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MANAGEMENT OF FAECAL SLUDGE BY RAJSHAHI CITY CORPORATION

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ABSTRACT

One important component of sanitation management is Faecal Sludge Management (FSM) which is the second generation challenge of sanitation. It includes the management of entire Faecal Sludge (FS) systems, on-site sanitation and services, as well as costing, economics, FS collection and haulage, FS treatment and Reuse or disposal of FS. As many of developing cities like Rajshahi, FSM offers a thriving challenge, producing significant adverse human health and environmental hazards. In the present study, a survey was made in Rajshahi City to know the situation of FSM and the data of last six years was collected from Rajshahi City Corporation authority. This paper represents the scenario of FSM arrangements in Rajshahi City by City Corporation in Rajshahi such as existing facilities of FSM, types of collection process and collection cost, treatment process, disposal methods and present and historical data for revenue earning by service providing authority per year, charge for collection per septic tank and how many septic tanks have been cleaned per year. It is found from the survey that the conservancy department of City Corporation has only one vacutug of 2000 L capacity and provides the service for only emptying the septic tank on a rent basis. The authority does not have any treatment facilities and disposed of in crude manner to the nature. Therefore, it could be concluded that in the upcoming years the management of FS by Rajshahi City Corporation should improve to save the nature.

Keywords: *Faecal sludge; scenario; collection; treatment; disposal*

1. INTRODUCTION

Bangladesh, a country of 160 million people, has achieved commendable sanitation success during the 15-year Millennium Development Goals (MDG) period. The laudable achievement was possible through a remarkable growth in on-site sanitation (OSS) facilities of which about 98% of the people in the country depend upon. However, the management of OSS remains neglected with a large quantity of faecal sludge generated in these facilities inaptly managed leading to significant environmental, health and economic challenges. Bangladesh has recognized the importance of an 'Institutional and Regulatory Framework' (IRF) for Faecal Sludge Management in order to ensure that the achieved sanitation successes are sustained. On-site sanitation (OSS) is a system that generally stores, treats and disposes faecal wastes within the premises of a household or a small community. In the urban context, septic tanks (with or without soakage pits) and different types of pit or pour-flush latrines are common OSS systems. The sludge generated within these OSS systems needs to be emptied at certain intervals and must be treated off-site (Rahman, et al., 2015). Onsite technologies include pit latrines, unsewered public ablution blocks, septic tanks, aqua privies, and dry toilets (Bari, 2017). Sludge is a hazardous material that harms human health and the environment including soil, air and aquatic systems (DoE, 2015). Globally a huge number of people rely for their sanitation on non-sewered systems which generate a mix of solid and liquid wastes generally termed 'faecal sludge'. Faecal sludge (FS) is the general term given to undigested and partially digested slurry or solids resulting from storage or treatment of blackwater or excreta (Peal, et al., 2014).

Faecal Sludge Management (FSM) is the second-generation challenge of sanitation. Faecal Sludge Management (FSM) refers to a systems approach that includes technologies and mechanisms for the management of entire Faecal Sludge (FS) systems, on-site sanitation and services, as well as costing, economics, FS collection and haulage, FS treatment, disposal and reuse of FS and conventional sewerage is not included in a FSM system (Agyei, et al., 2011). OSS facilities have become major sources of groundwater and surface water pollution. People living in high-density urban slums and low-income communities depend entirely on OSS facilities shared by multiple families. Most of OSS facilities including septic tanks are built without following any engineering design principle and therefore perform poorly. Therefore, in the absence of effective faecal sludge management (FSM) services, a huge quantity of FS generated in septic tanks and pits or pour-flush latrines are being discharged in low-lying areas, storm water drains, in lakes, canals and rivers leading to serious environmental degradation, particularly in urban areas, endangering public health. Recently FSM has been initiated as an urban sanitation option in some areas of Bangladesh. Some 16 Paurashavas (Municipal) towns have initiated FSM services, on a limited scale, with treatment plants built with assistance from the Department of Public Health Engineering (DPHE) and NGOs, and employing 'vacutug' for emptying, collection and transportation of faecal sludge to treatment plants. In large cities including the mega-city Dhaka, limited emptying and collection services are available through NGOs/private organizations, but the subsequent disposal of faecal sludge into sewers/low lands without treatment needs addressing. In all urban areas, unhygienic manual emptying systems predominate over the mechanical emptying system using 'vacuum' because of its limited availability and lack of public awareness. However, there are very little researches, regarding the sanitation services and Faecal Sludge Management situation of Rajshahi City Corporation. There are few projects run by private NGO's who analysis the sanitary situations (Rahman, et al., 2015).

Rajshahi is an important Metropolitan city, covers an area of approximately 97.18 sqkm. Its population is 4,49,756 (including male population is 2,32,975 and female is 2,16,782), total Holding No is 60,000 and consisting of 30 wards (RCC, 2017). It is the 4th largest city on the basis of population. The sanitation facilities of this city are not sufficient. Although every fiscal year a huge amount of money is collected for the improvement of sanitation system, for want of proper planning, the sanitation system failed to meet its demand. The environment of the city and the living standard of people are deteriorating due to lack of proper sanitation system (Moshiur et al., 2017). At present Rajshahi city is rapidly expanding and depending only on on-site sanitation system, the scenario of faecal sludge management is becoming critical day by day. The main purpose of the study was to assess the management practice for faecal sludge in Rajshahi by City Corporation.

2. METHODOLOGY

2.1 Study Area

Rajshahi City Corporation (RCC), which was formed in 1988, is one of the major divisional city corporations of Bangladesh and covers an area of approximately 48 sq. km being bounded on the east, north and west by Paba Thana. Before its establishment as City Corporation, it was a municipal corporation. Rajshahi city Corporation has 30 wards in which there are 30 selected ward councillors. Basically, Rajshahi City Corporation is a formation under the local government administration of Bangladesh to regulate the city area of Rajshahi, which is under the Ministry of Local Government & Rural Development (LGRD).

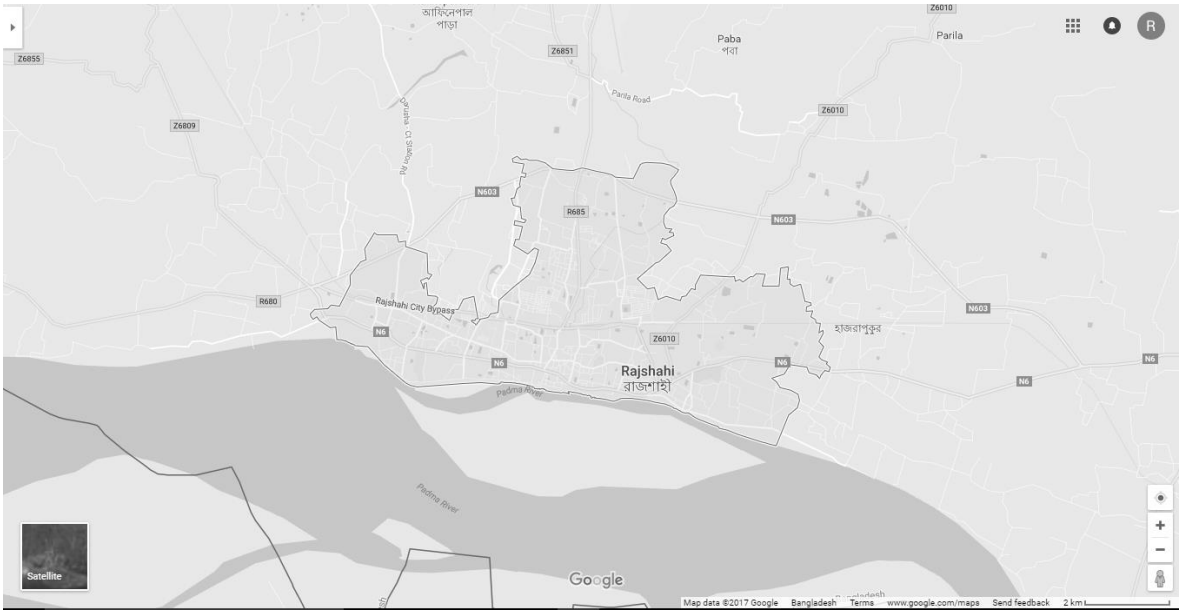

Figure 1: Rajshahi City Corporation map (google Earth Maps)

2.2 Field Observations

The information presented in this report is the outcome of experience, observations and field research data gathered from the RCC authority. To collect the information, specific questions about the existing facilities of FSM, collection, transportation, treatment, disposal process and costing of faecal sludge management were prepared to collect information from the RCC authority. The number of service for emptying the septic tank in each year was collected from the city corporation garage authority. Accordingly, RCC authority provided the information only on such important issues as the costing, economics and management of entire FSM systems, which would include all relevant infrastructure components and services, such as

- existing facilities of FSM
- types of collection process and collection cost
- treatment process
- disposal methods
- present and historical data for revenue earning by service providing authority per year
- charge for collection per septic tank and how many septic tanks have been cleaned per year.

These are described below-

Existing facilities of FSM:

Existing facilities of FSM includes technologies and mechanisms for the management of entire Faecal Sludge (FS) systems, on-site sanitation and services, as well as costing, economics, FS collection and haulage, FS treatment, disposal and reuse of FS.

Types of collection process and collection cost:

The action of collecting something is known as collection. There is only one way to collect the FS and that is by using the deslugding vacuum tanker. The collection cost in the year between 2002-2013 is BDT 2000 (25 US$).

Treatment process:

Treatment refers to the manner in which someone behaves towards or deals with the collected faecal sludge. There is no facilities for the treatment of the sludge which are collected by RCC authority.

Disposal method:

Disposal refers to the process of getting rid of something. At present there is only one disposal site to dispose the FS and that is at City Hut.

Others:

The present and historical data for revenue earning by service providing authority per year, charge for collection per septic tank and how many septic tanks have been cleaned per year is briefly described in the FSM scenario below.

3. FSM SCENARIO

All information collected from Rajshahi City Corporation authority were analysed and represented here. Total sanitation coverage of the city is 96%. The faecal sludge management by RCC authority has started from 2002. Before that the septic tanks were emptied manually or directly connected to open drain or soak pit.

3.1 Collection

Collection of FS from septic tanks by RCC authority is call for service basis. When someone chooses to use the service provided by RCC authority, has to go to the city corporation office to collect form of that specific service and deposit fees to the specific bank.
Desludging vacuum tanker has been being used for collecting FS since 2011. Before the arrival of desludging vacuum tanker, City Corporation collected the FS manually by refilling the faecal sludge in big drums from septic tanks. This was very poor process because there was possibility of dissipating the FS which creates nuisance to the environment.
There is only one desludging vacuum tanker having capacity of 2000 liters with 100 ft hose pipe. Other equipment provided by RCC authority are tractor and pump machine. Figure 2 shows the vacutug used for collection and transportation of faecal sludge by City Corporation.

Figure 2: Desludging Vacuum Tanker with Tractor

The number of service for emptying the septic tank from 2011 to 2017 is presented in Table 1. In the year of 2011 only one septic tank was emptied because the service was started near the end of that year. There are 30 septic tanks that have been emptied up to June of 2017. From the data table it is seen that the demand and service are increasing every year. Because of the publicity and feasibility of the service the rate of emptying septic tank in Rajshahi city is increasing day by day. Public awareness and cost of emptying is another reason of this increasing rate of emptying septic tank every year.

Table 1: Number of emptied septic tank

Year	Number of emptied septic tanks
2011	1
2012	17
2013	26
2014	29
2015	69
2016	54
2017	30+

3.2 Transportation

The desludging vacuum tanker is connected with a tractor to provide the collection and transportation service from household to the disposal point. The tractor connected with the desludging vacuum tanker travels from the city corporation garage to the house owner's place who chooses to take the service. Labourers connect the pipe of desludging vacuum tanker to the septic tank. After collecting the FS from the septic tank according to the capacity of the desludging vacuum tanker the tractor travels to the disposal site. Basically, the traffic condition of the city is mixed traffic condition. Distance of the disposal site at City Hut from the important point of the city was measured from google earth map and the required travel time based on 30 km/hr average vehicle speed were calculated and are given in Table 2. The route distance was measured from google earth map. There are eight probable routes from important locations to the disposal site are shown in Figure 3.

Table 2: Important points of Rajshahi City and their distance

Route	**Location**	**Distance From City Cow Hut (km)**	**Estimated Time at 30 (km/hr)**
1	Court	8	16 min
2	Court Station	6.8	15 min
3	Binodpur Bazar	11.9	24 min
4	CNB more(N6)	6.6	14 min
5	Horogram Bazar	8.1	17 min
6	Laxmipur more	6.2	13 min
7	Zero point	8.4	17 min
8	Alu pottir mor	9.2	19 min

Figure 3 (a): Travel routes to sludge disposal site from Court

Figure 3 (b): Travel routes to sludge disposal site from Court Station Road

Figure 3 (c): Travel routes to sludge disposal site from Binodpur Bazar

Figure 3 (d): Travel routes to sludge disposal site from CNB More (N6)

Figure 3 (e): Travel routes to sludge disposal site from Zero Point

Figure 3 (f): Travel routes to sludge disposal site from Horogram Bazar

Figure 3 (g): Travel routes to sludge disposal site from Alu Pottir Mor

Figure 3 (h): Travel routes to sludge disposal site from Laxmipur More

Figure 3: Travel routes to sludge disposal site from important points of Rajshahi City (google Earth Maps)

3.3 Treatment

The collected sludge is disposed directly to the disposal site at municipal waste dumping site without any treatment which is very harmful to the environment, public health and underground resources.

3.4 Disposal

FS collected from septic tank are disposed to the disposal site. There is only one disposal site at Rajshahi city which is near City Hut (Figure 4) where FS are disposed along with solid wastes. This site covers approximately an area of 4 acres. Wastes have been disposed at this site since 2004. The capacity of this site has almost filled. It is reported by Bari (2017) that sometimes the faecal sludge is discharged in the municipal large open drain at remote place which is harmful to the environment. FS collected in drums were also disposed at the City Hut and sometimes to open drains near the house or on the way to the disposal site which was a very harmful activity. Previously at first, FS was disposed at new market, then stadium and at last Zia Shishu Park. And presently the disposal site is at City Hut. A scheme has taken by RCC authority to construct a disposal site along with treatment plant over an area of 300-400 acres at City Hut.

Figure 4: City Hut Disposal Site

3.5 Costs

In between 2002-2013 a house owner had to pay BDT 2000 (25 US$) to the RCC to empty a septic tank. The amount of money was deposited to RCC fund. From November, 2013, the cost has decreased and the money has to be deposited to the Agrani Bank, a schedule bank of Bangladesh, with additional vat of 15% of the total amount to Bangladesh Bank. Data of cost of emptying per septic tank is given in Table 3.

Table 3: Cost of Emptying

Duration	Cost (BDT)	Cost (US$)
2011-2013	2000.00	25.00
2013-2014	1400.00	17.25
2014 to present	1200.00	15.00

From the table it is seen that the cost for emptying septic tank is decreasing. This is another reason for the increasing rate of emptying septic tank per year. Along with this cost there are some additional costs such as fuel cost, labourer and driver fee, chemical cost etc. which have to be paid by the house owner. According to the distance from septic tank to the disposal site the amount of fuel cost has to be paid by the house owner. The desludging vacuum tanker needs one liter diesel for each 3 Km up and down distance. Each liter diesel costs 0.875 US$ or BDT 70.00. At least two labourers are required for this operation and each labourer demands 6.25 US$ or BDT 500. The driver's fee is same as labourer. The additional costs varies according to the size of the septic tank.

4. CONCLUSIONS

From the above information and discussion it could be concluded that Rajshahi City Corporation authority provides faecal sludge collection, transportation and disposal service as call for service basis with payment. They collect FS from septic tanks by desludging vacuum tanker called vacutug and dispose them directly to the disposal site without any kind of treatment which is very dangerous to the environment and the major cause of environmental pollution. Dumping site at City Hut has already reached to its capacity. The authority does not have any faecal sludge treatment plant and proper management system rather they are only providing septic tank emptying and sludge disposal service. Therefore, to save the environment as well as the Divisional City, Rajshahi City Corporation should immediately take necessary steps for proper faecal sludge management system including collection, transportation, treatment and reuse or disposal.

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