



IMPACT OF SOLID WASTE MANAGEMENT PRACTICES ON THE SUSTAINABLE ENVIRONMENT IN DINAJPUR MUNICIPAL AREA

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ABSTRACT

Waste creates a detrimental impact on the sustainable environment. The solid waste management practice is in jeopardy in Bangladesh. In this regard, judicial management practices of solid waste are significantly important for the protection of a sustainable environment. The present study is focused on the impact of solid waste management practices on sustainable livelihood in the Dinajpur municipal area. In Dinajpur, 12 tons of solid waste was generated every day. Most of the waste was generated from households (80%) and the rest of the waste was generated from commercial activities and hospitals (5%), restaurant and institution activities (10%), and industries (5%). The maximum number of respondents (42%) threw their waste in open areas such as fields in their neighborhoods. It was found, 65.25% of community people suffered from Diarrhea, 18.47% suffered from Typhoid, 8.44% suffered from Malaria and 3.28% suffered from Jaundice due to the improper management of municipal solid waste. The majority of the respondent (70%) suffered from dirtiness, bad smell, and mosquito problems due to improper waste management. In the Dinajpur municipal, suitable solid waste management can be practiced which can lead to a healthy environment.

Keywords: Solid waste, environmental impact, waste generation, waste management

INTRODUCTION

Waste is defined as any substances that constitute scraps of materials or other surplus unwanted substances arising from the application of any process (EPA 1990). Waste is classified into two groups such as solid and liquid waste. In other developing countries like Bangladesh, a large quantity of solid waste is generated in municipal areas however most of them are not managed properly. Increasing rates of urbanization and consumerism could double the volume of municipal solid waste annually by 2025, difficult environmental and public health management in the world's cities, though a number of this waste is ultimately recycled, the doubling of municipal solid waste would bring substantial environmental problems and cause difficulties in management practices (U.S. EPA 2014). Solid waste amount and composition, depend upon population density, supply diversity, and therefore the financial gain of the individuals within the vicinity.

With a rise in population, economic activity, and financial gain, the amount and composition together with the non-biodegradable and dangerous wastes square measure certain to increase. In developing countries where resources and capability square measure unnatural, the challenges become serious (Penjor 2007). The biological process of waste amount and characteristics consequently challenge the municipal authorities in management, rigorous additional and additional resources, and technical competence. Nowadays, municipal solid waste represents one of the most vital environmental problems for all countries particularly owing to the widespread pollution of soil and aquatic systems. In most developing countries, categorized by the quickening population and the escalating demand for food, there has been an increase in the amount of waste generation. This waste ultimately reaches public disposal sites and due to poor and ineffective management, the potential for negative health effects on people and animals, and the quality of land, air, and water. Organic waste disposed of in wetlands, rivers, seas, and lakes increases toxic substances in the food web, through different trophic levels. The contaminant's presence in groundwater particularly near landfill sites affects the quality of aquifer and domestic water supply (Rajkumar *et al*, 2012). Open dumpsites harm the atmosphere through releases of greenhouse gases (e.g. CH₄, CO₂) during which trappings heat within the atmosphere (Defra 2004). Soil and plants as elements of the scheme square measure contaminated by unsought chemicals from dumpsites. Significant metals square measure hierarchal high among the chief pollutants of inexperienced vegetables (Mapanda 2005) and harmfulness to plants (Magaji 2012). Prevention of waste is more desirable than recycling and recycling is more desirable than disposal. While highly complex and cost-intensive waste management systems have been designed in most of the developed countries to reach the objectives of solid waste management, countries with low and middle income (World Bank 1999) and so lower profits from taxes and donations to finance their waste management systems, notice it troublesome to use these systems (Brunner and Natw 2008). The high nutrient gift in organic wastes will cut back watery gas in water bodies, needed to fish and alternative aquatic life forms. The unpleasant odors and unattractive look of piles from the solid waste disposed on streets and in fields, forests, and alternative natural zones will put off business enterprises (Zeiss 1988). It is one of the largest municipal areas with a huge population number 186727 (BBS 2014). Therefore, the study was conducted to assess the source of waste generation, the existing status of solid waste management and its environmental impacts and to establish a guideline for the management of solid waste in Dinajpur municipal areas. It is hypothesized that solid waste management guidelines will help to reduce waste generation and environmental impacts on sustainable livelihood.

MATERIALS AND METHODS

Study area: This study mainly focused on the present status and environmental impact of solid waste management in the Dinajpur municipal area. It is located 413km (25°37'N 88°39'E / 25.617°N 88.650°E) north-west of Dhaka Bangladesh. The area of the Dinajpur municipal is 20.7 sq km.

Preparation of questionnaire: At first, a questionnaire was prepared. The questionnaire was pre-tested by interviewing a few respondents in the study area. After pre-testing, a set of the final survey questionnaires was developed with necessary corrections and modifications. The questionnaire was elaborated to include all types of questions relating to the objectives of the study.

Data collection: The study was conducted through personal in-depth interviews, observations, and questionnaires. Data was collected through a structured questionnaire. Data collection included the amount of waste generation, solid waste collection, transportation and storage, the environmental impact of generated waste and disposal systems in the studied area. This study identified the lacking of proper waste management in municipal areas and also the authority's future management plan. Both qualitative and quantitative data were collected through direct field observation of the study area, and focus group conversation with the participants. Secondary evidence was also collected for proper documentation.

Primary data collection: The primary data regarding solid waste management practices were collected from community people whose involvement with diverse professions. The respondent was selected randomly. The first information was collected through a form survey from day-laborers, businesspeople, students, job holders, and ladies of the house to assess the precise state of affairs of solid waste management with direct field observation. Primary data was also collected by visiting the waste collection process and the selected municipal dumping area. The waste site was visited as well as the dustbin of the road site and its situation was also observed. Also, expert opinion and the key informant interview were carried out with the various participants who are experts and related to solid waste management practice in the selected area.

Secondary data collection: Secondary data like population, the quantity of waste generation, activities existing on solid waste management, and the environmental impact of the generated waste in the selected study area were collected from the studied area. It was collected from Dinajpur municipality. The collected information was about transport which was responsible for solid waste management, collection time, and waste disposal.

Data analysis: The collected data were classified according to the contents. The organized knowledge was then overviewed to urge a general sense of rising trends, patterns, and ideas. The data was separated into wide groups like waste generation, waste collection and transportation, waste decision-making process, public involvement in the decision-making process, environmental impact, and so on.

RESULTS AND DISCUSSION

Socio-economic and demographic data: One hundred and sixty respondents were interviewed in the selected area. Both male and female respondents were in the interview, where 47% were male and 53% were female. Among them 62% were Muslims and 38% were Hindus. The age of the respondent was considered at the range 26-60 years because of considering the mature one. From the data, it was clear that the highest number of respondents were female and Muslim.

The respondent's education level: Figure 1 shows the education level of the respondent in the study area. The education level of the respondents in the study area was considered in six categories as the primary level, under SSC, SSC, HSC, Bachelor, and MS. From the collected data, it was found that the maximum percentage (24%) of respondents were SSC-passed, on the other hand, the minimum percentage (10%) of the respondent's education was the primary level in the study area. The bar diagram indicates $\pm$ SE, where $n = 80$.

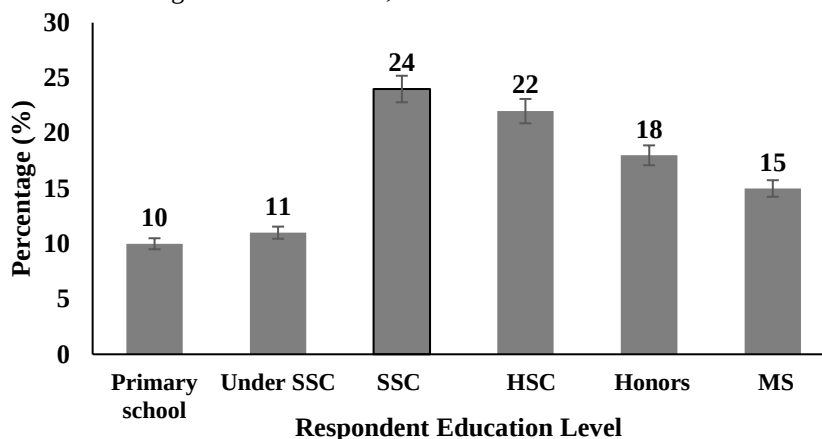


Figure 1. Education level of the respondent in the study area

The respondent's occupation: We included all classes of the respondent for our study those who were directly involved with solid waste management activities. Respondents were selected from a considerable number of the housewife, day labor, businessman, employee, student, and farmers. The highest percentage of the respondent was found housewife and the lowest percentage were found farmer. The occupations of the respondent are shown in Figure 2. The bar diagram indicates $\pm$ SE, where $n = 80$.

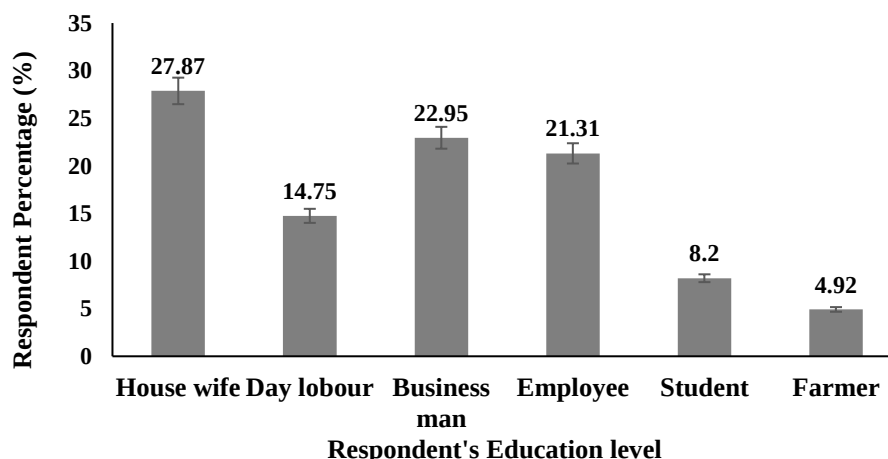


Figure 2. Occupation of the respondent

Generation of solid waste from the household: Most of the respondents had a common idea about solid waste as well as its management and very few respondents were unaware of solid waste generated from their houses. From the collected data it was found that 100% of households discharged organic or vegetable waste. It was also found that 55%, 91.8%, 32.79%, 24.59%, and 40.1% of households generated paper, plastic, rubber, wood, textile, and garden waste respectively shown in Figure 3. In the studied area, maximum solid waste is perishable and when thrown or dumped in the open air it pollutes the air. The result is also the same as the line of previous research result which indicates that the highest component of waste generated in developing nations consist of organic materials (UNEP 2005). The bar diagram indicates $\pm$ SE, where $n = 80$.

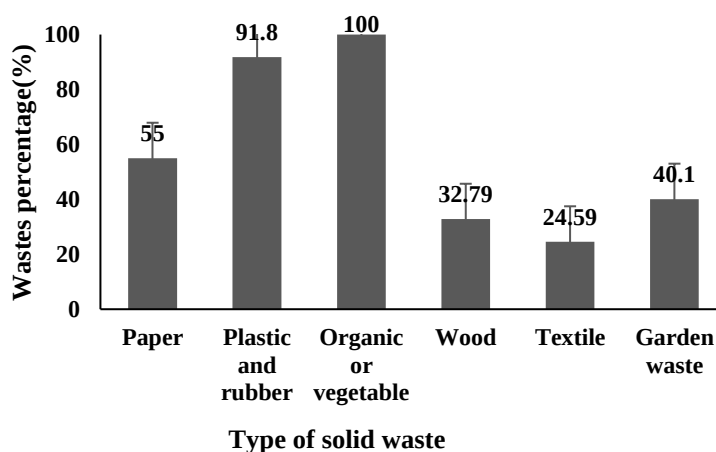


Figure 3. Percentage of households generated different types of waste

Amount of the solid waste: According to the collected data, there were different amounts of solid waste generated from the respondent's house in the Dinajpur municipal area are shown in Figure 4. The maximum percentage (40.97%) of respondents generated 3kg of solid waste from their houses per day. On the other hand, the minimum percentage (6.56%) of respondents discharged 8 kg of solid waste from their houses every day. It was also found that 11.48%, 31.15%, and 9.84% of respondents generated 0.5-1 kg, 2 kg, and 4 kg solid waste per day respectively. The amount of municipal solid waste generated in developing countries from households (55% - 80%), market areas (10% -30%), and institutions among others (Nabegu 2010, Nagabooshnam 2011 and Okot-Okumu 2012). The amount of solid waste and composition depends on population density, source variety, and the income of the people in the area. If the number of family members and income level is high then the amount of solid waste generation in that family is high. The bar diagram indicates $\pm$ SE, where $n = 80$.

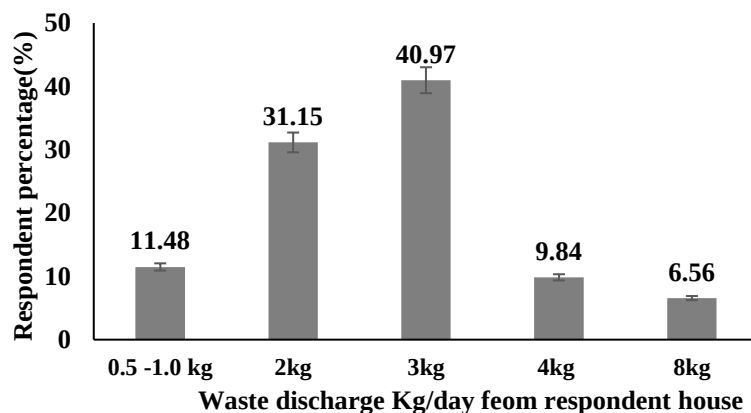


Figure 4. The amount of solid waste generated from the respondent's house per day

Resident perception regarding the solid waste management: In the studied area, it was found that the maximum number of respondents were satisfied with the solid waste management system are shown in Figure 5. But according to their education level, the highest unsatisfactory idea about solid waste management was found in primary school pass respondents. They were thrown waste on the roadside and other places which generate numerous problems in the study area. On the other hand, the highest satisfactory idea was found in SSC pass respondents. They threw waste in the dustbin or selected places. The educated man is more aware of waste management than the uneducated man. The bar diagram indicates $\pm$ SE, where $n = 80$.

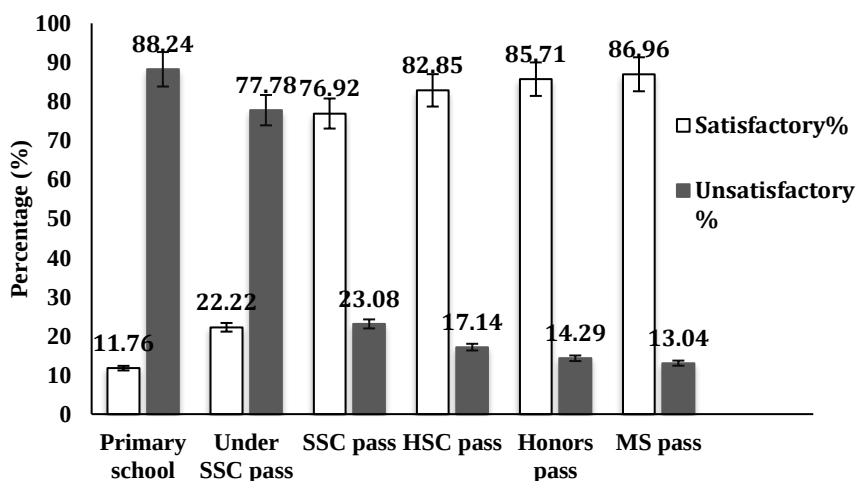


Figure 5. Respondent's idea about waste management practices according to the respondent's education level

Sources and collection pattern of municipal solid waste: The main sources of solid waste in the Dinajpur municipal area were households representing 80%. Waste generated from commercial activities and hospitals was 5%, restaurant and institution activities were 10% and from industries 5%. The generation of solid waste from different sources is shown in Figure 6. There 185 dustbins were used for the temporary dumping of waste in the Dinajpur municipal area. The municipal authority used 40 driving vans, 7 garbage trucks, 1 beam lifter, and 1 chain bold dozer for the collection and transport of solid waste. For the management of solid waste, two officers and 110 laborers work in Dinajpur municipal. The collection pattern of solid waste is irregular in the study. Normally the sweeper collected the waste every day in the morning by driving a van from a different place. Then the garbage truck carried all the solid waste to the final dumping place named Sukhsagar.

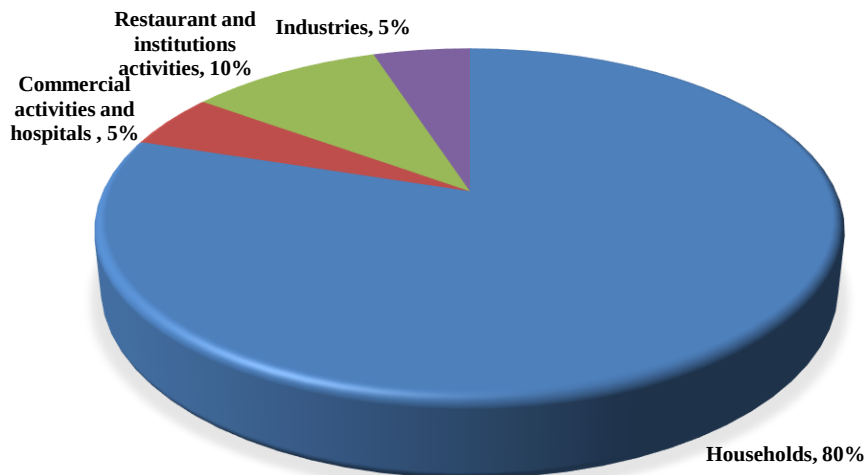


Figure 6. Different sources of solid waste generation in the Dinajpur municipal area

The dumping site did not meet the required standard and hence posed a serious public health hazard to residents in the area and its surrounding communities through polluted air and disease-carrying pests.

Solid waste management by local people: In Dinajpur municipal area, the respondent kept their solid waste in a container that may be made of plastic. When the container fills with solid waste then they throw it dustbin or convenient space or roadside or drain etc. In the municipal area, it was observed that 25% of respondents used dustbins, 16% of respondents threw their waste in inconvenient spaces or the roadside, 11% of respondents threw waste in the nearby drain where

irregular cleaning by sweeper, 42% of respondents threw their waste in an open area such as fields in their neighborhoods and 6% respondents threw waste in ponds or river as shown in Figure 7.

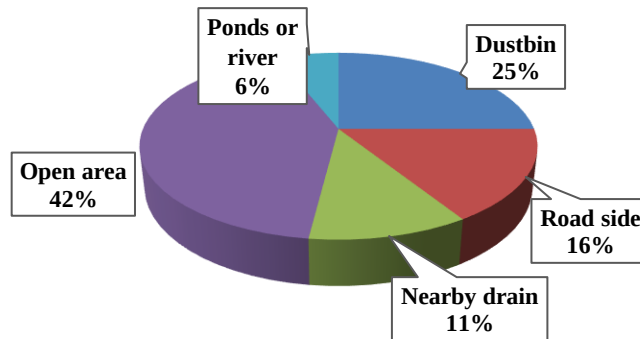


Figure 7. Percentages of respondents thrown their waste to different places

Respondent's opinion about solid waste management: In the Dinajpur municipal area solid waste management system was not well developed. Based on the questionnaire, only 5% of the respondents reported that waste management was properly done, whereas a big percentage (40%) of the respondents said the waste management was not properly done. It was found that 50% of the respondents supposed that the waste management system needs to improve and 5% of respondents had no idea about it. In the municipal area, the majority of the respondents (70%) suffered from dirtiness, bad smell in the municipal street, and mosquito problems in their houses due to improper solid waste management. On the other hand, 30% of respondents feel no dirtiness, bad smell, and mosquito problems. The respondent's feelings about dirtiness, bad smell, and mosquito problems due to improper solid waste management are shown in Figure 8.

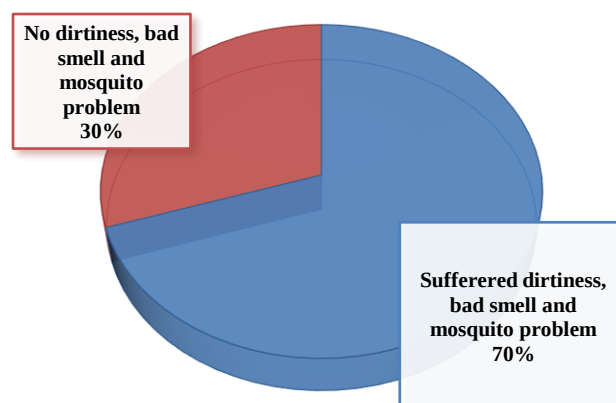


Figure 8. Respondent's feelings about dirtiness, bad smell, and mosquito problems due to improper solid waste management

Health condition of the respondents affected by municipal solid waste: During the investigation, it was found that 65.25% of the community people suffered from Diarrhea, 18.47% suffered from Typhoid, 8.44% suffered from Malaria and 3.28% suffered from Jaundice due to improper management of municipal solid waste in the Dinajpur municipal area are shown in Figure 9. However, 4.56% of respondents did not suffer from any disease due to improper management of municipal solid waste. This study showed that waste management affected the health of the community in the study area, this is evident and true based on the comments provided by the respondents approached. They claimed that most of their children suffered from dysentery and malaria due to the existence of the household solid waste disposed of in an open dump which offered breeding grounds for mosquitoes and microbes.

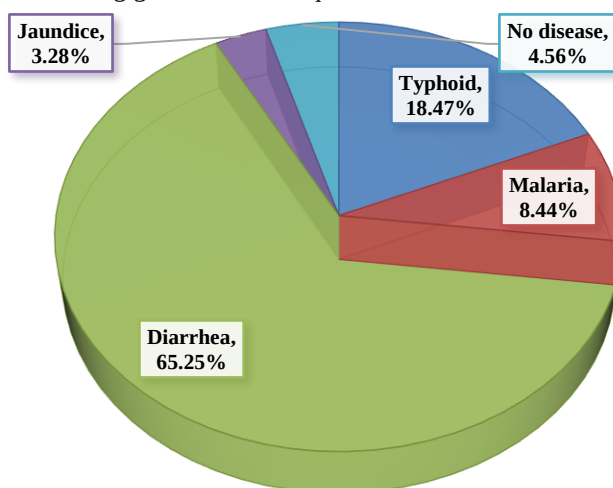


Figure 9. The community people suffered from different types of diseases due to improper management of municipal solid waste

Environmental impact of improper solid waste management: According to Dinajpur municipal offices, 12 tons of solid waste was generated every day in the studied area. The number of dustbins (185) and the number of workers (110) are not adequate for removing dirtiness, stopping air pollution, and keeping the environment clean. According to collected data, waste management in Dinajpur municipal area was not well developed. For this reason, the community people face dirtiness in the street, bad smells, mosquito problems, and some diseases like Typhoid, Diarrhea, Cholera, and Jaundice due to water pollution directly or indirectly. Improper waste management activities can increase disease transmission (Oteng Ababio *et al.* 2013, UNEP 2005). It was also noticed that during the field visit the unwanted solid waste in open dumpsites sometimes is being burnt and creating drastic air pollution. Waste dumped in the drainage channels also leads to the outbreak of vectors. Since the open dump within the town is exposed to all or any of the living, feeding on animals, like cows the chance of obtaining diseases is thus high. The organic domestic

waste in open dumps poses a heavy threat, since they ferment, making conditions favorable to the survival and growth of microbic pathogens. Maximum waste is carried to rivers during heavy rains in the form of runoff and this drops the water quality for consumption and some aquatic animals. Wastes that are mixed with the water bodies negatively change the chemical composition of the water; this disturbs all ecologies existing in the water. It can also cause harm to animals that drink from such polluted water as cows and buffaloes. Waste management deficiencies contaminate ground and surface water, release greenhouse gases and other air pollutants (Nordtest 1995), and damage ecosystems (Zeiss 1998). Uncontrolled dumping of wastes poses threats to air quality indiscriminate decomposition of waste additionally ends up in the discharge of greenhouse gas that ends up in the depletion of the layer. Solid waste must be disposed of scientifically in sanitary landfills and recycled. Segregation of recyclable material would also lead to a reduction in the amount for final disposal. The municipal authority should be allotted higher priority to the management of municipal solid waste and a scientific approach should be adopted for optimizing the complete operation of solid waste management surrounding segregation at timely supply and correct assortment, transportation routes and kinds of vehicles, development, and correct operation of the landfill site.

CONCLUSIONS

A study on the environmental impact of solid waste management practices in the Dinajpur municipal area was conducted. This study was conducted to assess the amount of waste generated from different sources, to assess the present status of waste generation and municipal collection, and the resulting environmental impact of generated waste. In the studied area, it was found that 12 tons of solid waste were generated every day. Most of the waste was generated from households (80%), and the rest of the waste was generated from other sources such as commercial activities and hospitals (5%), restaurant and institution activities (10%) and industries (5%). The maximum percentage (40.97%) of respondents generated 3kg of solid waste from their houses per day. On the other hand, the minimum percentage (6.56%) of respondents discharged 8 kg of solid waste from their houses every day. In the studied area, 25% of respondents used dustbins, 16% of respondents threw their waste inconvenient spaces or the roadside, 11% of respondents threw waste in the nearby drain where irregular cleaning by a sweeper, 42% of respondents threw their waste in an open area such as fields in their neighborhoods and 6% respondents threw waste in ponds or river. In Dinajpur municipal area, the majority of the respondent (70%) suffered dirtiness, bad smell in the municipal street, and mosquito problems in their house due to improper solid waste management. During the investigation, it was also found that 65.25% of the community people suffered from Diarrhea, 18.47% suffered from Typhoid, 8.44% suffered from Malaria and 3.28% suffered from Jaundice due to the improper management of municipal solid waste. But 4.56% of respondents did not suffer from any disease due to improper management of municipal solid waste. It was also noticed during the field visit that unwanted solid waste in open dumpsites sometimes is being burnt and creating drastic air pollution. Wastes that mixed with the water bodies negatively changed the chemical composition of the water; this was disturbing all ecologies existing in the water. It can also cause harm to animals that drink from such polluted

water as cows and buffaloes. The solid waste management in Dinajpur municipal area appeared to be insufficient and it should be improved. Improving the present situation or for the betterment of the management system required more vehicles for the timely transport of waste, required adequate budget, more sweepers, an increased dumping site, adequate knowledge of waste management, a construction waste treatment plant and finally proper monitoring is required.

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