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MUNICIPAL SOLID WASTE MANAGEMENT IN BANGLADESH: A STUDY OF X MUNICIPALITY

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Abstract: Proper solid waste disposal is very important for the nature itself and its' inhabitants. However, a study covering various aspects of solid waste management including management practices, prevailing problems and possible solutions are scarce in the literature. Accordingly, this study investigates a municipality of Bangladesh to understand the practices, problems and probable solutions of solid waste management. The dwellers of the surveyed municipality throw solid waste in various places like dustbin, drain, roadside and other crude dumping sites. Only about one-fourth of the respondents throw wastes to designated dustbins. More than half of the respondents don't have knowledge about proper disposal of solid wastes. The study findings indicate that the survey respondents throw waste throughout the whole day. More than 80 percent of the respondents are either dissatisfied or highly dissatisfied with the existing solid waste management services of the municipality. The data indicate that about two-third of the respondents are willing to pay for improving the waste disposal system. The respondents informed that they are affected by various diseases such as diarrhea, pneumonia, asthma, and bronchitis during the last one year which they perceive as the outcome of improper solid waste management. Therefore, this study suggests for awareness development, time management of waste disposal, establishment of more disposal and collection points, employment of more manpower and vehicles, introduction of the 'door to door' waste collection mechanism, segregation of industrial and clinical wastes for ensuring a better managed solid waste disposal system in the municipality.

Keywords: Solid Waste, Management, Municipality, Bangladesh

Introduction

Human being is surrounded by animal, plant, air, water, land, energy, and other objects, which are elements of environment. Environment is the sum of social, biological, physical and chemical factors, which compose the surround of human being (Ahmed, 1994). Public cleanliness and safe disposal of waste are essential to public health and environmental protection (Hamer, 2003). Solid waste creates

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environmental problems (Zurbrügg, 2002). Usually, solid waste refers to the waste generated from household kitchen, slaughterhouse, market, industry and so on. Urban solid waste management is considered to be one of the most immediate and serious environmental problems confronting urban governments in developing countries (Schertenleib and Meyer, 1992).

The economic development of a country, its' increased habitation, population density, changing food habit, social and cultural habits, and education grossly affects the physical composition of waste in the country which again has been changing over the years (Yousuf and Rahman, 2007). Only 0.2 kg/day out of the estimated 0.5 kg/day per capita solid wastes generated in the main cities of Bangladesh is carried out to the final disposal points and the rest is disposed-off locally due to the poor waste management system (Farzana and Kabir, 2004).

Solid Waste Management (SWM) is defined as the control, generation, storage, collection, transfer, transport, process and disposal of solid waste consistent with the best practices of public health, economic, financial, engineering, administrative, legal and environmental considerations (Bruvoll, 2001). Municipality refers to a town or district that has local government. Municipal solid waste management signifies the management of waste within a stable and rational financial expenditure of a municipality for a nourishing environment and healthy society (Kassim and Ali, 2006). Inadequate management of municipal solid waste is an obvious cause for degradation of the environment in most cities of the third world (Zohoori and Ghani, 2017). It is, therefore, a prime task to ensure proper disposal of municipal solid waste for protecting the environment (Memon, 2002).

According to McDougall et al. (2001), the concept of Integrated Waste Management (IWM) takes an overall approach and manages waste in an environmentally effective, economically affordable and socially acceptable way. It involves the use of a range of different treatment options at a local level and considers the entire solid waste stream. However, cities in developing countries are confronting a twin dilemma. On one hand, the urban population is growing rapidly, causing a huge increase in demand for waste management services, and on the other hand, the traditional public sector is responding poorly to the growing demand for such services (Ahmed and Ali, 2006).

The solid waste management in the urban areas of Bangladesh is mostly managed by the public sector, more specifically by the municipal/city corporation of the Bangladesh government. A study covering various aspects including management practices, prevailing problems and possible solutions are scarce in the literature. Hence, it is very important to investigate the management of municipal solid waste in the country with a holistic approach covering all related dimensions. Accordingly, this study attempts to fill in this gap. The main objective of this study is to examine the practices, problems and probable solutions of municipal solid waste management in Bangladesh. Accordingly, the corresponding research questions are: 1) What are the prevailing solid waste management practices in the municipality? 2) What are the problems faced by the municipality in managing solid wastes? and 3) What are the probable solutions of the problems?

Through analyzing the data, this study attempts to understand the prevailing solid waste management behavior of the city dwellers, problems faced by the municipality for managing wastes in response to the said behavior and probable solutions for better management of municipal solid wastes. Accordingly, the embedded research framework involves actions of two major parties: city dwellers and municipal authority. The actions of city dwellers impose constraints to the municipal authority in managing solid wastes. In addition, infrastructural and other facilities also hinder smooth functioning of solid waste management by the municipality. Hence, role of both the dwellers and municipal authority are important in handling the problem.

This section portrays the background of the study, while the next section explains the material and methods of the research. Section 3 reveals the study results and section 4 discusses study findings compared to available literature. Finally, section 5 concludes by highlighting recommendations.

Materials and Methods

This study purposively selects 'X'[1] municipality of Bangladesh to observe the practices, problems and probable solutions regarding solid waste management. It is declared as a municipality on 10 July, 1996. Currently there are nine wards in the municipality. Table 1 lists ward-wise population distribution and estimated solid waste generation scenario in the municipality. Among the nine wards of the municipality, this study randomly selects five wards (ward no. 1, 4, 5, 6 and 9) for collecting primary data. A total of 175 respondents of the municipality are surveyed in year 2012 randomly taking 35 from each of the five selected wards. Voter list of the area is used to randomly select samples in the selected wards. Personal, socioeconomic and waste management related information is collected through a questionnaire survey from the sample respondents. Accordingly, this study analyzes the data collected from the field to grasp a clear picture about solid waste management practices, constraints and probable solutions. A five-point likert scale is used to measure the satisfaction level.

Table 1: Generation of Solid Waste in the Municipality

Ward No.	Population	Area (acre)	Estimated waste generation		
			Kg/capita/day	**Kg/day**	**Percent**
1	18,250	747	0.27	4,928	31
2	9,500	38	0.29	2,755	17
3	12,200	181	0.15	1,830	12
4	9,020	277	0.15	1,353	9
5	10,400	225	0.20	2,080	13
6	7,500	454	0.08	600	4
7	11,600	328	0.07	811	5
8	10,850	348	0.07	760	5
9	14,583	718	0.04	583	4
Total	103,903	3,316	0.15	15,700	100

Source: XM (2012)

Results

The dwellers of the municipality throw solid waste in various places like dustbin, drain, roadside and other crude dumping sites. The sweepers of the municipality usually collect wastes from crude dumping sites and dump in secondary dumping places like dustbins, from where a municipality truck collects waste and dump in the final dumping ground. There are 16 dustbins in the area during the survey period. The final dumping ground is about four km far from the municipal area. The municipality has 12 vans, three handcarts and one truck for collecting and dumping wastes (XM, 2012). Assuming four trips in the morning and three trips in the afternoon and 1.5 ton per trip carrying capacity, the municipality has the capacity to carry about two-thirds of generated waste to the dumping ground per day.

According to the survey data, most of the surveyed respondents are literate. About half of them have six to ten years of formal schooling, and another one-fourth of them have more than ten years of formal schooling, while the rests have five or less than five years of schooling experience or can sign only. About one-third of them are engaged in business, while other important occupation sources include government sector, teaching, private sector and agriculture.

[1] The name of the municipality is not disclosed here to maintain secrecy and privacy.

Table 2 describes the waste disposal behavior of the respondents. This data portrays the answer of the first research question of this study. It seems that only about one-fourth of the respondents throw solid waste to designated dustbins, while the rests throw in roadside, open field, river, drain or ditch. Survey findings indicate that more than half (53 percent) of the respondents don't have knowledge about proper disposal of solid wastes.

Table 2: Waste Disposal Behavior

Waste disposal behavior	No. of Respondent	Percent
Throw in the dustbin	41	23
Throw in the roadside	62	36
Throw in open field	27	15
Throw in the river/drain/ditch	45	26
Total	175	100

The data indicate that the respondents don't throw waste in any specific time. For example, about 54 percent of the respondents throw waste in the afternoon, 22 percent in the morning, 14 percent at night and 10 percent at noon.

This study tries to understand the satisfaction level of the respondents about the ongoing waste disposal service of the municipality. The data signal that none of them are highly satisfied with the ongoing service facilities, while only 3 percent of the respondents are moderately satisfied and another 16 percent are somewhat satisfied. However, more than 80 percent of the respondents are either dissatisfied or highly dissatisfied with the ongoing solid waste management services of the municipality.

This study tries to estimate the willingness to pay of the respondents for improving the waste disposal system. Based on pilot survey findings, the survey puts four options (BDT[2] 20, 15, 10 and 0 per month) and asks the respondents to express their wiliness to pay. The survey data indicate that about one-third (31 percent) of the respondents are not willing to pay at all in this purpose. The findings indicate that about 10 percent, 22 percent and 37 percent of the respondents are willing to pay BDT 10, 15 and 20 per month respectively for improving the solid waste disposal system. The respondents are asked about the reasons behind their willingness to pay. About one-third (31 percent) of them want to pay for getting a better environment in the city. Around 26 percent and 16 percent respondents express the importance of hygiene issue and aesthetic views, respectively, behind their willingness to pay. About 60 percent of the respondents, who are not willing to pay, respond that they perceive waste disposal as the duty of the city government and hence they are not willing to pay for that. Only about 5 percent respondents are not willing to pay due to non-affordability, while 11 percent respondents think that waste is not a problem for them and 6 percent respondents are not willing to pay due to low volume of waste generation by themselves.

Wastes like broken bottles thrown here and there may become a breeding ground for mosquitoes and spread diseases. Improper disposal of wastes may lead to human injury. For example, when a person steps on the broken bottles or nails or other shaped objects, he/she can get injured. Wastes like human stool can cause diseases when poorly dumped, since the flies will carry the germ from the stool. This study attempts to understand the incidence of diseases among the respondents due to improper waste disposal. The respondents are asked to report disease history related with improper solid waste management in one year. About 42 percent of the respondents informed that they are affected by various diseases, such as diarrhea (21 percent), pneumonia (10 percent), asthma (6 percent), bronchitis (2 percent) and others (3 percent) in the last one year and they think that improper management of solid waste is the probable reason behind the said sufferings.

[2] BDT refers to the currency of Bangladesh. 1 US$ = 84.93 BDT (as on 10 January, 2021).

The surveyed municipality is lacking from a sewerage system. Therefore, people dispose household sewer to the surface drains or surface water bodies. Most of the outlets of the drains are blowing towards the rivers without any treatment measure. Most of the industrial units in the municipality are dumping their generated solid and liquid wastes in river, drain and in the municipal solid waste collection points. This study finds that the hospital and industrial wastes of the study area are not separated before dumping, which is a serious threat to human health and environment.

In response to the second research question of this study, it is found that lack of uniformity in terms of time of throwing solid wastes by the dwellers, throwing wastes here and there instead of throwing in designated places, lack of a sewerage system, mixing hospital and industrial wastes together are the major problems faced by the municipality in managing solid wastes.

In response to the third research question, this study recommends for capitalizing the willingness to pay of the respondents in addition to awareness creation, waste disposal time management, establishment of more disposal points and procuring more vehicles for improving the solid waste management services.

Discussion

This study identifies shortage in waste management handling capacity of the investigated municipality which is similar to the finding of Saifullah and Islam (2016) and Zahur (2007) who state that there is shortage of waste management capacity in the municipalities of Bangladesh.

This study discovers the lack of knowledge of most of the respondents regarding proper disposal of solid wastes. Such finding is similar to the finding of Banga (2011) who observe that about 60 percent of the households in Uganda don't have knowledge about segregation of solid waste.

This study observes heterogeneity in waste disposal time among the surveyed respondents. Such finding is similar to the finding of Sheheli (2007) and Sobhan et al. (2013) who find that people of Bangladesh dispose waste in different time periods.

The survey data signals that the satisfaction level of the respondents regarding ongoing waste management services of the municipality is disappointing. Such finding is similar to the finding of Sarker et al. (2012) who state that more than 60 percent people are not satisfied at all on present solid waste management system in a municipality of Bangladesh.

This study recognizes that most of the surveyed city dwellers are willing to pay additional money for getting improved waste management services. Such finding is similar to the finding of Barmon et al. (2015) and Bhattarai (2015) who find that the city dwellers of Bangladesh and Nepal are willing to pay for getting improved solid waste management service.

The study respondents argue that improper management of solid wastes by the municipality invites their sufferings from various diseases. Such finding is similar to the finding of Ahmed and Quader (2011) and Sarker et al. (2012) who find that improper management of municipal solid waste is a root cause behind spreading diseases among the city dwellers.

There is scope to improve the waste management system in the city. The municipality authority is not familiar with any modern waste management system. In this connection, some innovative civic authorities of non-governmental organizations (NGOs) and the communities such as 'Pradipan' in Khulna have been successful in developing participatory community-based solid waste management (Murtaza, 2002), which may be explored by the municipality under consideration.

Conclusion

The capacity of the municipality in terms of manpower, vehicle and waste disposal center is not sufficient for managing the generated solid waste properly. Only 16 dustbin and one truck is not sufficient to serve more than 0.1 million people of the municipality. There is no 'door to door' collection system of waste in the study area. More than half of the people in the area are not aware

about proper management of municipal solid waste. A serious mismatch is observed regarding time of waste throwing by the households and collecting by the municipal authority. Most of the respondents are dissatisfied with the current municipal solid waste management service. More than half of them are willing to pay for an improvement of the service.

Therefore, this study suggests for creating awareness among the people for proper management of solid wastes. Some other recommendations, as derived from the study findings include time management of waste disposal, establishment of more disposal points, employment of more manpower and vehicles. Introduction of the 'door to door' waste collection mechanism might go a long way in solving the waste management problem. Since a majority of the respondents are willing to pay for improving the waste disposal system, the municipal authority might think to impose a monthly fee to raise fund for managing solid wastes in a better way. Steps are needed to segregate industrial and clinical wastes and dump those with special attention. A better managed solid waste disposal system may be achieved through joint involvement and participation of all the stakeholders including local and national government, private organizations, individuals and local community.

This study covers only one purposively selected municipality of Bangladesh which is the main limitation of this study. Future study might extend the area coverage to get better insight on the study topic. An attempt to collect latest data will definitely help to understand the overall situation. Special effort to collect financial and willingness related data might help to validate the findings of this study.

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