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**Recent Patterns and Trends of
Hazardous Waste Management:
A Case Study**

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Abstract

In the last two decades, hazardous waste management is the major problem being faced by municipalities because it involves a huge expenditure and receives scant attention. It is not only a technical problem but it also is strongly influenced by political, legal, socio-cultural, environmental and economic factors, as well as available resources. Hazardous waste management system deals with the hazardous waste from its source of generation until its final disposal, which includes all the operations and transformation of this waste. Improper management of hazardous wastes constitutes a growing concern for cities in developing countries. Proper management requires the construction and installation of essential facilities and machinery, based on a suitable management plan. Hazardous waste management planning strategies should advocate avoiding waste generation, using cleaner technology, promoting waste recycling and recovery, using suitable treatment for generated waste and adequate waste final disposal. The purpose of this study is to provide a broad overview of the recent patterns and trends of hazardous waste management in Samsun, Turkey.

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Introduction

Hazardous waste is recognised as a serious problem that may have detrimental effects either on the environment or on human beings through direct or indirect contact. Global concern for preservation of environmental quality has resulted in the passage of laws aimed at proper management of hazardous wastes in many countries of the world (Orloff and Falk, 2003; Kikuchi and Gerardo, 2009).

In developed countries, legislation and good practice guidelines define hazardous wastes and state the various possible ways for collection, transport, storage and disposal of them. Also, the best available technologies are used for the development of alternatives for proper disposal of hazardous wastes with minimal risks to human health and the environment. However, in developing countries, hazardous wastes have not received sufficient attention. In many countries, hazardous wastes are still handled and disposed of together with domestic wastes, thus creating a great health risk to municipal workers, the public and the environment (Silva et al., 2005).

Over the years, various waste management systems and practices have been reported for appropriate handling and safe disposal of hazardous wastes. Some of these practices include landfills (Li et al., 2002), incineration (Morselli et al., 2002), autoclaving (Palenik and Cumberlander, 1993) and recycling (Lee et al., 2002). Generally there is no single practice as a solution to the problems of managing hazardous waste, so in most cases, a number of practices are used in combination. Each practice has its own weaknesses and strengths (Nemathaga et al., 2008).

Turkey is a rapid developing country with an increasing standard of living. Hazardous wastes have been one of the major environmental problems in Turkey as in most of the developing countries. Hazardous waste is generally disposed of in an open dump in many Turkish cities and towns, which is not the proper way of disposal because such crude dumps pose environmental hazards causing ecological imbalances with respect to land, water and air pollution.

Samsun, which is located in the middle part of the Black Sea region, is the only metropolitan urban center of the region with population about 600000. In the metropolitan area of the city more than 600 tones of municipal, agricultural and hazardous solid wastes are collected daily by local municipalities and are dumped directly to the Yılanlıdere Valley in an uncontrolled manner. The Yılanlıdere Valley is a branch of the Mert Stream which crosses the city center from South the north and disembogues into the Black Sea.

The purpose of this study is to provide a broad overview of the recent patterns and trends of hazardous waste management in Samsun, Turkey. The dynamics of hazardous waste management problems and causes are outlined. It is targeted to emphasize the importance of reorganizing the institutional tools in a wide-angle perspective in order to generate coherent solutions to hazardous waste management problems in Samsun, Turkey.

2. Generation of hazardous waste

The inhabitants of the Samsun city generate approximately 300 tones of municipal solid wastes daily. In the city, 165 tones of municipal solid waste is generated in summer season while 135 tones of municipal solid waste is generated in winter season. Increasing population levels, rapid economic growth and rise in community living standards will accelerate the future municipal solid waste generation rate in Samsun such as other cities of Turkey which is a developing country.

The amount of municipal solid waste per capita from 1994 to 2010 is given in Figure 1. The rate of waste generations is highly influenced by the population income. This is evident as the rate of waste generation in rural areas is 0.8 kg per capita per day while in urban areas 1.6 kg per capita per day. Household wastes are the main source of municipal solid waste in Samsun and contributes about two-thirds of the total municipal solid waste quantity. A typical composition of municipal solid waste in Samsun is shown in Figure 2. As can be seen, organic waste is the main component of municipal solid waste. 22% of the material is denoted as “other” which mainly includes construction and demolition debris, coal ash, and hazardous wastes.

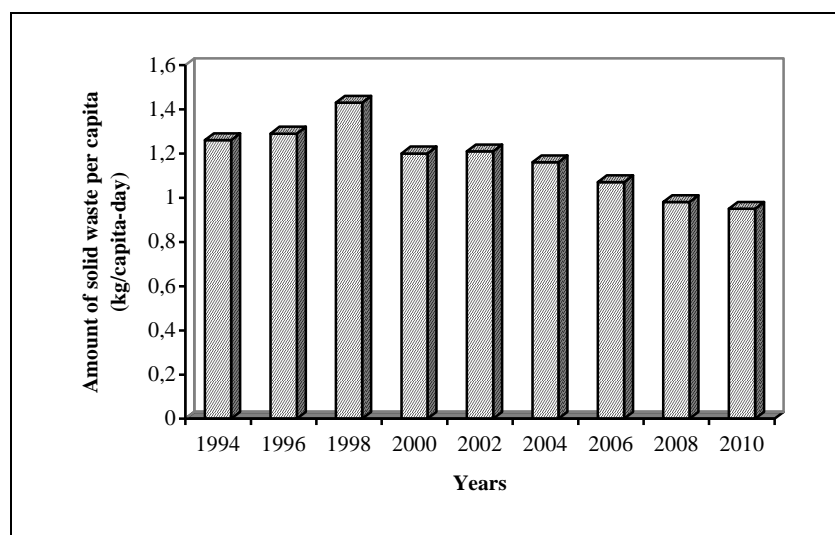


Figure 1. Amount of solid waste per capita (kg/capita-day)

Industrial and medical wastes are the main components of hazardous waste. Data on the amounts of hazardous waste discarded are very limited and are hampered by insufficient definitions of what constitutes hazardous waste. Consequently, the risks associated with the disposal of hazardous waste have not been fully elucidated.

The generation of industrial hazardous waste is closely related to the industrial structure. The categories of industries is shown in Figure 3. As seen in Figure 3, the quantity of top five categories of industries in Samsun: plastic, woods, non-electrical machines, nonferrous metals and food, accounted for 64% of total industries. In Samsun, the quantity of industrial hazardous waste was around 685000 tones in 2006 (Governorship of Samsun; 2006).

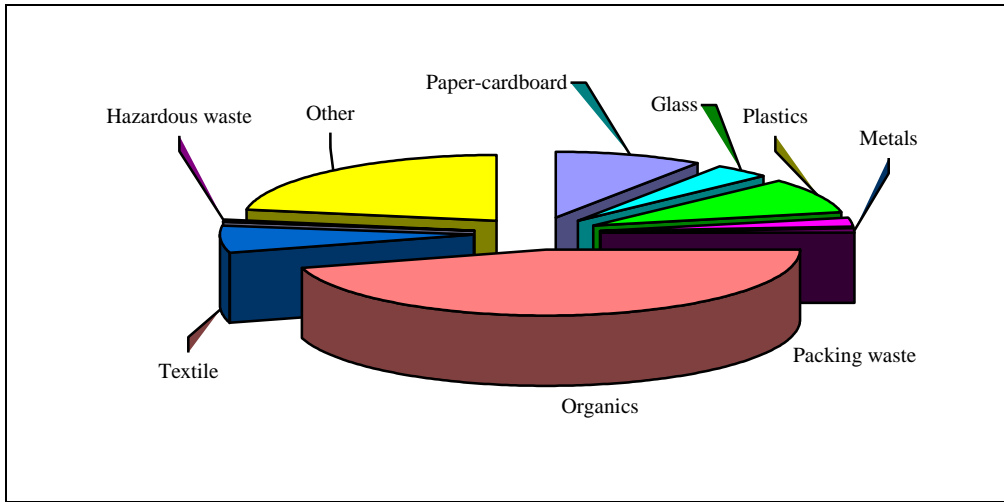


Figure 2. Solid waste composition in Samsun

However, the quantity of medical wastes was approximately 550 tones in 2006 (Governorship of Samsun; 2006). Increasing population levels, rapid economic growth and rise in community living standards will accelerate the future medical waste generation rate in Samsun such as other cities of Turkey which is a developing country.

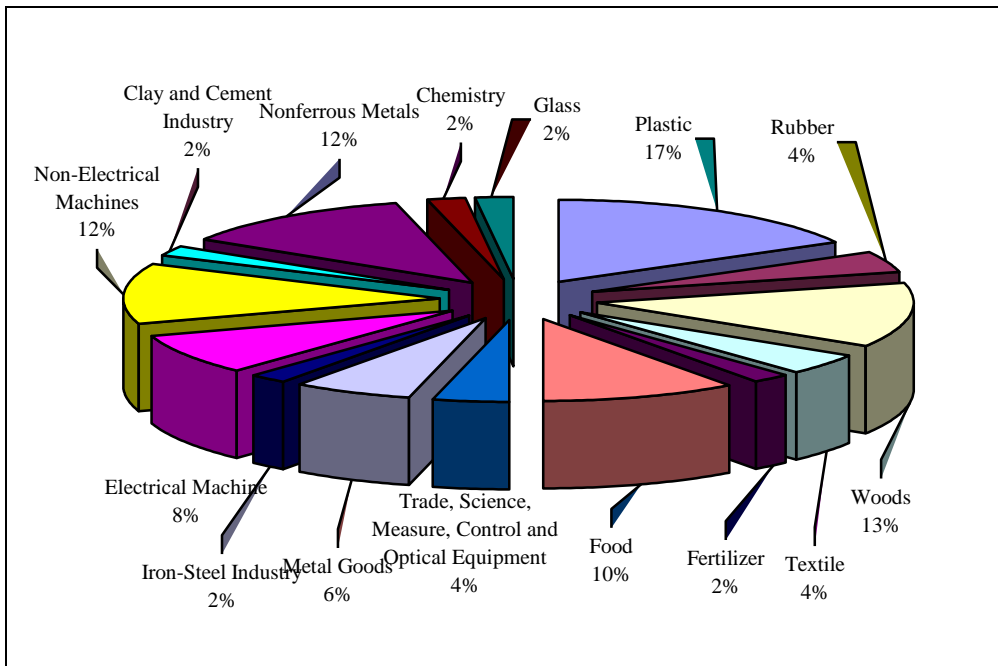


Figure 3. The categories of industries in Samsun

3. Activities for hazardous waste management

In many cities of Turkey, deficiencies in the provision of waste services are the result of inadequate financial resources, lacking management, and technical skills of municipalities and government authorities to deal with the rapid growth in demand for service (Turan, 2009).

Approximately 60% of solid waste is generated in urban areas and collected by municipalities in Samsun. Hazardous wastes produced from individual households is taken to the collection point or just deposited on the adjacent roadside from where it is collected with municipal solid waste. Municipality of Samsun has provided two types of community bin containers for municipal solid waste storage. The first one has wheels and its capacity is 1 m³. The bin is placed along the roadside in areas. The second type of community bin is without wheels and its capacity is 2.2 m³. In Samsun, the disposal site is generally within approximately 15 km of the collection points, hence transfer stations are not used and the municipal solid waste is directly hauled by the transport vehicle from the collection points to the disposal site. In Samsun, open dumping area named Yılanlıdere Valley where the municipal solid waste of the city was used for many years. The Yılanlıdere valley is a branch of the Mert Stream which crosses the city center from south to north and disembogues into the Black Sea. This application caused very serious environmental and health problems. In the past years, the disposal site was out of the city center and its direct effects to public health seemed to be less but today it is side by side with the residences due to rapid growth of population and unplanned expansion of the city. Since then, the dumpsite has been closed, rehabilitated, and covered with soil, and has had gas vents installed. The Gürgendağı solid waste sanitary landfill site where is out of the city center opened in the last of 2007.

In Samsun, there is no hazardous industrial waste disposal service facility licensed under applicable regulations. Currently, land disposal is the most common method of industrial waste management in Samsun. Industrial hazardous waste creates a significant risk to the environment. This is why local authorities had implemented a comprehensive solid waste management system for years. As a result of the growing number of new companies and developments in Samsun, and the increased volume of hazardous waste, it is very important to build a new station to control industrial hazardous waste.

In the most of the cities of Turkey, there is no detailed statistical data for medical waste management. In Turkey, almost above 90% of the total medical waste was deposited as municipal solid waste or incinerated without controlling in open area; only 10% was incinerated in a formal way. Medical wastes is collected separately according to the characterization such as infectious, sharps and households. Collected wastes are transferred to the dumping area separately by the municipality. Medical hazardous waste is treated using special imported equipment to burn them within new sanitary landfilling area.

4. Conclusions

In Turkey, legal documents related to hazardous waste management are published and continuously updated, but the main problem has been in their proper application. “Hazardous Waste Control Regulation”, which was published in the official gazette of Turkey on 27 August, 1995, encompasses the full range of hazardous waste management concerns.

Hazardous waste management also needs better organization, adequate facilities and strict surveillance with recordkeeping. Care for hazardous waste should be evidence-based, and compared with the data obtained by laboratory research and population studies, advanced treatment and control methods. Legislation should emphasize prevention of effects that are harmful to health and that degrade the environment. Moreover, a condition to make the system work is to make education of persons responsible for the organization of waste management and those who handle it.

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