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FAECAL SLUDGE MANAGEMENT: AN APPROACH TO SAFE DISPOSAL AT CHATTOGRAM CITY AND KUTUPALONG REFUGEE CAMP, BANGLADESH

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ABSTRACT

Faecal sludge (FS) comprises human excreta both in liquid and semi-liquid contents stored in pits and septic tanks. Faecal sludge management (FSM) refers to the containment technology, emptying, transport, treatment, and safe disposal or reuse of human waste. In this study, the aim is to identify the on-site containment management practices at three different types of settlements of Chattogram City Corporation (CCC) and Kutupalong Rohingya Camp-4 extension, Bangladesh. The study has been conducted through a series of household questionnaire surveys, key informant interviews (KII), and focus group discussions (FGD). The data gathered from the questionnaire have been analyzed by Standard Package for Social Science (SPSS) and Microsoft Excel software. The study finds that only 7% of septic tanks have a soak well and the rest of the septic tank is connected to a nearby drain or water body in the residential area. Also, in this area, about 81% of the containment is suitable and 77% is accessible for mechanical emptying whereas in the mixed-use area about 41% of containment is accessible and 59% is not. However, in a low-income area, about 78% of containment is not accessible. In all three areas, the emptied sludge is disposed to nearby drains if emptied manually and disposed to the faecal sludge treatment plant (FTP) if emptied mechanically. The study also revealed the quality of emptying of both areas. The overall emptying quality found as 42.14% for the residential and 35.57% for the mixed-use area which represents partially safe emptying practices in both two areas where the score for the same is found to be 17.35% in the low-income area which indicates unsafe emptying. Septic tank outlet connections were found inaccessibility of containment, emptying largely manually ignoring the safety issues, knowledge gap, etc. issues are the main problems to achieve safe emptying.
KEYWORDS: *Faecal sludge, treatment, containment, safety, disposal*

INTRODUCTION

Historical records show that sanitation has been a matter of concern to the human race for a very long time (Rosen, 1994). According to WHO (2008), the importance of sanitation is indisputable for water supply and sanitation, and it is a crucial steppingstone tobetter health that sanitation. Bangladesh has reached to her goal of improved sanitation and mostly completed the Millennium Development Goal (MDG)-7 by 2015 (JMP, 2015). The country has also shown remarkable progress in sanitation sector, so it's urgent need for Faecal Sludge Management (FSM) in Bangladesh (Islam, 2016) mainly in urban areas, where most human waste is dumped untreated into waterways or onto marginal land, harming the health of the country poorest (Opel, 2011). But sanitation coverage is unhappily inadequate in Bangladesh with about 64.7% in urban and about 64.3% in rural areas as of 2019 (JMP, 2019). The situation is worse in the peri-urban areas which are often plagued with inadequate water supply and low access to sustainable basic sanitation (BPP, 2019). This study is an attempt to explore and emphasize an existing management approach especially from emptying perspective for the urban on-site sanitation services by identifying the quality of sludge emptying in the study area categorized by safeemptying, partially safe emptying and unsafe emptying and to find out the problems related to emptying of containment and to propose arespective probable solution. The study mainly focused on an integrated management by all stakeholders in the provision and management of FS in Chattogram City and Kutupalong.

METHODOLOGY

Study Area

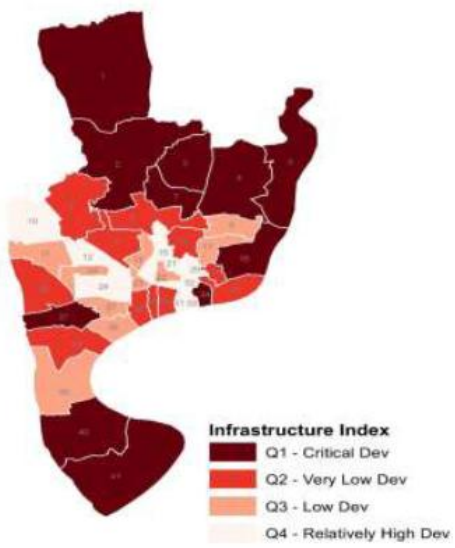

Figure1 Map of Chattogram City Corporation (CCC) with study area

Chattogram and Ukhya is situated in the southern part of Bangladesh (Figure 1). The area of the total city corporation of Chattogram is 155.4 km^2 and Ukhya area is 261.8 km2. The climate of this city is hot humid during summer and pleasant in winter. The maximum temperature is about 35.5°C during summer and minimum temperature is about 12.5°C during winter (Adhikary *et. al*, 2006). There are two main rivers adjacent tothis city, named Bhairab and Rupsha. Chattogram City Corporation (CCC) is the local administrative authority of Chattogram city under Local Government Division (LGD). CCC has in total 41 wards with 66,257 holdings . In Chattogram city on an average, about 49% households are using sanitary water-sealed latrines where average 40% households are using sanitary but non-water sealed latrines (Kabir and Salauddin, 2015). About 10% households on an average have non-sanitary facilities (BBS, 2011).

This study mainly focuseson the emptying provision and facilities of two different types of settlements. It is the aim to identify the existing containment management practices, also to find the quality of emptying and finally to propose some respective solutions to achieve safe emptying of two different types of settlements. The first type of settlement is Bijoynagar Charerpar a slum area, the second one is Ukhya refugee camp area. These two types of settlements have been found in Ward No. 09 in Chattogram City Corporation and Ukhya as shown in Figure .2.

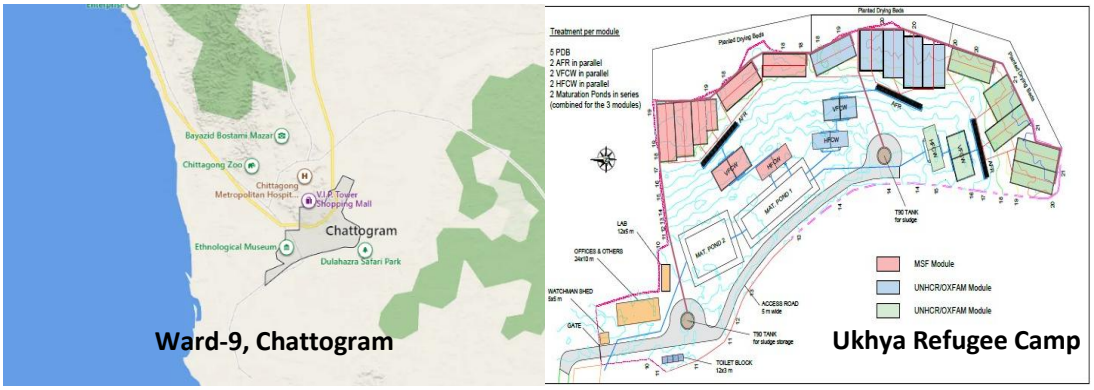

Figure 2 Map of Ward No. 09 of CCC and Ukhya refugee camp with specific study areas

Selection Criteria for Emptying Quality and Respective Indicators

The quality ofemptying is divided into five criteria in Unicef baseline statistics in 2014. For this study, some modification has been applied to these five emptying quality criteria and further divided into three categories namely unsafe emptying, safe emptying and moderate emptying that means partially safe emptying. Based on the criteria, total fourteen indicators have been selected for the containment management section, emptying section and knowledge and perception of users section. Table 3.1 shows the list of selected respective indicators taken for this research.

Table 1 Selection of indicators for this research

Sections	Indicators	
Containment(*4 Indicators*)	Containment size	
	Containment condition	
	Containment location & accessibility	
	Containment outlet connection	
Emptying (*7 Indicators*)	Emptying type	
	Emptying service providers	
	Emptying frequency	
	Safety issues	
	Emptying cost	
	Vacutug efficiency	
	Disposal of FS	
Users Knowledge &Perception (*3 Indicators*)	UsersLevel	Containment infrastructure
		Policy and regulations
		Mechanical emptying provision
	Emptiers Level	Health and safety issues
		Disposal regulations

Analysis Procedure of the Research

The research has been conducted as mix method research. Because both types of data that mean qualitative and quantitative data have been collected and analyzed in this research. Qualitative data have been gathered from several Key Informant Interviews (KII) from the stakeholders of CCC and Group Discussion (FGD) to the emptiers. Quantitative data have been collected by a series of household surveys by preparing a questionnaire in the study area. The questionnaire has been prepared based on the indicator. The objective wise data collection and methodology adopted has been shown in Table 3.4.

Data Entry and Analysis Procedure

Two types of data have been gathered during data collection phase of the research. Aftercollection of 234 household information, the data have been firstly processed in StandardPackage for Social Science (SPSS) software. The variables have been selected and identified for the preparation of data input. After completing data input, the data have been transferred to a Microsoft Excel spreadsheet for further analysis. From this extensive data, the percentage of containment, containment suitability, containment overall condition, containment outlet connection, emptying ever or not, emptying type, service providers, frequency, cost, knowledge about regulations etc. have been found. This data covers the first objective of the research. In the second objective, emptying quality parameters (unsafe, partially safe and safe emptying) have been determined. Emptying Quality has been determined by two way based on indicators of containment, emptying and knowledge, and perception of the users. This research used the simple colour method to point out the emptying quality intensity (Red, Yellow and Green). The scores have been given accordingly within value 0-1. Forcategory ‘Red’ the score is given 0 points which indicated unsafe emptying, for category‘Medium’ it's 0.5 for partially safe emptying and for ‘Green’ it's value is 1 point for safeemptying. Actually, for the easiness of the research, such kind of scale is these research indicators are valued using the 0 and FSM situational assessment tool was used to identify the key factors causing the problems, recognition of possible solutions and establishment of baseline information for prioritizing goals and objectives. Thus, the assessment helps to identify the conditions that need to be addressed in order to obtain more effective planning in the future (AIT, 2016).

RESULTS AND DISCUSSION

A total 234 households have surveyed during the data collection of this research where the household head is the main target. The respondents are mostly women compared thanthe male during survey time. In most of the cases, the respondents are free-flowing to give the answers but some of the respondents are unwilling to give information.

Existing Containment Management Practices at the Study Area

To evaluate the existing containment management practices in the three types of study areas, extensive data collection and analysis has been conducted. At first, the containment types have been shown in Figure 3. About 62 No. household have been surveyed in the residential area and found that all the containment is the septictank. On contrary, both the septic tank and the ordinary pit has been found in the mixed-use and the slum area. In the mixed-use area, total 131 respondents have been surveyed where the number of septic tanks is more than the pit latrine. About 73% of containment is septic tanks and remaining 27% is pit latrine in this area where the single pit is 12% and the twin pit latrine or more is 15%.

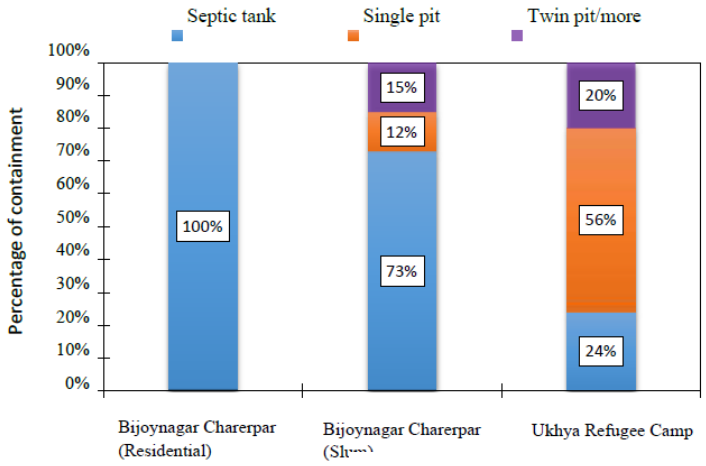

Figure 3 Containmer

In the slum area, total 41 households have been surveyed and found that where the numberof pit latrine is higher than septic tank. About 76% of containment has been found as pit and only 24% is septic tank. In pit latrine, the single pit is 56% and twin pit is 20%.

From the Figure 4, it has been seen that the majority of the containment is suitable where only 2% of containment is not suitable. Almost same criteria have been found in the mixed-use area where about 75% of containment is suitable, 19% is in moderately suitable and 6% is not suitable.

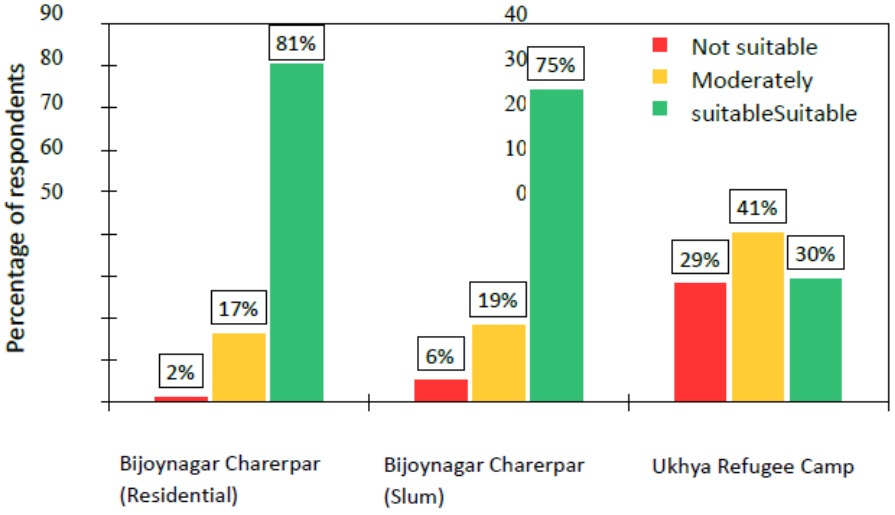

Figure 4 Containment size suitability of the study

Similarly,49% of containment is suitable, 41% is in moderately suitable and rest 10% is not suitable for the slum. In the slum, the percentage of containment unsuitability and moderate is more than other two area. Figure 5 represents the containment condition of the selected study area. To describe the containment condition, it has been classified into three categories e.g. good, moderate and poor.

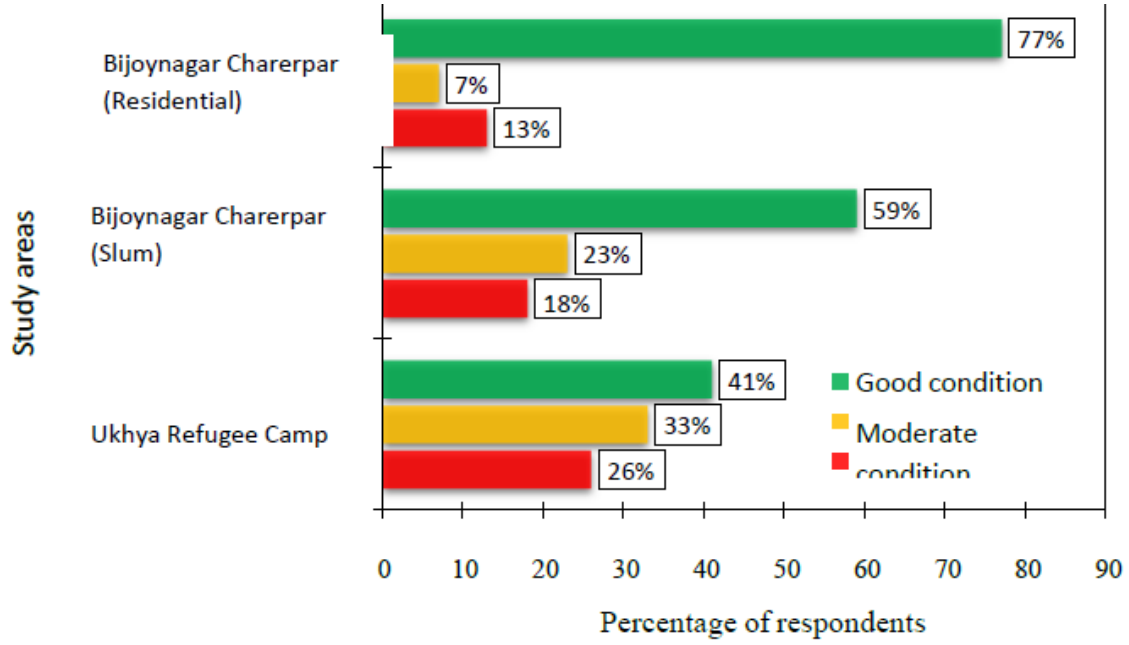

Figure 5 Containment condition at the study areas

From the Figure 5, it is seen that containment condition is found good in most of the household in almost all three types of area. About 77% of containment are in good condition, 10% are in moderate and 13% are in poor condition in the residential area. Similarly, it shows that 59% of containment are in good condition, 23% are in moderate and 18% are in poor condition at the mixed-use area. And in the slum area, it has been shown that 41% of containment are in good condition, 33% are in moderate and 26% arein poor condition. It is obvious that the condition of containment is better in Bijoynagar Charerpar residential area and worst in Ukhya Refugee camp.

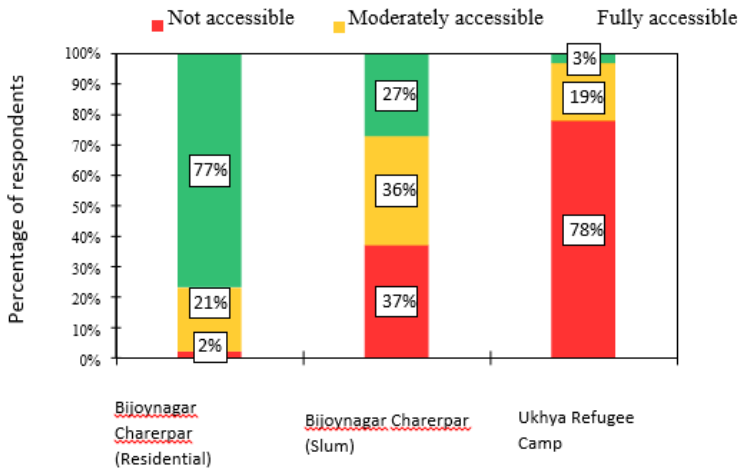

Figure 6 Containment accessibility for mechanical emptying at the study areas

Emptying types of containment have been shown in Figure 7 and it is seen that most ofthe containment have emptied manually emptying process in all of the three types of the study area. It also shows that a big portion of people are not emptied their septic tank in the residential area and its quantity is 58%. This cause is most of the respondents buildingis new and age of these building is about 6-8 years. On contrary, 42% of the septic tank is emptied. The manually emptying process is 29% and the mechanical process is 13%.

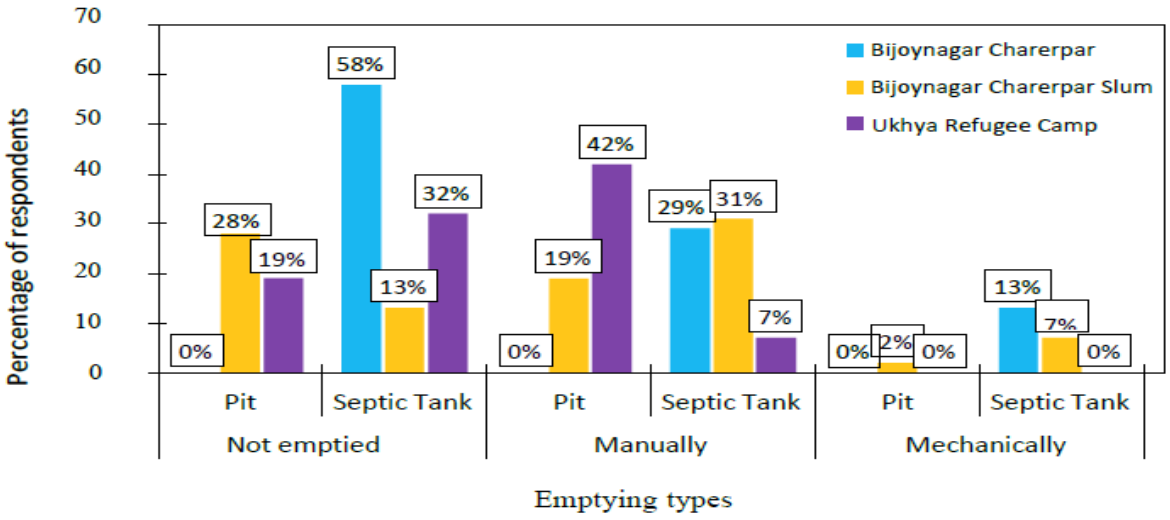

Figure 7 Emptying types of containment in the study areas

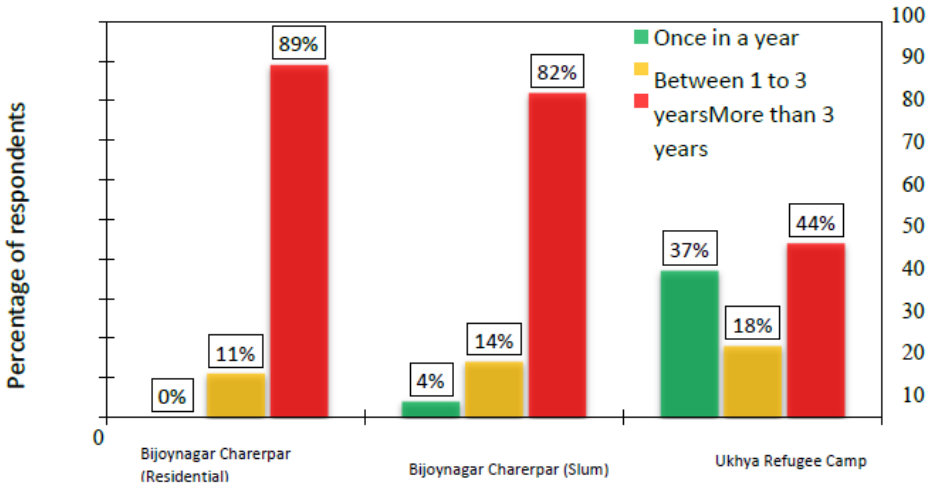

Figure 8 Emptying frequency of containment at the study areas

The containment emptying frequency of the study area has been shown in Figure 4.9. Emptying frequency of containment has been categorized into three types i.e. more than 3 years, equal or less than 3 years and at least once in a year. At residential area, total 26respondents have emptied their septic tank and 19 respondents have emptied twice or more times and only 7 respondents have emptied once. In these 19 respondents, 17 of them that means 89% respondents have emptied their septic tank by 3 years or more and rest ofthem have emptied their septic tank by less than 3 years as

shown in Figure 4.9. At the mixed-use area, about 82% of respondents have emptied their containment by 3 years or more and 14% of respondents have emptied their containment by less than 3 years. But only 4% of respondents have emptied the containment once in a year. Similarly,at the slum area, 44% of respondents emptied their containment by 3 years or more and 18% emptied their containment by less than 3 years. But 37% of respondents have emptied the containment once in a year.

At residential area, it is seenthat about 65% of emptied sludge is disposed to nearby drains or stagnant water bodyor rivers which is harmful to the surrounding environment where only 7% of emptied sludge is disposed to the faecal sludge treatment plant (FTP). A big portion of respondents nearly 27% do not know where the emptied sludge finally being disposed. On the other side, at the mixed-use area, about 55% of emptied sludge is disposed to nearby drains where only 4% of emptied sludge disposed to FTP. Similarly, at slum, 35% of respondentshave not any idea about the sludge disposal, 60% of respondents septic tank connected todrains or ponds or another water body. 5% of sludge buried in the household plot at boththe Nachiaghonaand Shahid lanearea. Finally, the overall emptying quality score has been found as 42.14 for the residentialand as 35.57 for the mixed-use area which represents partially safe emptying practicesin both two areas. Where the score for the same has been found as 17.35 in the slum which indicates unsafe emptying practices.

CONCLUSIONS

In this study, it has been found that 81% of containment are suitable at the residential area where this value reduced to 75% and 30% respectively for the mixed-use and slum area. Also, most of the containment is in good condition exceptthe slum. Highest 77% of containment is in good condition at the residential area where 26% of containment at slum is in poor condition. In the residential area, 77% of containment are accessible for mechanical emptying operation where 78% of containment is not totally accessible at the slum. Most of the septic tank at all three area is connected to the nearby roadside drains or stagnantwater body where only 7% and 4% of containment have soak well respectively for the residential and the mixed-use area. A large number of containment have not emptied yet. Again about 31%, 44% and 39% of containment have emptied twice or more times for the residential, the mixed-use and the slum respectively. All the empties both manual and mechanical ignore the safety issues during emptying operations. Mechanical service has taken more in the residential area than the other two area. Safe disposal of emptied sludge ispossible to FTP by using GPS devices and proper monitoring. Also, there are some small emptying devices such as sludge gulpher, MDHP, MAPETetc. can be implemented by proper evaluation mainly where mechanically emptying is not possible. The knowledge regarding the proper FSM among the people can be increased by organizing different types of the effective awareness program extensively. The study has been conducted in small scale and only the three selected areas of Ward No. 09. The further study can be conducted on the whole Ward wise as well as the total Chattogram City Corporation area. A study also can be undertaken to develop a forecasting tool for the emptying demand emptying quality determination based on the selected indicators in future

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