

A investigation of the quantity and quality of coastal solid waste (Case study: Coasts of Noor city)

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Extended abstract

Introduction

Coastal areas are always attractive for tourists due to special features. Descending the environmental quality of coastal areas as a consequence of human activities, tourism as an effective factor causes pollution of the coasts. One of the most important environmental problems in these areas is the lack of proper waste management. A large amount of solid waste is accumulated daily on the coast and causing serious damage to these areas (Rezazadeh et al., 2013; Joozi et al., 2012). Noor city is one of the most favorable regions of Iran for tourism due to its natural and climatic conditions, especially in the summer. Also, it has ease of access to Tehran and other populated mega city of Iran. At present, the municipality of the Noor city, as a trustee of waste management in the coastal areas, collects waste from these areas like other areas on a daily basis and transfers directly to the waste disposal site of the Noor city. Solid waste in coastal area disturbs beautiful landscape. One of the most important factors in improving the environmental and health conditions of the coast, is proper waste management. Solid waste management is a big challenge in the coastal area. First step in designing waste management systems is calculating the amount of generated waste. Generally, various factors are effect generation rate increase, including economic situation, geographical location, seasons, days of the week, and customs (Del Angizan & Mahmodi, 2012). One of the most important duties of the municipality is waste management, which includes collecting, transporting and disposing it, and a significant portion of the municipal budget is allocated to it. Therefore, increasing tourism in coastal areas and the amount of waste generated by them Cause to increase that cost. Therefore, in order to improve the environmental and health conditions of the coasts, planning and management of waste is necessary.

Material & Methods

Noor city as the center of the Noor county with a population of 26,947 people is located between 36° 34' 25" northern latitude and 52° 00' 50" eastern longitude. The length of the shoreline of the Noor city is about 11 km. Due to the public access to coast and investigating these coastal areas by existing maps and field visits, three stations were allocated for sampling reasons.

This research is a cross-sectional descriptive study and the solid waste of coastal areas of Noor city during 12 months from July 2017 to May 2018 has been investigated. The weight analysis method has been used to measure the quantity of waste. Random samples were taken from the contents of the bins available at the selected stations. Every month, three weeks were determined, and two days a week were selected, and 216 random samples were performed in year. For studying the effects of tourism and holidays on the composition of waste components, sampling was performed on Mondays and Thursdays. Sampling of the contents of each bins was performed to separate the components and determine the weight. These components were divided into eight categories: degradable, paper and cardboard, glass, plastics, PET, metal, textile and others. From the results obtained each month, a numerical mean for each of the eight components was obtained. In order to measuring density of solid waste, one sampling every month and tree sampling every season perfumed and means of them calculated as a seasonal density. According to information of the Governorate, the Municipality and the Cultural Heritage and Tourism Bureau and field visits, the approximate number of the visitors was estimated during the year. Then, data were analyzed using SPSS software, ANOVA and Tukey tests.

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Discussion of Results & Conclusion

In order to improve and increase the participation of people, it's needed to effective and efficient programs to increase people's awareness and the importance of recycling them to reduce environmental pollution. Based on the results of this research, the highest part percentage of waste components were included respectively: degradable (53/50 %), plastic (17.39%), paper and cardboard (8.48%), other (6.69%), glass (4.98%), PET (4.22%), textile (2.69%), and metal (1.77%). The results of the study on Scotland's coast in 2007 also showed that parts of waste consist of plastic (46%), glass (9%), metal (6%), paper (6%), textile (4%), wood (4%), ceramics (3%), other (2%), rubber (2%), poly Styrene forms (7%) of the waste weight (Storrier et al., 2007). The results of the investigation on the Catalan coast of northeastern Spain showed that plastics (21%), degradable (28%), glass (22%) and paper (4%) are main parts of waste (Ariza et al., 2008). This difference can be due to cultural differences, nutritional patterns, and quality of raw materials. In the study, the annual rate of degradable is 53.50 % of the total waste. Therefore, it has a high potential for material and energy recovery such as compost or digester. Also, 39.8% of the total waste product is recyclable materials, including paper and cardboard, plastics, glass, PET, metal and cloth, which can be taken as an effective step in the recovery of waste. The results of this study showed that the average annual density of waste was 172.70 kg/m^3 , and the highest amount of waste density was related to summer season with 238.08 kg/m^3 and the lowest amount was in winter 12.08 kg/m^3 . Since, having more moisture and density in fruits and vegetables, and generally, degradable materials are higher than other components of the waste, having large amounts of glass in summer as a result of the increased use of these products, having increased the density in this season than in other seasons. The results showed that the per capita of daily waste generation in the Noor city and in the study area is 1.4 kg and 0.620 kg, respectively. The results of study on the island of Menorca in Spain (2013) showed that the per capita of daily waste generation by urban residents and a tourist is 1.48 kg and 1.31 kg, respectively (Mateu-Sbert et al., 2013). This difference (1.31 kg compared to 0.620 kg) in per capita generation of each tourist can be due to the following reasons: (1) The present study is conducted only in part of the coastal areas of the Noor city, while on the island of Menorca, total waste of the island has been examined. (2) It can be due to the difference in economic, social and cultural status between two regions. In support of the above, the daily per capita generation in whole city of Noor (1.4 kg) is slightly different from that per capita in Menorca Island (1.48 kg).

In this study, the highest amount of waste generation was in September and the lowest amount was in December. In the coastal Liduo plague of the Ramsar city, it was stated that waste generation in the months of August and April is higher than in December (Bakhshi et al., 2013). This comparison showed that the situation in the regions is somewhat similar because of the months of the tourist's presence. There was also a significant difference between visitors to the coastal areas of the Noor city in different seasons of the year, where in summer has the largest number of visitors. By the study in the coastal Liduo plague of the Ramsar city, there was also a significant presence of tourists in the warm months of the year stated (Bakhshi et al., 2013). In the present study and Bakhshi et al. (2013), there is a direct relationship between holiday and number of tourists with waste generation. One option can be considered is managing based on the policy of separation from the source by the customers, giving tourists two bags of different colors at the time of their arrival and obtaining appropriate deposit to ensure that they would return wet and dry components of their wastes.

One-way test (ANOVA) was used to examination the different components of waste in the months of the year. There was a significant difference in the variables of degradable, glass, plastic, and PET in different months ($p < 0.05$). Average difference between the different components of the waste and the months based on Tukey's test was presented. The results showed that there were the highest amount of spoilable materials in the July, August and September, and a significant difference between them and other months (in a significance level of 0.05) was seen. It is expected that the generation of degradable will increase in the range of study area due to holidays, weather conditions, increase in the number of tourists, and more use of fruit, vegetables in accommodation period. Tukey's test showed that the glass has the highest content in July and August, and there was a significant difference between July and August with other months. Also, there was no significant difference in compared to April, July, and September. The reason for this difference can be the increase in people's use of drinking glass bottles to relieve thirst in hot summer months. The results showed that the highest amount of plastic was in April, and there was a significant difference between April with November, December, and March, but there was no significant difference with other months. One of the reasons for this item can be traveling tourist on Norooz and their excessive use of plastic jars and vacuumed food in the coastal areas. The results showed that the highest amount of PET was in August and it had a significant difference with other months, but there was no significant difference in compared to April, July, August, and October. The reason of this item could be from increasing the use of water bottles by travelers due to thirst in hot months in coastal areas.

Keywords: costal areas, Noor city, quantity and quality of waste.