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Solid Waste Management System of Dhaka North City Corporation and Process Development for Healthy Environment: A Case Study

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ABSTRACT

Waste is one of the problems that require appropriate policy, law, effective strategy, management and cooperation. The indiscriminate dumping of solid waste on roadsides and into drains is leading to serious health hazard and degradation of living environment for millions of people. This study aims to provide the information about the current zone-wise waste management system, practices, existing problems and people's perception in Dhaka North City Corporation (DNCC) to ameliorate the scenario for future. Data were collected by semi-structured questionnaire survey with 200 families as well as Key Informants Interview (KII) at DNCC to understand the waste generation in relation to population growth, new consumer product in market, income level, and education. It is found that the volume of waste generation will be reached 1954063 MTs in 2025 in compare to 560880 Million Tons (MTs) of 2014 with a growth rate 7.5% to 68.9% respectively. Surprisingly, this study also revealed that income and education level has considerable influence on waste generation in DNCC. People perceived strong and integrated cooperation by the government, NGOs, media, the community leaders, concerned authorities, political leaders, the civil society, professional organizations and voluntary organizations could be helpful to improve this situation.

KEYWORDS: Education, waste generation, collection, management, ISWM, Income, Practices.

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INTRODUCTION

With the advent of urbanization and the soaring economic growth, both developed and developing countries have been facing the challenges to maintain urban solid waste, which has turned into one of the most serious environmental issues. Wastes are defined as unwanted or unusable materials. Waste is any substance which is discarded after primary use, it is worthless, defective and of no use. According to EPA[1], waste is "any discarded, rejected, abandoned, unwanted or surplus matter, whether or not intended for sale or for recycling, reprocessing, recovery or purification by a separate operation from that which produced the matter"[2, 3]. Dhaka, the Capital City of Bangladesh, is expanding rapidly turning it into a mega city with an enormous growth of population at a rate of around 6 percent a year[4]. In Dhaka city, with the increasing population growth, there is a massive problem of waste management. Ever-growing urbanization has made solid waste management a serious and a more complicating issue for the management authority. Waste is an unavoidable byproduct of human activities. Economic development, urbanization and improving living standards in cities have led to an increase in the quantity and complexity of generated waste.

Rapid growth of population and industrialization degrades the urban environment and places serious stress on natural resources, which undermines equitable and sustainable development .Rapid growth of industries, lack of financial resources, inadequate trained manpower, inappropriate technology and lack of awareness of the community are the major constraints to solid waste management for the fast growing metropolis of Dhaka. Solid waste disposal poses a greater problem because it leads to soil pollution if openly dumped, water pollution if dumped in low lands and air pollution if burnt. Dhaka city is facing serious environmental degradation and public-health risk due to uncollected disposal of waste on streets and other public areas, clogged drainage system by indiscriminately dumped wastes and by contamination of water resources near uncontrolled dumping sites[5] .The Dhaka City Corporation (DCC) is responsible for solid waste management. DCC is facing serious problems in providing a satisfactory service to the city dwellers with its limited resources and a poor management plan. An inadequate information base (regarding quantity, type and characteristics of wastes), poor operation and maintenance of service facilities and above all lack of civic awareness on the part of a section of the population are adding up to the deteriorating environmental situation. Absence of monetary assets, institutional shortcoming and inappropriate choice of technology and absence of public consciousness have made solid waste management services far from satisfactory[6]. City administrations in many urban areas and towns are as of now over-troubled, and just can't take care of the developing demand for municipal administrations, bringing about unhygienic and smudged living condition in the areas [7].

In developing countries, particularly in Bangladesh the volume of waste generated has been quite significant. It has been estimated that 14 thousand tons of solid waste are being generated in 522 urban centers per day [8-11]. Bhuiyan (2010)[12] argues that the projected rise in solid waste per capita in 2025 will be around 0.60kg[12]. With such an enormous volume of solid waste only 56 percent are collected and dumped as per the report [13]. So it is time to address these issues urgently. A healthier, cleaner city life, comfortable and sound environment are rightful demand for people dwelling in city areas as municipality collects tax for waste management services.

The objective of this study was to increase efficiency and effectiveness of waste collection and management system which will help in decision making regarding zone wise waste collection and management. It was aimed to scrutinize the present state of waste generation, characteristics and its management practice in DNCC area. The study also looks at the impact of solid waste disposal on Environment along with ways to sustainable waste management for healthy environment. In addition, it was estimated of the total quantity of household waste generation and density of waste generated in Dhaka North city Corporation (DNCC) and to understand the strength of the process development of healthy environment.

METHODOLOGY

The methodology of the study included empirical field observations, field level quantitative data collection through inventory, questionnaire survey, formal and informal interviews, secondary data collection by published-unpublished sources, using SPSS software for primary data analysis, related statistical tests for analyzing/quantifying data, and laboratory analysis also conducted for understanding the impact of MW.

The questionnaire was selected as a means of collecting information from Household Consumption and Expenditure (HCE) by a field survey of DNCC area and the information was also collected from different staffs of the selected five wards. Close and in-depth-interviews were also conducted for understanding the problem and issue related to the study.

Study area

Dhaka metropolitan area is the fourth most densely populated city in the world with a population of 18.89 million. Corporation's area of Dhaka City i.e., North and South lies between 23.69° and 23.89° North latitudes and 90.33° and 90.44° East longitudes[7] with covering about 127 km^2 of land area. Dhaka North City Corporation (DNCC) is situated in the northern part of Dhaka City which consists of 36 wards. It lies between 23°44' to 23°54' East Latitude and 90°20' to 90°28' North Longitude with covering an area of 196.22 km^2This study is conducted in the Dhaka North

City Corporation (DNCC) area (Zone-1: Uttara) (Figure 1).The Zone-1 (Uttara) of DNCC is consists of two wards and thetotal area is about 11.570 km[14].

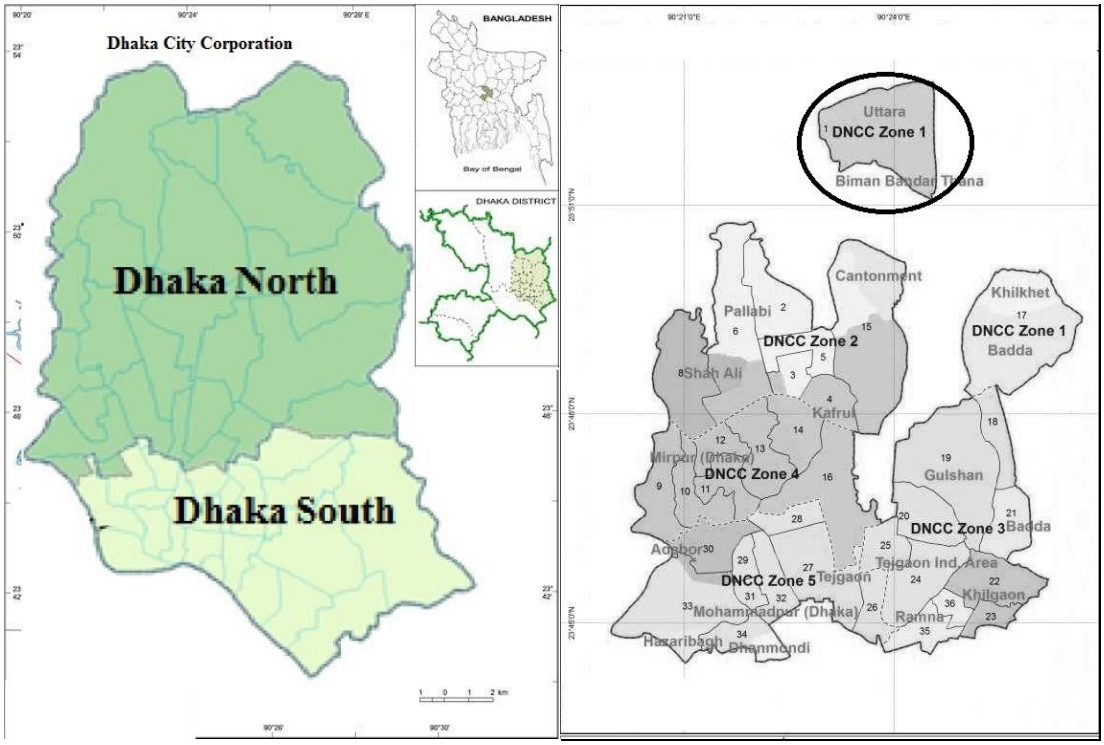

Figure 1. Study area Zone 1 (Uttara) under DNCC[15]

Data Collection

The study comprises solid waste generated by household sector and managed by the local community. It is focused on primary data survey in 2019 and 100 households were interviewed by means of questionnaires. Questionnaire measured keeping eye on existing solid waste practices as well as individual knowledge, attitudes, concerns, eagerness to participate on the general issues of solid waste. Interviews were carried out among people who are the guardian of house and face to face at respondents in absence of main person of the homes throughout the Area. Interviews are run between 10.00 am and 12:00pm in two days. The research at the 100 households was gained by sampling technique. The sample distribution was selected such that it was reflected on different socio-economic circumstances (High income, Middle income & low income). The survey was run across the group of the population and personal interviews were used to collect data.

RESULTS AND DISCUSSION

Dhaka City Corporation collects municipals waste which is accumulated in DCC's bins or container. About 8886 cleaners are employed for street sweeping and collection of waste found in

places other than dustbin, roadside, open spaces, ditches etc. by hand trolley. It has 2080 hand trolleys for primary collection of waste. DNCC has 115 demountable container carrier trucks for collection of accumulated waste in 414 containers and 242 open trucks to collect waste from municipal bins at different locations. Manpower allocation to collection and transportation in DNCC and DSCC is summarized in Table 1.

Table 1. Number of Cleaners and Drivers in DNCC and DSCC

Workers category	Number	
	DNCC	DSCC
Cleaners	3586	5300
Waste management drivers	108	183
Central Garage	1	1
Number of waste carrying container	180	270
Number of waste collection trucks	115	235

Source: Field Survey, 2019

Though residents are responsible for bringing their waste to the waste collection points, NGOs/CBOs/private sector provide primary collection services to collect waste door-to-door and transport the waste to dustbins, containers, or sometimes to vacant lands, by rickshaw vans. The city corporations are responsible for secondary waste collection to remove waste from its dustbins or containers, and transport the waste to final disposal sites. During study it was found that all garbage of the DSCC is transported to Matuail landfill site while the DNCC uses Amin Bazar landfill site. According to DNCC total waste generated per day in DNCC is 3000 tons and 70 percent of waste is organic (Table 2).

Table 2. Physical Composition of Solid waste

Volume of waste	Types	
Types of waste	organic	inorganic
Total waste	2100000	900000
percentage of total waste	70	30
Average per capita waste gene rated	.53	.22

During the field study 100 households taken as Sample from the wards of the 5 zones of Dhaka North City Corporation in which it revealed that vegetables contribute the most percent (Figure 2).

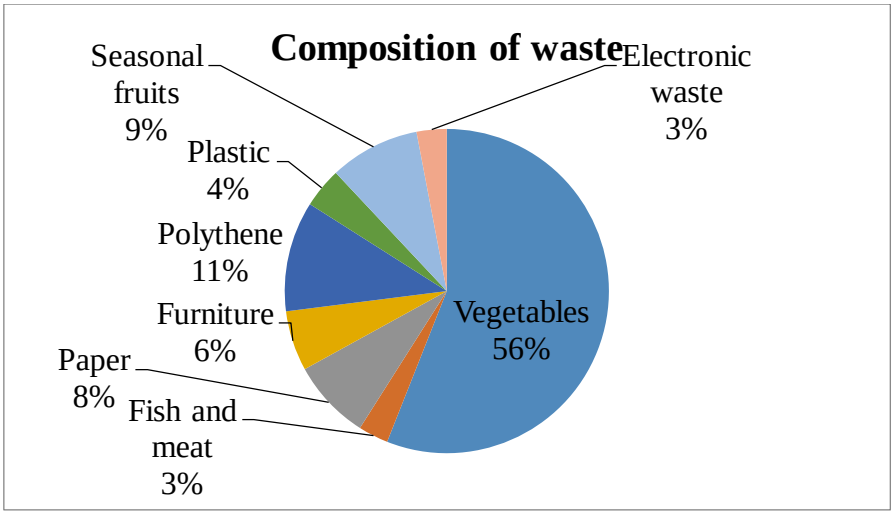

Figure 2. Composition of solid waste in DNCC

Waste generation changes all the year round. Out of 100 households, it was revealed that highest amount of waste generates in rainy season (45%) whereas 31 households responded during all over the year and 20 households believed festival may accelerate. During the study households were asked about the process or sorting of waste number and size of waste bins. Out of 100 households plastic bucket has been used by 49 households. Reason behind using bucket is to its low cost, durability and convenience of movement and handling. Besides, 18 household were using plastic bags and drums and 8 were polythene respectively.

Roads and open space cleanliness: Households' opinion:

The study has showed the households' opinion regarding cleanliness of roads and open space in their area. Out of 100 households' give their opinion about the cleanliness activities by the city corporation (Figure 3).

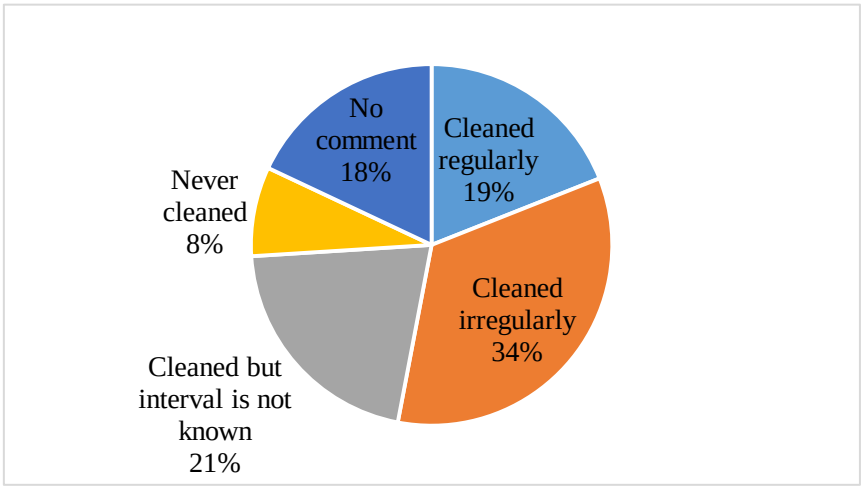

Figure 3. Households' thinking regarding roads and open space cleaning

Projection of waste growth at DNCC

It is evident from the facts and figures that the waste growth will continue in this rate if the present rate of waste growth persists. In 2025 the waste growth will be 68.86% (Table 3)

Table 3. Waste generation since 2014 and projection for 2025 (%)

Year	Generation (%)
2014	7.5
2015	13.31
2016	24.75
2017	21.93
2018	30.555
2019	36.028
2020	41.501
2021	46.974
2022	52.447
2023	57.92
2024	63.393
2025	68.866

CONCLUSION

The generation of waste is increasing by coping with the rapid growing population. Dhaka City Corporation (DNCC and DSCC) is responsible for the waste collection and transportation where an integrated and sustainable approach is necessary to introduce in Dhaka city. The uncollected and unplanned waste creates a heavy drainage problem especially in the monsoon season. The open disposal and random dumping system is unhygienic for environment where modern technology and equipment is needed. Vast portions of waste do carry the compostable content which can be recycled in a scientific and sustainable way.

To ensure the sustainable solid waste management in Dhaka North City Corporation the following measures can be adopted for the purpose of strengthening the process development of healthy environment, (i) Educated and high income group have more waste generation, therefore awareness is also essential for them, (ii) Compulsory environmental education in school curriculum. Every house is one school and every mother is a teacher of her child. So mother can teach her child about environment pollution and necessity of neat and clean environment, (iii) Voluntary involvement in various campaigns and solid waste management activities, (iv) Publicity of waste management practices through distributing of leaflets, posters and mass media support, (v) Practicing

source separation of waste and proper application of provided facilities, (vi) Educate women about necessity waste separation and storage facilities, and (vii) Educate peoples about the sanitary habits in the various religious institutions.

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