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Solid Waste Management System in Dhaka City of Bangladesh

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Urban Solid Waste Management Is Considered As One Of The Most Immediate And Serious Environmental Problems Confronting Municipal Authorities In Developing Asian Countries. Although Municipal Authorities Acknowledge The Importance Of Adequate Solid Waste Collection And Disposal As Well As Resource Recovery And Recycling, It Is Mostly Beyond Their Resource To Deal Effectively With The Growing Amount Of Solid Waste Generated By The Expanding Cities. Bangladesh Is A Developing And Densely Populated Country. The Process Of Urbanization Is Increasing Day By Day In This Country. Dhaka Is One Of The Most Heavily Occupied Cities In The World. Over Population And Enormous Consumption Lead To Large Quantities Of Waste. Waste Management Is One Of The Most Instant And Serious Problems Of Dhaka City Corporation. This Research Paper Explores The Problems And Prospects Of Solid Waste Management In Dhaka City. There Is No Single Solution To Improve Solid Waste Management System In Any City. It Must Be Based On Integrated Systems With A Combination Of Different Methods.

Keywords: Waste Management, Waste Generation, Recycling, Environmental Benefit

1. Introduction

Waste is produced by different human activities, like industrialization, urbanization, improving living standards etc. Urban population and industrialization have been increasing rapidly and these are creating a serious hassle on our natural resources, which is a big challenge for sustainable development. Disorganized management and dumping of waste is a noticeable cause of ruin of the environment in most cities. A municipal corporation of Dhaka city is trying to manage this problem but they are unable to control waste management. Each day Dhaka produces 3000 tons of household waste (Ahmed and Rownok, 2006).

On the other hand Dhaka city also produce more waste in different ways , like- hospital, small industry , tannery and others heavy industry. Bangladesh is the ninth most populous country and twelfth most densely populated country in the world. In particular, the projected urban population growth rate from 2010-2015 is 3% over the years of 2010-15. Currently, according to a UNFPA report, Dhaka is one of the most polluted cities in the world and one of the issues concerned is the management of municipal waste. According to Bangladesh Bureau of Statistics the population of Dhaka Metropolitan was 6,487,459 in 1991 and 9,672,763 in 2001 and 14,543,124 in 2011.

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Rapid growth of industries, lack of financial resources, inadequate trained manpower, inappropriate technology and lack of awareness of the community are the major constraints of solid waste management for the fast growing metropolis of Dhaka.

A healthy life, cleaner city and better environment are the logical demands for the city dwellers as the municipality is traditionally funded for solid waste services from municipal tax system for waste collection and disposal. Due to limited finances and organizational capacity, it has been really difficult for the municipality to ensure efficient and appropriate delivery of solid waste collection and disposal services to the entire population. Maximum people are not concerned about waste management. This is an important cause of mismanagement of waste. In Dhaka city household waste are thrown in the roadside and open areas. The sources of solid wastages are garbage, refuse, sludge and discarded material and the wastages are produce by industry, hospital, or household community activities. Waste management is a tactic used to waste collection largely from different sources, including recycling and re-use of materials.

Section 1 describes the Literature Review, Methodology and Objective of this study. Section 2 describes the composition of Solid waste management system in Dhaka city, Solid Waste Generation in this city, Present status of educational situation, Condition of the total system and Recycling of solid waste. Finally, in section 3, it describes the Waste recycling and environmental benefit, how to recycle for employment, result and the concluding remarks are given and future research directions are provided.

2. Literature Review

Trends of Urban Waste Creation in Bangladesh Waste generation was estimated at 5,650 tons per day or 2.06 million tons per annum in 2003. The daily waste generation is projected to be 8,280 tons and the annual generation 3.02 million tons by 2010. By 2021, the daily and annual generation will amount to 15,110 tons per day and 5.52 million tons per year. There is an increasing rate of waste generation in Bangladesh and it is projected to reach 47, 064 tons per day by 2025. The Waste Generation Rate (kg/cap/day) is expected to increase to 0.6 in 2025. A significant percentage of the population has zero access to proper waste disposal services, which will in effect lead to the problem of waste mismanagement. The total waste collection rate in major cities of Bangladesh such as Dhaka is only 37%. When waste is not properly collected, it will be illegally disposed of and this will pose serious environmental and health hazards to the Bangladeshis. Four types of waste streams i.e. Domestic (49%), commercial (21%), industrial (24%), and hospital (6%) constitute the total solid wastes of Dhaka city.

2.1 Evolution of Solid Waste Collection Method &Technique:

Year	System of Collection
1717	Manual night soil collection system
1864	Night soil collection by bullock cart by Dhaka Municipality
1963	Liquid waste collection by DWASA & Dhaka Municipality side by side
1982	Bullock cart system suspended, night soil collection replaced by Septic tank, introduction of open truck for solid waste collection by Dhaka Municipality.
1989	Introduction of night time waste collection instead of day time collection.
1993	Demountable container introduced along with closed and open truck.
2002	Open truck replaced by covered truck.

2.2 Sold Waste management by DCC

- ✓ DCC sweeps roads & drains daily.
- ✓ Accumulate wastes from roadside.
- ✓ Cleaners collect & transfer to the nearest dustbin/container.
- ✓ DCC's truck dump to the dumping depots.
- ✓ Dressing by bulldozers, tire dozers, pay loaders & excavators.

2.3 Impact of Solid Waste Disposal on Environment

- ➢ Open air dumping creates unhygienic and poses enormous threat to the people.
- ➢ Causes aesthetic problem and nuisance due to nauseating pungent odor.
- ➢ Promotes spreading of diseases.
- ➢ The situation further aggravated by the indiscriminate disposal of Hospital and Clinical Waste.
- ➢ Presence of extremely high level of Total and Facial coliform.
- ➢ Pollute water bodies.
- ➢ Carbon dioxide and Methane produced from solid waste are extremely harmful to the environment.
- ➢ Gases are produced in the landfills through aerobic and anaerobic decomposition of organic compounds, which are threat to the environment.

2.4 Study area

The study area was Dhaka City (capital of Bangladesh). It's one of the largest city in the world.

2.5 Study duration

The study was conducted from 15 April 2014 to 30 October 2015

2.6 Research design and data collection

This study mainly focused on the present status of solid waste management practice in Dhaka city. Data collection included solid waste collection, transportation, and storage and disposal system. These studies identify the lacking of waste management and the authority future management plan. Both qualitative and quantities data were collected through direct field observation, focus group discussion with the stakeholders, secondary information were also collected for proper documentation, like research articles, books, periodicals. Both primary and secondary sources were used to collect data as fulfillment of the study.

2.7 Primary data collection through Questionnaire survey

To find out the solid waste management practice in Dhaka city, the primary data was collected from various classes of people and the respondents were selected randomly. The primary data was collected through questionnaire survey from day labor, rickshaw and van puller, business man, student, job holder and housewife to assess the exact situation of solid waste management with direct field observation. Primary data was also collected by visited the waste collection process and the selected dumping area. For assessing expert opinion the key informant interview was conducted with the various stakeholders who were expert and associated with solid waste management practice in this city.

2.8 Secondary data collection

Secondary data about population, volume of waste generation, activities exiting on solid waste management in Dhaka City was collected.

2.9 Data analysis

Though the data had been collected from various sources so it transcribed. The data was classified according to the contents. The organized data was then overviewed to get a general sense of emerging trends, patterns and concepts. The data was divided into broad categories like waste generation, waste collection and transportation, waste decision making process, public involvement in the decision making process and so on.

3. Methodology

The study uses both primary and secondary data. The study was conducted from 15 April 2014 to 30 October 2015.This study mainly focused on the present status of solid waste management practice in Capital Dhaka City of Bangladesh. Data collection included solid waste collection, transportation, and storage and disposal system in selected area. These studies identify the lacking of waste management and the authority future management plan.

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also collected by visited the waste collection process and the selected dumping area. For assessing expert opinion the key informant interview was conducted with the various stakeholders who were expert and associated with solid waste management practice. Secondary data about population, volume of waste generation, activities exiting on solid waste management were collected. It was collected from Capital Dhaka City of Bangladesh.

The study was conducted following a variety of methodologies, techniques and tools to find-out appropriate and authentic information. The main method of the study is surveying method.

3.1 Sources of Data

Data were collected from primary and secondary sources: Sources of primary data: Primary data were collected from the study area. Valuable information was gathered by interviewing DCC officials and workers in this study.

3.2 Sources of Secondary Data

Secondary data, mainly from research papers and study reports on solid waste management. This study focuses mainly on domestic solid waste management under the jurisdiction of DCC. The collected information was analysed to develop an understanding the problems and prospects of existing solid waste management system in Dhaka City.

3.3 The Study Tools

A set of objective-based questionnaire was developed for data collection in the areas related to target respondents. A set of guidelines was also developed to provide for better understanding of the interviewer and the supervisors for systematic collection of data. The guidelines include the definitions and clarifications of critical areas of information. The questionnaire, duly pre-tested, was finalized though a thorough review of the test findings. The questionnaire was the combination of open-ended and close-ended questions. The assigned data collectors have been provided with adequate training on the methodologies used and also orientation on the tools.

3.4 Sampling

A total number of 100 respondents from DCC officials and workers were selected by purposive sampling. Among them 50 were officials and 50 were workers.

4. Objective

The general objective of this research is to develop solid waste management and recycling process on Dhaka city, and the specific objectives on the study are as follows:

1. To discuss about the sources of solid waste and its composition.
2. To discuss the applicability of waste management systems in terms of disposal collection and temporary storage, reuse, recycling, and treatment.

3. To discuss about public participation in recycling, employment and financial benefit.

5. Solid Waste Management in Dhaka City

Dhaka City is now seizing with the troubles of sky-scraping volumes of wastes. But, these troubles have also afforded a window of prospects for city to find solution. The community and all the sectors have to involve their innovative technologies and disposal methods and concerning behavior changes and awareness rising. A healthy planned waste management process will not only help of pledge a cleaner atmosphere but it also cost-effective for citizens. Dhaka City Corporations are mainly maintaining this responsibility.

Figure 1: ***Sector 11, Uttara, Dhaka***

DCC separated its area into 10 zones for supervision of solid waste production. Following table shows total waste composition in Dhaka city every day.

Table 1: Nature of Waste composition in Bangladesh

Waste Composition	Bangladesh (Dhaka) (% By Weight)
Food and Vegetable	70
Paper Product	4
Plastics	5
Metals	0.13
Glass and Ceramics	0.25
Wood	0.16
Garden Waste	11
Other (Stone dirt etc)	5
Moisture	65

Source: Ahmed, M.F., & Rahman, M.M,. 2000

The total solid waste management involves 3 departments namely conservancy, transport and mechanical engineering. A number of studies were undertaken from time to time by the World Bank, Bangladesh Centre for Advanced Studies (BCAS), Japan International Cooperation Agency and DCC itself for assessment of waste generation. JICA has prepared “Clean Dhaka Master Plan” that will address solid waste management of Dhaka city. Following table shows the growth rate of solid waste in Dhaka city from 1991 to 2025.The growth rate of waste is increasing dangerously.

Table 2: Growth in Solid Waste Generation in Urban Cities of Bangladesh

Year	Total population	Urban population(% Total)	Waste Generation rate(KG/cap/day)	Total Waste Generation(Tone/day)
1991	20872204	20.15	0.49	9873.50
2001	28808477	23.39	0.50	11695.00
2004	32765152	25.08	0.50	16382.00
2025	78440000	40.00	0.60	47064.00

Source: ADBI and ADB 2000 &Zurbrugg 2002.

The DCC conservancy department currently holds 370 trucks and container carriers, 4,920 bin/container and 300 handcarts per day. It is supported by 7,156 cleaners/ sweepers and 190 supervising officers and only 1 officer to supervise transports, for all desired activities (DCC, 2004). Of the total waste produced, nearly 20% issued for recovery and recycling and about 37% remains scattered laying around on roadsides, open spaces or in drains. (Dhaka city sate of environment: 2005: 1).According to a World Bank report, the solid waste generation of Dhaka Metropolitan area (360 sq. km) in 1998 was 3,944 tons/day (WB1998a in BCAS, 2003).Report of “Solid Waste Management Project” of DCC was prepared by JICA and DCC experts in 2000 and it shows that the metropolitan area of the city generates 4,750 tons of solid waste every day. Another report stated that the waste generation of DCC area was no less than 3,700 tons per day (Imtiaz and Alam, 2002). DCC and some other reports state that the waste generation of DCC is about 4,000 to 5,000 tons/day (personal communication and The Daily Star, 21 June 2004). On the other hand, JICA team of “Clean Dhaka Master Plan” found the

existing solid waste generation (dry season) within Dhaka City Corporation area 3,340 tons/day, will increase to 4,600-5,100 tons/day in 2015 (JICA, 2004).

The team also mentioned that the waste generation would be a little higher during the summer when fruits are available abundantly, which may result in 3,500 tons of average waste generation per day (JICA, 2004). Of the total waste produced, nearly 20% is used for recovery and recycling and about 37% remains scattered laying around on roadsides, open spaces or in drains.

6. Solid Waste Generation in Bangladesh:

1995:10742 tons/day
2001:17000-tons/ day
2025:4.064 tons/day (estimated)

7. Composition of Solid Waste:

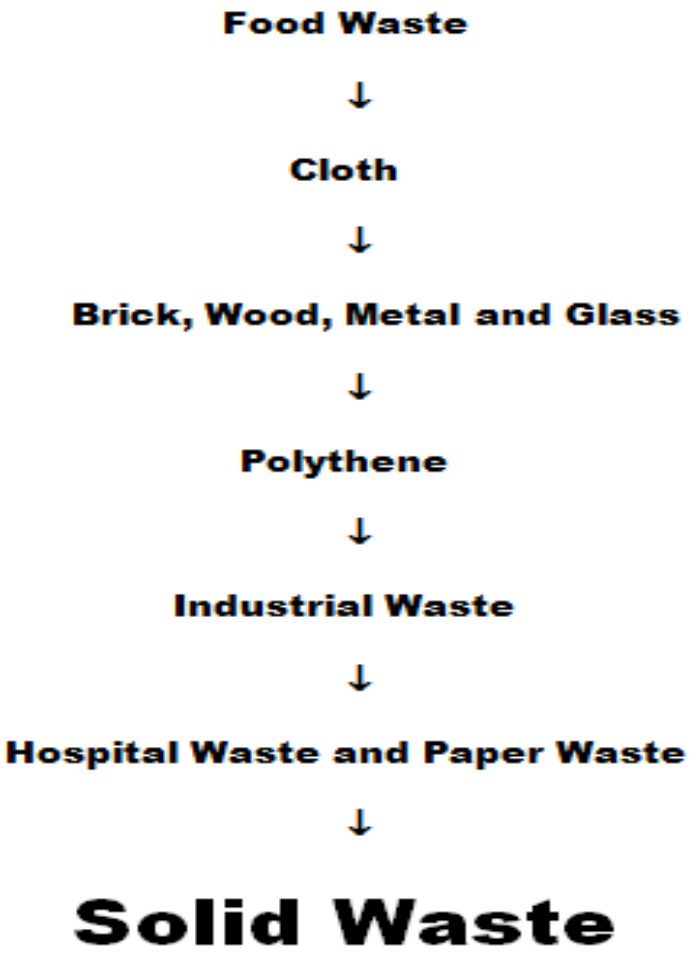

Figure 2: Composition of Solid Waste

Figure 3: Cleaning of composite solid waste

Figure 4: Cleaning of composite solid waste in Uttara Zone,Dhaka

8. Solid Waste Generation perDay:

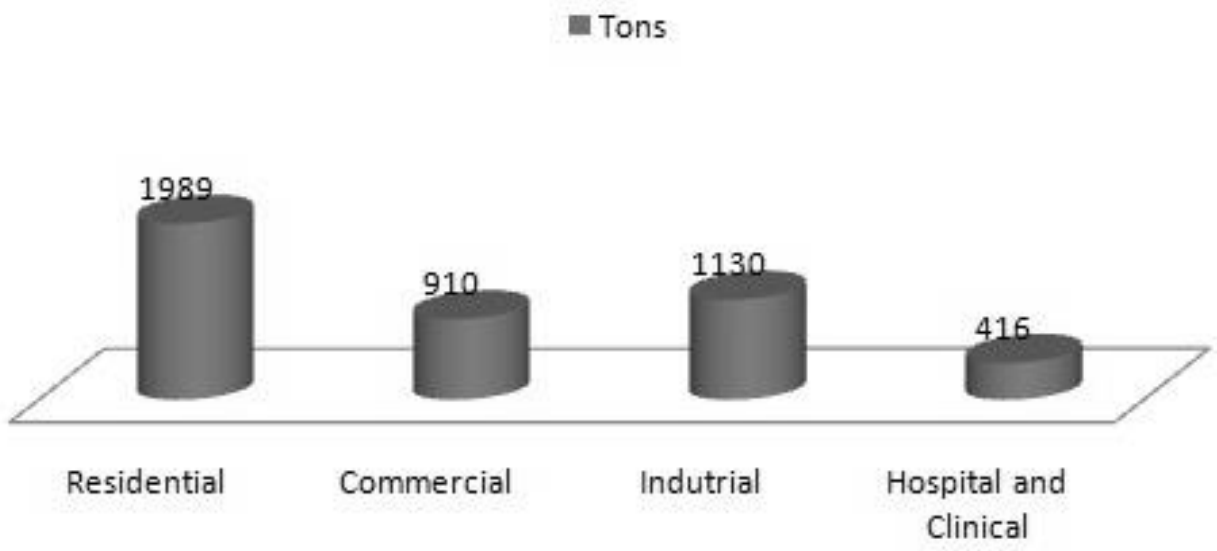

Figure 5: Solid Waste GenerationperDay in Tons

9. Education Level of the Workers

By questionnaire survey, the education level of the solid waste workers of the capital Dhaka City of Bangladesh is given in the table below.

Table 3: Education Level of the Respondent (Found from Questionnaire Survey)

Education Level of the Workers	Percent (%)
Uneducated	45
Primary school pass	30
Under SSC pass	9
SSC pass	6
HSC pass	5
HSC pass to Under graduate	3
Graduated	2
Total	100

The above table showed that, the percentage of uneducated people was about 45% where encompasses mostly the rickshaw puller, day laborer and other percentage shows that people were educated in primary, SSC, HSC, Under graduate and graduate level.

We can understand the condition from the figure below:

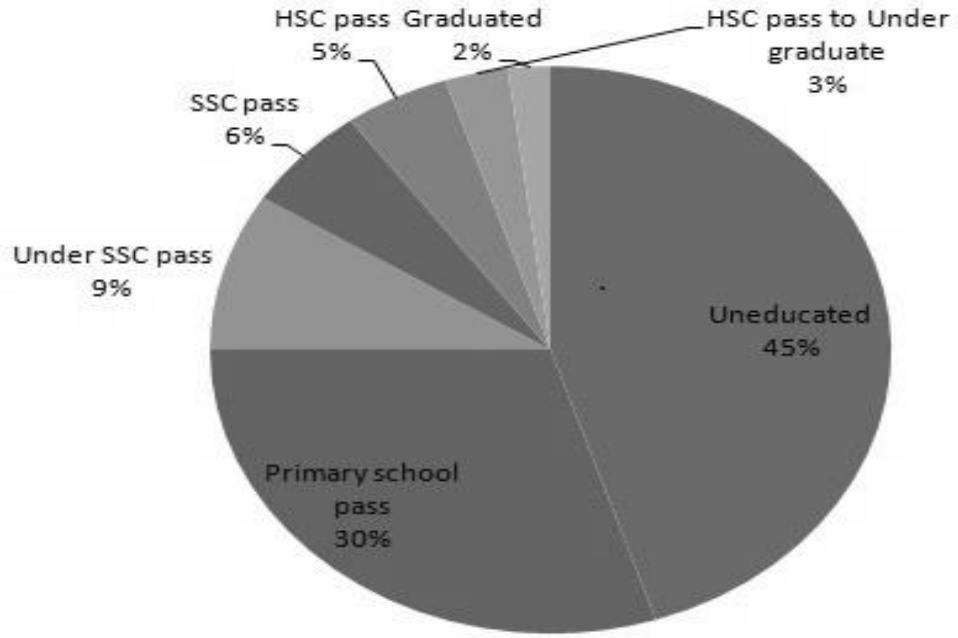

Figure 6: Education Level of the Respondent

10. Potential Sources of Waste

There are many sources of waste production, but truly potential sources are residential and commercial source. Different commercial and residential sources are explain here-

10.1 Commercial Sources

Commercial sources are one of the bulky sources of waste production. Commercial sources mean different industries like garments, pharmaceuticals Company, hospital and other industry. Basically huge chimerical are used by different industries like sulfuric acid, chromium, ammonium sulfate, ammonium chloride, and calcium oxide. The wastes may contain chromium salts and/or tannic acid. The manufactures also use pesticide and fungicide. Metallic and non-metallic industries may produce solid waste containing some sort of heavy metals. Dust discharged from smelter or furnace of those factories may often contain heavy metals to some extent, so that, if dust is not disposed of appropriately, dust will be a pollution source of soil as well.

Hospital and pharmaceutical industries produce three types of wastes-

- Infectious waste -(Pathological tissues, organs, body parts, blood and blood products, body fluids, placenta, human excreta, culture materials from laboratories and other infectious materials.)
- Sharp Waste(Needles, syringes, intravenous set, scalpel, saw, blades, broken glass, nails and sharps generated from support service, etc.)
- Non-infectious Waste(Expired drugs, waste contaminated with Cytotoxic drugs and leftover Cytotoxic drugs & radioactive waste)

(Source: Information is modified from Manual for Hospital Waste Management, Ed. By A.K.M. Saiedur Rahman, General of Hospital Services, Ministry of Health and Family Welfare, 2001)

10.2 Domestic Waste

Domestic waste is another big source of solid waste, which is about 1718 tons /day at a percentage of 49.08 %. These contain paper, vegetable peelings, onion seed coat, broken plastic and festal, spider etc, soil and dust, pieces of thread, animal fasces, grasses, used shoes, pieces of cloth, small bottles, soot, used car parts, etc.

10.3 Hospital and Clinic Waste

There are more than 500 clinics and hospitals in Dhaka City, and all hospitals and clinics are producing huge amount of waste in every day. The present average of clinical waste generation in hospitals and clinics is calculated using 1kg/bed/day and an extra 200 kg/year for clinics. It is estimated that 20 percent of the whole hospital wastes (255 tons, 7.29 % of total solid waste generated per day) generated in the city is infectious and dangerous.

Waste is collected from small bowls (plastic or metal) or plastic bins provided for each bed and emptied into larger containers. Wastes from operation theaters, laboratories, and kitchens are also dumped into these municipal bins. Since hospital wastes contain toxic and infectious materials, they are more unsafe than other types of wastes. In Dhaka, all types of medical wastes, like syringes and needles are thrown into the municipal dustbin. For this reason inflectional diseases spread out easily.

10.4 Tanning Waste

Tanning waste is another type of industrial waste, which is polluting the environment dangerously. There are about 149 tanning industries in Hazaribagh area in Dhaka and they are producing 18,000 liters of liquid wastes and 115 tons of solid wastes. Wastes from tanneries contain sulfuric acid, chromium, ammonium sulfate, ammonium chloride, and calcium. Tanning wastes have harmful impactions on environment in terms of health, welfare, and environment like fever, headaches, respiratory and skin diseases and may also bring undesirable changes in land use and fisheries. It has also negative impact on groundwater, surface water, and the ecosystem in general.

11. Recycling the Wastages

Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" waste hierarchy (Wikipedia). Recycling includes collecting recyclable materials that would otherwise be considered waste, sorting and processing recyclables into raw materials such as fibers, manufacturing raw materials into new products, and purchasing recycled products.

12. Step of Recycle

The first step of recycle is to collect waste from the community. All types of waste should not collect collectively. Because of waste are being in deferent categories. After collection waste will be sorting. Than recyclables are sent to a materials recovery facility to be sorted and prepared into marketable commodities for manufacturing. More and more of today's products are being manufactured with total or partial recycled content. Common household items that contain recycled materials include newspapers and paper towels; aluminum, plastic, and glass soft drink containers; steel cans; and plastic laundry detergent bottles. Recycled materials also are used in innovative applications such as recovered glass in roadway blacktop (glass halt) or recovered plastic in carpeting, park benches, and pedestrian bridges. Purchasing recycled products completes the recycling loop. By "buying recycled," governments, as well as businesses and individual consumers, each play an important role in making the recycling process a success. As consumers demand more environmentally sound products, manufacturers will continue to meet that demand by producing high-quality recycled products. The glass, lumber, wood pulp, and paper manufacturers all deal directly in commonly recycled materials. However, old rubber tires may be collected and recycled by independent tire dealers for a profit. Recycling is also an eco-friendly process. That's why it's become more popular in the resent world.

13. Waste Recycle and Environmental Benefit

A healthy environment is the essential condition for a happy life. In order to gain a healthy environment, management of waste materials is very essential. In very simple words, waste management is a process that involves collection, transportation, processing, recycling or disposal, and monitoring of waste materials (wastemanagment.net). The waste management method involves processing of waste materials for the purpose of producing new products. It prevents waste of potentially useful materials by reducing the consumption of new materials.

Waste recycle offers an admirable and environmentally-friendly process. Waste management methods reduces air, water and land pollution, it also limits the need for new natural resources, such as timber, petroleum, fibers and other materials. Waste reduction is a way to reducing greenhouse gas emissions, a contributing factor to global warming. Greenhouse gases, such as carbon dioxide, methane and nitrous oxide trap heat in the lower atmosphere that would otherwise escape to the stratosphere. Both the manufacture and distribution of products and the disposal of associated solid waste in landfills can contribute to the emission of Greenhouse gases (East-West Gateway Council of Governments.p.8). Waste recycle will help to reduce greenhouse gas emissions by diminishing the energy needed to make products from raw material; reducing emissions from incinerators and landfills. Solid waste recycle can eliminate air, water and land pollution. Ammonia, carbon dioxide, carbon monoxide, methane are produces from solid waste and that creates huge pollution. In Bangladesh maximum rivers are polluted by industrial wastages. In same way land and air also become polluted. Buriganga River, which flows by Dhaka, is now one of the most polluted rivers in Bangladesh because of uncontrolled dumping of industrial and human waste. "Great part of the Buriganga is now gone, having fallen to insatiable land grabbers and industries dumping untreated effluents into the river," said AinunNishat, a leading environmental expert. "The water of the

Buriganga is now so polluted that all of the fish have died and increasing filth and human waste have turned it into a black gel. Even rowing across the river is now difficult for it smells so badly," he told to the reporters. (Financial Express, 7). A World Bank study said four major rivers near Dhaka — the Buriganga, Shitalakhya, Turag and Balu rivers receive 1.5 million cubic meters of waste water every day from 7,000 industrial units in surrounding areas and another 0.5 million cubic meters from other sources.

"Unfortunately, all these bad things - encroachment dumping of industrial waste occur in full knowledge of the authorities," said Professor Abdullah Abu Saeed, a renowned activist for "Save Buriganga, Save Lives." Among the top polluters are dozens of tanneries on the banks of the Buriganga. The government has initiated to move the tanneries outside the capital, and also asked illegal encroachers to vacate the river. There are no fish or aquatic life in this river apart from zero oxygen survival kind of organisms. Chemicals such as cadmium and chromium and other elements such as mercury carried by the industrial waste are also creeping into the ground water. If we want to protect our river we have to take initiative now. Industrial wastages should recycle properly. Otherwise we can't save our environment.

14. Recycle and Employment

Wastages are not only great sources of investment; it can also play a vast source of employment. It creates huge employment opportunities. Wastages recycle will help us to reach a sustainable solution and develop our entrepreneurial actives. We have to start our waste management process at micro level, like community level. Most of the develop countries are trying to rethinking about their garbage and developing an extensive system to decrease environmental hazard and cost-effective solution of wastages. Bangladesh is one the poor country of the third world and Dhaka city is one of the most populated and polluted metropolitan city of the world. Unemployment problem is another crucial issue for Dhaka city. For this reason wastage recycle is the most excellent solution for Dhaka city. Waste recycle provides three great particulars to us, like neat and clean city, employments, recycle goods. So recycle will help us to solve our three big problems.

15. Results and Discussion

In the study the following obstacles and prospects have been identified and the necessary discussions are included. Waste Management Activities by DCC 45% DCC workers sweeps roads and drains are daily, 55% DCC worker sweeps roads & drain often. According to the results the status of DCC sweeps roads and drains are not good. 70% DCC Cleaners Accumulates wastes from roadside & transfer to the nearest dustbin/container often, and 30% do these activities daily.

So, in this case, DCC cleaner's activities are not good enough. Only 20% cases DCC's trucks dump to the dumping depots and Dressing by bulldozers, tire Dozers, pay loaders & excavators daily. On the other hand (80%) cases DCC's trucks dump to the dumping depots and dressing by bulldozers, tire Dozers, pay loaders & excavators often. So, in this case DCC management couldn't maintain the regularity. Waste collection is not efficiently planned and does not reach all communities in most places, the municipality is collecting waste only once a week, a

practice that has created illegal dumping. So, it is clear that there is a big problem with regularity among the DCC waste management System.

15.1 Obstacles to Solid Waste Management:

(60%) respondents said that financial problem is the main obstacles to Solid Waste Management, (30%) respondents said about institutional problem and (10%) said Legislation and regulation problem is the main obstacles

15.2 Legislation and Regulations Problem

These are set up for particular purposes, and are often difficult to adapt to new circumstances. In particular, the legislative and regulatory context of solid waste management is dispersed, fragmented, and incomplete, and so does not tend to facilitate the formation of cross-sectoral partnerships. But if such partnerships come into being, existing legislation normally provides few tools for coordinating or managing them, which ultimately reflects in our current waste management situation. Presently, the solid waste management system in Bangladesh is not organized well. However, efforts are under way to improve the organizational structure for solid waste management in different cities/towns. Solid waste management is organized and run by a conservancy section of the urban local bodies, whose prime responsibility is maintenance of the sanitation system. The number of staff for conservancy varies from city to town depending upon the size of the city and the workload. Some of the cleaners and sweepers are hired on a temporary basis. Although the organizational structure deals with the collection and storage of waste as well as street sweeping, separate departments in the city corporations and municipalities transports the waste. The chief conservancy officer or the conservancy officer in the municipalities has to coordinate with the transport department to get the waste transferred from collection points to designated waste disposal sites. In addition to the shortage of personnel, the staff is handicapped with a relatively small amount of resources.

15.3 Negative Impacts of Poor Waste Management

This study finds out that (40%) respondents said that poor waste management is harmful for health, 35% respondents said about river pollution and 25% said that it is harmful for floating children. One of the most adverse impacts of poor waste management, especially municipal waste, is the incidence and prevalence of diseases such as malaria and respiratory problems, as well as other illnesses through the contamination of ground water. Biomedical wastes pose great danger in Bangladesh too as a report estimated that 20% of the biomedical waste is "highly infectious" and is a hazard since it is often disposed of into the sewage system or drains. Such poor sanitation has serious consequences for the health of the residents and a report suggests ‘most of the child mortality could be related with this problem’. With regards to the living standards, solid waste leads to blockage in the drainage system, which leads to flooding in the streets.

Consequently, mosquitoes and bad odor are among the negative impacts resulted. Dhaka City is situated on the river Buriganga. The River is afflicted by the noisome problem of pollution. The chemical waste of mills and factories, household waste, medical waste, sewage, dead animals, plastics, and oil are some of the Buriganga's

pollutants. The city of Dhaka discharges about 5,000 tons of solid waste every day and most of it is released into the Buriganga.

15.4 Elimination of Environmental Problem

To eliminate environmental problem, the following measures could be taken:

- ✓ Increase the facility of house-to-house collection in all areas of DCC.
- ✓ Assurance of regularity in collection and transportation of solid waste from the household, bins and primary dumping stations.
- ✓ Separation and collection of separated waste separately from the house by increasing awareness.
- ✓ Increase awareness for reduction of solid waste generation.
- ✓ Implement proper environmental laws.
- ✓ Transportation of solid waste during nighttime instead of daytime. If it transport during daytime use cover on the waste transportation vehicle to reduce the odor pollution and other associated problems.
- ✓ Increase the salary and safety of the labor who working in the solid waste management system.
- ✓ It is unlikely that government agencies alone would be able to tackle this problem. A combined effort by NGOs like Waste Concern, Legal Organizations like BELA, External Support Agencies Institutional Member; (ESAs), entrepreneurs and communities is essentially needed.

16. Conclusion

In Bangladesh we have some common dreams that are neat, clean and poverty free society, and waste recycle process can help to bring this dreams into reality. But government alone cannot bear the responsibility. We have to work together and share these responsibilities. The city corporations have started to organize their own waste collection services for keeping their localities clean. The city corporation starts their work on the basis of their community arranged system. Wastages are being collected from households and carried to then ear by municipal roadside containers. The community-managed house-to-house waste collection service is gaining momentum in Capital Dhaka City and gradually expanding into a major environmental movement. In Dhaka City, more than 170 communities of varying sizes (less than 50 to more than 300 households) have started this participatory intervention. The system has already increased garbage collection coverage by 20 percent of the generated waste and created approximately 500 jobs and proven to be appropriate for addressing local problems (Mousum, 2007).We can save our environment and also become finically benefited through concerted efforts. Waste recycle also reduces the greenhouse gas reduction. The recycle waste helps to decrease the energy need of new production and reduces emissions of carbon dioxides in the atmosphere. That is why we have to increase waste recycling actives and help to increase environmental benefits for our future generation.

Dhaka City Corporation (DCC) is unable to offer the desired level of services with the existing capacity and trend of waste management. Projection of future generation rate indicates that by the year 2020 it may exceed 32 thousand tons/day, which in turn will require over 200 acres/yr of landfill area. Experts have suggested that a community based solid waste management system involving recycling and

composting in conjunction with sanitary landfilling with possible provision for transfer station to account for long distance of landfill sites may be the possible way out of the current inefficient system. To reduce the undesirable adverse impacts of overflowing of waste bins and accumulated wastes on roadsides, strict rules must be applied on the management related activities and the level of public awareness should be increased.

Waste Management is an issue of renewed focus and no longer to be neglected. In our country this problem is very acute. Extensive research works are needed in this field to find ways to abase the problems arising from improper solid waste management. A number of studies have been conducted in Bangladesh and few studies have also been conducted in Chittagong on the issue of waste management. But an integrated study enveloping manifold aspects of waste management like waste generation, reasons behind improper waste management have got little focus in the studies of earlier researchers. This research gap has created proclivity in present researchers to conduct a research on the issue.

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