



## State of urban solid waste administration: A GIS based analysis of Dhaka South City Corporation (DSCC)

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### Abstract

Dhaka, the capital city of Bangladesh with a population of nearly 15 million is the only mega city in the country. About one third of the total urban population of the country lives in this city. Although Dhaka is the heart of the country, it is beset with serious environmental crises such as solid waste management. Waste collection was a most important process of solid waste management. This study was undertaken to identify the process and methods used to collect waste. Located in the older part of Dhaka city characterized by high population and economic activities densities Ward 33 of Dhaka South City Corporation was selected as a study site. Ward 33 is. It found that the city authority has not been able to solve the waste problem due to the lack of manpower, necessary equipment and poor governance. Waste generation was the highest in this area in comparison with other areas in the city but the collection services were not sufficient and uneven. While most of the household wastes were collected by door to door services using waste collection vans (bicycles) the mapping results revealed that some parts of the Ward did not get served properly and equally or missed entirely.

**Keywords:** Dhaka, environmental crisis, GIS, household waste, urban solid waste management, waste collection service

### Introduction

At present Bangladesh is rated the most populated nation in South Asia having roughly 150 million individuals where the population density is 1,125 per square kilometer (Hossain & Uddin, 2014). During the period of 1951, 95.67% of the entire population was rural. However, this circumstance began to change as urbanization has been increasing at the disturbing rate of 3.27% brought about by rural-urban migrations in search of better living conditions (DOE, WC & ITN-BUET 2004). The Urban population of this nation is presently 40 million, which is 28% of the aggregate population of this nation and it is anticipated that it will be 140 million in 2040 (BMDF, 2012; APO, 2005). Among the urban zones of Bangladesh, Dhaka city is the most under pressure of this rapid urbanization. It was voted as by the Economics Intelligence unit as the second most exceedingly bad place of this planet to live. At growth rate of 6% every year its 14.2 million (BBS, 2012) population is projected to reach 20 million, by 2020 (Zahur, 2007) making the most congested spot over the globe (Matter, Dietschi & Zurbrugg, 2013). Yet In spite of the fact that Dhaka is the heart of the nation the physical development of Dhaka is extremely and erratic (WSP, 2000). On account of the impromptu and unmanageable development, the city is confronting major issues like inadequate housing, and lack of utility and amenities. Other than these, the city power authorities likewise neglected to take care of the demand of the city occupants because of the rapid development of the population, poor economy, and in suitable arrangement and plans and low capacity of the power (Ahmed & Quader, 2011). Under these situations, Dhaka has also been facing several environmental issues like sanitation blockage, absence of water supply, air contamination, water

pollution, traffic congestion, waste management problem, deforestation etc. (Alam & Boie, 2001). Among these, solid waste administration has turned into a noteworthy concern towards the urban communities and towns of Bangladesh. Controlling urban solid waste is an inevitable challenge in developing countries, basically in the larger urban centers like Dhaka city (Afroz, Hanaki & Tudin, 2011). Hasty and unpremeditated urbanization leaves regions to a great extent overpowered with regards to the gathering and dumping of mounting measures of solid waste (Medina, 2005). Absence of monetary assets, institutional shortcoming, inappropriate choice of technology and absence of public consciousness has made solid waste management services far from satisfactory (DOE, WC & ITN-BUET 2004). 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 (Taniya, 2014). So as to manage the overall circumstance, legitimate study is required to break down the urban waste administration situation of Dhaka City (Enayetullah, Sinha and Khan, 2005).

Economic improvement, urbanization and enhancing expectations for everyday comforts in urban areas, have prompted an increment in the amount and multifaceted nature of producing waste (Zahur, 2007). Solid waste management represents a prominent issue in light of the fact that it prompts land contamination if transparently dumped, water contamination if dumped in the swamps and air contamination if smoldered. Dhaka city is confronting serious environmental imbalance because of the uncollected transfer of waste on avenues and other open territories, obstructed seepage by tainting of water assets close uncontrolled dumping locales. Almost all the area of this city does not experience adequate waste management (UN Habitat, 2010). The residents of this city are not content about the present circumstance. Authority is searching for approaches to enhance the general circumstance likewise by expanding reusing rates (MoEF, 2010; Bahauddin & Uddin, 2012). A huge volume of solid waste is produced each day in the city regions and shockingly solid waste administration is being disintegrated step by step because of the constrained assets by taking care of the expanding rate of waste created. The urban zone of Bangladesh produces roughly 16,015 tons of waste for each day, which indicates more than 5.84 million tons every year. It is anticipated this sum will grow up to 47,000 tons per day and near 17.16 million tons for each year by 2025 because of development, both in the population and the increment in per capita waste generation (Ahmed & Ashfaq, 2002). Taking into account the present aggregate urban population, per capita waste generation rate is estimated at 0.41 per capita on a daily basis in urban territory of Bangladesh (DOE, WC & ITN-BUET, 2004). If we think globally, the calculated amount of Municipal Solid Waste (MSW) is 1.7 – 1.9 billion metric ton (Ray, 2008).

Near about 40% waste is collected by the authority, but uncollected waste is dropped in open dustbin beside the road which is very detrimental to the environment. Considering the Dhaka city's fast development and lacking waste management, the requirement for enhanced strong waste management shows a key open door for concurrently tending to the environmental and health issue (CCAC, 2014). There is a variation of waste generation between Old Dhaka and New Dhaka. Dhaka creates roughly 1.65 million metric huge amounts of strong waste every year. Per person waste generation is somewhere around 0.29 and 0.60 kilograms dependent upon the people of various income levels (APO, 2007). As the exceedingly thick and urbanized capital of Bangladesh, Dhaka City is now producing 4,600-5,110 tons of waste per day (Mukti, 2015).

The two administrative units of Dhaka city (Dhaka North City Corporation and Dhaka South City Corporation) are in charge of collecting waste and its disposal in their particular ranges. A recent report of 2007 assessed that around 42% of the whole city's waste are managed by DSCC and DNCC. 14-17% of the city corporation budget is used for solid waste management (Zerin & Ahmed, 2009). Around 7,500 cleaners are occupied with road clearing and waste accumulation action as they collect waste from the bin located at several points in the area, but there is no specific rule and regulation of locating the dustbin. In situations where there are no containers, waste is just dumped on the surface. In some high class residential areas of Dhaka city, waste collection system is different and daily waste are collected in different ways (Hai & Ali, 2005).



**Figure 1.** Map of Dhaka City (Source: Dhaka Calling, 2015)

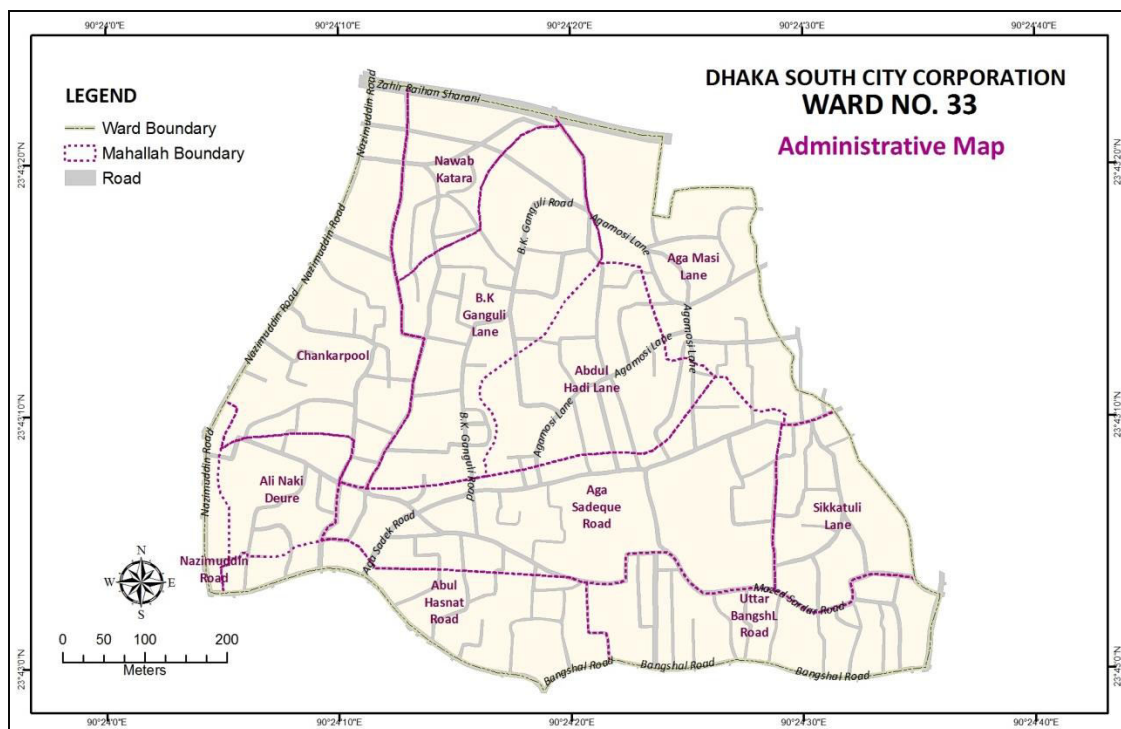
Old Dhaka, part of the DSCC is extremely dense in terms of population, trade and business activities. Very old and compact building structures, tight roads, commercial activities, absence of open spaces and inadvertent growth are the main characteristics of the area. Because of the profoundly populated region, it is extremely difficult for the city corporation authority to afford adequate support for waste collection. It is previously specified that, waste collection is unsatisfactory in DSCC regions as the administrative capacity of the authority is very poor. Considering the capability of the authority and context of the Old Dhaka region, this study has attempted to investigate the waste collection status, coverage of waste collection service, waste collection system, status of waste dumping station, proficiency of ward authority of waste collection and to sort the areas where waste collection services are not present.

## Objectives and site selection

In the broader context the aim of the study is to explore the waste collection status and system in the study area. More specifically the objectives of the study are;

- to identify the methods and coverage of the waste collection services.
- to identify the waste dumping spots in the study area.
- to explore the capability of the authority in collecting the wastes.

Ward 33 of Dhaka South City (DSCC) has been chosen for the present study, which was already numbered 69 of the Dhaka City Corporation (DCC) before. This area is very compact in terms of population and commercial activity. As indicated by Population and Housing Census-2011, more than 65 thousand individuals live in 12,891 family units. The size of the average family size unit is 4.9, 10,723 households live in residential units, 16 households are official and 2,152 households are kept in another category households (BBS, 2012). Most of the household's source of income is services activity. Table 1 illustrates the basic statistics of ward 33 and figure 2 shows the administrative units of the study area.



**Figure 2.** Administrative Map Of DSCC (Ward No.33)

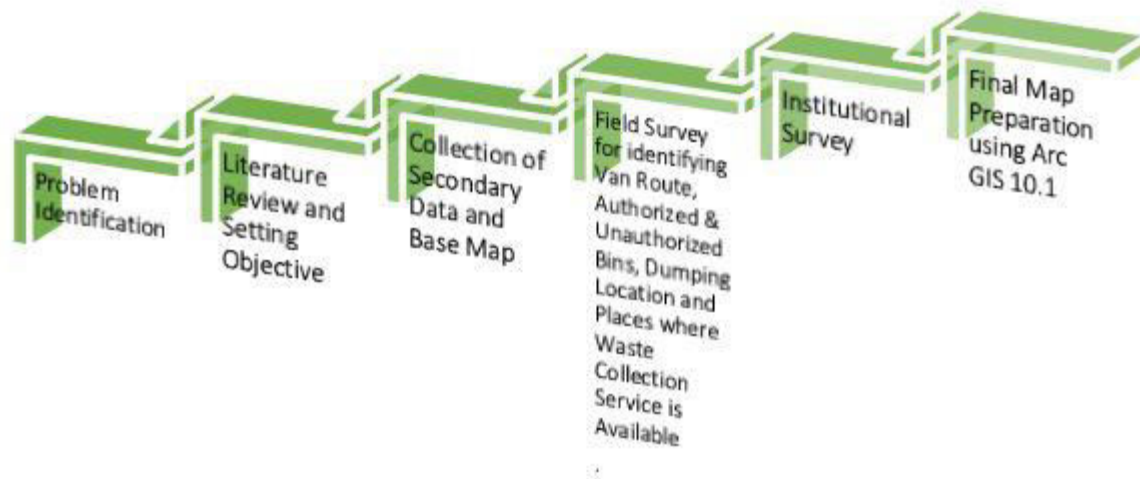
**Table 1. Demographic characteristics of the study area**

Population	: 65289	
Households	: 12891	
Average Household Size	: 4.9	
Household Types:		
Dwelling	Institutional	Others
10723	16	2152
Literacy Rate	: 73.40%	
Source of Income:		
Agriculture	Industrial	Service
Male-17, Female-0	Male-395, Female-9	Male-5168, Female-789
Electricity Coverage (% of HH)	:99.80%	
Sanitation Coverage (% of HH)	:96.90%	
Sources of Drinking Water:		
Tap	Tube well	Other
96.10%	3.60%	0.20%
Type of Household Structure:		
Pucca	Semi Pucca	Jhupri
86.20%	13.20%	0.30%

## Methodology

Base map of ward 33 was collected from two sources. One is from the DCA and another is from the Center for Urban Studies (CUS). Both these maps comprehend the major characteristics of the study region. Secondary data have been collected from different reports and statistics. To recognize the demographic qualities of the study area, information from the recently published BBS report has been utilized. Moreover, some other data with respect to the collection of waste were collected from the report of the DCA. Field survey (for mapping) and institutional survey have been done to collect data about solid waste management in order to know the waste collection coverage in different *mahallahs* by city authority, the van routes by which city authority collects waste, bin & its capacity, unauthorized dumping spots and those areas which do not get any waste collection service. Institutional survey was directed to identify the capacity of the ward authority regarding waste collection system by consulting with the people of ward office. Collected data were analyzed with Microsoft Excel 10 and mapping was done using ArcGIS 10.1.





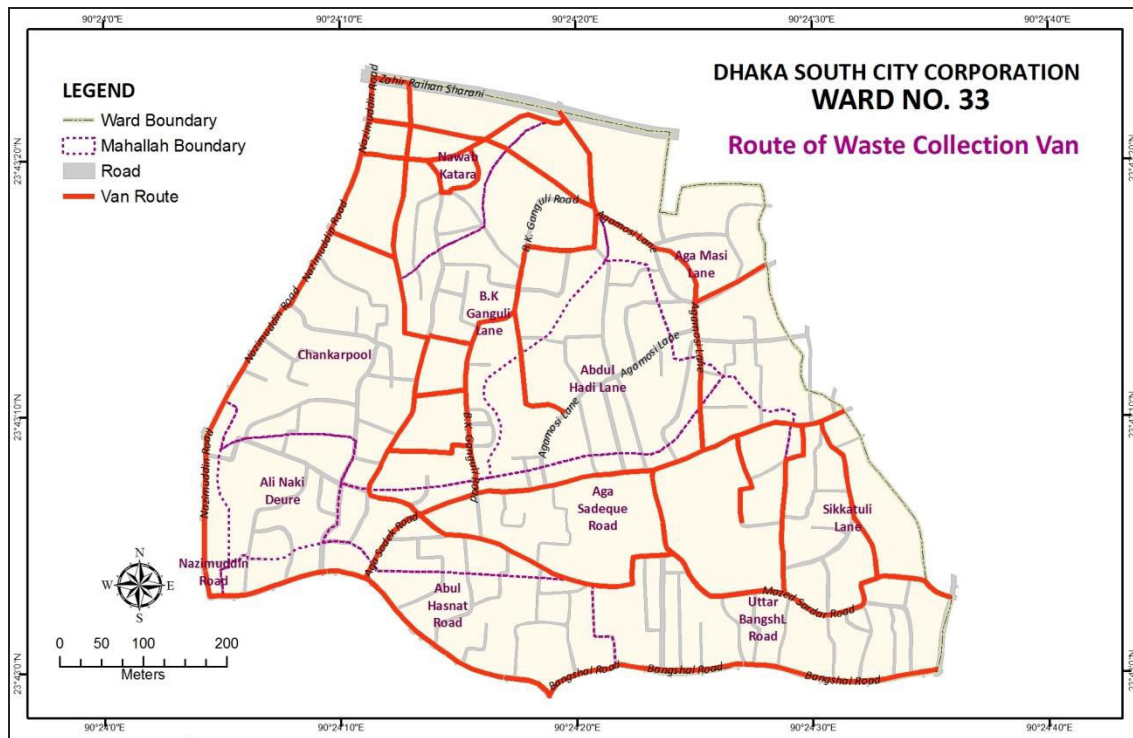
**Figure 3.** *Methodology of the study*

## Results and findings

Like other parts of the city, Ward 33 has a likewise absence of solid waste management services. It is difficult to collect waste material from each part of the area due to mixed land use pattern, high population density and narrow road structure. Everyday more than 32 metric tons of household solid waste are generated in Ward-33. But the city authority can collect and manage only 80% of the generated waste (Ward Authority, 2013). Around there are two sorts of waste collection framework existed in the vast majority of the zone. In most of the area, the city authority collects the household and industrial waste. City authority provides door to door services in some areas. In some important areas, the authority provides bin where local people dump their waste and city authority collect that waste. There are some locations where city authority does not provide any service. In that case, some persons are employed to collect their waste and they are paid monthly for their services. These people dump the collected waste in the nearest dustbin so that city authority can collect all the generated waste.

### *Household waste collection by vans*

Household waste collection through van service is a compelling approach to collect household waste. Waste collection is done by this procedure in most of the part of ward 33. Some of the dwellers claimed that, “the van services are insufficient and in some areas they do not collect waste regularly”. The following map shows the route of garbage vans in ward 33. It is clearly identified on the map that the service is insufficient in the western and southern part of the ward.



**Figure 4.** Route of waste collection vans in Ward 33



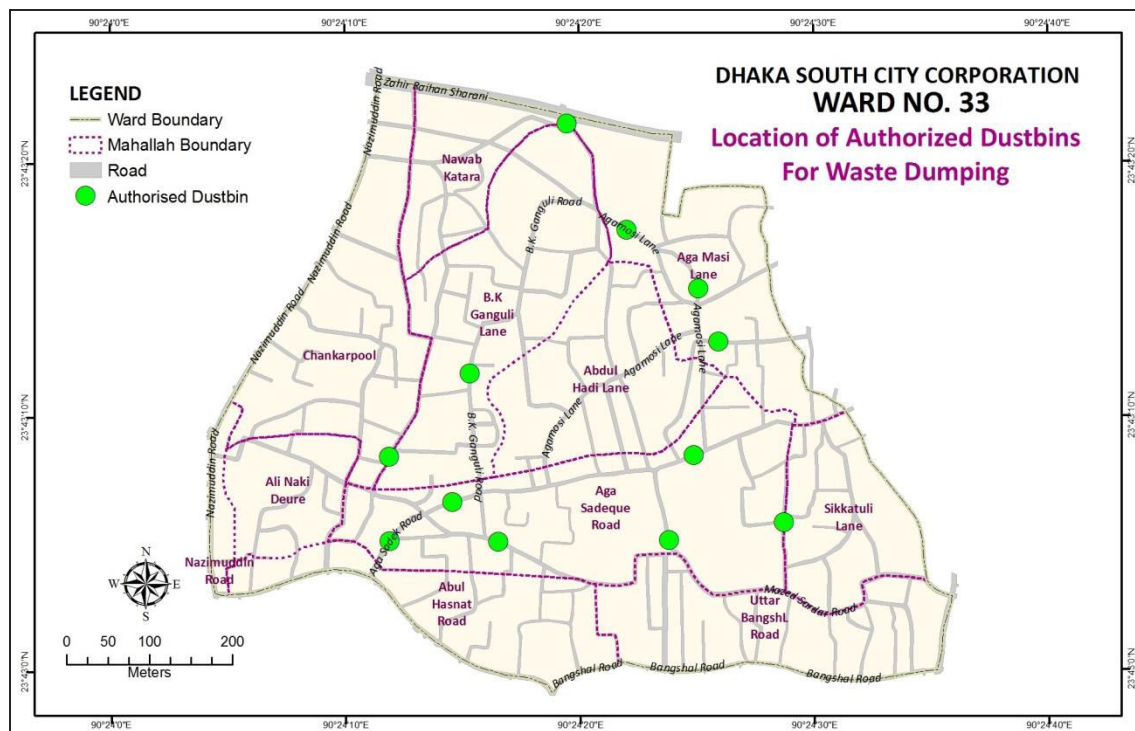
**Figure 5.** Waste collection 'vans'

#### *Collection from dustbin (Authorized)*

City authority provides dustbin to dump waste in some important locations in spite of the fact that these are not adequate. There are 12 dustbins in Ward 33 provided by City Corporation which are located in Chankarpool lane, Ali Naki Deury lane, Bangshal road, Aga Sadeque road, B.K Ganguli lane, Bangladesh Math, Shikkatuli lane and Agamasi lane. Consistently waste collection truck and van collect waste from those dustbins to the dumping station.



**Figure 6.** City corporation dustbin in Ward 33



**Figure 7.** Distribution of dustbins provided by City Authority in Ward 33

### Road side dumping area

Due to lack of door to door service and lack of dustbin, sometimes people through their daily waste in the road. In most cases, they throw waste in some specific locations. This study identified some locations



A photograph showing a large, messy pile of garbage and waste on a street. The waste includes plastic bags, food scraps, and other debris. In the background, several people are walking on the street, and a person is sitting on the ground near the pile of trash. The scene is set in a developing country, with a stone wall visible on the left.

[illegible]

**Figure 9.** *Location of road side waste dumping sites in Ward 33*

There are 11 *mahallahs* in Ward 33. Status of waste collection of each *mahallah* is described below;

**a. Abul Hasnat Road**

Most of the part of Abul Hasnat road is neat and clean. Sufficient numbers of dustbins are available in this *mahallah*. Household waste is collected by door to door services. Waste collection van collects household's waste every day. Due to some narrow roads, van cannot reach every house. People keep their waste in front of their houses in a small bin and waste collector collects that. There is no road side unauthorized dumping stations.

**b. Agamasi Lane**

Waste collection service in Agamasi Lane is good and fully covered by the city authority. Door to door waste collection by a van is sufficient and there is a sufficient number of dustbin in this area.

**c. Ali Naki Deure**

Ali Naki Deure area is generally overlooked region by DCA in light of the fact that city authority van does not come here and collect any family unit waste. On the other hand there is no accessibility of dustbin available in this *mahallah*. Dwellers of this area employ a person to collect household waste (two or three days in a week). Every household pays him monthly 30 BDT for his service.

**d. B.K. Ganguli Lane**

B.K Ganguli Lane is a unique area because the city corporation van comes every day and collect household waste and road side waste till 11 am. After this time some people dump waste in the road side and make the area dirty.

**e. Abdul Hadi Lane**

This area is very clean because dustbin is not available here, but van coverage is 100%. DCA Authority collects waste regularly.

**Table 2. Waste collection system and coverage**

Mahallah name	Coverage (%)	Service available		Road side dumping
		Van	Dustbin	
Abul Hasnat Road	Maximum (70%)	✓	✓	No
Agamasi Lane	Fully	✓	✓	Yes
Ali Naki Deure	Partially (30%)			Yes
B.K Ganguli Lane	Fully	✓	✓	Yes
Abdul Hadi Lane	Fully	✓		No
Sikkatuli Lane	Partially (40%)		✓	No
Chankharpool Lane	Maximum (80%)	✓	✓	No
Nawab Katara	Fully	✓	✓	No
Nazimuddin Road	Fully	✓		No
Uttar Bangshal Road	Partially (20%)			Yes
Aga Sadeque Lane	Fully	✓	✓	No

#### f. Sikkatuli Lane

Sikkatuli Lane is mainly an industrial area. Van service is not available in this area. People use the nearest dumping station to dump the waste. The city authority collects waste from those dustbins 3-4 days in a week.

#### g. Chankharpool Lane

Approximately 80% area gets services from the city authority. Although door to door service is available, but it is not on a regular basis (only a few days in a week). Road side waste dumping was not seen in that area during the survey.

#### h. Nawab Katara Road

The waste collection service of this area is satisfactory. Door to door collection by van service is available in the whole area and road side dumping is not visible in this area.

#### i. Nazimuddin Road

Nazimuddin Road area is mainly a commercial area but there are some households also. Although van service is available, but there is no dustbin in this area.

#### j. Uttar Bangshal Road

This area is mainly an industrial area and road side dumping is the highest in this area. Sometimes the city authority collects waste from the road. In areal context, the coverage is not more than 25%.

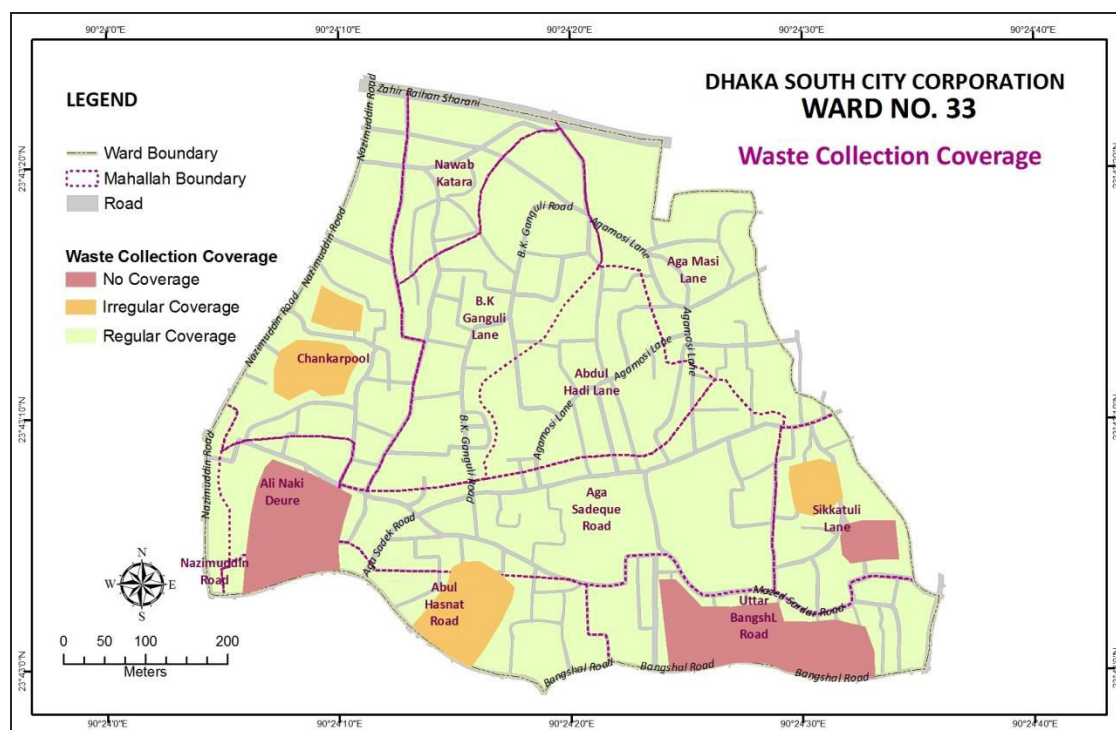


Figure 10. Waste collection coverage of Ward 33

### *Capacity of ward authority to collect waste*

Capacity of ward authority to collect waste is limited. There is an acute shortage of manpower and equipment also. This ward is different from the other regions of Dhaka city because of its high population density and waste generation. The Management system is also found very weak. There are only two trucks for transporting collected garbage, but each truck has 1½ tons capacity only. To collect waste from household and road side garbage, there are only 8 vans, which are insufficient to collect and manage the regular waste.

**Table 3. Capacity of waste collection of ward authority**

Name of the equipment	Number of the equipment	Capacity
Bin and Container	11	5 tons (2) and 3 tons (9)
Open Truck	2	1.5 tons
Van	8	-

### **Conclusion**

Solid waste management was relatively much poorer in the old part of Dhaka than in the other area. This study has explored the state of solid waste collection system in ward 33 of old Dhaka. Ward 33 was one of the most densely populated areas in Dhaka city and the land use pattern of the area was characterized by intensive commercial, industrial and residential uses. Because of the high density, generation of solid waste was also very high. The study found the overall solid waste collection to be moderate. In most of the areas, household wastes were collected by vans although the service was not regular. The central part of the Ward 33 was quite good because of the availability of the door-to-door waste collection system. Six among eleven *mahallahs* were fully served by the waste collection. Van service was available in eight *mahallahs* and authorized dustbins were available in seven *mahallahs*. The route of vans and location of authorized and unauthorized dumping stations were mapped in order to identify the service gap in Ward 33. The capacity of the authority was not sufficient to support all the ward areas. So for the proper management of the waste it is necessary to enhance the capacity of the authority and awareness of the people to participate in that process. The accomplishment of appropriate waste management relies on selecting the remedial methodologies. The achievement and manageability of the community based approach depend to a great extent on the group support and on distinguishing the needs of the general public.

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