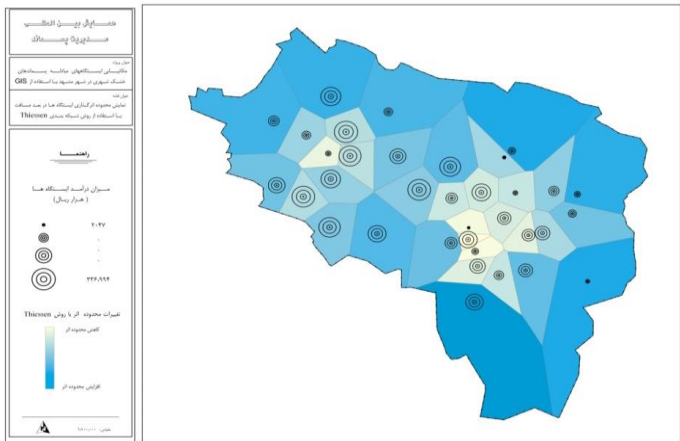
Map 4. Tyson polygons for each station waste bank rate and the rate of absorption of dry residue

The location of existing station in urban area

Comparing the placement of the successful stations waste bank , can be concluded that most of the stations are located in the arterial streets grade 2 .

In addition to this matter with more survey it was found that the location of most stations are placed in The maximum distance of 150 meters second arteries degree avenues and 50 meters from accumulation and distribution Avenues   so with use of   function of zoom creation (Buffer) in software GIS, suitable locations were created for new stations at a distance of 150m from 150 meters second arteries degree avenues and 50 meters from accumulation and distribution Avenues. Arteries

boundary value considered equal to 2 , the value of privacy streets gathering and broadcasting was considered equal to 1 . The total score of situation index location of Stations among the other indicators according to experts were considered 15.

Map 5 shows the success of stations waste bank in rate of uptake dried residue positions compared to the locating in all kinds of urban streets.
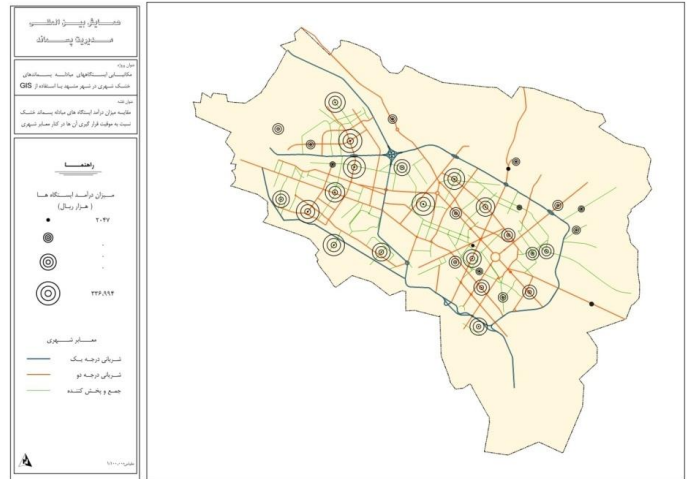
Map 5. Success stations using waste bank and its position on a variety of urban street

Physical analysis of dry waste in zooms

To form the dry recyclable waste layer in every zoom the information relate to the physical analysis of waste considered separately to zooms accordingly. The results of analysis showed that regions of 1 and 9 contain of most recyclable dry waste in origin. Due to the increase in amount of recyclable dry waste in a waste bank is the suitable reason for creating a waste bank new station, the more weight has given to area with a greater proportion respectively. Finally a weight of 5 was assigned to zoom of 1 and 9 , weight of 4 has assigned to reign by the name of samen and zoom of 8 , a weight of 3 was assigned to zooms of 5,11 and 12 and Wight of 2 to zoom no.6 that includes the minimum amount of dry recyclable waste .The overall score of 14 was considered , according to experts. Map 6 shows the extent of dry recyclable waste in the areas or income of the stations. Referring to Map 6 the direct connection between the success of stations and high dry residue in each area can be clearly seen.
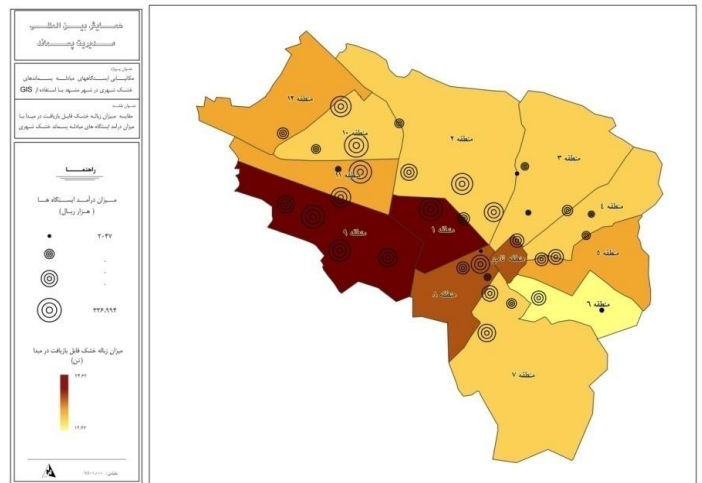

Map 6. The amount of dry waste, recyclable waste bank in the region, compared with income Stations

Zones Development Level

To determine the level of development in Mashhad city area there has been used of results of project done by Shahnony

and colleagues (2008). With comparison between extents of developed areas with success of existing stations, can realize the direct relationship between these standards. This means that by increasing the level of development, the success rate of stations also will be more . Therefore to make development layer, first of all areas classified in 5 categories , each weight of them was determined. Areas with the highest level of development, weighing equal to 5 and so were the lowest level of development in terms of the number 1. The overall development index and other indices equal to 25 were considered, according to experts.

Map 7. The extent of the level of development of the area reveals to income waste bank station
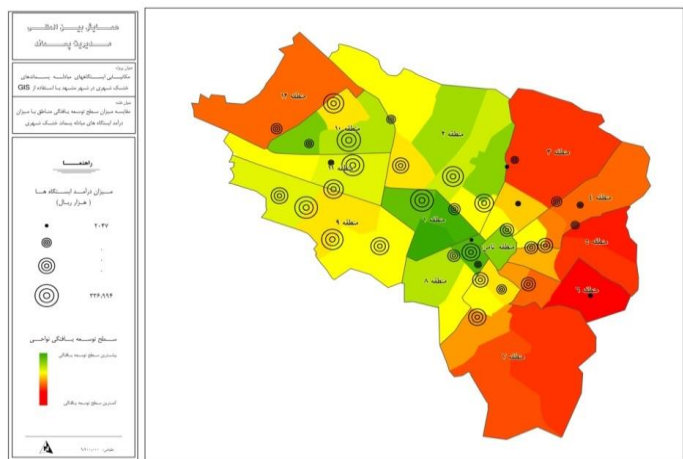
The amount of household participation in waste segregation at the regional level

In this context, there has been used of the index of citizen participation level that has been defined by Rafii and colleagues (2011).

With the mapping of this evaluation, it is noted that the areas with average development have the most participation in this field. So in preparation for this layer relate to this index, the most of the weight (3) was given to this group. Area Weight with medium and low levels also was determined 2 and 1 respectively. Were. Overall index of household participation rate among other indicators, according to experts, were considered equal to 10. Map 8 shows the participation rate of zones households with the extent stations' income.
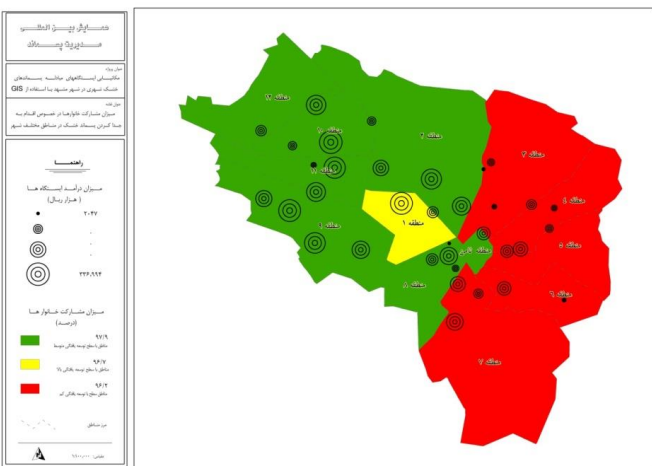
Map 8. Household participation in recycling sorting station in the region, compared with income of waste bank

Conclusions and recommendations

After obtaining the required layer in GIS software partitioning and determining the weight of each of them, using the Union function in Arc Toolbox tool set and overlaid all layers, a single integrated layer that surrounds all the required

parameters were obtained. Due to the overall weights of each layer, the total marginal value per unit multiplied by the total weight of each layer in the substrate Encompass prepared. Due to the overall weights of each layer, is calculated by the total marginal value per unit multiplied by the total weight of each layer in the substrate are obtained, respectively. (For example, the position marker layer Stations in Urban substrate has two values located within the boundaries of the arteries degree equivalent to the number 2 in the range of collector streets and player privacy was considered equivalent to 1 . was determined by the total weight of the layer 15 . thus multiplying the total weight of these criteria , the final value of the layer is calculated according to the degree of arterial streets in 30 of the streets and play plural 15 was also calculated)

For example, in the index layer of position of these existing stations location in urban streets, there are two sub-layers.

The value of areas located in the vicinity of the second class arteries equivalent to the number 2 in the area of privacy and distributor of collector streets was considered equivalent to 1.

This layer was determined by overall weight of 15. Therefore, by multiplying the total weight of these criteria, the final value of the layer is calculated for arterial streets, collector streets and player for grade 30 and 15 was calculated the values obtained were classified in seven categories.

In this classification also the Natural Breaks method located in the notation of layers is used (Zymology). In map No. 9 the suitable sites is proposed for new stations were located in seven priorities. According to studies carried out and analyze the factors influencing people's participation in the exchange fixed station design of zones. The most suitable areas for the location and construction of stations considering the circumstances are 1,11,9 and 8 zones.

As these sites are concentrated in central and West of Mashhad city therefore in order to consistent develop and further development of these centers the following relevant recommended:

1. Given the direct impact of literacy level of participation is recommended for low-literate working people who are leaving in weaker areas in cooperation point view the face to face advertising and training has been considered more and more .

2. More attention to the participation of children and more teaching to them and also encourage and persuasion or variety of donated product s proportionate to their age group such as toy and dolls in the dry residue of municipal sewer station.

Considering that in zones of 4,5 and 6 in spite of the large population, there is minimum participation of separation, isolation and delivery to stations therefore the effective incentive policies should practiced like increase the amount of gifts in exchange for such cooperation .
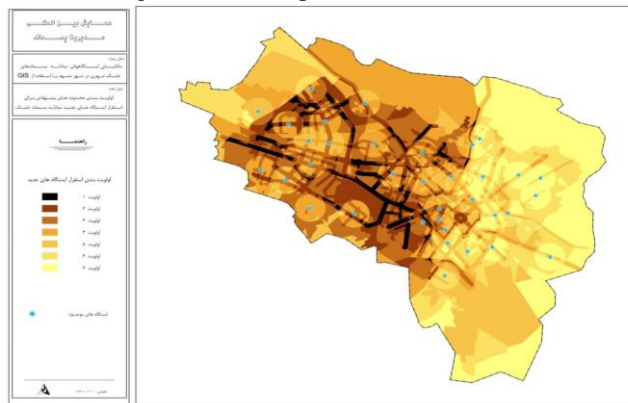
Map 9. Proposed area to establish a new station waste bank

Table 1 - Comparison of the rate of income and weight of the waste bank stations were placed in different positions relative to the urban streets

Urban crossover Type	No. of Stations		Receivable Amount		Waste Wight	
	Number	percentage	Riles	percentage	Tone	percentage
Arterial second degree	23	66%	2207000000	72%	2795	72%
	12	34%	875000000	28%	1072	28%
Total	35	100%	3082000000	100%	3867	100%

References

1. Akbar Ali, Livani Jamal In 1390" Location of municipal solid waste sanitary landfill method with AHP Case Study: Behshar City, Journal of Physical Society of Iran, No. 30, pp. 111-95, 2012.

2. Khorsid Dost &Adli "Using Analytical Hierarchy Process (AHP) to find the optimal location of the landfill (Case Study BONAB city)" , Journal of Ecology , No. 50 , pp. 32-27,2010, Tehran, Iran.

3. Kazemi Khybari Ave" The study of Economical Aspects of separation from origin of municipal waste, The 5th National Conference on Waste Management ,2011, Mashhad.

4. Karim Zadgan, Shidai& m. Afshar Amin". Recycling Economical Evaluation of Municipal waste, pp. 98-89, No. 35 Journal of Environmental Studies, 2005 Iran.

5. Moin Uddini, khorasani, Daneh Kar & Darvishsefat, " Locating landfill Karaj using hierarchical fuzzy TOPSIS (case study of Tehran) , Journal of the natural environment"natural resources Iranian Journal, pp. 155-167, Volume 64, Issue 2, 2012.

6. Mtkan , Shakiba &Pourali " Locating suitable sites for landfill using GIS (study area: the city of Tabriz) , Journal of Environmental Sciences , Year VI , No. 2, pp. 132-121,2009.

7. Neknami, Hafezi & Moghadas "Location of municipal landfills in Golpayegan system using GIS, pp. 66Journal of Applied Geology, No. 1 Year VI, 2011.

8. Pur Ahmed, Habibi, Zahraei, &Nazari Adli ."The use of fuzzy algorithms for locating urban facilities (Case Study: City Landfill BABOLSAR city) ", Journal of Ecology, No. 42, pp. 42-31, 2008, Tehran, Iran.

9. Rafiee , Rahnama , &Shahnvshy "A study and Evaluation of household participation in waste separation from Origin schemes : A Case Study in Mashhad city" Shar Pajo quarterly journal, pages accessed : 36-21, no.2, second year , second edition, ,2011, Tehran, Iran.

10. Syhany Porshko, Deghani &Ghadri   "Locating sanitary landfill waste Haji Abad AHP method using GIS" , , pp. 74-63Journal of Geography of lar" , No. 12,2012,Iran.