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Quality And Quantity Of Municipal Solid Waste In Mashhad

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ABSTRACT

The yield of human activities created solid waste which nowadays changed a lot in compared to the past because of various in life style. Municipal solid waste is one of the serious environment concerns throughout the regions of Mashhad. In Mashhad lots of waste is produced daily. In this study we collect data from various municipal regions in Mashhad. In this paper quality, average generation rate, physical composition, organic material, inorganic material and chemical analysis in all of municipal regions of Mashhad also were investigated. According to the different area in Mashhad the wastes can be divided into eight groups of organic materials, paper and cardboard, rubber and plastics, wood, glass, metals, construction wastes and others. According to obtained results from this study the amount of MSW generated in regions of Mashhad was 585972420 kg per year, and the average generation rate of MSW was 262.2 kg/capita/year. Results showed that the amount of organic material in the regions of Mashhad is 67.5 % and the amount of inorganic material is 32.5%.

Keywords: Municipal Solid Waste (MSW), quality and quantity of waste, Mashhad city

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INTRODUCTION

The second largest city in Iran is Mashhad which placed in the center of Razavi Province neighbor of Afghanistan and Turkmenistan and 850 kilometers to east of Tehran. Mashhad is located in the north east of Iran with a population of 2,772,287 at the 2011 population census as shown in the Figure 1. Solid is defined as undesirable and unwanted fraction which created from activities of human and animals. It is produced from agricultural, industrial and social activities. The consequence of life is Solid waste which is various from community to the next one. Several researchers reported the unsuitable management of solid waste in various cities of developing countries [1], [2], [3], [4]. Also there are several studies about municipal solid waste management in different countries like France [5], Sweden [6], England [7], Turkey [8], China [9], Japan [10], Germany [11], New Zealand [12], Nigeria [13], Greece [14], Netherlands [15]. These studies evaluated the analysis of MSW management in different countries. Few years ago there were two types of solution for solid wastes such as traditional composting and producing the fertilizers. The solid waste disposal developed when people decided to community, society and urban life. Waste production and composition depend on many factors, such as the stage of development; socio-economic, climatic and geographical conditions; and collection frequency [16], [17]. Municipal solid waste defined as some parts of solid waste that is related to municipality. These types of waste contain packaging, food waste, bottles including PET & glass, cans, papers and agricultural wastes are the wastes which are unwanted and useless for all residents during their life. After the industrial Revolution some problems were faced based on solid waste management due to change in pattern of utilization society. One clear example of municipal solid waste is packaging that is applied for many goods in our life. Using the plastic and cardboard as the net materials for packaging causes increased the amount of waste in our life every day.

This paper presents an overview of current municipal solid waste (MSW) in Mashhad city. This study may be beneficial for authorities and researchers of developing countries to work towards improving their present municipal solid waste.



Fig 1 The location of Mashhad city in Iran

MATERIALS AND METHODS

Study Area

Mashhad is placed at 36.20° latitude and 59.35° east longitude in nearby a river of Turkmenistan country which called Kashaf River in the middle of Binalood and Hezar Msjid. The benefits being between mountains included cold winters, nice springs, moderate summers and fine autumns.

Mashhad is 250 km to Ashghabat (Turkmenistan). The center of the city is Mashhad. City is divided to 13 smaller parts units which contains a population of 2.5 million. There are around 20 million of a visitor who travel to Mashhad every year.

Mashhad include 4 seasons such as spring, summer, fall and winter. There is only 250 mm of precipitation every year that falls in the form of snow in the winter. Mashhad has two month which are wetter and drier with the value of annually precipitation among the January and May. Summer is with hot and dary weather with maximum temperature 35°C. Winter is cool and chill witch during the night the temperature lows normaly decreasing below freezing. The enjoyable hours for mashhad during sunshine in every year is 2800[18].

Data Collections

Mashhad's Statistics Analysis of municipal solid waste evaluated during the different seasons of 2008. Several questionnars got ready and administrated to different municipality paerts to evaluate Mashhad municipal Solid Waste. The collection date based on data which are collected from questioners, auther viewing, some interviews and visiting with people containing engineers who work in the municipality and the Mashhad composting plant. The Mashhad city divided into 13 areas that the amounts of municipal solid waste measured for each area separately.

There are two methods for collecting waste in Mashhad. The first method is mechanical and the second method is manual. Nowadays these methods are utilized for collecting residential waste. For waste collection in Mashhad normally utilizes from manual method which is 54.4% of municipal solid waste is gathered per day and transferred to disposal sites, so 48.6% of waste collected during night. Data and report needed for this knowledage gathered from Mashhad Municipality Recycling Organization.

RESULTS

Generation of municipal solid waste depends to several parameters such as population, development index, environmental conditions, vastness of areas, social reasons, economical reasons and etc. According to data collected by the local authorities, the amount of MSW generated in regions of Mashhad in different seasons shown in the figure 1-9.

According to figure 2, Mashhad city divided into 13 areas that the amount of MSW generated and population showed. The amount of MSW generated has a direct relation to the population. As shown in the graph, the highest amount of MSW generated is in the area

2 which there is maximum population. The amount of MSW generated in area 2 is 90295260 kg and the population in this area is 388,063 people. Minimum MSW generated is in the area 12 by 2975040 kg and a population of 20000 people. The total amount of MSW generated in all regions of Mashhad is 585972420 kg.

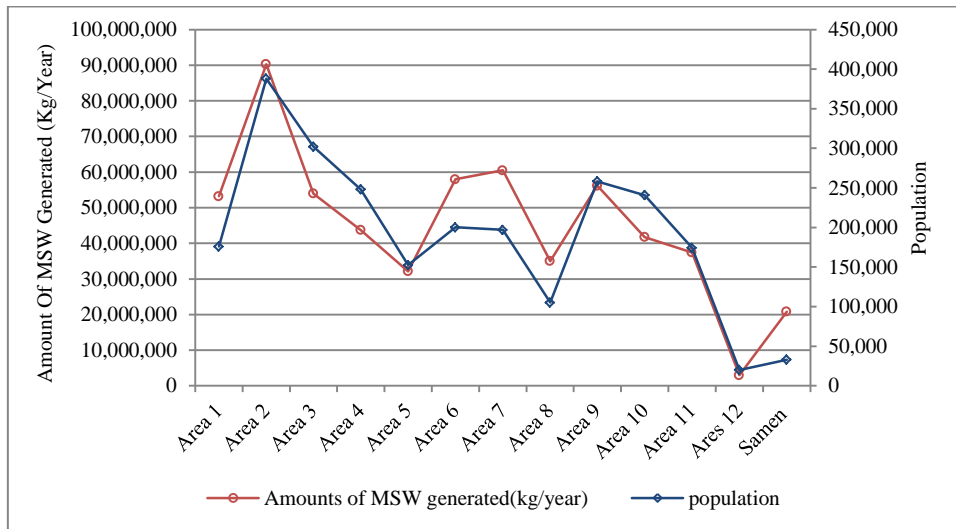


Fig 2. The annual amount of MSW generated in the regions of Mashhad, 2008

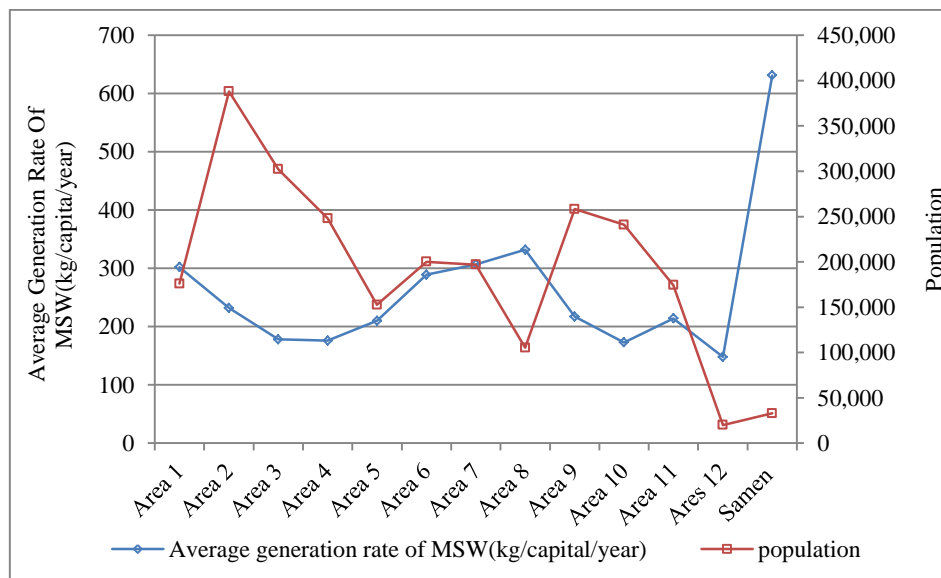


Fig 3. The annual average generation rate of MSW in the regions of Mashhad, 2008

The next item which observed in this study was the average generation rate of MSW that shown in Figure 3. The maximum average generation rate of MSW belongs to Samen region by 631 kg/capita/year and the minimum of this amount is belong the area 12 by 148 kg/capita/year. The total average generation rate of MSW for all regions of Mashhad city is 262.2 kg/capita/year.

According to Figure 4, most of municipal solid waste in Mashhad city includes household waste which is around 76.79 percent. The amount of household waste generated

in different regions of Mashhad is 449982120 kg and alsosarjaro 122576270 kg, sludge 11515070 kg and branch 1902960 kg.

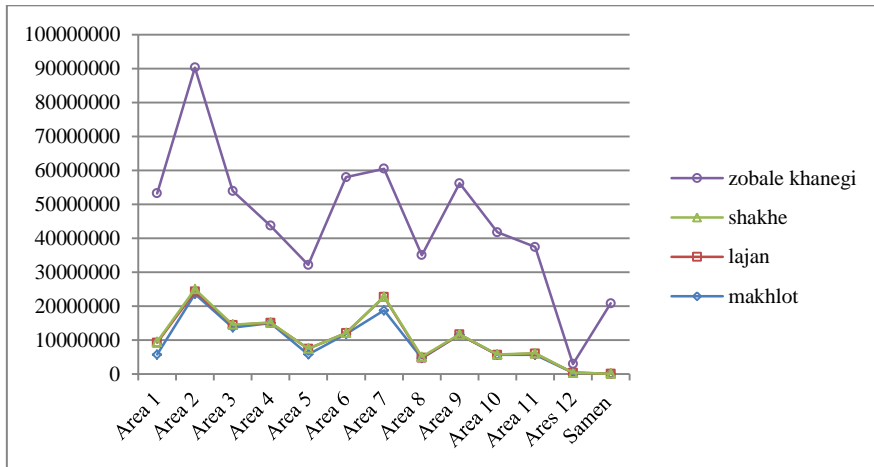


Fig 4. The different type of MSW generated in the regions of Mashhad, 2008

Figures 5 – 9 evaluated quality and quantity of household solid waste in different seasons in Mashhad city. The quality of household solid waste is divided into eight parts which includes organic material, paper and cardboard, rubber and plastics, wood, glass, metals, construction wastes and others. Most of household solid waste is organic material in each season. The amounts of organic material are 278986434 kg for the spring season that is 62% per year. The amounts of paper and cardboard, rubber and plastics, wood, glass, metals, construction wastes and others are respectively 21058836 kg, 33073391kg, 9449541kg, 7379641kg, 20474004kg, 51207510kg, 28348621kg which the total household solid waste generated is 439626218 kg in the spring season.

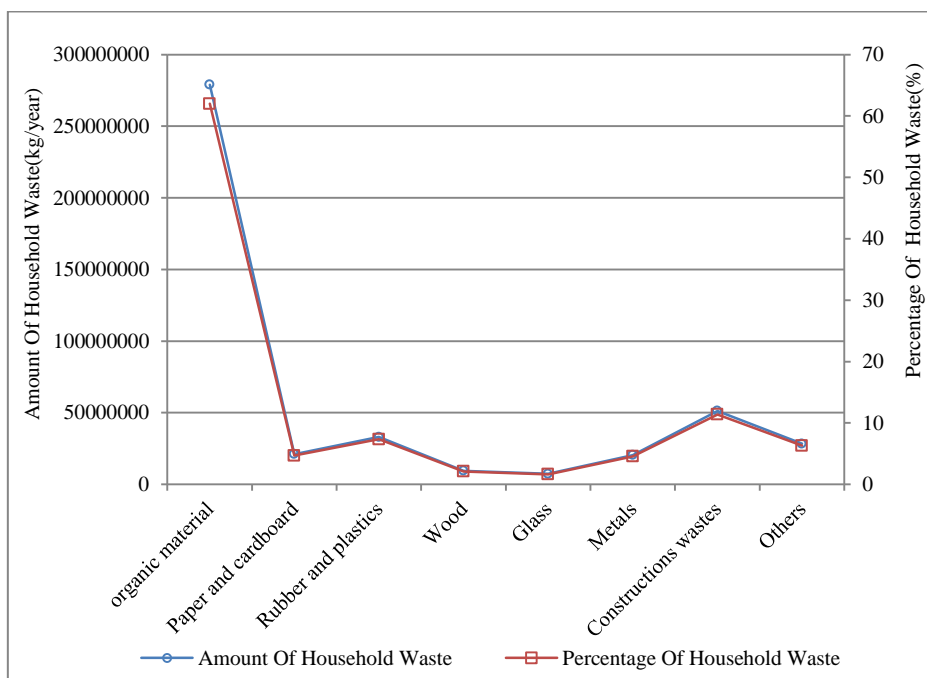


Fig 5. Percentage and amount of the annual rate household waste components in Mashhad, spring season 2008

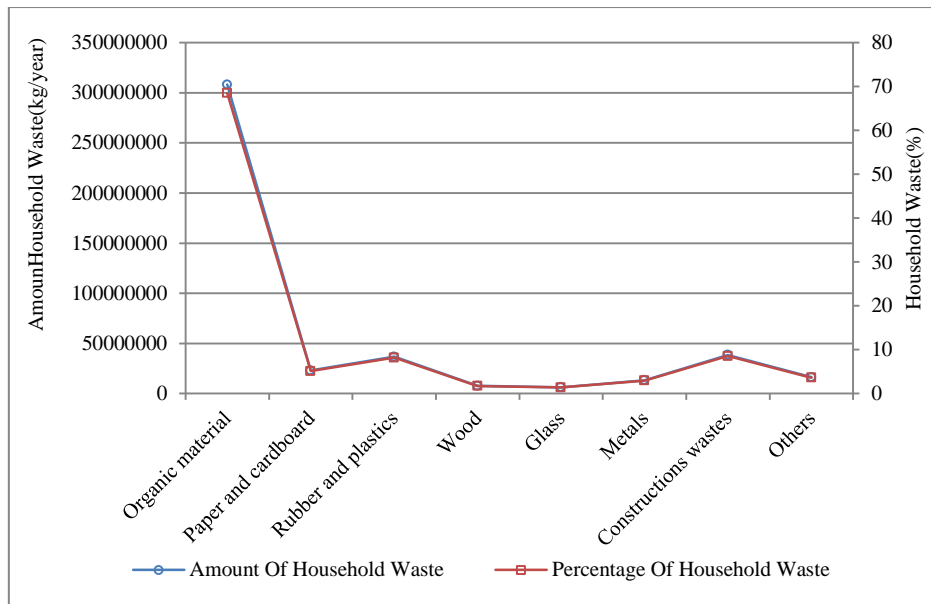


Fig 6. Percentage and amount of the annual rate household waste components in Mashhad, summer season 2008

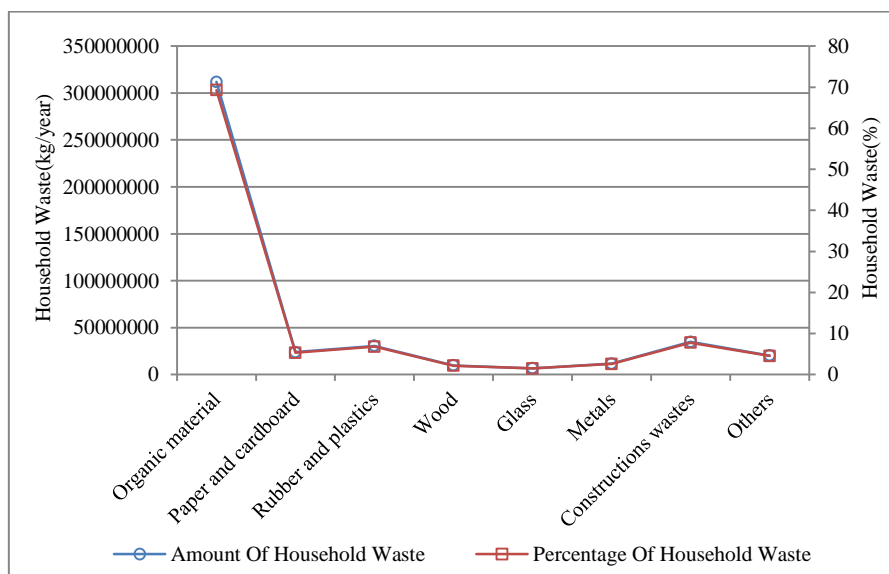


Fig 7. Percentage and amount of the annual rate household waste components in Mashhad, autumn season 2008

The amounts of household solid waste measured for the summer season that the results shown in figure 6. The results shown that organic material 308235012 kg, paper and cardboard 22948884 kg, rubber and plastics 36763212 kg, wood 7739624kg, glass 6254696 kg, metals 13319352 kg, construction wastes 38473129kg and others 16244211kg. As a result there are 68.5% organic material into the household solid waste in the summer season.

Figure 7 shown The amounts of household solid waste in the autumn season. According to the figure 7 shown The amounts of household solid waste are as follows:

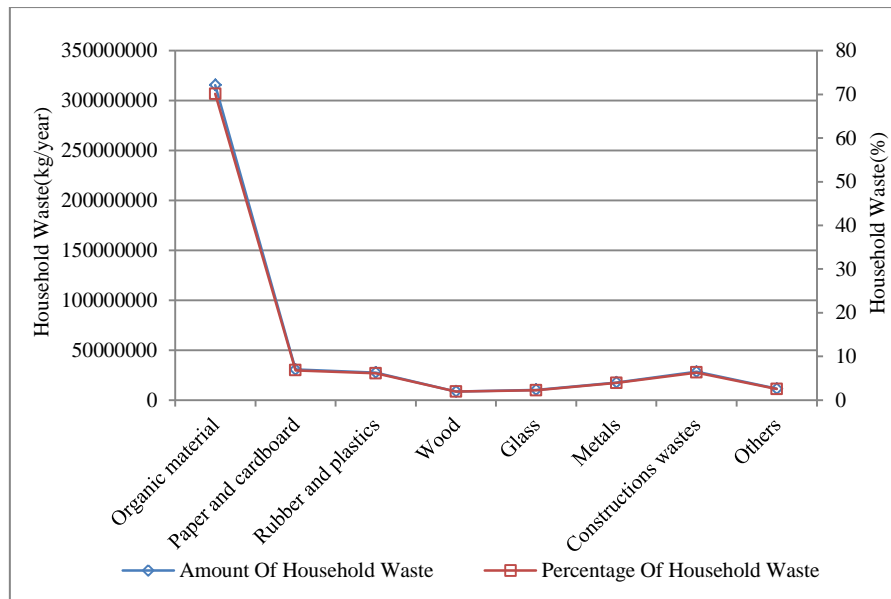


Fig 8. Percentage and amount of the annual rate household waste components in Mashhad, winter season 2008

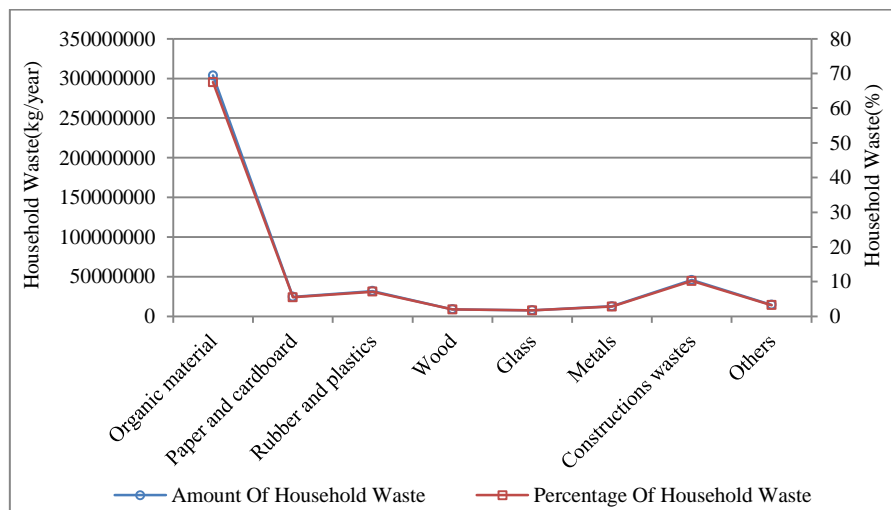


Fig 9. The average of the annual rate household waste components in Mashhad, 2008

Organic material 311834837 kg, paper and cardboard 23938835 kg, rubber and plastics 30643501 kg, wood 9764525kg, glass 6749672 kg, metals 11699431 kg, construction wastes 34918302 kg and others 20429007 kg. As a result there are 69.3% organic material into the household solid waste in the autumn season.

As well as the results of household solid waste in the winter season evaluated. Figure 8 shown Organic material 315434662 kg, paper and cardboard 30688508 kg, rubber and plastics 27538661 kg, wood 8729575 kg, glass 10349497 kg, metals 17684140 kg, construction wastes 28438617 kg and others 11429444 kg. As a result there are 70.1% organic material into the household solid waste in the winter season. The average of household solid waste in the four seasons shown in the figure 9. The average of organic material is 303735231 kg for all seasons that is 67.5 % per year.

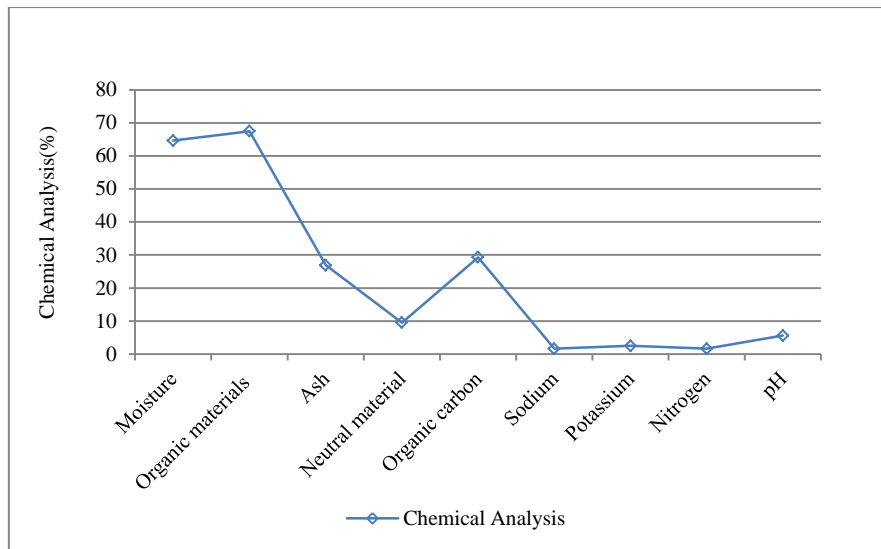


Fig 10. Chemical analysis of MSW in Mashhad – 2008

Finally the chemical analysis of MSW in the Mashhad shown in the figure 11. The results of chemical analysis are moisture 64.6%, organic material 67.5%, ash 26.9%, neutral material 9.5%, sodium 1.6%, potassium 2.5%, nitrogen 1.6% and pH 5.6%.

CONCLUSIONS

The responsibility of the municipality in Mashhad is solid waste management, same as other cities. Because of an increasing population and various in lifestyle, the quantity and quality of MSW has changed. The current state of solid waste management in Mashhad city has been improved in the past 10 years. The waste analysis of Mashhad showed that the percentage of organic waste in the MSW is quite high, mainly due to the use of unprocessed foods in the daily diet of the inhabitants. At present, both mechanical and manual methods are used for the collection of residential wastes. MSW is collected daily and transferred to disposal sites. In this study the amount of MSW generated in regions of Mashhad was 585972420 kg per year, and the average generation rate of MSW was 262.2 kg/capita/year. Results showed that the amount of organic material in the regions of Mashhad is 67.5 % and the amount of inorganic material is 32.5%. The waste analysis of Mashhad showed that the percentage of organic waste in the MSW is quite high, mainly due to the use of unprocessed foods in the daily diet of the inhabitants. MSW is collected daily and transferred to disposal sites. There are many challenges for the solid waste management system of Mashhad city. Lack of resources, infrastructure, suitable planning, leadership, and public awareness are the main challenges.

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