NewVision

Baseline Survey Report on Faecal Sludge and Solid Waste Management in Saidpur Municipality, Nilphamary.

Study Conducted by –

NewVision Solutions Ltd.

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Submitted to –

WaterAid Bangladesh

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Executive Summary

Bangladesh is a developing country and considered predominantly as a rural economy. The population of Bangladesh is 164 million and ranks number 8 in the world population. With urban population growth rate of 3.44% about 35.6% of the total population is living in urban area. Urban population growth has a linkage with generating various types of wastes in faster mode. It is also happening in Bangladesh. Nowadays, waste management has become a major concern in the cities and towns due to high rate of migration in urban areas. Unplanned growth of the cities and towns cause health and environmental hazard in the country. In urban areas, faecal sludge is not managing properly due to lack of awareness among the citizens and insufficient service delivery from the city corporations and municipalities. Other than some of the city corporations, solid waste becomes another problem for not having adequate facilities and mechanisms to remove wastes on a regular basis. Municipal services in most of the cities and towns are already over-burdened, and simply cannot meet the growing demand, resulting in unhygienic and filthy living condition in the neighborhoods.

Saidpur Paurashava of Nilphamari district is an 'A' category municipality covering an area of 34.42 square kilometers. The total number of households is 27,515 and population size is 135,048. This study has provided efforts to make an assessment on faecal sludge management, solid wastes generation and hospital waste situation.

The main objective of the study is to understand the current situation of Faecal sludge and solid waste management in Saidpur municipal area. The study is expected to provide detail information and analysis of the current situation and practices related to waste generation (faecal sludge, solid waste, and medical waste), volume, collection, disposal and treatment and to provide a critical input regarding the scope of a comprehensive wastes management model. This study is mainly based on primary data as there is acute absence of reliable secondary data of faecal sludge and solid waste generation rate and management practices of Saidpur Municipality.

After analyzing the nature of the study, both qualitative and quantitative data were collected from the fields. The sample size for this study was 739 for conducting F2F interview among the target beneficiaries. Besides that 20 KIIs and 9 FGDs were conducted

to collect qualitative data. On the other side, secondary resources focused on literature review of various books, reports and publications relating to the intervention and relevant areas of the study.

Key Findings of the study:

The key findings of this study are as follows:

A. Toilet Types and Ownership:

1. The survey shows that about 92% of the total surveyed households have their own latrine.
2. Considering the latrine technology issue, around 55% of the respondents are using pit latrine (Single pit- 31%, offset pit – 24%), 43% of the respondents use sanitary latrine with septic tank and rest 2% of the respondents stated that their latrines are directly linked with the drainage system of the municipality.
3. Other than household, among the commercial enterprises (institute/business/market), around 55% of enterprises have sanitary latrine with septic tank is, about 31% of enterprises have pit latrine technology and only 14 % of total enterprises have no latrine within the premises.
4. Among the commercial enterprises, average size of the septic tank is found to be 523 ft3. About 57% of septic tanks have 2 chambers, 39% of septic tanks have 3 chambers, and only 4% of septic tanks have 1 chamber.
5. At household level, about 67% of septic tanks have 2 chambers, about 24% of septic tanks have 1 chamber and only about 9% of septic tanks have 3 chambers..
6. Under household category, about 51% of the pit latrines have rings within the range of 6-8 rings, about 35% of the pit latrines have rings within the range of 1-5 rings, about 8% pit latrines have within or more than 10 rings, and about 6% pit latrines have rings within 9-10.
7. Around 74% of household latrines and about 57% of non-household latrines do not maintain BNBC in latrines design and construction.

B. Using pattern and Maintenance of Latrines:

1. About 50% of the latrines exhibit 6-10 users, , about 42% of the latrines possess 1-5 users and only about 8% latrines have more than 11 users.
2. Under non-household category, about 48% of the latrines are used by 1-25 persons perday, 18% of the latrines are used by 101- 250 persons per; about 12% of the latrines are used by 251-500 persons and 22% of the latrines have byuser with different ranges and in a much significant amount.
3. About 94% of total households spend money to keep the latrines clean and healthy. They spend on an average BDT 82 in a month for operation and maintenance (O&M) purposes.

C. Faecal Sludge Generation and disposal practice:

1. About 60% of the surveyed households have emptied their pits or septic tanks at least once since construction. Around 40% of households yet to require for emptying pits or septic tanks.
2. Around 32% of total household have emptied their pit/septic tank within 2-3 years interval and 26% have emptied within the interval 7-12 months. Rest of the households have emptied their pit/septic tank within different time interval. .
3. A major portion of household (73%) doesn't have any idea about the standard time gap between two emptying of pit/septic tank.
4. About 98% of the household have emptied their pit/septic tank by private sweepers through manual emptying processes. Only 1% of the surveyed household have received emptying service from municipality..
5. In recent time, the municipality has introduced the mechanical process of emptying pit/septic tank by using vacutug. Presently, the municipality has 2 vacutug vehicles of different sizes. Such service becomes popular in the town..
6. Discharging of collected faecal sludge into environment causes a serious problem due to lack of fixed dumping place. About 81% of the households had to face unwanted situation at the time of discharging sludge after emptying their pits/septic tanks. About 60% of the households have dumped the sludge illegally on the open water bodies (canal, ponds, drains) and open places. . Rest 40% of the households have buried the sludge into ditch within their own yard.
7. The average faecal sludge generation rate in Saidpur municipality is 0.56 liter/person/day. Estimated total volume of faecal sludge is 27,990 m3 in 2017.

D. Solid Waste Generation:

1. Information was collected from randomly selected 180 households. Households were asked to keep their waste in a bucket/poly-bag and those were weighed on the following day.
2. Average waste generation rate in the municipality is 0.33Kg/person/day.
3. From the composition analysis, about 90% of the total wastes were organic wate (vegetables and food waste) which is easily compostable. About 5% of waste were bio-degradable (wood and leaves), rest of 5% were recyclable products (polythene and plastics, textile, paper, glass & ceramics, and metals).
4. About 54% of the households do not store their daily generated household wastes. around 38% of the households store their daily waste in a bucket/poly-bag and 8% of households store in a hole within their premises.
5. About 40% of the households that store waste in bucket/poly-bag, usually dispose the wastes into open space behind their house, around 25% of

household dispose into drain, 9% of households give the waste to the municipality's van in morning, 14% dispose in an open hole, 7% on canal and rest of 5% dispose in other ways.

6. About 99% of the respondents are willing to pay money for better service to the municipality.

E. Hospital/medical Waste generation:

1. Average waste generation rate of the hospital is 15 Kg/hospital/day. Total waste generation by 3 hospitals is 45 Kg/day and 16.43 MT/year.
2. Average waste generation rate of the Clinic is 7 kg/clinic/day. Total waste generation by 6 clinics is 42 Kg/day and 15.33 MT/year.
3. Average waste generation rate of the Diagnostic center is 4 kg/center/day. Total waste generation by 11diagnostic centers is 44 Kg/day and 16.06 MT/year.
4. Most of the Staffs of the hospitals/clinic/Diagnostic centers do not take any kind of measures for the safe disposal of medical waste.
5. Most of the clinical wastes are dumped in the open land or dustbin adjacent to the hospital/clinic. After a certain period of time, they burn those waste by using kerosene. Some of the wastes are occasionally buried.
6. There is no initiative taken by municipality to manage the clinical waste in environmentally safe way. Hospital and clinical authority are not interested to pay for managing clinical waste.

Conclusion

This baseline survey has exposed present practice scenario of the citizens on sanitation issues in broader aspects. Based on analytical outcomes, this study has identified some of the issues where more efforts would have to be given for improving overall sanitation situation and introducing effective FSM approached within the town.

Most of the households in the Saidpur municipality have access to a toilet irrespective of its quality. Due to lack of following standard design of septic tanks and no treatment facilities, 100 percent of faecal sludge is discharged into environment. Moreover, there is a large no. of toilets are illegally connected to open drains and water bodies. Municipality are convinced to cut-off this illegal connection. In spite of this action environment will never be healthy and safe unless and until a proper emptying and treatment procedure is established.

Due to lack of adequate dumping places, most of the solid wastes are disposed on roadside or open spaces behind house. Though a significant portion of households store their daily generated waste into a bucket or polybag but a small portion of them dump into dustbin.

Medical authority is unaware of the medical waste management. They consider and treat medical waste as like solid waste. Hazardous/infectious products are not segregated before dumping into nearby dustbin or open places behind hospital.

To ensure improved faecal sludge and soid waste management municipality should increase the capacity of the conservancy department through increasing manpower, vehicle and others equipment. Innovative and appropriate approaches should be taken for the emptying, collection disposal of faecal sludge in safe and environmental friendly manner. Separate disposal places are required for different kinds of waste. Extensive training programs are needed to make the citizen aware of the different kind of waste management and also about the negative consequences of dumping wastes directly into the environment.

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1. Introduction

1.1 Background

Bangladesh being a developing country has predominantly a rural economy. In line with MGDs, the government of Bangladesh was setup a target of achieving 100 percent sanitation coverage by 2015. Presently, the national confined defecation coverage is 99 percent with nearly 100 percent in urban areas. Although it has achieved remarkable improvement in sanitation coverage from last two decades, waste management has become a major concern for the cities and towns. High population growth rate and faster migration in urban areas are the key causes of creating such unpleasant situation. In urban areas, human generated faecal sludge is managed by following conventional system. As a consequence, overall environmental condition in urban areas under city corporations and municipalities is deteriorating rapidly due to conventional system of collection, transportation and crude dumping of such waste. By considering current situation of different municipal authorities, municipal services are already over-burdened for addressing huge population pressure, and simply cannot meet the growing demand in most of the cities and towns, resulting in unhygienic and filthy living condition in the neighborhoods.

Solid waste management (SWM) is another major environmental threat in cities and towns. With the high urban population growth rate and enhancement of purchase capacity, generation of solid waste has been increasing significantly for last few years. In absent of systematic solid waste management mechanism, generated wastes are disposed at the roadsides, open drains, landfills, and open public places. Unmanaged disposal of solid wastes create environmental risk in urban areas. In addition, generated medical wastes from hospital and clinics contribute on environmental pollution and public health hazard. Without introducing a proper solid waste management mechanism, improved hygienic environment is unattainable.

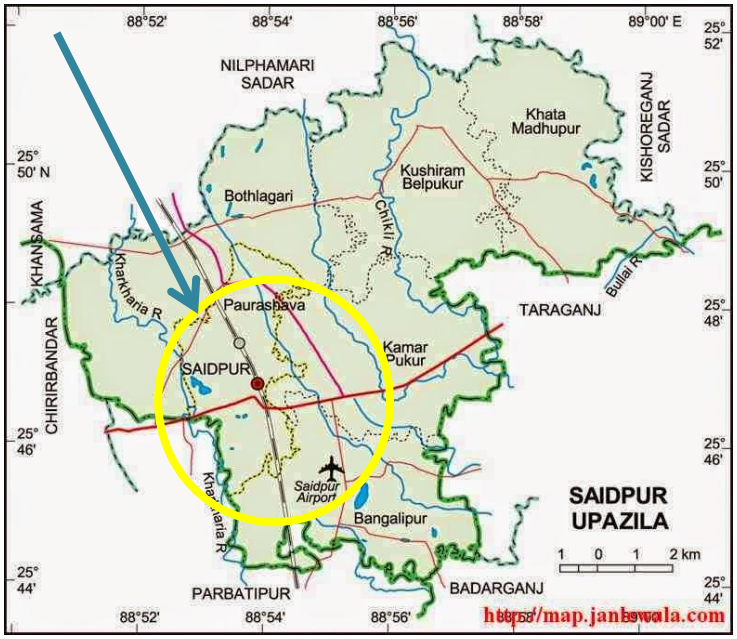
WaterAid Bangladesh (WAB) is a leading international development organization, wishes to design a comprehensive faecal sludge and solid waste management plant at Saidpur Municipality in Nilphamari district. In this regard, WAB has taken initiative to gather

knowledge upon current situation and practices related to faecal sludge and solid waste management of the municipality which will provide further opportunity for developing detail planning on sustainable faecal sludge and waste management approaches.

In order to deal with the prevailing situation NewVision Solutions Ltd. (NVSL) is awarded to conduct an extensive baseline study to analyze the current faecal sludge and waste management condition in Saidpur Municipality. With an aim to prepare an evidence based analytical report, NVSL has designed and conducted the baseline study in consultation with WAB.

1.2 Saidpur Context

Saidpur is one of the populous cities under Nilphamari District, came into existence on 30 April, 1958 as a municipality. Nothing is definitely known about the origin of the city name. However, it is learnt from the elderly citizens of the town that in the long past a renowned and influential family came from Kuchbihar of India and settled in this area for preaching Islam. The title of the family was 'Saiyed'. It is generally believed that the city might have derived its name Saidpur from the name of that Saiyed family.



The city occupies an area of 34.42 square kilometer. It is located between 25º44′ and 25º52′north latitudes and between 88º51′ and 89º01′east longitudes.

The city is recognized as Paurashava with 15 Ward and 42 Mahalla (communities) and its adjoining other urban area for comprising only one Mauza (a small territory).

Saidpur is a railway town and a commercial hub situated in Saidpur District of Rangpur division of Bangladesh. In 1870, the Assam-Bengal railway set up its largest workshop in Syedpur and many Biharis or Urdu-speakers came to work there. It is situated near Parbatipur, which was an important rail junction in undivided India, connecting the North East to the rest of the country. During the British rule the telephone exchange for the whole Assam-Bengal District was also situated in Syedpur. It was the largest city of Bangladesh

after Dhaka and Chittagong before 1971. Because of its vibrant town, soon it areas became the commercial hub for all the surrounding districts.

One of the major business community, namely the Marwaris attracted by the prospect of trade and commerce in this areas and therefore, they had settled in the town of Saidpur, long before the Partition of India. The Marwaris became a part of the local population and contributed to the society. Some of them had earned a respected position in the society because of their social work. After the Partition, the Marwaris chose to stay back in East Pakistan, instead of immigrating to India. Thousands of Urdu-speaking Muslims from Bihar and the United Provinces settled in Saidpur. In 1971, the Urdu speaking Muslims constituted 75% of the population of city. Presently, they constitute roughly 40% of the entire population in the city. Therefore, Urdu still is one of the dominating languages in Saidpur.

Previously Saidpur was a very important place of Bangladesh both historically and commercially. Saidpur Municipality was established in 1915. After Dhaka and Chittagong, Saidpur was the third largest City in Bangladesh. Life standard in Saidpur was as good as a big city of the Country. It had all the modern amenities, which was available at that moment. Unfortunately, now it's an ailing town. Even though, it generates at least 90% of the total revenue of the Nilphamari District and one of the major taxpayer of the Country.

The total population of the Municipality is 127,104 of which 65,060 are males and 62,044 are females with a density of 4,442 persons per sq.km. The sex ratio of the city is 105 and the literacy (7 years and above) is 63.9%. The total number of household of the city is 26,311. It is estimated that, 136,696 people are living in Saidpur in 2017 with number of household 28,309. (Source: Bangladesh Bureau of Statistics,2011)

In Saidpur, people are served by onsite sanitation system such as septic tank, and different types of pit latrines. A large volume of sludge is being produced and major portion is released into open drains, water bodies and agricultural land. Open drain connection from septic tank or pit latrine is one of the general scenarios in Saidpur. In addition, a large volume of Solid waste is being generated from Household and Market places in the area. Due to lack of proper management system, almost all the wastes are disposed at the side of roads, open drains, landfills, or in the open places. As a result, water bodies and the environment have been polluted badly.

1.3 Objective of the Study

The baseline study has been conducted to gather detail information and analysis of the current situation and practices related to faecal sludge considering sanitation value chain and solid waste management includes sludge generation, toilet standard, containment emptying – related available services as well as community perspectives, practices & willingness, transportation, treatment and disposal. The outcome of the study is expected to provide critical inputs regarding the scopes of a comprehensive FSM plant for Saidpur municipality, and in developing marketing approach for the products generated from the plant.

1.4 Specific Objectives of the Study

The baseline study has focused mainly on following 3 issues:

(i) faecal sludge and solid waste generation, collection, transportation and disposal,

(ii) willingness and ability to pay for collection of both faecal and solid waste, and

(iii) marketing potential for the output from the proposed sludge management plant.

To get the output from above issues, following task has been done:

- Estimate volume of faecal sludge and solid waste generated in Saidpur municipality in (a) households, (b) Colonies (c) slums (d) institutions (e.g. schools, colleges, mosques, clinics, hospitals, different govt. and non govt. offices etc.) (e) business unit (poultry, factories, skills training centers etc.) and (f) markets in given period of time (daily/weekly/monthly). The detail information will cover:
    - No. of household/institutions/markets use pit
    - No. of household/institutions/markets use septic tank
    - No. of septic tank/ pit or others directly discharge sludge into the environment
    - No. of HH and estimated volume of waste-water(Both black and gray water) discharge into the environment
    - No. of septic tank/pit or others emptied manually/ mechanically
- User wise Containment patterns, emptying mechanism (both traditional and mechanical) and frequencies, available facilities and patterns, containment connection to drain and environments, number and location of disposal sites.
- Prepared a Shit Flow Diagram (SFD) of the town.
- Current scenario of toilet and septic tank types compare to the set standard in Bangladesh National Building Code (BNBC), scenario of containment and emptying standard, scenario of available emptying services in both public and private sectors, scenario of community practices in regard to emptying, their perception and their preparedness, frequencies and costing of emptying, willingness to pay for emptying,

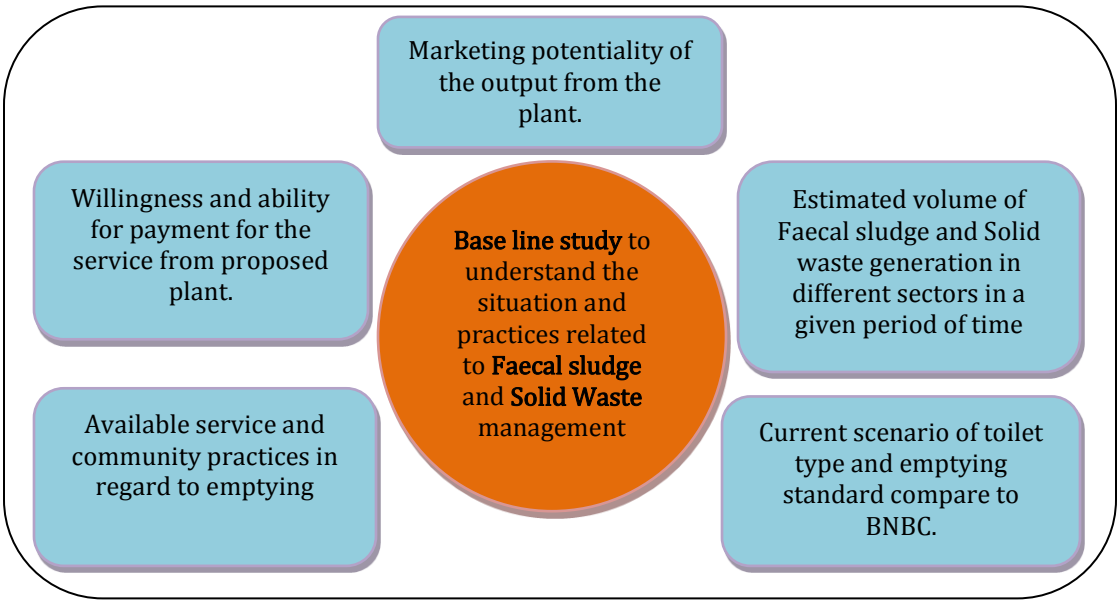
transportation facilities, treatment facilities including removal efficiencies/quality of effluent and disposal practices.

- Estimated volume of different types of hospital and clinical waste generation, current disposal practices and facilities.
- Current role and capacity of municipality authority as a service provider as well as regulatory body both in human resources and facilities
- Public sector resource allocation and involvement for city's faecal sludge management.
- Assessment of formal and informal sweeper groups, their health risks and knowledge and practices
- Current business practices in sanitation value chain.
- Scopes for the comprehensive FSM plan for Saidpur municipality, reuse opportunities as well as marketing opportunities of end product considering sanitation value-chain.

1.5 Conceptual Framework of the Study:

The consultant team has provide efforts for in-depth understanding of the study and identified key aspects that would be needed to consider under the base line survey and reflecting the outcomes on the study report.

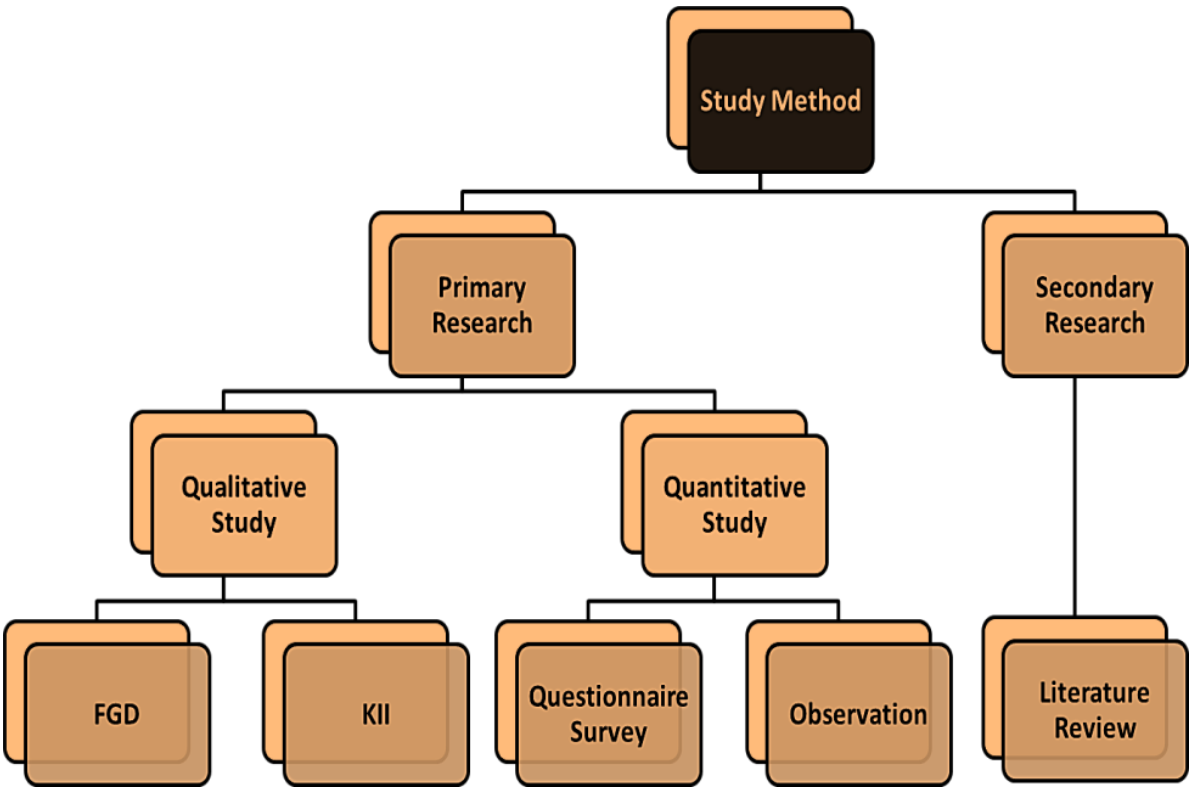
Figure 1: Conceptual Framework for the Baseline Study



2. Methodology of the Baseline Study

The baseline study employed a mix of primary and secondary research techniques. Primary research entailed Face to Face (F2F) Interviews, Key Informant Interviews (KIIs), Focus Group Discussion (FGDs), and Structured Observation. On the other side, secondary research focused on literature review of various books, reports and publications relating to the intervention and relevant areas of the study.

Figure 2: Baseline Study Methodology



2.1 Survey Design and Sampling

The sample for the baseline is designed to provide a measurement of selected indicators. The methodology and sample size primarily focused on household level questionnaires.

Multistage cluster sampling with PPS (probability-proportional-to-size) has been used to distribute the face to face (F2F) interviews in the project area. From the 15 wards in the Saidpur Municipality 8 wards was taken and households were selected randomly from selected wards. Wards were selected on the basis of ward's area, waste generation scenario, and urbanization trend.

Sample of 800 respondents were selected from different waste generators in two stages. At the very outset, 8 wards were selected from the Municipality using a systematic random selection procedure so that the total number of households in each of the selected wards would be proportional to its population size. In the final sampling stage, respondents were selected from household, colonies, slums, institutions, business unit, and markets from each ward. The respondent selection was followed by a number of randomization processes to maximize coverage in clusters of different shapes and densities. Sample of institutions, business unit, and markets were selected purposively from Municipality area.

2.2 Sample Size Determination:

We have calculated the sample size by using the following formula:

$n = (z^2*p*[1-p]*N)/z^2*p*[1-p]+(N-1)e^2$

$= (3.8*0.5*0.5*26311)/3.8*0.5*0.5+(26311-1)*0.035*0.035$

$= 754 \sim 800$

Where,

n = required sample size

z=confidence level at 95 percent (standard value of 1.96)

p=estimated prevalence of variable of interest (0.5)

e=margin of error (3.5%)*

N= Population size (26,311)

**though 5% is the common use value for margin of error, to reduce the error and make the data more authentic we have calculated sample size considering 3.5% margin of error.*

2.3 Sampling Distribution for the Baseline study

Apart from the 800 face-to-face interviews, 20 KIIs and 9 FGDs were also conducted to collect qualitative data.

Table 1: Sampling for Quantitative Approach (Face-to-Face Interviews):

Target Respondent	No. of Sample	Type and number of target respondent
Household	460	• Lower income • Middle income, and • Upper income family
Colonies	70	• Lower income • Middle income, and • Upper income family
Slums	190	• Lower income
Institutions	35	• School/College/Madrasha • Universitiy • Vocational Institutions • Mosques • Clinics/Hospital • Govt. and non Govt. office
Business Unit	30	• Poultry • Factories • Skills Training Center
Market	10	• Shopping Mall • Hat/Bazar
Hospital/Clinic	5	• Govt. hospital • Private Clinic

Based on the Availability and considering importance of the respondents we have segregated respondents in above proportion.

Table 2: Sampling Distribution for Qualitative Approach (KIIs and FGDs):

Target Respondent	No. of Sample	Type and number of target respondent

Key informants /Experts	20	• Different ministry and Municipality representatives from
		  ○ conservancy department
		  ○ health department
		  ○ education department
		  ○ finance department
		• Representative from Educational Institutions
		  ○ Schools/Madrasa
		  ○ College/University
		• Representative from Hotels and Shopping Mall/Shops/Bazar committee
		• Personnel from Govt. office/Bank/NGOs
		• Representative of Civil Society/Religious Leader

Focus Group Discussions (FGD)	9	• Household–1 • Colonies – 1 • Slums – 1 • Institutions - 1 • Business community –1 • Market (shop owner/management committee) - 1 • Sweeper (Private) - 1 • Municipal Sweepers (Contractual) -1 • Community leader/religious leader- 1

2.4 Literature Review

Bangladesh has a population of over 162 million and considered as the largest least developed country in the world though recently achieved the status as the low-middle income country. Bangladesh is a highly populated country and 8th most densely populated country in the world. Dhaka, the capital of Bangladesh has the highest population density in the world and the figure is 44,500 per square kilometer (World Economic Forum, 2015) with the notion of rapid urbanization where annual growth rate is over three percent (3.44%) as estimated by the World Bank. In addition, current estimated urban population is 55 million by accounting for about 34 percent of the country's total population (data.worldbank.org) with an expectation of about 116 million by 2040; the trend is also indicating as accounting for about 50% of the country's total population (BBS 2012). It means unplanned rapid pace of urban growth without commensurate development has posed huge challenges for the service delivering agencies to provide necessary support to the growing population. At present, there are 11 city corporations throughout the country and 315 municipalities/Paurashavas. According to BBS, population density is 3,785 persons per square kilometer.

The country has achieved significant progress in sanitation where confined defecation coverage is declared as 99 percent in 2015 by the Government of Bangladesh and recognized by Joint Monitoring Programme (JMP) for water supply and sanitation organize by WHO/UNICEF. According to the JMP report in 2000, open defecation coverage was 19 percent in the country, which was indicating of having a real scary situation however overcome by the nation under the proactive initiative and great leadership of the government, more specifically, due to special drives of the Government of Bangladesh in collaboration with the development partners, with vigorous engagement of the local government institutions, and enthusiastic participation and cooperation of the communities. According the JMP report, urban improved sanitation coverage is 59 percent which is 57 percent in rural context. Overall open defecation coverage is only one percent (1%) at the present time and it is not considering as a concern as the government has been promoting the improved and total sanitation concept all over the country under SDGs.

Open defecation practices have been controlled significantly by ensuring confined defecation practices among the citizens all over the country, especially in urban areas. People depend on on-site sanitation systems. Other than the capital megacity Dhaka where sewage networking coverage is only around 20 percent, non-sewer sanitation system commonly exist because the containment facilities are situated within the plot of the dwellings or its immediate surroundings (Eawag/Sandec, 2008). Large proportions of

these people either connect their pits/septic tanks to the drainage system of the city/town, or do not have any intermediate containment at all. It is indicating going back to previous environmental hazardous situation if not taking mechanistic pit/septic tank emptying, collection, transportation, treatment initiatives.

Under the Sustainable Development Goals (SDGs), presently the focus is on the whole sanitation service chain from containment through to disposal. The challenge for urban sanitation is therefore not only to achieve access to toilets, however also that all excreta are safely managed along the whole sanitation service chain (World Bank, 2014).

Bangladesh is a small country and having serious space constrain allocating for installation of sanitary latrines. Therefore, the issue of properly emptying pits or septic tanks has raised and considered as the 2nd generation problem to ensure sustainable healthy environment in urban areas in the country. By considering existing situation in urban areas in Bangladesh, there is no sewerage system in the city corporations (except Dhaka) and municipalities for systematic disposal of faecal sludge throughout the urban areas. Sewerage system development is highly expensive and would be required recourses allocation. According to a study conducted by the World Bank Group (2017), on-site sanitation systems are the norm for both rich and poor in cities and towns of many developing countries, and are often the only form of sanitation available to poor people. From such perspective, most appropriate faecal sludge management (FSM) approach is also promoting in urban areas all over the country to ensure safe emptying, collection, transportation, treatment and use/application.

On the World Bank report, it is also mentioned that in order to manage on-site sanitation and FSM effectively, FSM must be included with national level policies. This must be complemented with city/town level sanitation planning systems, and byelaws that allow the authorities to obligate both households and service providers to play their part in delivering a full sanitation service chain (World Bank Group, 2017). In this regard, the Ministry of Local Government, Rural Development and Cooperative (MoLGRD&C) has developed a Faecal Sludge Management (FSM) Framework 2017 for supporting the sector through adaptation of policy guidelines. The FSM framework is approved by the government dated 11 May 2017. Different stakeholders are appreciated the current policy document including the other government institutions, donor agencies, other development partners and practitioners.

In Bangladesh, Faecal Sludge Management approach has already been introduced in few municipalities. One of the major such successes has been achieved at Shakhipur Municipality in Tangail district. WaterAid Bangladesh provided technical and financial support to establish the co-composting plant. Shit flow diagrams (SFD) were developed to quantify the pre and post condition of the municipality. The introduction of the co-composting plant is increased the proportion of safely disposed sludge from 21 percent to

58 percent within two years. Lab based testing has ensured that pathogen reduction is significant; in addition, a carbon and nitrogen ratio (C:N) is 16-20:1 which is within the acceptable range as ideas C:N ratio is 20-30:1. Average moisture content is around 16 percent. Approximately 24 metric tonnes of compost is produced yearly. Demand for the compost is in and around the town, and local Department of Agriculture officials advise farmers to use this compost. The municipal authority sells the compost directly to local farmers for BDT 15.00 (USD 0.20)/kg, and the farmers use this compost to produce different vegetables.

2.5 Data Collection Tools Development and Finalization

Both qualitative and quantitative data collection methodology was followed in the study. Structured questionnaire for Face-to-Face interviews was used as the main strategy for data collection from households, markets, institutions, and business units. The research tool included demographic information, socio-economic characteristics, and details of the practices related to faecal sludge and solid waste management.

Apart from quantitative data collection approach, observation, KII, and FGD were conducted during the study period. Different pre-structured checklists for each of the approaches were used for the collection of primary data. These instruments were developed in a participatory manner and reviewed before field-testing.

2.6 Questionnaire Survey

Face to Face (F2F) interview or the structured interview is always considered as one the most reliable sources to collect quantitative data from the target audiences. Therefore, a preset structured questionnaire was used for the collection of relevant primary information from various levels of respondents. During the data collection, we followed same order of questions in every interview to ensure reliably aggregated information. Hence, the study findings compiled with the number, statistics, rate, ratio, etc. according to the variables under the objective and specific objectives of the current baseline study.

Picture: Face-to-face interview

2.7 Key Informant Interviews (KIIs)

Picture: KII with Counselor

Key Informant Interview (KII) approach was extensively used for acquiring information on various aspects as mentioned on the ToR for supplementing the qualitative outcomes with the quantitative data. A total of 20 KIIs were conducted in the study area. Different stakeholders were covered under the KIIs. *(List of respondents are attached in Annex)*

2.8 Focus Group Discussions (FGDs)

Although a good number of secondary research reports were available from the partners' organizations, in order to document primary data from the beneficiaries, Focus Group Discussions (FGD) approach was also conducted by inviting representatives from different types of stakeholders. Each of the focus group was comprised of 6-8 persons. A total of nine (9) FGDs were conducted in the survey areas.

Picture: Focus Group Discussion

2.9 Limitation

Every research study faces certain problems or limitations as the present study also has gone through some of the difficult situation as mentioned below:

- Lack of unavailability of information;
- Lack of willingness of the respondents; specially under Key Informant Interviews (KIIs);
- Lack of knowledge of the respondents;

In spite of the above limitations, best efforts were employed to make the study a meaningful and representative.

2.10 Pre-testing Research Tools

A pre-test were done for testing the research tools. Different types of questionnaires were finalized by incorporating experiences that were gathered during pre-testing. Modification and adjustment were done wherever needed.

2.10 Team Selection and Training for Field Team

Team members were selected by a meticulous process considering proper blend of related experience, dynamism, predilection for conducting this type of assignment. Enumerators with previous work experience are deployed with a view to data collection and management along with evading any unpleasant situation if arise in the field.

Picture: Training

All the selected enumerators and other team members were attended on three (3) days training session to get better understanding on the questionnaires. They went through both in-house and field session (pre-testing) so that they were exposed of features and issues needed to address in light of survey parameters and indicators.

2.12 Training for Field Supervisors (FS)/ Quality Controller (QC)

The Field Survey Supervisors/Quality Controllers were recruited from the headquarters (Dhaka). Having previous experience of working as FS or QC in several projects was the main criteria in selection. A separate training session was conducted with selected FS and QC in Dhaka to share the project objectives and data collection methodology.

Picture: Training

2.13 Training for Field Investigators (FI):

Both in house and field training were conducted for the Field Investigators/ Enumerators. The Field Investigators were properly briefed on study objectives and the nature of the survey. Overall techniques of the data/information collection processes were explained to the team members.

After completing this procedure, the Investigators were taken to the field to be acquainted with the outcomes from using the research tools. The process helped the enumerators to understand whether the research tools were effective for collecting desired data and information from segments of respondents or not. Technically, it is the pilot testing of research tools.

Picture: Pilot Testing of Survey Tool

2.14 Data Collection from Filed

After successful completion of the training sessions, each of the field team was formed with five members: one field supervisor, one quality controller (QC), and three field investigators. A total of eight (8) field teams were deployed simultaneously to survey at several areas within the municipality territory. Detail schedule was previously prepared and followed strictly to meet the deadline of the study. The Field Supervisors and the Quality Controllers were continuously supporting to the field investigators in fields and applied their monitoring techniques to ensure quality data collection from fields.

Picture: Monitoring by QC

2.15 Quality Control and Monitoring Plan:

One of the major aspects of quality control of the field survey is to ensure collection of accurate data from the fields. Inaccurate data or information may come for various reasons like couldn't generate a clear conception upon all various types of research tools, lack of presentation of various questions towards the respondents, insufficient socialization of the respondents, negligence or irresponsibility of the investigators and so

on. Therefore, quality control mechanism needs to be pragmatic by nature. For ensuring effective quality control of the filed survey, one supervisor and one quality controller were attached with each team. The quality controller accompanied the investigators for judging the quality of collected data and information along with investigator's approach. The Quality Controller also was responsible for the back-check of the questionnaire. Supervisor not only guided the investigators in the fields but also helped to improve their techniques to communicate with the respondents. However, realizing high level of importance to collect accurate data and information, we had taken following measures to ensure reliability of data and information.

2.16 Questionnaire Checking by Field Supervisors

After successful completion of the questionnaires by the field investigator, the Field Supervisors/Quality Controllers randomly rechecked around 30% of the completed questionnaire for respective fields. If any major mistake or anomaly were identified, that questionnaire was rejected and the Investigators were asked for rectifying the identified issue. For ensuring quality control in the fields, a total of four (4) Quality Controllers were engaged during the survey period. If any member of the field team found inefficient or identified dishonest on his/her works, the person was replaced by an alternative one from the standby trained pool.

Picture: Questionnaire checking by Field Supervisor

2.17 Database Preparation and Data Entry

A database programme was prepared for efficient data entry, processing and output generation. The task of a database designer was to structure the data in such a way that eliminates unnecessary duplication and provides a rapid search path for all necessary information. The programme includes several editing syntax i.e. business rules which identifies initial errors in the questionnaire. This ensures that inconsistent data would not be entered in the database file. Indicators would be pre-coded in the questionnaire as well as in the data entry programme.

All interview questionnaires were checked for completeness and correctness before data entry. Questions were coded and a code list were prepared.

2.18 Data Validation

Most of the sophisticated data validation was incorporated with the proposed software. Function for logical error and range error check has also been incorporated with the software, apart from the standard editing method. A separate edit program was developed to identify data errors. This error identifier helped to identify

- Logical error
- Range Error
- Typical Error

2.19 Data Analysis

Data has been cleaned, checked and edited properly before analysis. Frequency distribution and proportion of important variables has calculated. Cross tabulation and association determined using the chi square test, if applicable, or any other relevant test.

2.20 Report Writing

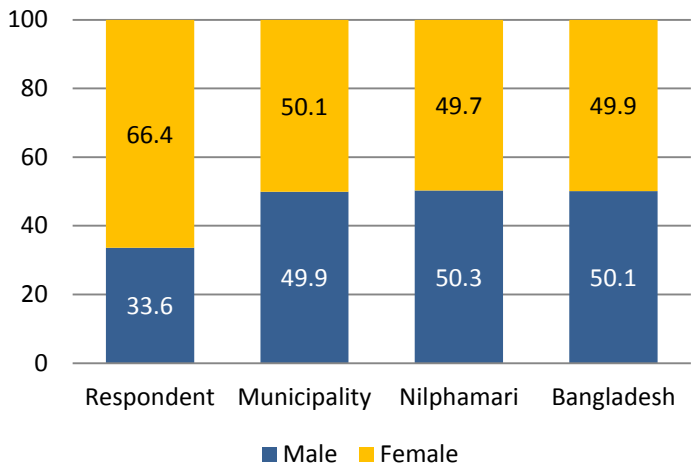
Dummy tables were prepared in advance to make output generation systematic. A framework of profiles and analytical tools were also prepared to come up with a quality report. Mostly descriptive statistics were used. Where necessary more advanced statistical tools has been employed entailing graphics, charts or any other figures.

3. Results and Findings on Respondents and Household Characteristics

Characteristics of Respondents:

3.1. Gender

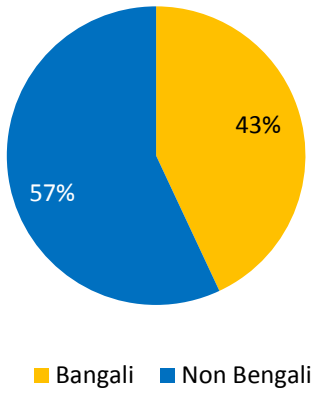
Figure 3: Gender



According to the survey outcome, around 66 percent of the respondents are female while the rest 34 percent are male. The head of the household irrespective of gender and his/her availability were interviewed. Male are the main earner in our society. Therefore, it can be well assumed that male person would not be available during daytime for their professional engagement and female, co-head of the household, would be able to share their valuable thoughts in this regards.

When considering the entire population in the municipality areas, population ratio is found almost equal and more specifically female ratio is slightly higher compare with male. Based on Nilphamari district level information, male ratio is slightly higher compare with female. While comparing with the national level ratio, male and female ratio is found just opposite. Overall male and female ratio is providing an indication that female citizens are slightly more compare with male in the municipal areas.

Figure 4: Ethnicity

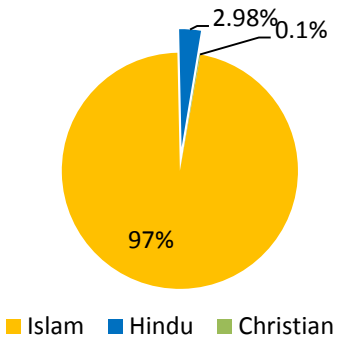


3.2 Ethnicity

Saidpur municipality is such a place where a significant proportion of people are non-Bengali. The issue is also reflected on this survey. Among the respondents, around 43 percent of the respondents were Bengali and the higher proportion of around 57 percent of the respondents was non-Bengali. (Bihari)

From religious perspective, nearly 97 percent respondents were Muslim along with 3 percent Hindu. Rest of 0.1 percent are Christian.

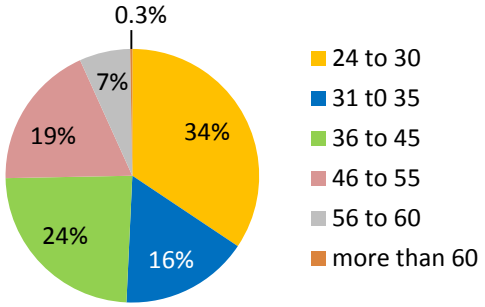
Figure 5: Religion



3.3 Age

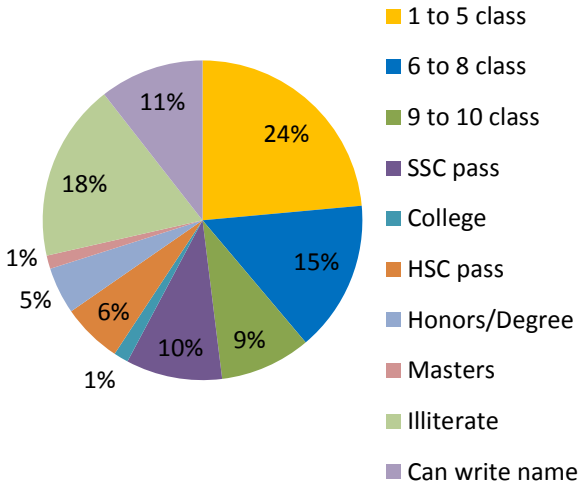
Age of most of the respondents was within the range of 24-30 years with coverage of 34 percent. Mean age of the people of Bangladesh is 26.3 years. It is also reflected on the survey. Another significant age range was 36-45 years as it was 24 percent of the respondents. A senior aged group person within the range of 46-55 was around 19 percent and followed by age group of 31-35 years as around 16 percent.

Figure 6: Age of respondents



When considering the age of the entire population in the municipality, most age concentration is identified within the range of 21-30 years which is around 25 percent. Mean age of the people of Bangladesh is 26.3 years and it is within this range. Other highest age ranges are 11-20 years with around 21 percent and 41-60 years with above 18 percent coverage.

Figure 7: Education



3.4 Education

Most of the respondents are educated at various stages and such coverage is around 82 percent. Highest around 24 percent have education up to class-V and around 15 percent within class-VI-X. Nearly 10 percent are found SSC passed. Above six percent (6%) are found having higher education means completed graduation. Only 18 percent are illiterate.

Education status of the population has given impression that most of the people have education up to class-V and followed by within Class-VI-VIII which is around 17

percent. Around 53 percent of the people have education up to class-X. Illiterate people's coverage is only around 11 percent. In this study area, literacy rate shows higher as around 74 percent compare with the nationally published figure under Population Census 2011 where it is around 64 percent in the municipality and only 47 percent in Rangpur division. Education scenario is given an apparent indication that new generations are engaging with education more and more, and it shows increasing trend. Overall education situation is provided positive impression. There is enormous possibility to accept new concept, approach and knowledge by the citizens for having a respective level of educational background.

3.5 Occupation

Most of the respondents (57%) are the housewives and it is expected as nearly two-third of the respondents was female. Other than that, major professions are entrepreneur (8%), private service (8%), small trader (6%), and tailor (4%). Around three percent (3%) of respondents were Students and two percent (2%) were unemployed. Rests of the respondent were identified agricultural labor, blacksmith, fisherman, boatman, homeopath doctor and so on.

Table 3: Types of Occupation (%)

Occupation	Respondent	Population
House wife	56.8	26.4
Entrepreneur	8.4	6.0
Service	8.0	10.8
Small Trader	5.6	2.9
Tailor	3.8	2.7
Student	3.1	26.8
Unemployed	2.3	7.6
Retired Service holder	1.9	1.3
Rickshaw/Van Driver	1.8	2.0
Farmer/Farming	1.5	1.2
Mason	1.4	1.8
Auto Driver	1.4	1.6
Labor		2.0
Others	4.0	7.0
Total	100.0	100.0

While considering the entire occupational status of the municipality other than house wife, a significant proportion of people are found service holders which is around 11 percent. (11%). People's profession as entrepreneur is six percent (6%) and followed by the tailor with three percent coverage (3%). Small trader coverage is almost three percent (3%). Besides that a huge proportion if around 27 percent (27%) of the population are student. Unemployed coverage is significant as around eight percent (8%).

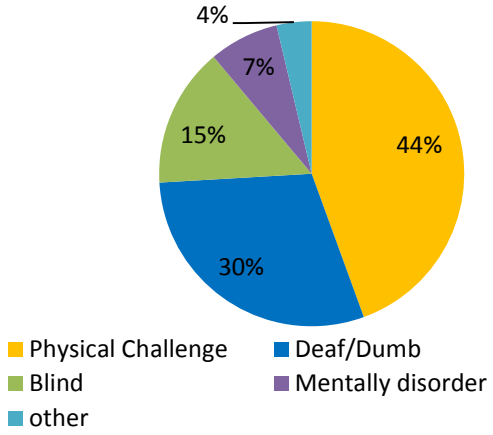
3.6 Marital Status

According to the survey outcome, above 52 percent of the population are married and 47 percent unmarried. On the other side, insignificant of 1.2 percent are either widow or divorced.

3.7 Differently able population

This study was provided efforts for identifying the percentage of differently able people in the municipal areas. The survey outcome has given impression that there are around four percent (4%) of the people who are differently able. According to the national coverage, people with disability are 9.07 percent of the population as published on the report of the Household Income Expenditure Survey 2010 by the Bangladesh Bureau of Statistics' (BBS). In particular, people with physically disable proportion are higher as 44 percent. It means people have disability on different parts of the body which is visible. Around 30 percent of the disable people are deaf & dumb. Around 15 percent people are found blind and above seven percent of the disable people is mentally disorder.

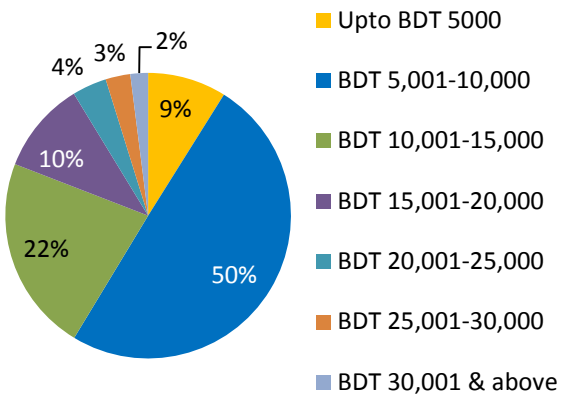
Figure 8: Differently able population



3.8 Monthly Income

Monthly income of most of the respondent are found within the range of BDT 5,001-10,000 which is almost 50 percent followed by within the range of BDT 10,001-15,000 as around 22 percent. Average monthly income of the entire respondents is BDT 12,198. Based on HIES 2010, Average monthly income per household is BDT 11, 479 at the national level. It is seem higher monthly income at the Saidpur municipality and reflecting the national claim that economic growth has steady and increased trend in the country.

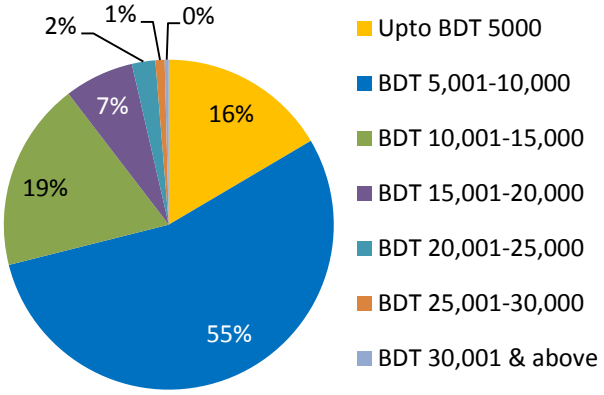
Figure 9: Monthly Household Income



3.9 Monthly Expenditure

Monthly expenditure of most of the respondent is within the same range of BDT 5,001-10,000 as it around 55 percent and followed by BDT 10,001-15,000 as around 19 percent and up to BDT 5,000 as around 16 percent. Average monthly expenditure is BDT 9,877.

Figure 10: Family Monthly Expenditure



3.10 Savings Practice

Positive aspect is that around 74 percent of the respondents are found having saving practices. On an average monthly saving of the respondent is BDT 1,880. Minimum and maximum saving amount as identified are BDT 500 and BDT 10,000.

4. Situation Analysis of Faecal Sludge Management

Containment Pattern at household Level

4.1 Latrine Use Pattern:

According to the survey outcome, 92% of the household have their own latrine while eight percent (8%) do not. However, very few of the latrines are environmentally safe.

Figure 11: Latrine Use Pattern

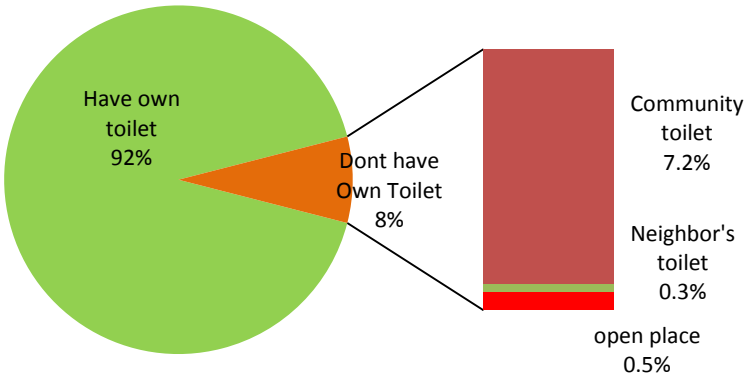
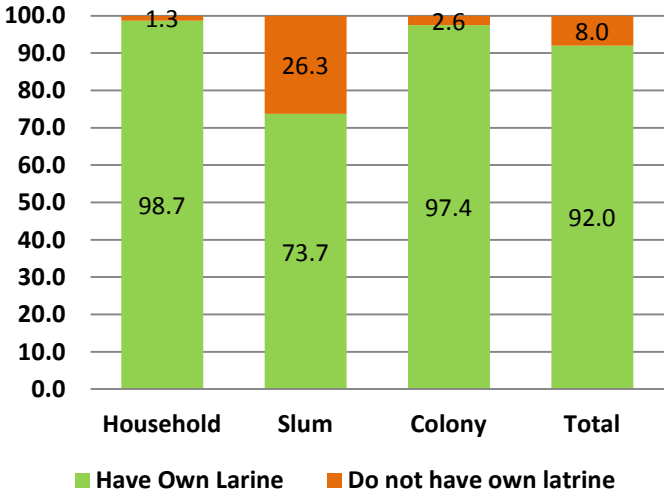


Figure 12: Have own latrine



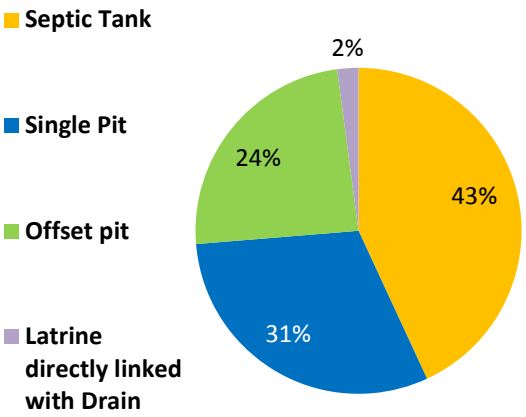
Around 7% of those who do not have own latrines are mostly using community latrine followed by 0.3% using their neighboring latrine. Such type of support should be appreciated for contributing on promoting healthy environment within a community. However, less than one percent (0.5%) of the entire population is still going for open defection; mainly those are living in slum areas. It is a grave concern and the municipal authority should take initiative for resolving such situation.

4.2 Types of Toilet in household level:

The mostly uses latrine are pit latrine (55%) followed by latrine having septic tank provision on it (43%). However, around 2% of respondents have connected their latrine directly with drain.

Among Pit latrine owner, around 31% of the household have single pit followed by 24% have offset pit latrine.

Figure 13: Types of Latrines at Household



4.3 Types of toilet in Institute/Business/Market:

Under this study, various types of commercial institutions are also covered for getting impression about sludge containment types and other relevant information. After communicating the municipality, a list of various types of major institutions has been collected. Based on the outcome of the survey, around 55 percent of the latrines under various types of institutions, market and business places have septic tanks provision. Such coverage is found highest among institutions (78%) followed by business centers (41%). Around 20 percent of the latrines have pit but most of the latrines are very unhygienic because of not having water seal or having broken one. 11 percent latrines has Off-set pit along with twin-pit latrine provision. In general, toilet provision in market usually keeps outside the market or in a common place where everyone can go for using at any time of the day. Such coverage is identified as 14 percent which is 80 percent in the market places.

Figure 14: Types of latrines in Institute/business and market place

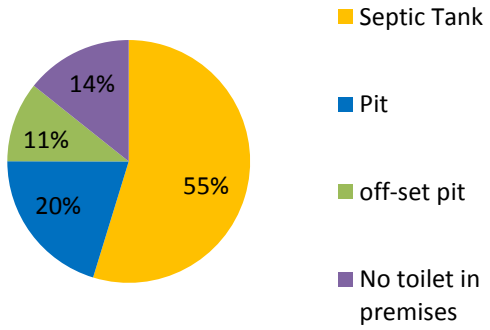
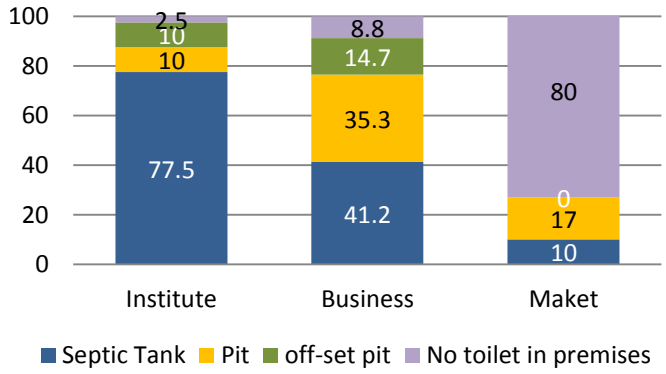
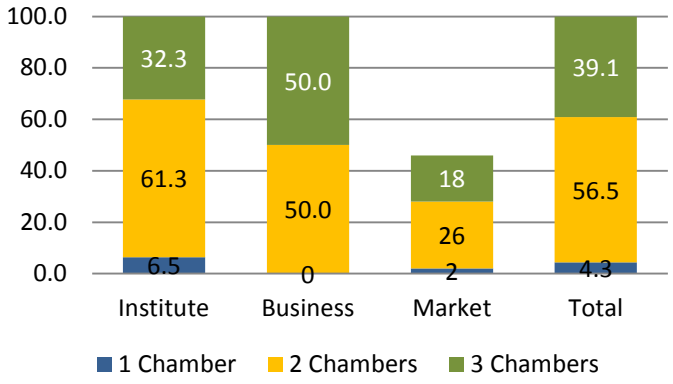


Figure 15: Types of Latrine other than HH (detail)



The size of the septic tanks is mostly found within the range of 301-500 ft^3 (37%). Average septic tank size is 523 ft^3. Most of the septic tanks have two chambers (57%) followed by three chambers (39%).

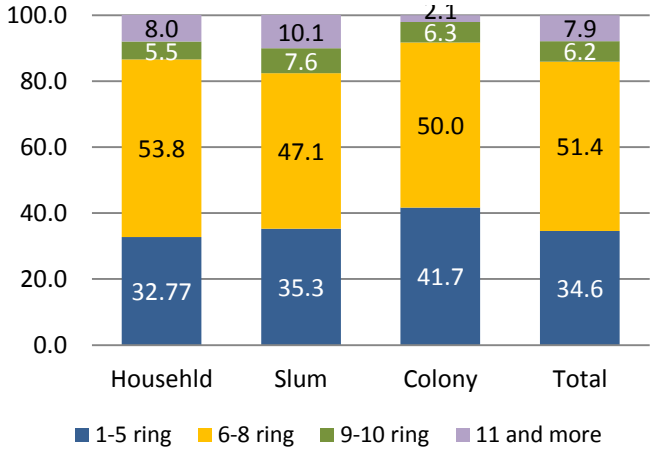
Figure 16: No. of Chamber in Septic Tank (Non-household)



4.4 Size analysis of Pit and Septic Tank in Household

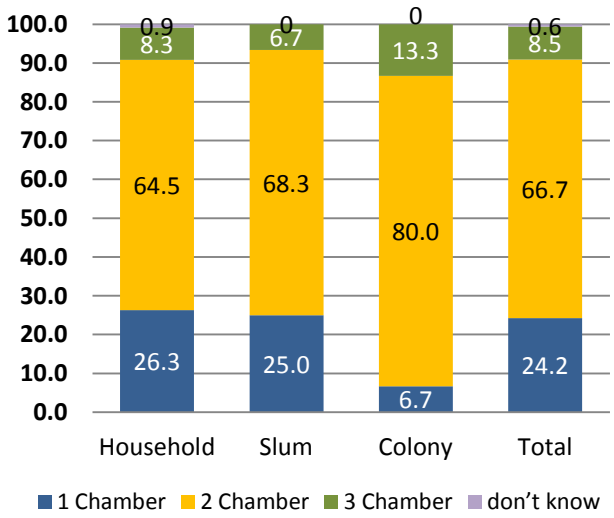
As identified through the survey, people use 6-8 rings mostly (51%) for constructing each of the ditches under single, dual or offset pit latrine followed by 35 percent uses 1-5 rings. Interestingly, about eight percent (8%) of the respondents stated about using 11 or more rings for constructing a pit. However, the survey has identified that on an average people use seven rings for the construction of one pit. Such type of practice should be appreciated for adjusting standard number of rings.

Figure 17: No. of rings in HH



It is revealed that, a major portion of the septic tank (67%) have two chambers which are highest in colony followed by slum and households. In slum areas, community latrines have been constructed by different NGOs under various projects. In this regards, a proto-type two-chambered sanitary latrine design was executed in those areas. Around 24 percent of total household, did not follow the standard design of septic tank. They have built one chamber instead of septic tank which is highest in household level (26%) followed by slum (25%).

Figure 18: No. of Chamber in Septic Tank (HH)

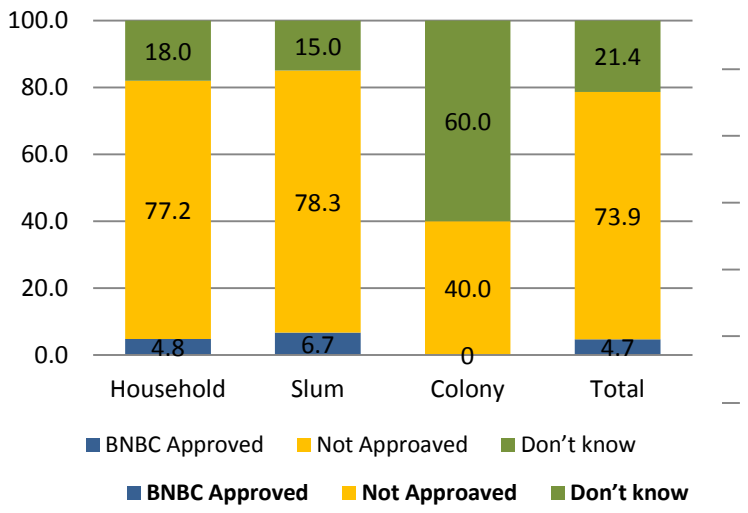


Interestingly, septic tank with three chambers is found but mainly in the colonies (13%). As a large number of people are living in the colonies, three-chambered septic tank based sanitary latrine construction should be an encouraging and acceptable latrine design option. In general, the septic tank size as identified is 768 cubic meters (m^3) where length is 12 feet and weight and height is 8 feet each.

4.5 Maintaining BNBC At household level:

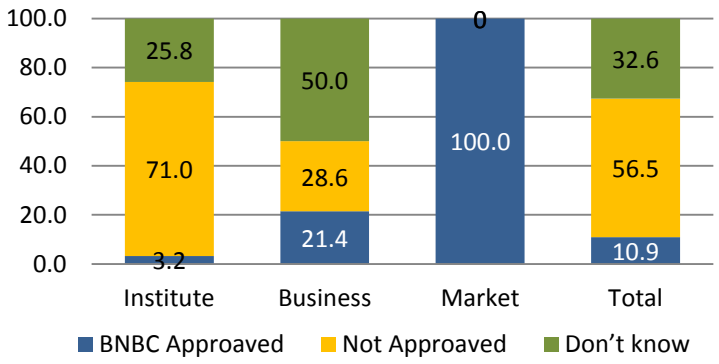
Most of the building owners didn't seek permission for septic tank design from the assigned authority. The issue is not getting any priority from the building constructors and also neglected by the most of the house owners (74%). About significant portion (21%) of household even don't know about the BNBC. About five percent (5%) stated positive comment about taking approval on their latrine design where septic tank is considered as a vital issue. Overall situation indicates of serious lack of awareness among the respondents regarding septic tank issue.

Figure 19: Maintaining BNBC at HH



4.6 Maintaining BNBC at institute/Business/Market Places:

Figure 20: Maintaining BNBC at other than HH

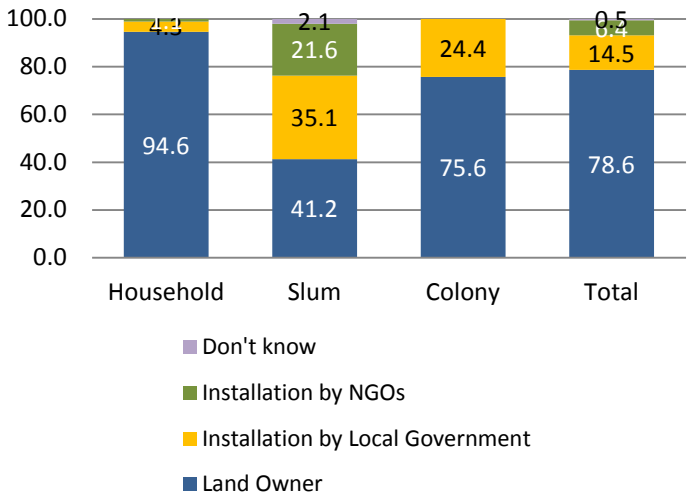


In non-household sector, most of the design of the septic tank (57%) did not follow BNBC. While a major portion (33%) is completely unaware of the BNBC issue. While around 11 percent of the household are leaned and followed BNBC in constructing septic tank.

4.7 Ownership of Latrine:

According to the survey outcome, most of latrine was financed by the land owners (78%). Such coverage is highest at the households (95%) followed by colonies (75%). In slum areas major portion of latrines (41%) are financed by land/slum owner followed by local Govt. (35%) and NGOs (21%).

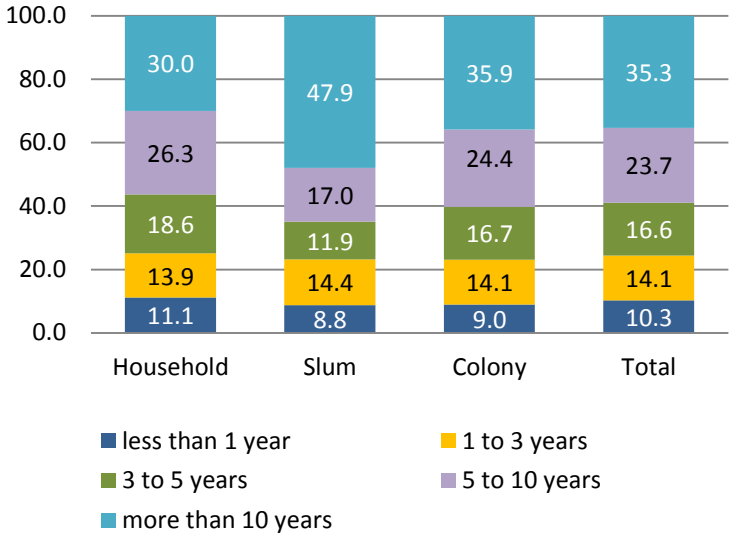
Figure 21: Ownership of Latrine



4.8 Duration of Latrine use:

The governments of Bangladesh setup a nationwide target to ensure confined defecation by 2015 and such decision was taken in 2003. Therefore, the present survey was provided efforts to identify how long people were using latrine. Around 35 percent of the households has been using latrine for more than 10 years followed by 5 to 10 years (24%) and 3 to 5 years (17%). Also 1 to 3 years latrines users and less than 1 year latrines user are found 14 percent and 10 percent respectively.

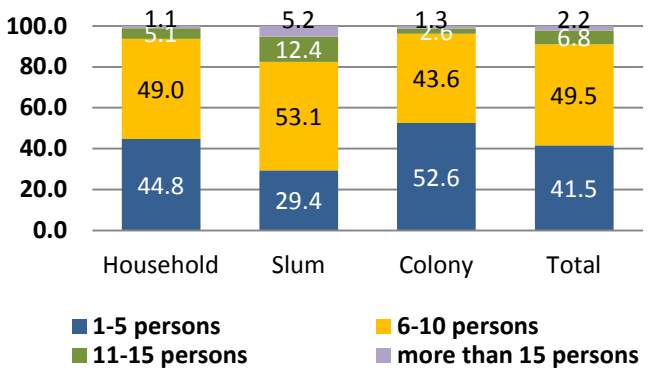
Figure 22: Duration of Latrine Use



4.9 Latrine Users at HH:

The survey outcome revealed that, 6 to 10 persons are sharing one latrine in Saidpur which is 50% followed by 1 to 5 persons 41% percent.

Figure 23: No of Users of One latrine in HH



4.10 Latrine Users Pattern in Institute/Business and Market Places

Table 4: No. of Users of One latrine in institute/business/market (%)

No. of Persons /Latrine	Institute	Business	Market	Total
1-25 person	23.7	78.8		47.9
26-50 person	5.3	12.1		8.2
51-100 person	2.6		50.0	2.7
101-250 person	31.6	3.0		17.8
251-500 person	18.4	6.1		12.3
501-1000 person	13.2		50.0	8.2
More than 1000 person	5.3			2.7

In non-household category, most of the toilets (48%) are used by 1-25 persons in a day followed by 18% by 101-250 persons and 13% by 251-500 persons.

In institution, about 32% of the toilets are used by 101-250 persons followed by 18% by 251-500 persons. It was found from the observation; most of the toilets in institution are neither environmentally safe nor hygienic. Most cases, separate toilet provision for male and female are not exits. Same scenario was found in market places.

4.11 Maintenance of latrine:

One of the major aspects of using latrines is to keep clean the inside of the toilets to ensure hygienic environment. Therefore, the issue of operation and maintenance (O&M) is considered as an essential concern. As identified through the survey outcome, a high proportion of the latrines users (94%) spend money for O&M purpose. Such practice is found highest at the household category (95%). However, a slightly lower 90% slum dwellers are found having practice to spend money for O&M.

Figure 25: Spend Money for O&M

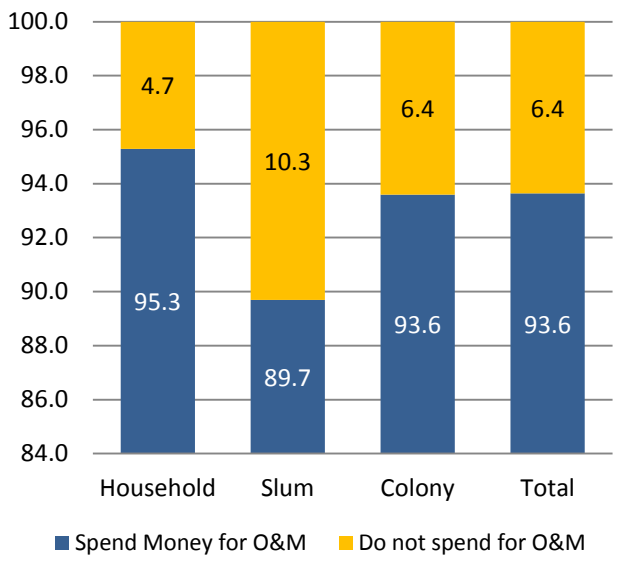
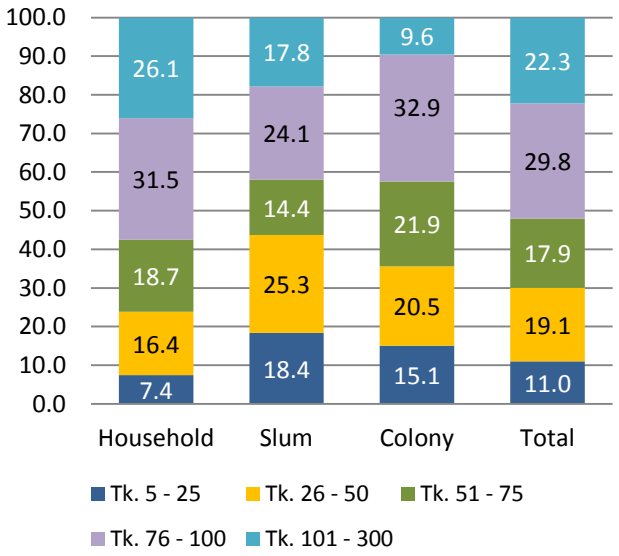


Figure 24: Amount of money for O&M



About 30% of household spends on an average 76-100 taka per month followed by 22% spend between 101-300 taka per month. On an average, monthly O&M cost is 82 taka.

4.12 Fecal Sludge Generation: Estimated volume of Faecal Sludge Generation

According to the census 2011, population size of Saidpur Municipality was 127,104. Population growth rate of Saidpur is 1.22% where national population growth rate is 1.19%. Using the population growth rate of 1.22% we have estimated the population for next 20 years.

Faecal sludge generation rate is calculated based on few factors i.e. volume of septic tanks/pit, number of users, and frequency of emptying. Information on selected factors was collected from 739 households. In calculating generation rate of sludge 324 households were discarded as they did not require emptying the septic tanks/pit.

It is assumed that, household takes initiative to empty the septic tank/pit when it is filled. We have calculated faecal sludge generation rate by using following formula:

$$\textbf{Fecal sludge generation rate} = \frac{Volume\ of\ the\ septic\ tank\ or\ pit\ (Liter)}{No.of\ users\ x\ de{-}sludging\ interval\ (yr)\ x\ 365}$$

Table 5: Fecal sludge production rate in the municipality (Field Survey, 2017)

Household	Fecal Sludge Production Rate	(liter/person/ day)	Reported rate from other studies
N=415	Average	0.561	0.50-1.3 liter/person/day (Aftab, 2012)
	Minimum	0.41	High income countries (100-200 g/person/d)1
	Maximum	1.55	Low income countries, rural (350 g/person/d)2
	Standard Deviation	0.136	Low income countries ,urban (250 g/person/d)2
			China (315 g/person/d)3
			Kenya (520 g/person/d) 4
			Thailand (120-400 g/person/d)5

Source: *1 Lentner et al. (1981); Feachem et al. (1983); Jönsson et al. (2005); Vinnerås et al. (2006); 2 Feachem et al. (1983); 3 Gao et al. (2002); 4 Linda et al. (2014); 5 Schouw et al. (2002)*

The calculated fecal sludge generation among the households is somewhat varies between 0.41-1.55 lite/person/day. The calculated average fecal sludge production rate in Saidpur municipal area is close to the reported value by Aftab (2012) in Bangladesh. The other reported values are taken from other countries, which have different socio-economic situation compared to Bangladesh.

While comparing the calculated faecal sludge production rate of Saidpur municipality with the reported value of Shakhipur municipality, FS rate is found higher compare with Shakhipur municipality i.e. the volume is 0.561 liter/person/day in Saidpur municipality and 0.461 liter/person/day in Shakhipur municipality.

Considering 0.561 liter sludge generation by a person/day the estimated volume of total faecal sludge is 27,990 m^3 in 2017. It indicates every year a large volume of faecal sludge is being generated in the municipality area. Such huge volume of faecal sludge is definitely providing extreme negative impacts upon enlivenment as it is extremely harmful for the

people. Gradually, environment pollution will be in serious threat for the citizens if not introduce any kind of effective technical mechanism to prevent overall environment of Saidpur town. In future, projected volume has shown that situation will be even worse like faecal sludge volume will be around 30,841 m^3 in 2025 and 34,818 m^3 in 2035 and 36,994 m^3 in 2040. It is high time taking initiative on adopting appropriate and effective faecal sludge management mechanism in the municipal areas.

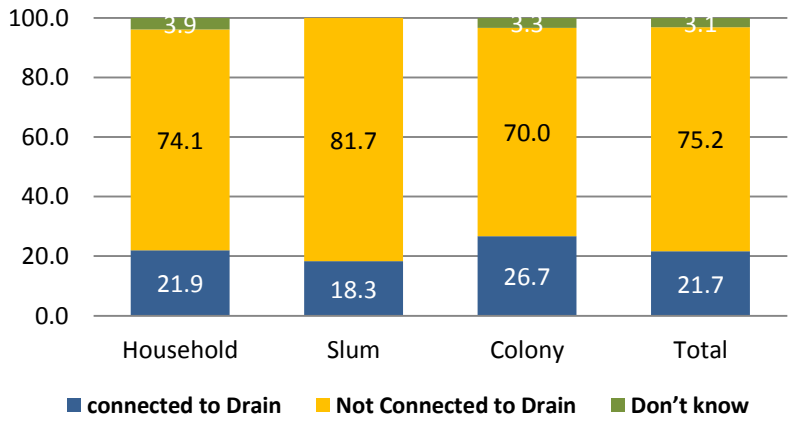
Table 6: Projection of Faecal Sludge Generation for 20 years

Year	Population	Faecal Sludge/day (liter)	Faecal Sludge/day (m^3)	Faecal Sludge/Year (m^3)
2011	127104	71,305	71.3	26,026
2017	136,696	76,686	76.7	27,991
2025	150,621	84,498	84. 5	30,842
2035	170,040	95,392	95.4	34,818
2040	180,668	101,355	101.4	36,994

Faecal Sludge Disposal Practice:

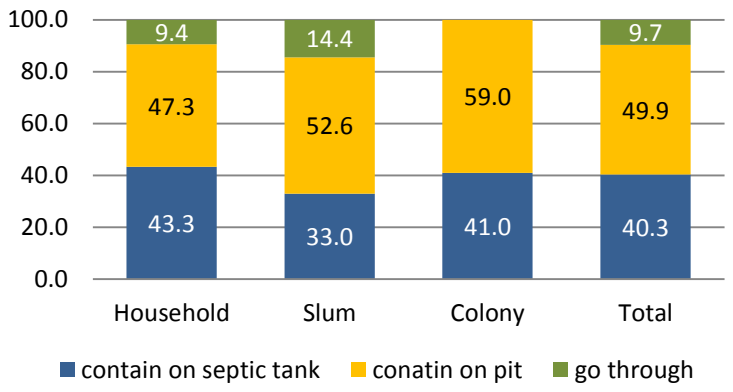
4.13 Pit/Septic Tank Connected to Drain:

Figure 26: Connection to Drain



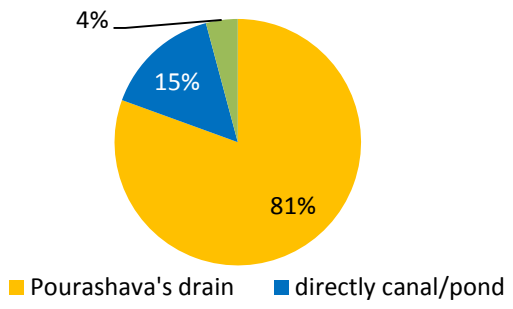
According to the household survey outcome, a large proportion of household (75%) stated that, the septic tanks of their sanitary latrines are not directly connected to the municipal drainage system. This can be an appreciable practice for not having such type of unethical exercise at a large scale. Same situation are found in slum (82%) and colony (70%). On the other hand around 22% of the households have connected their septic tank directly to drain. Therefore, it pollutes surrounding water and the environment.

Figure 27: Storage of Sludge



About 40 percent of the household that have septic tank mentioned that feces are being stored in the tank. While earlier 75 percent stated their tank is not connected to municipal drainage. It indicates there are alternative options other than drain for sludge disposal from septic tank. About 10 percent mentioned that sludge are disposed directly into open water body and open spaces from the septic tank and pit.

Figure 28: Disposal of Sludge directly from septic tank

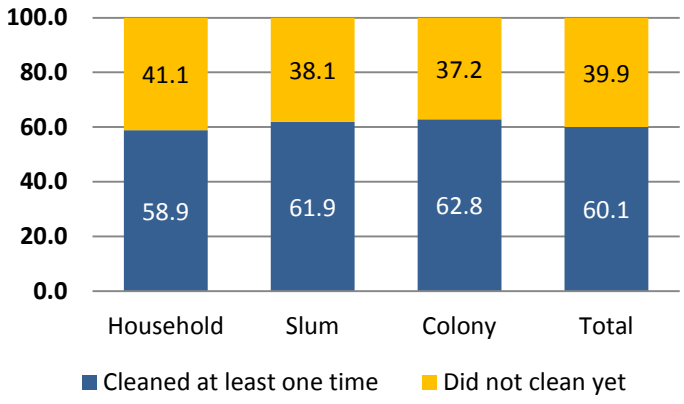


Among 10 percent of households that discharging feces directly around 81 percent have direct drainage connection, around 15 percent directly discharging into the canal and pond and 4 percent discharge into open places behind their house. This practice is polluting water bodies and surrounding open environment. Water bodies' pollution is one of the major causes of the waterborne diseases like diarrhea.

4.14 Emptying Pattern:

It is revealed from the household survey; about 60 percent of the households have emptied their pit and septic tank at least once. Rest of 40 percent did not need this service of emptying so far. The percentage of having emptying service is high in colony (63%) followed by slum area (62%) and household (59%). Among the households that did not get the service, 86 percent mentioned that their pit/septic tanks were not filled. 12 percent stated that sludge was not stored

Figure 29: Emptying status of Pit/Septic Tank



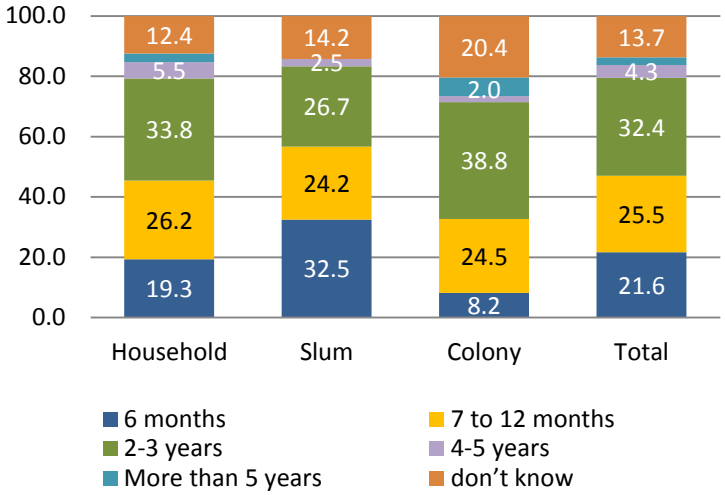
as pit/septic tank was connected to drain and water bodies. Only 1 percent mentioned that they covered the pit when it was filled.

4.15 Frequency of Emptying

In Saidpur, 32 percent of households that got the emptying service have emptied their pit/septic tank once in 2-3 years. This practice is much high in colony (39%) followed by household (34%) and slums (24%). Around 26 percent of the

household stated that usually they empty septic tanks or pits once in every year. Some of the respondents also found emptying the septic tanks or pits in every 6 months.

Figure 30: Frequency of Emptying Pit/Septic Tank



4.16 Knowledge on standard gap between two emptying:

Frequency of cleaning the septic tanks or pits is one of the important factors that have a link with identifying efficient faecal sludge management mechanism. Therefore, the households were asked whether they have any idea about the emptying time for cleaning septic tanks or pits. A major portion of households (73%) do not know about the standard time. While only 27 percent have expressed affirmative impressions regarding the issue.

Respondents were asked about the standard time gap between two empty of septic tank and pit. 50 percent of the respondents stated that the septic tanks or pits should be cleaned once in every 7-12 months. 13 percent households considered 6 months is the standard time gap. Another 13 percent thought there is no standard time gap, septic tank or pit should be emptied when it is filled. 2-3 years and 4-5 years were mentioned as standard time gap by 1 percent and 9 percent of household respectively.

Figure 32: Knowledge about emptying time

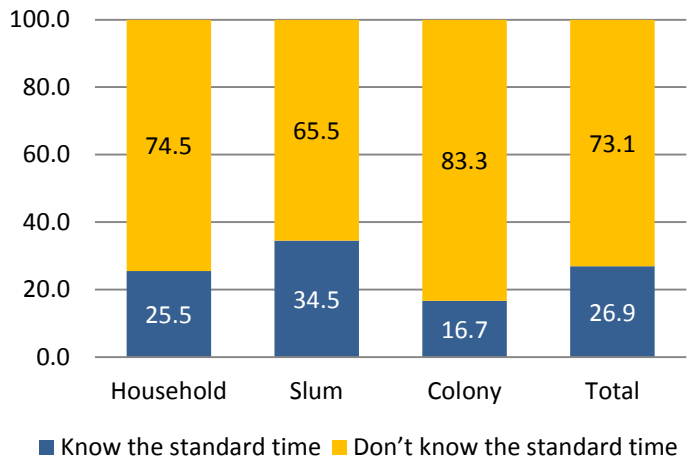
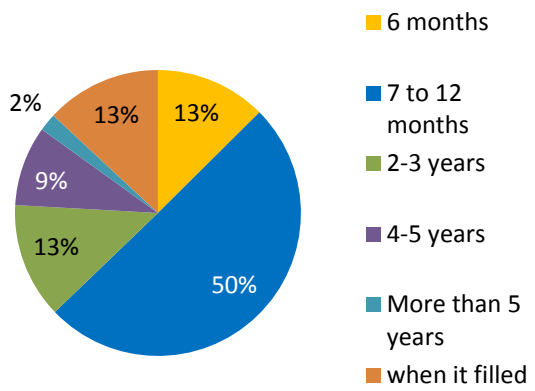


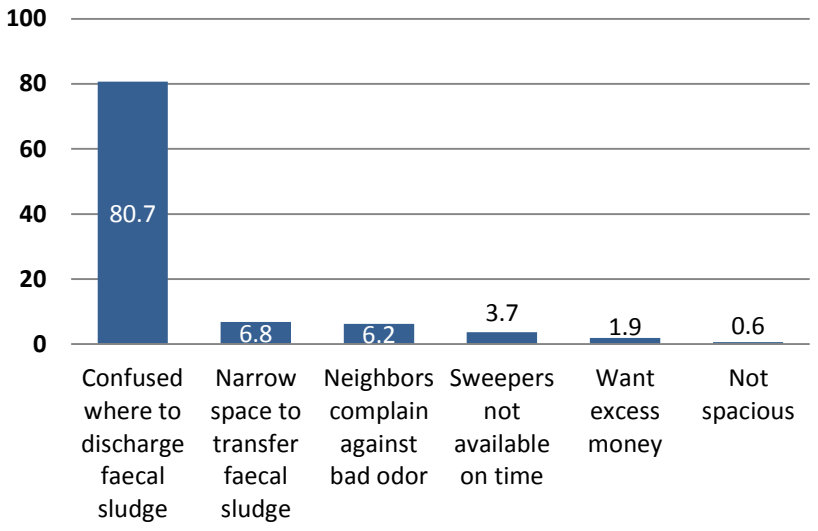
Figure 31: Time gap between emptying tanks



4.17 Difficulties of Emptying Pit and Septic Tank:

Respondents were asked to share the problems they were facing in emptying the septic tank or pit. 27 percent of the household mentioned that they have faced problem. Among them about 81 percent households faced problem at the time of discharge sludge after emptying. As there is no fixed dumping place for discharging sludge household faces difficulties in discharging sludge. Most of the time they dump it into nearby ponds, canal, and open places. Therefore, their neighbors complain (6%) for the bad odor. Because of narrow space around the tank few households (7%) cannot empty their septic tank or pit easily. Congested and unplanned houses construction along with unintended construction of latrines due to lack of knowledge about sanitary latrines is the cause of occurring such type of

Figure 33: Difficulties in emptying pit/septic Tank



situation.

On the other side, around 73 percent of the respondents stated that they couldn't face any kind problem for emptying the septic tanks or pits.

4.18 Cleaners of pit and Septic Tank:

Though one of the major mandates and responsibilities of the municipality is to provide pit or septic tank emptying service to the citizens, real ground scenario has given different impression. According to the survey outcome, people are largely depending on the private sweepers for emptying septic tank or pit. Around 98 percent of the people those emptied their pits or septic tanks are confirmed about appointing the private sweepers. Only one percent (1%) mentioned about taking sludge emptying service from the municipality and other one percent (1%) is emptied by their own.

One of the major causes for not taking sludge emptying service from the municipality is the present inadequate and uncertain service provision. The municipal authority has included mechanical process and providing the faecal sludge collection services with the vacutug. Most of the people have a common complain regarding the vacutug and complain is vacutug service is unavailable. It means the municipal authority unable to serve the citizens due to excessive demand of emptying pit or septic tank which is not possible to meet with limited sludge collection resources.

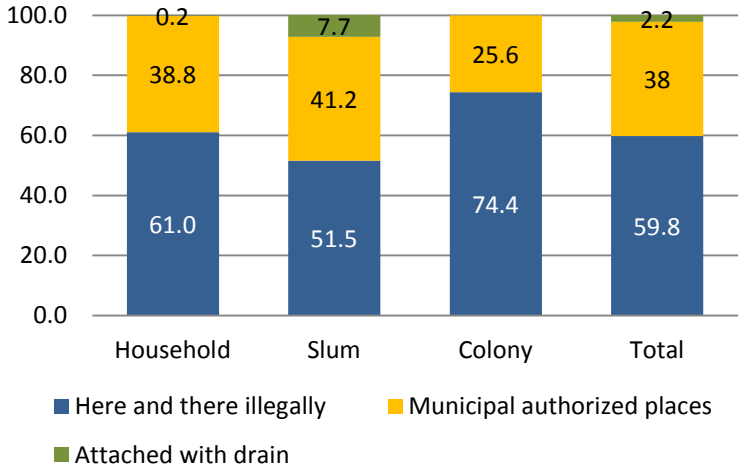
People also complained against the procedure to get the emptying service. Under the present procedure, a citizen has to apply by filling up an application form which makes them obligated to go to the municipal office; after that the person needs to pay the service charge in advance by depositing the money on a prescribe bank in favor of the municipality. With the copy of the deposited money the person again needs to submit the application form to the conservancy department. According to the resolution of the municipality, the conservancy department would provide emptying serve within next 72 hours. In general, it takes 3-4 days to get the emptying service from the municipality though it is uncertain. Most of the respondents expressed same comment about the emptying service pattern of the municipal authority.

Usually people take initiative when pit/septic tank become full and over flooded. It's very difficult for them to wait for 3-4 days to get service from municipality instead they to call private sweeper. Such service is easy and prompt like just make a call and negotiate the service charge.

4.19 General Idea about Disposal of Faecal Sludge:

Around 59% of the respondents confirmed that while people go for emptying the septic tanks or pits, all collected faecal sludge are dumped illegally anywhere nearby places by the appointed sweepers. Such unethical practice is found highest in the colonies (74%) followed by the households (61%). Such type of practice found comparatively lower (51%) in slum areas. Interestingly, 38% of the respondents stated that the sweepers discharged collected faecal sludge at the municipal authorized places; though there are no dumping places of municipality. Sometimes people consider Canal and drains as the authorized places by the municipality. Around two percent (2%) of the pits or septic tanks are found connected with the municipal drainage system, which is completely an illegal practice.

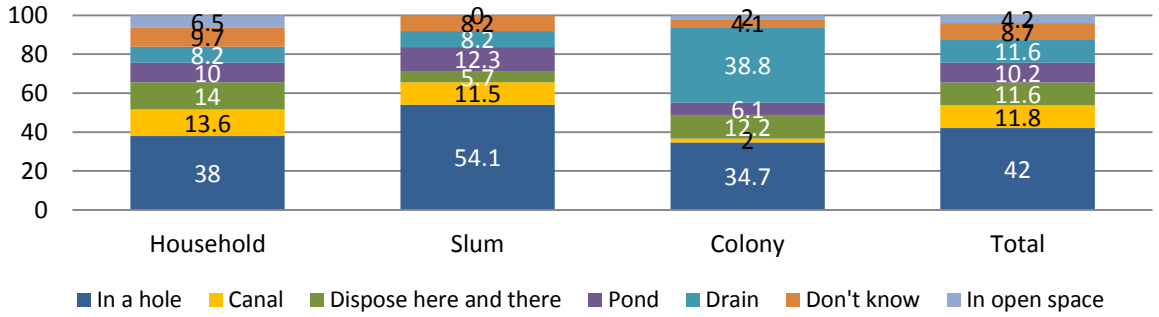
Figure 34: Ultimate Disposal of Faecal Sludge



4.20 Disposal of Faecal Sludge by sweepers after emptying Pit/Septic Tank:

Discharging of collected faecal sludge is a serious problem in the town as it is found through the field survey outcome. One of the common practices is discharging collected faecal sludge into a hole and it is mentioned by highest 42 percent of the respondents. On the other side, discharging in a canal or pond is also found significant (22%).

Figure 35: Disposal Practice of Faecal Sludge(%)



Besides such practices, the sweepers also discharge faecal sludge within the surrounding areas like lowlands, behind of houses, etc. And this type of coverage is around 12 percent. Disposing on the open drain is also a common practice (12%). These are frightening and a

great threat for the environment. These types of uncontrolled, careless and exposed faecal sludge discharging patterns are the causes of environmental hazard and negative impacts on human health. In addition, such types of practices are completely illegal as mentioned by around 69 percent of the respondents. It is indicative that there is a lack of acceptable mechanism for effectively discharging of faecal sludge.

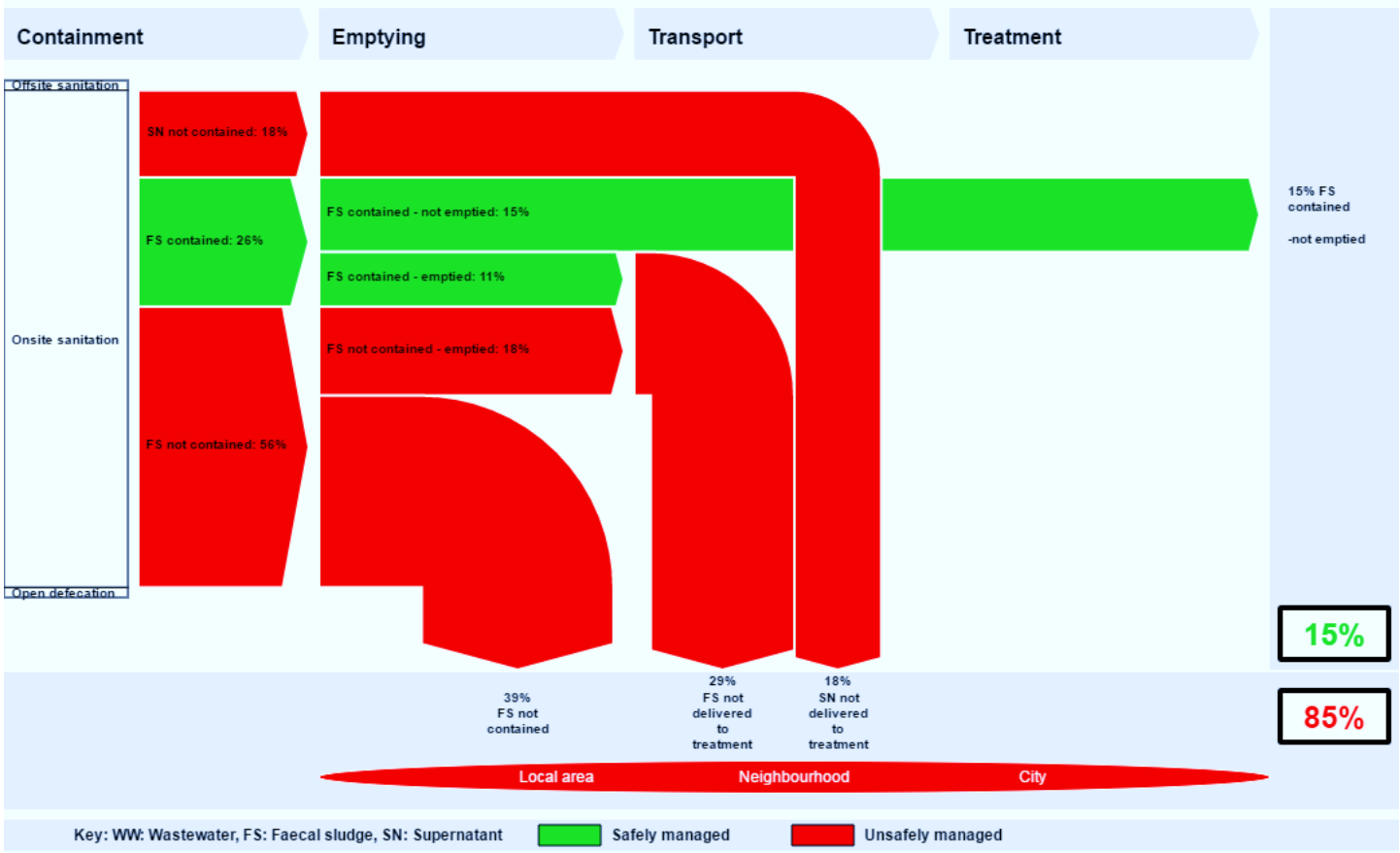
On the other side, rest 31 percent have expressed their ignorance regarding the issue. It has an apparent indication of having necessity to introduce appropriate mechanisms for discharging collected faecal sludge in a systematic manner.

The survey outcome revealed that there is no faecal sludge management process functional in the municipal areas. Under the present practice, when any septic tank or pit filled with feces then the private sweepers are hired for emptying such chamber. The appointed sweepers follow conventional manual process for emptying septic tanks and pits. They use bucket, rope, kerosene, etc. for the collection of faecal sludge. It is completely an unhygienic process and having high risk on health of the sweepers. In most of the cases, the issue of transportation is not considered and they are discharging sludge illegally at nearby places. Such disposal system is completely mentioned by all of the respondents (100%). However, there is not any initiative for stopping such emptying practices. The respondents ensured that the sweepers are dumping untreated and crude substances in many different ways including in a hole, water bodies, open drain, etc. Presently sanitation coverage in terms of installation of latrines is significantly high to ensure confined defecation practice among all the citizens. However, such success wouldn't sustain in the long run unless introducing effective and useful de-sluging mechanism through adaptation of faecal sludge management process in the municipal areas. On the other turn, such success might be gone in vein unless properly address the faecal sludge management aspect at this stage.

Picture: Discharge Sludge into Hole

Picture: Sludge Discharge into Drain

4.20.1 Shit Flow Diagram of Saidpur Municipality:



The SFD assessment has shown that, 85 percent of the excreta is not contained and therefore unsafely managed. Offsite sanitation in Saidpur is non-existent. Excreta are either discharged to open drain, water bodies or household don't know where the user interface discharged to. All onsite sanitation systems in Saidpur require regular emptying services. However, only 11percent of the total population utilizes emptying services in case of sludge contained in septic tank. 64 percent use system that do not contain faecal sludge and furthermore do not receive emptying services.

4.21 Impression about Sweeper's Service

Sweepers are the main force of emptying pits and septic tanks in the municipal areas. Historically, 'Harijans' have exclusively performed the task of cleaning roadsides, collecting solid waste from the city and emptying human feces. A small and deprived hindu believers are engaged with these types of activities and the community is known as "Dalit". Nowadays, Bengali Muslims are gradually included with these activities. Through FGDs findings, the survey team has identified that Harijans and Dalit communities are considering as the minority population in the municipality and they are extremely deprived by the government. The proportion of Muslim sweepers is increasing very fast.

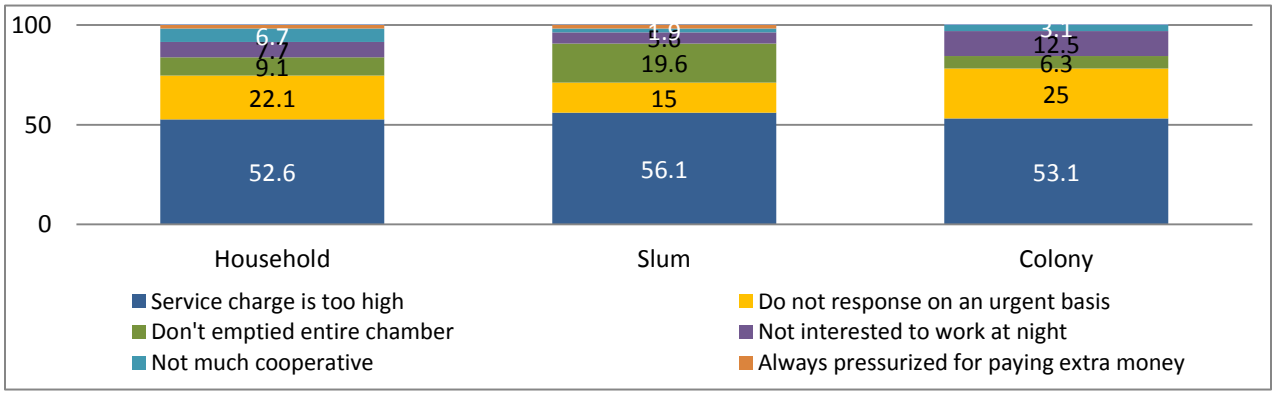
Previously, there was a quota system for the Harijans and Dalit sweepers. Under such provision these people should be entitled to get 80% quota among all cleaners and sweepers. This quota system has been vanished gradually.

Nowadays, Muslim sweepers are getting more preference on these jobs and others are depriving at the highest level. By analyzing the present situation, "corruption and bribery" is the main cause of getting preferences by the Muslim sweepers communities. Presently, the proportion of the Muslim sweepers and others is 60:40. Therefore, people of these communities live in constant fear of having their jobs 'stolen' from them.

Presently, a total of 190 enlisted sweepers are working under the municipality on payroll basis and interestingly all of them are Muslim sweepers.

The survey outcome has given impression that the household owners need to negotiate charges of emptying pit or septic tank with the private sweepers and it is considering as a serious problem. Nearly 54 percent of the respondents stated that the sweepers are always demanding for higher charges for emptying septic tank or pit. This type of undesirable situation grows for not having any instructions or guidelines on the payment of emptying service charge from the municipality mentioned from about 50 percent of the respondents.

Figure 36: Difficulties in emptying by Sweepers



In general, above 50 percent of the respondents under different categories mentioned that the emptying service charge is extremely high and it is heavily claimed by the slum dwellers (56%), followed by colonies and household members, around 53 percent under each of the categories. The private sweepers are also not responding immediately right after communicating with them and it is problematic as mentioned by around 21 percent of the respondents. Such claim is highest among the people living in the colonies (25%), followed by household and slum dwellers (15%).

Some of the respondents also claimed that the sweepers are partly emptying the chamber of pit or septic tank means not removing the entire solid substance remaining at the bottom of the septic tank or pit. Around 11 percent of the respondents made such comment.

4.22 Situation Analysis of Sweeper Groups

The sweepers are a small community living in Saidpur Paurashava. They are deprived of social and economic perspective; and not receiving adequate government support for protecting the people. In general, this community is known as Hazong!?. Among them, approximately 1,000 sweepers serve the entire town for emptying the septic tanks and pits. Basically the sweepers are renting their services to the municipality on pay-roll basis. It is a temporary job arrangement i.e. no work, no pay process. A very few of them are also working under Saidpur Railway where employment condition is same. Therefore, the lives of the sweepers are not at all secure.

Municipality doesn't have provision to appoint sweepers on a permanent basis which is one of their major frustrations. The issue is pointed out by the sweepers while conducted FGDs and the issue is also confirmed by the conservancy officer. The sweepers stated that they are the extreme minority in the society without having any dignity in their lives. Their lives are completely uncertain for not getting opportunity to be employed as municipal employees. These sweepers are serving as private stakeholder. People communicate with them for emptying the septic tanks or pits when they requires.

As mentioned by the sweepers during FGDs, they follow manual process for emptying septic tanks or pits. They do not have knowledge about improved emptying system and processes in addition of not receiving any formal training on improved sanitation, and completely unaware of faecal sludge management.

From FGDs, the sweepers mentioned that disposing sludge is a serious problem and its risk factor is extremely high. They are not allowing to work under the day light except executing any assignment provided by the municipal authority. Hence, they have to wait till late night for the collection and disposing of faecal sludge. They are always careful about discharging the collected faecal sludge. Generally, people are not allowing disposing faecal sludge

within the existing drainage system. Moreover, people also dissatisfied with the sweepers for discharging sludge in unhygienic manner. Sometimes, the sweepers are also physically harassed by the people.

In urban areas, mostly the septic tanks or pits are constructed at the backside of the houses without following any design and engineering procedure on its installation mechanism. In most of the cases, there is no plan for 'entry and exit' to reach at the septic tank or pit for de-sludging faecal sludge when it fills with feces. Therefore, entering into the septic tank or pit becomes a serious challenge. They do not follow any preventive measures due to lack of knowledge about faecal sludge management. The sweepers do not get enough cooperation from the household owners in arranging the required tools. They have to manage all equipment and tools themselves for emptying pit and septic tank. Sometimes, they are heavily affected by different types of health hazard such as skin diseases, respiratory problem etc. They are expecting external cooperation for their capacity building on FSM.

Overall demand for emptying septic tanks and pits has been slightly increased. Nowadays, people are more interested for emptying their septic tanks and pits by following mechanical process and so want to take emptying service by using modernized equipment , such as 'vacutug'.

Through FGDs the sweeper community stated that the demand for emptying service has been increasing for last few years, but the demand of Horijon sweepers has reduced due to involvement of a large proportion of Muslims sweepers in this occupation. Usually, they manage the assignments by providing bribe to some of the municipal members. Even though, they are not committed towards their works. On the other side, Horizon sweepers are working devotedly.

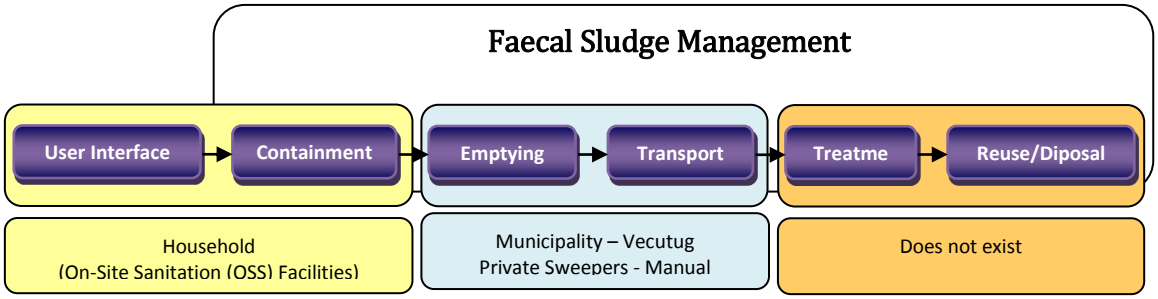
Some desires from the sweepers are like arranging effective FSM training for enhancement of their knowledge regarding faecal sludge issues and other efficient mechanisms, arranging provision for availing opportunity to be recruited as the permanent employees. In recent time, they have been informed about installation of faecal sludge plant and they want to be an effective stakeholder of the entire system.

4.22.1 Present Faecal Sludge Management Situation

The survey outcome has revealed that most of the households are using sanitary latrine where it has either pit or septic tank provision for containment of human feces. Mostly, people are aware about the negative consequences of not using latrine. Therefore, the owners of the households are kept provision and installing sanitary latrine within the premises by spending their own money. The issue of installing a latrine within the owner's premises is the responsibility of the land owners. In this regard, the land owners should take clearance approval certificate on the design and the physical structure of the latrine from BNBC.

Basically, the municipality has provided efforts on awareness raising initiative and also provided some hardware support for the installation of sanitary latrines among the hardcore poor in the vulnerable areas and communities.

Another important aspect of FSM is the 'emptying and transport' where is the responsibility of the municipality according to the Paurashava Act 2009. However, the municipal authority has limitation to engage adequate manpower and resources allocation to serve the citizen in effective way. As a consequence, the private sweepers are also serving the citizens for emptying and disposing the faecal sludge.



The survey outcome has given identified that emptying, collection and disposal process follows conventional or traditional system. Both public and private sweepers are renting their skills on emptying pit and septic tank. In general, they use simply bucket, rope, and kerosene for emptying purposes. They never take protective measures while engaging themselves on emptying activities. They are completely unaware about taking protective measures for emptying pit and septic tank. The concept of wearing protective clothes, using gloves and putting strong gumboot is identified as completely a new issue to them and protective measures is a new concept which was revealed through FGD where the participants came from sweeper's community. In general, the sweepers do not have practice to use transport for carrying the collected sludge and dispose it safely. One of the major common practices of the sweepers is to discharge all collected sludge to the adjacent drains, low laying areas and also on the water bodies. The sweepers also informed that they never try for digging a hole for discharging sludge in a confined place unless the owner of the household offer them extra money for it. Digging a hole for discharging collected sludge is a separate assignment for them and also separately negotiates the matter with the person who hired them for emptying pit or septic tank. This type of manual based conventional emptying process is commonly and widely followed in urban areas. It is continuously polluting surrounding areas, created unhygienic situation and providing negative impacts on human health.

In recent time, the municipally has introduced two (2) vacutug to service the citizens under automation process. The emptying service of the municipality is extremely inadequate against the public demand. At this stage, the municipal authority should take research base initiatives for estimating the demand of emptying pit and septic tank on a daily basis and also to identity the required number of vacutug for ensuring effective emptying and collection process in the town.

Presently, there is no treatment plant of faecal sludge in Saidpur municipality. In recent time, the municipality has allocated a separate place outside the town areas for legal discharging of the collected faecal sludge from various places with the municipal areas. Therefore, the issue of producing any recycled product is considered as irrelevant at the moment.

4.23 Sanitation Value Chain Analysis

The issue of value chain analysis for sanitation sector in Saidpur municipality calls for a holistic and structured approach. It should be synthesis of four different dimensions of the value chain which leads towards sustainable development and improvement of the sector. These four dimensions are institutional, social, environmental, and economic.

Institutional perspective: the municipal authority is the lead government institution to serve for WASH facility in the town. The authority couldn't serve the citizens for WASH in effective ways due to some limitations including the manpower and financial allocation for improving and establishing adequate infrastructure development in this sector. However, the municipal authority is eager to engage private stakeholders in this issue. Under constitutional obligation, they are working through GO-NGO partnership approach.

The private sector involvement in sanitation sector is an indication of existing favorable institutional arrangement in the town. In the municipal areas, two sanitation hardware manufacturing companies are producing modern fittings and materials that are used as bathroom and sanitation items. Besides, a good number of local entrepreneurs are producing ring, slab and other related products to meet the local demand of such type of products. In addition, around 20 various types of outlets are displaying and selling those

materials to the end users i.e. the consumers. Therefore, overall situation is indicating that exiting institutional arrangement is in favor of promoting sanitation market in the town.

Social perspective: A whopping 92 percent of the people are found using own latrines indicating their consciousness about positive impacts of using latrines. Less than one percent of the people have open defecation practice and these people may be living in economically at the vulnerable stage. Large proportion of latrines are having septic tank. These physical evidence are thereby proving social awareness on sanitation. At his stage, these people need to learn about improved sanitation for enhancing their knowledge regarding the issue. Massive capacity building initiatives would engender positive impacts among the citizens.

Environmental perspective: It is a matter of concern that people are not aware of the environmental impact on not properly managing feces. Through awareness building initiatives, there is a possibility to alter the mindset and perspective of people. In this regard, external support would be required for disseminating knowledge among the officials of the concern authorities, private sector, NGOs as well as the citizens. However, the existing situation is indicating that people have the attitude to accept positive aspects on sanitation related issues.

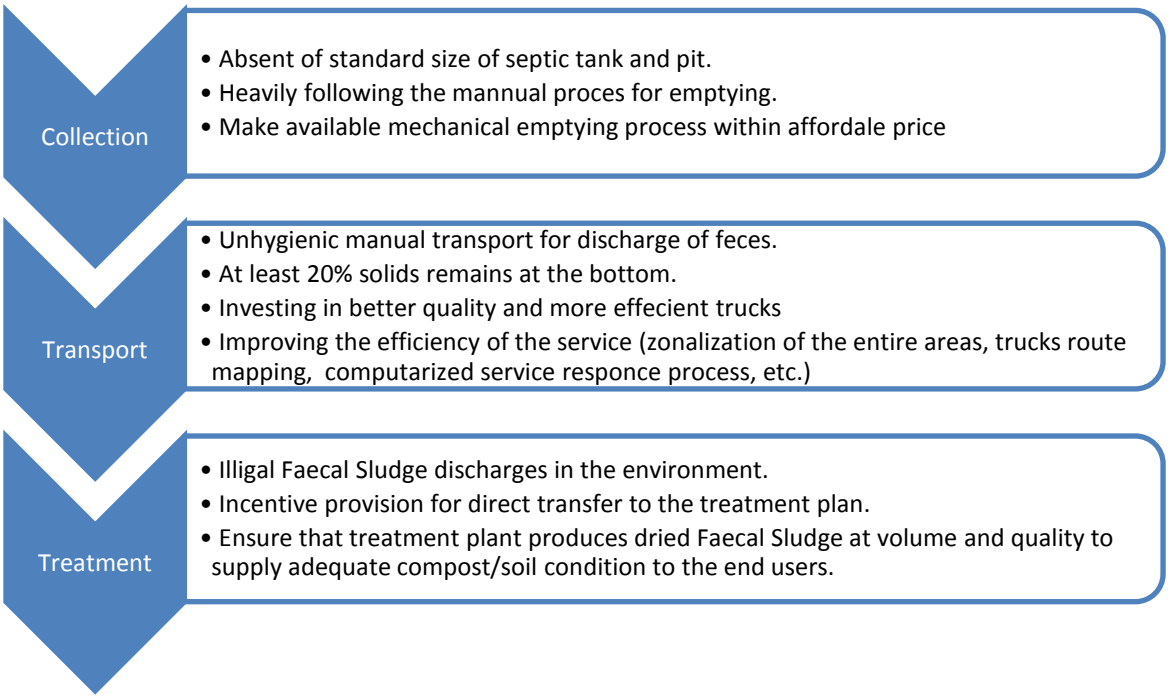
On the other side, while any external organization would take any initiative for installation of faecal sludge treatment plant, they should work with technological alternatives for selecting appropriate and environment friendly technology to ensure positive outcome from such technological option.

Economic perspective: Considering the present situation, the latrine users keep extra money for ensuring O&M of such provision. In addition, they are paying a significant amount of money for emptying the septic tanks or pits. On the other side, a large proportion of people have shown their willingness to pay more for adaptation of any kind of improved process and technologies. These are providing positive impacts upon economic condition of the citizens. Moreover, a significant number of entrepreneurs are involved with trading of sanitary latrine items. As such it is signifying that there is positive economic environment for doing business with sanitation related materials.

From the manufacturer's perspective, raw materials are available at the market and possible to buy from the local sources. Supply of raw material situation is favorable as stated by the entrepreneurs.

Therefore, these four dimensions have provided positive impressions regarding sanitation value chain analysis. By understanding overall situation of the town, people are primarily need of knowledge enhancement support, appropriate technology for materials and hardware installation, and effective management approaches to ensure significant and sustainable advancement in sanitation sector.

Figure: Technological aspects of the Sanitation Value Chain Situation and Recommendations for Improved Value Chain and Faecal Sludge Treatment Plan



4.24 Specific outcome of Sanitation Value Chain Analysis

In general, economic feasibility is the foremost factor to consider for commercial product. Major considering factors are economic and technical opportunity. In this study, one of the major aspects of the value chain would be value addition upon existing faecal sludge system. In this regards, it is shown absolute positive impacts.

Under the present survey, on an average, the latrines owners are found spending BDT 761 for de-sludging septic tank or pit each time. People has expressed positive impression for spending more money if mechanistic process is introduced for the collection of feces from the household. In addition, the latrine owners are also paying BDT 52 on an average as intensive to the sweepers for providing such type of services. On the other side, people are expressing positive impression that they are willing to pay more money if improved faecal sludge service is provided. Therefore, the overall situation is indicating that the latrine owners are prepared to pay about BDT 1,061 for receiving a better feces collection services.

In the recent time, a local NGO, named SKS has come up with a technology based de-sludging system which is commonly known as vacutug for serving citizens with technology based device and vehicle. Under the present practice, the price of taking service from SKS is set as BDT 1,000 per trip for de-sludging feces charging BDT 10 for per kilometer distance from the feces collection point.

Therefore, overall situation is showing positive indication that inclusion of vacutug for faecal sludge management has every possibility on value addition of the sanitation services. However, the concerned organization that would provide faecal sludge collection service through technology based device, they have to consider challenges e.g. under the present design of vacutug, it wouldn't be possible to reach every places due to lack of wide road and space. Therefore, the issue of customizing the present design may need to be considered.

Referring from a study conducted by a couple of organizations in 2015 under the study titled as VeSV- Value at the end of the Sanitation Value Chain, it tried out some alternative options like gulper pump, electric pump, diesel pump, and diaphragm pump. All such technologies have pros and cons. However, the study suggests to promote the diaphragm pump for reducing contact with sludge while emptying pits found it most feasible option. This technology option may consider under pilot basis in Saidpur municipality.

This analysis suggests that there is a large market for septic tank and pit emptying and sludge transportation services. Households empty pits when it is full, and the sludge is disposed of in ways that is poised of environmental and health risks. Therefore, there are avenues to create business for collection and transportation of faecal sludge.

Favorable institutional support from the municipality is encouraging for the private sector. Municipality is providing administrative cooperation to them as part of contribution to improve the sector. There are manufacturing companies for producing sanitary items and materials for the economically better-off people as well as the general citizens. Sanitation related hardware and other items are found available in the local markets. This is an clear indicator of value addition to promote the sanitation sector from all respects. It means effective institutional arrangement has provided significant positive impacts on sanitation values chain.

Form social perspective issue, installation of hardware scenario is extremely satisfactory . This is an indication of social acceptance of using sanitary hardware for handling feces through containing it in one place. Large proportion of installed latrines of different kinds is also an indication of financial ability and affordability to purchase and installation of hardware. Moreover, sharing latrines with the economically deprived people is also an indication of socially cooperative attitude that are adding value for the society. It means under the present sanitation value chain situation, social aspects already has provided positive impression and it has enormous possibility to enhance more social value by capacity building of the citizens.

At present, people are lacking in understanding the economic impacts on sanitation issue. However, the citizens are found interested to learn more on this issue and having positive attitude for learning and contributing more in the sector. So, different types of capacity

building initiatives should be taken by the external agencies for ensuring value addition under environmental aspect from the citizens.

Therefore, sanitation value chain is on the right track and having possibility to increase rapidly with time if technological and capacity building support are available from the municipality and external agencies. It means more value can be added on sanitation by emphasizing on capacity building issues on knowledge development, use of improved sanitary hardware, impact of using mechanistic process for feces collection and installation of faecal sludge treatment plant and overall faecal sludge management.

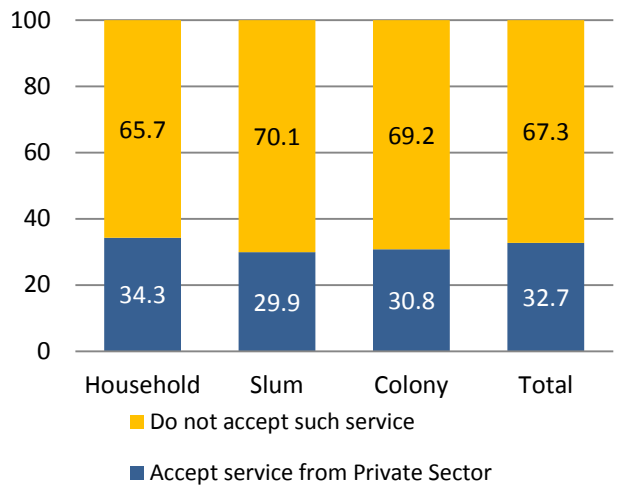
4.25 Opportunity of Private Sector Involvement

The private sectors are always encouraging to serve the people in every sector in Bangladesh. Construction of sanitary latrine hardware materials is such a sector where the private sector is mainly contributing in the country by supplying materials to the people. It is also found similar in Saidpur Paurashava. Under the present survey, 78 percent of the sanitary latrine owners stated that they bought latrine materials from the nearby market and local manufacturers and they were completely private entrepreneurs. The concern municipal authority informed to the study team through KII that the municipal authority was distributed sanitary hardware materials among the hardcore poor and those latrine materials were purchased from the private entrepreneurs through open tendering. One of the NGO representative also expressed same opinion. On the other side the business community stated through market level FGD that entire sanitary latrine hardware materials is supplying by the private sector in this municipality. Such situation has given an apparent indication that the private sector is already contributing in sanitation sector in a significant way.

On the other side, while asking the respondents about the practice of empting pit or septic tank, 98 percent of the people ensured that they emptied their pits or septic tanks by appointing the private sweepers. It means emptying, collection and disposal activities are absolutely depending upon the private sector. According to the opinion of the conservancy officer, the municipality has limitation on resources. From administrative perspective, there is no legal provision of keeping permanent sweepers under the municipal authority. Only a non-significant 190 sweepers are working under payroll basis. That's why the municipality couldn't provide adequate emptying services to the citizens; as a consequence, the private sweepers are mainly providing emptying service to the people. It is also indicating that there is a significant opportunity for the private sector to be involved on sanitation activities. Presently, the private sweepers are not organized and serving the people through individual communication.

According to the survey outcome, it is also expressed positive indication. One-third of the respondents stated that they would accept private sector involvement in FSM. On the other side two-third of the population are found not in favor of accepting private sector. Based on their understanding, it is the responsibility of the municipality to provide FSM service to the citizens. However, they also mentioned that they would accept the private sector involves on FSM services if engaged by the municipal authority.

Figure 37: Acceptance of Private Service in FSM



Such situation may be reflecting of having lack of knowledge about the impacts of the private sector involvement relating to ability and scope of work of the provide better service compare with the municipality. It has indicating for having possibility to discuss the issue with the citizens in more extensive ways and make them understand about the positive impacts of involving the private sector to serve the citizens in more effective ways. Therefore, such massive discussion with people would be effective to enhance their knowledge level and ignite them to accept the private sector for contributing in this sector. There are many such examples in many parts of the country where some of the municipalities already have engaged the private sector in this sector and as such providing better service to the citizens.

4.26 Scope of establishing a comprehensive FSM Plant

Through KII with Upazila Nirbahi officer of DAE it was found that agriculture is one of the major economic sectors in Saidpur district. There is a huge demand of chemical fertilizer for ensuring effective productions of various types of agriculture foods. Under the FY 2016-2017, a total of 12,345 Metric Ton chemical fertile was used for crop growing. Estimated requirement has gone higher under the present FY 2017-2018 as 12,575 Metric Ton. Most demand based chemical fertilizers are urea, MOP, Jipsam, and TSP.

It was also found that excessive use of chemical fertilizer provides negative impact on top soil of the agriculture land. Every year more than 12 thousand Metric Ton fertilizer is used on the cultivated land. It has given a clear indication that there is a demand of soil conditioner to use on the soil for improving the soil condition which has a relation with effectively absorbing chemical fertilizer. Therefore, the municipality may install such a

faecal sludge treatment plant where the 'soil conditioner' will be produced as the end product.

Table 7: Demand of Chemical Fertilizer

Name of Fertilizer	Demand (Metric Ton)		
	2015-2016	2016-2017	2017-2018
Urea	4,115	4,900	4,900
TSP	910	1,270	1,280
DAP	935	1,750	1,800
MOP	845	2,300	2,400
Jipsam	185	1,820	1,820
Zinc Sulphet	90	200	200
Magnesium Sulphet	140	80	100
Brone		25	75
NPKS	70		
Total	7,290	12,345	12,575

Some important aspect of fertilizer

- There is huge demand for organic fertilizer.
- There is one manufacturer of organic fertilizer in Saidpur. But the quality of their product is not good. The farmer communities are dissatisfied with the performance of such organic fertilizer.
- On an average, 50 families in every village (total village 42) are producing verming compost and using as fertilizer on their cultivated lands means not for commercial purposes. Therefore, estimated 2,100 families are presently producing verming compost. However, few of them are also selling after meeting their own demand.
- Almost every household in village are producing fertilizer using household waste and "kochuri pana".

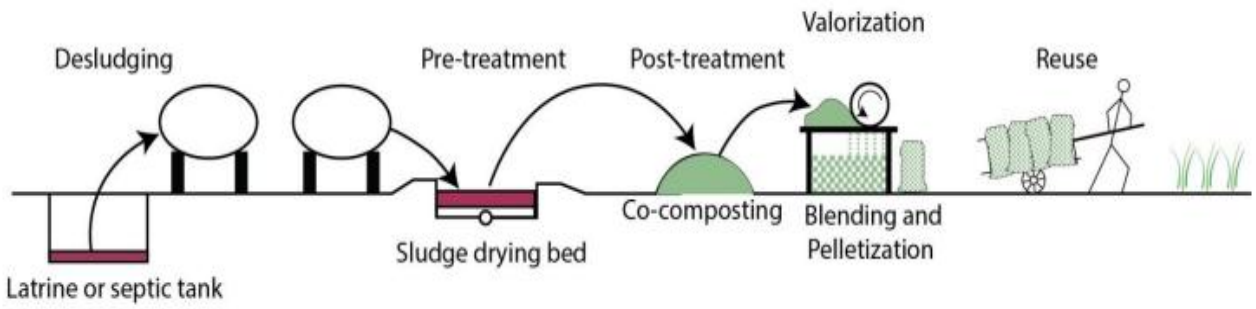
Through KIIs, the situation is found favorable for producing soil conditioner from the FSM treatment plant as the end product. However, different representatives also mentioned that,

- External support agency like WAB and local level NGOs like SKS are planning to produce fertilizer from Faecal sludge, people may be shown hesitation to use it.
- Training/awareness building program should be initiated for farmers.

4.26.1 Major Aspects of developing a Comprehensive FSM Plant

For the development of a comprehensive FSM plant, management aspects of the containment of feces, emptying process, transportation aspects and treatment options would have to be understood properly by gathering in-depth information through holistic approaches. This study already has developed the Shit Flow Diagram (SFD) for better understanding the overall scenario. Currently entire faecal sludge is managing through manual process which is extremely hazardous for health as well as for the environment.

Figure 38: Faecal Sludge Management



In recent time, municipality has received technology based mechanical device for collecting feces from various types of septic tanks and pits. The municipal authority need to be developing a systematic process for serving the citizens in more effective manner. A detail management process would be requiring by addressing how to apply for availing such service, how the service charge would be determined, type of application form, effective mechanism to provide such services promptly and quickly. Furthermore, developing a convenient mechanism requires involving sweepers with this mechanistic process for the collection of feces from entire town area along with addressing the issue of losing opportunity to income by providing private service by these sweepers. It should be outlined that they will not be affected through introduction of mechanistic process of FSM service.

Transportation process is a vital issue as it has a direct linkage with environment pollution in many ways. The concern authority needs to develop effective route plan for providing maximum possible services by allowing minimum interval possibility each time. Under transportation option, detail plan ensuring safety and security while transferring to the final discharging point from collection point through various types of vehicles. Detail plan for discharging collected feces would also need to be developed.

Most extensive and rigorous plan will have to be developed in regards to the Faecal Sludge Treatment Plant. Selection of technological option would be the most challenging issue. As WaterAid Bangladesh is presently operating one such treatment plant in Sakhipur of Tangail district. This experience of this plant would play a vital role for the development of an appropriate and effective plan for the FS treatment plan.

According to the available information about FS treatment plant in Bangladesh, co-composting is a viable option for the management of faecal sludge in most appropriate way. Selection of products under various types of composts would be another considering factor.

An expert panel needs to be formed for resolving all technological and chemical reaction related issues. Another issue needs to be ensured by the experts that the quality of products would meet the standards required in Bangladesh (People's Republic of Bangladesh, Ministry of Agriculture, 2006). After that, a detail marketing plan would be requiring to be developed by keeping commercial aspect which can be done through conducting product feasibility survey study.

Therefore, under this study, it is suggesting to take an initiative for conducing separate extensive research and study for the development of a comprehensive FSM plan which has not covered under this limited opportunity.

4.26.2 Institutional Arrangement for developing FSM Plant

Through KIIs, the study team provided efforts to identify relationship pattern of the municipality with other government and non-government institutions from the perspective of bilateral cooperation, organizational communication, knowledge sharing, legal bonding and scope of work, etc. In this regards, the policy document, namely "the Institutional and Regulatory Framework for Fecal Sludge Management (FSM): Paurashavas" was followed as the guideline for the development of a comprehensive institutional setup for the Saidpur Paurashava.

According to the statement of the honorable mayor, the municipality has always maintained cordial relationship and communication with the line government departments and institutions. The municipality also has appreciable understanding with those organizations. In addition, the municipality provides extensive cooperation to the NGOs and the private sector on those activities where there is a possibility to be benefiting by the general citizens.

Through the qualitative survey under KIIs, the honorable Mayor stated that the Paurashava has maintained close communication with MoLGRD&C and always follows and timely executes all kind of instructions that came from the ministry. Therefore, Saidpur Paurashava will execute FSM related orders and instructions with their greatest sincerity.

The municipal authority also informed that they always welcome expert and specialized support and cooperation from the donor agencies including INGOs. Presently, they are expecting extensive assistance from those organizations for the development of a comprehensive FSM system in the municipality.

Therefore, the study team communicated with different relevant institutions by covering government, non-government and private sector and exchanged views on the issue of institutional arrangement pattern which might be effective to manage FSM in all parts of the urban areas within the municipality.

Municipality has confirmed that they have practice to work with DPHE and LGED based on the specific laws as mentioned on the Paurashava Act 2009. They would appreciate and accept any relevant cooperation on FSM sector from those government organizations. According to the Institutional and Regulatory Framework for FSM, it is mentioned these two government organizations shall play supporting role to implement the entire FSM system in the Paurashava. Hence, it is given a clear indication that DPHE and LGED should include as the key institutions while developing the institutional framework on FSM in the Saidpur Paurashava.

According to the current practice, the municipality is managing the entire activities of collection and transportation of faecal sludge by introducing two mechanical vehicles, namely 'Vacutug' in the town areas. Presently, the municipal authority does not have any plan for involving the private sector for the collection of faecal sludge by using vacutug vehicle. Moreover, they are interested to operate the sludge collection and transportation issue by their own. It means further intervention is required through the feasibility study to identify more economically viable process to serve the citizens on collection and transportation aspect. Presently, the private sweepers are also working on emptying pits and septic tanks at the household level for inadequate service providing capacity of the municipality. Overall situation is indicating that there is a opportunity to work on identifying an effective collection and transportation process and mechanism at the municipal level.

Presently, the municipality wants to operate the 'Collection and Transportation' service under own management system and not interested to outsource by engaging the private sector. Gradually, they will take initiative to increase the number of the mechanical vehicle, namely vacutug for meeting the emptying service demand in the town. Under the current situation, they are overlooking the private sweepers for emptying pits and septic tanks due to not having adequate internal resources to serve the citizens on timely basis. However, in accordance with Clauses 95 and 96 of Paurashava Act 2009, it is mentioned that the Paurashava may engage the private sector/non-government organization (e.g., outsourcing) for collection and transportation of fecal sludge from onsite sanitation facilities.

The study also identified that the sweepers are not organized and they don't have any organization of their own through which they can communicate with the municipal authority for creating favorable service environment by securing profession. Overall situation has given indication that there is an opportunity for the development of an effective working mechanism and process on the issue of 'Collection and Transportation' of faecal sludge in the municipality. In this regard, the external support agency may provide expertise support to the Paurashava.

Similarly, the municipal authority has ensured to hold the entire authority for the installation, management and maintenance of a Faecal Sludge Management Treatment Plant by adopting all relevant treatment facilities on it. Through KIIs, the municipal authority mentioned that they would take the responsibilities of the management of faecal sludge treatment plant, marketing and sale of end productions, and quality assurance of end products.

When discussed about the issue of quality assurance aspect of the end products, the municipal authority stated that Department of Agriculture Extension (DAE) has a role while any agriculture based new product needs to launch in the locality. DAE is responsible for issuing the commercial license for marketing the products and provide clearance certificate on the quality assurance of the products. Therefore, DAE should have to play a vital role to promote and accelerate marketing of the end products that would produce from the FSM treatment plant. Such indication has already been existed on the National FSM Framework under the clause of Sub-section 4.2.4: (7). Through KIIs, DAE has expressed highly positive expression to cooperate the municipality for creating favorable fields for marketing the end products by all means.

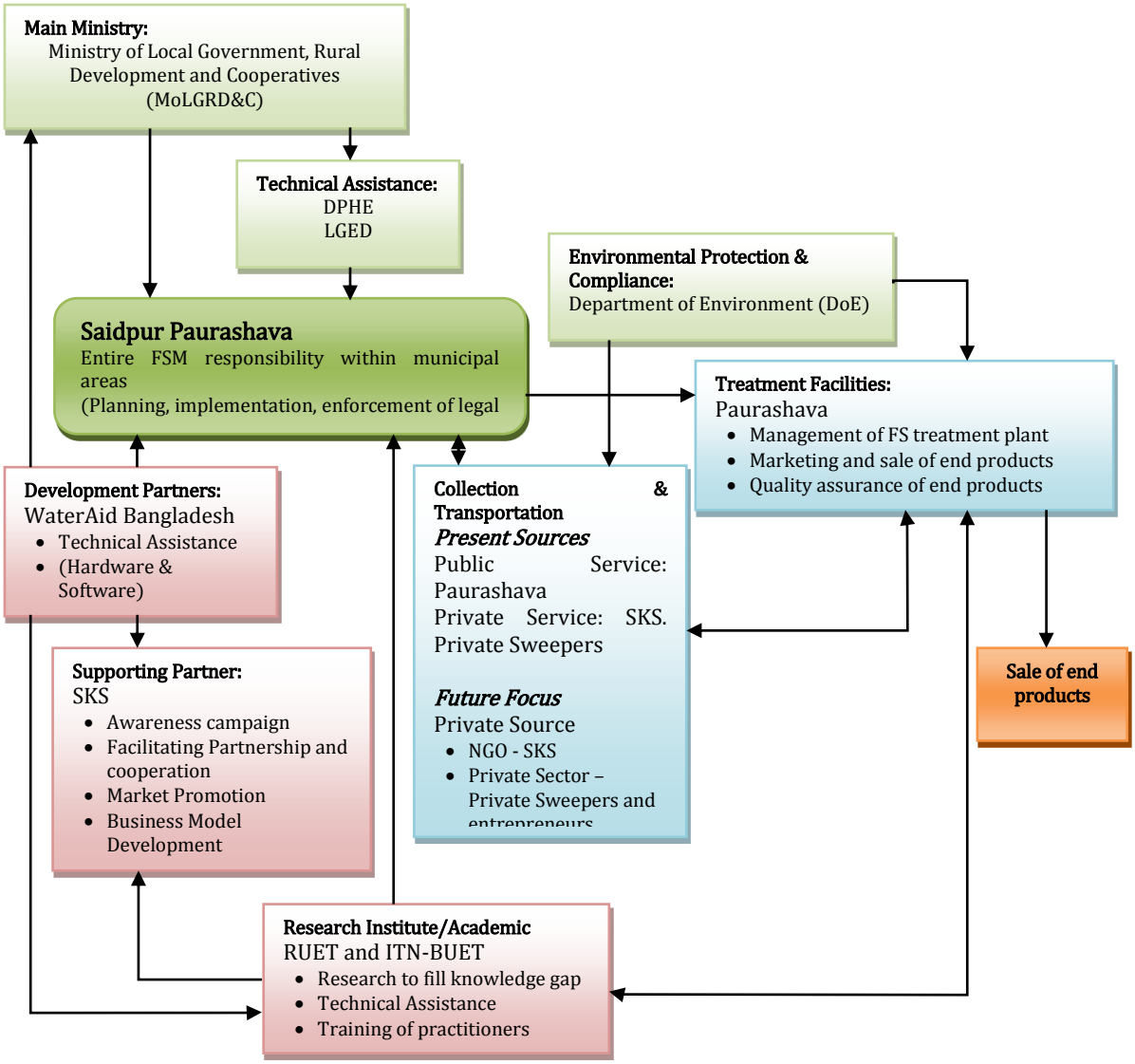
On the FSM policy guidelines, there is an apparent indication that the Paurashava will seek assistance of the Department of Environment (DoE) in fulfilling compliance with the existing rules and regulations in regard to installation and operation of fecal sludge treatment facilities [Sub-section 4.2.4: (6)]. While discussed the issue with the concern official of DoE, they have provided extremely positive impression regarding assisting the municipality on compliance issue.

About the capacity building aspect, the municipal authority has shown interest to be working with Rajshahi University of Engineering and Technology (RUET). In addition, they also mentioned that the concern institution and/or relevant department of Bangladesh University of Engineering and Technology (BUET) could also provide expertise support to the municipality. According to the FSm policy framework, ITN-BUET will be the appropriate institution to work on capacity building aspect in the Saidpur Paurashava.

Based on intensive understanding on the issue of formation of an effective institutional framework for the Saidpur Paurashava, the study team is suggesting the following

institutional framework. The external support agency will need to work on it further for finalizing this framework through extensive formal consultation with different stakeholders.

Figure 39: A Comprehensive Institutional Setup for FSM in Saidpur Paurashava



4.26.3 Possible involvement of different stakeholders on FSM sector

Through KIIs, the study team communicated with possible stakeholders that have the possibility to contribute on FSM sector for accelerating the process in effective way to work with Saidpur Paurashava. In general, all the stakeholders are basically unaware about the FSM concept and how they can be involved with the process. The study team raises relevant issues and collects their comments and reactions on some of the specific issues. Based on such efforts, different stakeholders have expressed their option about how they can involve with FSM process to work with the municipality. The summary findings are mentioned on the below:

Table 8: Different stakeholders in the Faecal Sludge sector and possible involvement at different levels from Institutional perspective

Stakeholder	Laws	Coordination	Collection & Transport	Treatment	Resource Recovery	Enforcement	Training & Information	Monitoring
Ministries	√	√				√	√	√
Municipality		√	√	√	√	√	√	√
Govt. Depts.		√						√
Police						√		
Private Companies*			√	√	√			
Associations & CBOs		√			√	√	√	
I/NGOs		√					√	√

Note:

* Private Companies aspect is presently absent.

*Association means any profession based organizations formed through defined objectives.

*CBO mean Community Based Organization that can provide services for the community.

The study team is suggesting working further on this issue in more extensive way. There is a need to identify the advantages and drawbacks linked to the involvement of each of the stakeholder, together with documentation and contractual requirement of different stakeholders. In addition, identification of specific needs of different stakeholders is also an important factor for ensuring an effective FSM management and institutional setup. Based on the outcomes on these issues will create discussion opportunity for the municipality with other stakeholders and opportunities for singing MoU with them.

Therefore, an extensive research needs to be conducted on stakeholders' involvement and participation aspect.

Technology

Technology is one of the major aspects of FSM. The issue of selecting appropriate technology will be depends upon many factors like social norms, economical characteristics, religion acceptance, and behavioral reaction, etc. This issue will have to be considering by analyzing local conditions.

While the study team discussed about the technology aspect with different stakeholders through KIIs, people were expressed ignorance regarding the issue. Therefore, the study team discussed about some of the end products that are produced from faecal sludge through treatment process.

The concern officer of the municipality stated that if the end product can be used as the soil conditioner then farmers will be interested using on their agriculture lands. The municipality also mentioned that treated water can be deliver for irrigation if can product bulk liquid quantity from the treatment plant. They also stated that building materials can be marketing widely if it ensures durability and the cost can be kept comparative with presently produced bricks. As there are broiler firms and fish cultivation practice, proteins production from faecal sludge can be promoted. The officer also mentioned that biofuel option might not be feasible.

While discussing about reuse aspect of faecal sludge with the concern officer of DAE, they have provided absolute positive expression. The concern officer mentioned that they would provide possible cooperation to the municipal authority on FSM related issues. It would be required extensive awareness raising initiatives for convincing the farmers for using the soil conditioner onto their agricultural fields. However, it has a huge potential sector for effectively recycling of faecal sludge in their locality. Treated water can also be promoted for irrigation of cultivation lands. DAE also stated that some other reuse products like fodder for cattle and plants and proteins can also be endorsed as these entire areas depend on agriculture and livestock sectors.

The concern officer of the department of livestock also interested to provide adequate cooperation to the municipality on FSM related issues. The person stated that though it would be challenging to promote reuse products those are produced from faecal sludge however through massive awareness campaign it can be made acceptable among the people.

Table 9: Type of End product or End-use

End-product / End-use Type	Recycle Possibility	Technology	Remarks
Soil Conditioner	√	Co-composting Unplanted Drying Beds Vermi-composting	High level of possibility; Require mass awareness campaign
Fodder for cattle and plants	√	Planted Drying Beds	High level of possibility; Require mass awareness campaign
Proteins	√	Black Soldier Fly Process	Fish feed and Chickenfeed can be promoted
Building Materials	√	Incorporation of Dried Sludge	High level of possibility if can ensure durability and cost-effective
Irrigation from reclaimed water	√	Mechanical Dewatering Process	High level of possibility of using clean water for irrigation Require Massive awareness campaign
Biofuels	X	Biogas from anaerobic Digestion	Wouldn't be possible in near future

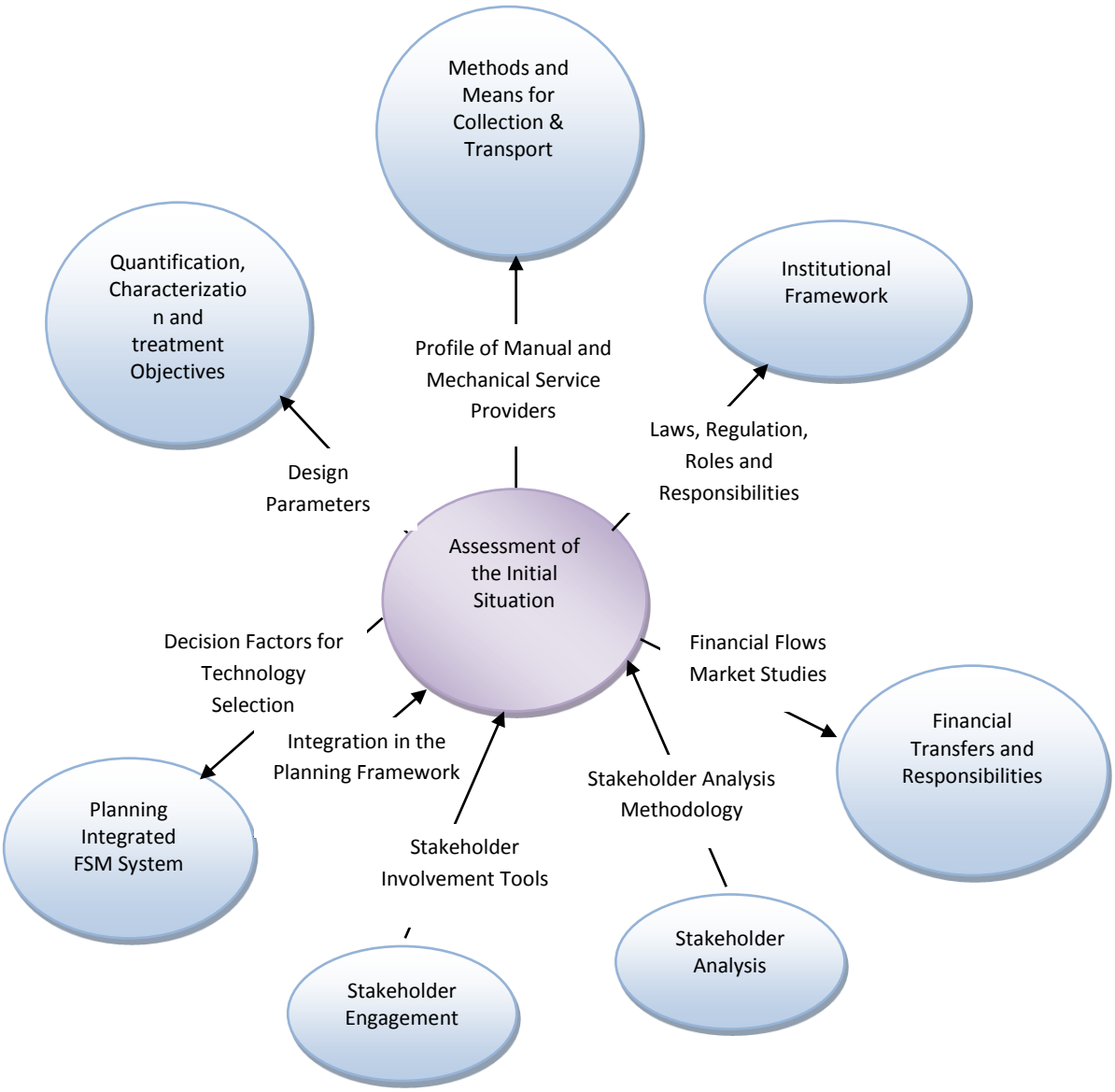
The external support agency will need to work more intensively on the issue for narrow down this list and identify most acceptable reuse products by conducting a feasibility study on end-product. According to the outcome of the study an appropriate technology can be implemented in the municipal area.

Planning

It is one of the most important aspects of FSM. Development of an effective planning depends on extensive assessment of initial situation of the particular areas. Initial situation assessment is most important aspect in the planning process of FSM approach which would visualize the baseline information for decision-making.

Some of the major issues need to be address under the assessment of the initial situation. Most considering factors are mentioned below:

Figure 40: Assessment Components of the initial situation



Major issues of the initial assessment are identifying stakeholders that having possibility to involve with FSM process, analysis of role and responsibilities of different stakeholders and scope of work to be engaged with one and another, and institutional framework analysis means assessing present laws, regulations along with role and responsibilities of different government institutions.

In addition, identifying manual and mechanical service providers, characteristics of faecal sludge and feasibility study on different types of end products, assessment of daily collection volume of faecal sludge which would be the basis of estimating capacity of the faecal sludge treatment plant, and select appropriate technology for installation of the treatment plant would also need to be analyzed for collecting relevant information upon initial situation of a particular area.

The external support agency should take initiative for conducting an intensive study on assessment of the initial situation on Saidpur Paurashava. The analytical report on the assessment of initial situation would be the basis for the development of the faecal sludge management planning framework.

According to the FSM concept, different types of studies need to be conducted for the development of an integrated planning approach. Based on the FSM Planning from A to Z guidelines, a total of 26 aspects need to be addressed under six different phases. The outcomes of those indicators will be considered as the authentic information and be used for the development of a location based integrated planning on FSM. These phases with indicators are mentioned below:

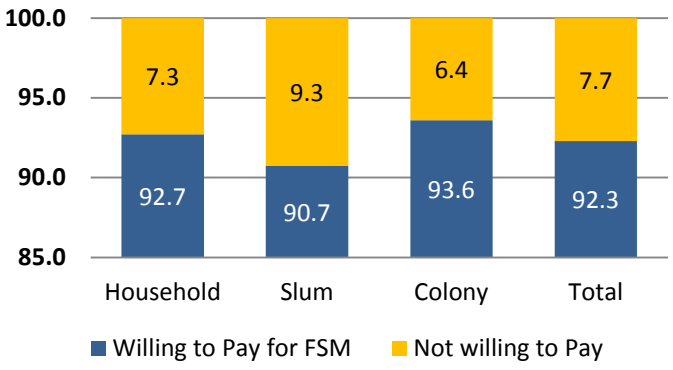
Standard Phases	Type	Activities	Participatory Stages
Exploratory Study	A	Preliminary assessment of the initial situation and first inventory of stakeholders	Process ignition
		Inception Report	
Preliminary (pre-feasibility) studies	B	Identification and preliminary characterization of the stakeholders and their relationships	Launch of the planning process
	C	Initial launching workshop, including field visit with all the stakeholders	
	D	Assessment of: - Sanitation practice and needs, reuse interests - Institutional setup, government support - Legal and regulatory framework - Existing organizational modes - City structure and heterogeneity of sanitation practices - Existing financial flows - Climate	Detailed assessment of the current situation
	E	Selection of potential organizational modes	

	F	Identification of sites for treatment	
	G	Characterization and selection of key stakeholders	
		Priliminary studies report	
Feasibility study	H	Quantification and characterization of sludge	**Identification of service options**
	I	Characterisation and selection of sites	
	J	Pre-selection of combinations of technologies, organizational modes and financial mechanisms	
	K	Detailed evaluation of selected options, including: - Requirements of technology combinations, pros and cons, O&M - Organizational mode and institutional setup; roles & responsibilities; contractual arrangements - Capital and operation costs, financial mechanisms, estimated budget - Skills required to run each system - Environmental impact assessment	
	L	Preliminary presentation of the results to the key stakeholders	
	M	Final selection of system options	
	N	Workshop : Validation of chosen options by all the stakeholders	
	O	Reassessment of key stakeholders according to the validated options	
		Feasibility study report	
Detailed FSM project development	P	Detailed project development (Action Plan): - Detailed design of the treatment plant - Detailed definition of roles & responsibilities - O&M management plan with clear allocation of costs, responsibilities and training needs - Conventions between stakeholders, securing financial and institutional mechanisms - Strategy for control and enforcement - Definition of needs for capacity building and job creation - Definition of contracts and bidding processes - M&E strategy for the implementation phase - Timeline for implementation with distinct phases and an itemized implementation budget	**Development of an Action Plan**
	Q	Workshop : Presentation of the Action Plan	
	R	Reassessment of key stakeholders according to Action Plan	**Implementation of the Action Plan**
		Detailed Project Document	
Implementation	S	Recruitment of contractors for building and O&M	
	T	Organisation of the sector, transfer of roles & responsibilities	
	U	Capacity building / information campaigns	
	V	Monitoring of construction	
	W	Reassessment of key stakeholders before inauguration of the FSTP	
	X	Start-up of the system	
	Y	Official inauguration ceremony	
M&E	Z	Monitoring of the running system (technical stability, satisfaction of stakeholders, cost recovery)	

4.27 Willingness to Pay for Better Service

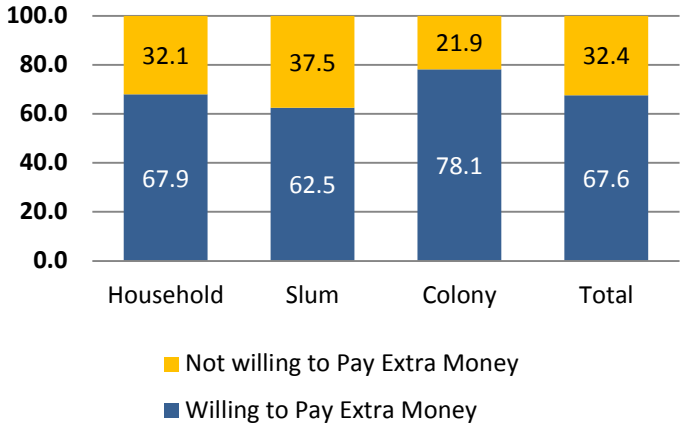
According to the survey analysis, people are expecting extensive cooperation from the municipality for introducing improved faecal sludge management (FSM) service as mentioned by around 92 percent of the respondents. More people that are living in the colonies are found more interested to get FSM support from the municipality and it is mentioned by significant 94% of the respondents under colony category.

Figure 41: Willingness to Pay for Batter service



In this regards, a large proportion of the respondents are also interested to pay extra money for availing such improved services from the municipality. Like before, most of the people under colony category have expressed highest level of interest to pay extra money and it is more that 78 percent under such category.

Figure 42: Willingness to Pay extra money



The survey outcome is indicating that most of the people are ready to spend BDT 151-200 per month as extra for availing improved FSM service from the municipality. Around 20 percent of the people are prepared to pay up to BDT 50 per month. On the other side, around 14 percent of the respondents also mentioned that they can pay even higher amount of money within the range of BDT 251-300; and around 13 percent can pay within the range of BDT 51-100. On an average people are interested to pay BDT 248 for improved FSM service to the municipality per month, as evident from the study.

4.28 Market Potential of Faecal Sludge Management

Considering the present scenario, the municipality recently has introduced a vacutug for faecal sludge collection through mechanical way. Municipal authority would also have to develop a systematic process about how the citizen will apply for receiving the service, what would be process of paper management and payment mode etc. As municipality has a separate conversancy department, the concern authority should develop a convenient process in favor of delivering quick service to the citizens.

There is a significant market potential of sludge management. First issue would be to identify the end-uses. For ensuring effective use of vacutug, the end-users are the owners of the various types of sanitary latrine users those would be needed to emptying their septic tanks and pits. This study has identified that under the present condition, people are paying about BDT 761 eachtime for emptying septic tanks or pits. Annually, people are spending approximately 1 crore and 25 lac taka (BDT 12.5 million) only for emptying purpose. In addition, most of the people have expressed their desire to use mechanistic process for the collection of feces from the septic tank or pit. As such, it has given an apparent indication that market potential of sludge management at the primary level is positive. However, major challenge is how to include the sweepers' community on this collection process.

The most common form of enduse and resource recovery from sludge is land application. It is commonly carried out in an informal fashion without regards to treatment objectives such as pathogen reduction, but has the potential to be anything from use in agriculture to bagged compost products sold for use at the household level (Strande et al., 2014). In Saidpur municipality, there was no use of faecal sludge as a soil conditioner. Through processing the collected faecal sludge at the sludge management plant, there is a possibility to produce soil conditioner out of it. Such soil conditioner can be used on the agriculture land fields. As WaterAid Bangladesh has already been established a FSM Plant at Sakhipur in Gazipur district, the experience from the existing plant would be extremely useful for projecting financial potential under Saidpur municipality.

While the FSM plant will be executed the management authority would also be able to produce +compost as an alternative of natural fertilizer that can be used for other purposes like gardening and so on. In Bangladesh, there are many initiatives where some of the manufacturing companies or institutions are producing compost from solid waste. Therefore, marketing experience of these entities can be used for promoting such product in massive ways within the municipal areas. The market potential of compost is extremely high.

However, in-depth research on this issue would be required for make an effective financial and marketing assessment on this issue.

Investment in research is required to demonstrate and replicate the market of faecal sludge potential. One of the major assumptions is that market potential aspect of sludge management would have to be based on considering local situation along with peripheral conditions.

According to the outcome of various FGDs and KIIs among the citizens, sector expert, and the practitioners, all the representatives expressed about their complete ignorance regarding faecal sludge and its market potential aspect. The concern authority of the

municipality also expressed their desire for sharing expert knowledge with them as well as conducting extensive research on this issue for providing useful direction for the management of faecal sludge plant.

4.29 Service Coverage of emptying septic tank/pit (yearly estimation)

While identifying how much money do the latrine users need to pay for emptying the septic tank/pit, the survey outcome has given an impression that mostly people need to spend money within the range of BDT 301-500 as mentioned by around 34 percent of the respondents followed by the range of BDT 751-1,000 as stated by 23 percent. On the other side, another significant proportion of about 19 percent of the respondents also confirmed paying within the range of BDT 501-750. Payment scenario is almost same under different categories means colonies, households and slum areas. On an average, each time people need to pay BDT 761 for emptying the septic tank/pit. The survey outcome has also identified about having a practice of spending some additional money as incentive. On an average, people are found paying BDT 52 as extra money upon the negotiated cleaning charge.

Table 10: Amount for Emptying Once the Pit or Septic Tank

Amount in Taka	Household	Slum	Colony	Total
	%	%	%	%
Tk. 100 - 300	11.3	20.8	12.2	14.0
Tk. 301 - 500	32.0	37.5	38.8	34.2
Tk. 501 - 750	17.5	18.3	24.5	18.5
Tk. 751 - 1000	25.8	16.7	22.4	23.0
Tk. 1001 - 1500	8.7	4.2	2.0	6.8
Tk. 1501 - 2000	2.5	1.7		2.0
More than Tk. 2000	2.2	0.8		1.6
Total	100	100	100	100

According to the findings of the survey, 98 percent of the latrine user have own latrine and another 7.4 percent having practice of using shared latrine of different kinds, and the rest 0.60 percent go for open defecation. In addition, the survey has identified that 60 percent of the latrines of different kinds were undergone emptying process during last year. Therefore, overall calculation has estimated that 59.8 percent of the latrine need to spend money for emptying their septic tanks or pits. The survey outcome is also indicating that average emptying cost of the septic tank or pit is BDT 761 per episode in a year. According to the Urban Area Report (August, 2014), total household of the municipality is 27,515. Based on this information, yearly estimation of requiring emptying service of septic tank

and pit is 16,465 households. Therefore, the estimated amount to spend to avail emptying services from various sources is BDT 12,529,595. In a year, the citizens need to pay more than 1 core and 25 lac taka (BDT 12.5 million) for the entire town only for emptying septic tank or pit. This is an important outcome of the study which is indicating that there is a huge potential to attract the private sector to serve the citizens by introducing effective and efficient faecal sludge management process and mechanism in commercial basis.

Presently, the municipality does not maintain any logbook or keeping records relating to provide the faecal sludge services to the citizens. It is also reflected on this study as identified most of the citizens are taking septic tank or pit emptying service from the private sweepers.

While conducting the field survey, it is seen that the conservancy department of the municipality is operating pit and septic tank emptying service and a local NGO, namely SKS is monitoring their services from the outside based on mutual understanding of both the parties. According to their logbook, this municipality already have emptied a total of 195 various types of septic tanks and pits within the last six months duration through the vacutug with capacity 1,000L. Municipality did not maintain logbook for the other vacutug (capacity 3,500 L).

Table 11: Monthly Based Emptying Service Coverage (Vacutug-2, capacity 1000L)

Month	HH	Community	Institute	Mosque	Education Ins.	Thana	Total	Total volume (ltr)	Total Taka
July-Aug 2016	46	1	37						
Sep-Oct 2016	31	1		1	4				
Nov- Dec								Non functional	
Jan- 2017	20	2		3	3	3	31	31,000	15,500
Feb-2017	42						42	42,000	21,000
March-2017	36						36	36,000	18,000
April -2017	27						27	27,000	13,500
May-2017	27		2				29	29,000	14,500
June-2017	30						30	30,000	15,000
Total (Jan-June 17)	**182**	**2**	**2**	**3**	**3**	**3**	**195**	**195,000**	**97,500**

On an average, a total of 33 septic tanks or pits are served in a month by Municipal Authority by the vacutug of 1,000L capacity. On the other hand, on an average 45-50 septic tank or pits are de-sludged by the vacutug of 3,500 L capacity. It is insignificant compare with the required demand as estimated under this survey.

4.29.1 Sludge Collected by Sweepers:

On the contrary, there is 65-70 sweepers work on sludge collection and disposal purpose. According to the FGD outcome, a total of 20-25 teams are formed to provide emptying service among the people. Every team can manage to work for 3-4 days in a week. They work both in urban and rural parts of the Saidpur. They can emptied 3-4 pit or septic tanks in a day. Therefore, 1,000-1,200 pit/septic tanks are being emptied by the private sweepers in a month. Urban and rural latrine emptied ratio is approximately 40:60. Based on such calculation, the private sweepers are able to empty within 400-480 pit and septic tanks in a month. It has given an apparent indication that the contribution of the private sweepers is 12-15 times higher compare with the service that provided by the municipal authority. It means the municipality is losing a large amount of revenue earning every month from the citizens.

5. Situation Analysis of Solid Waste Management

5.1 Estimated volume of Solid Waste Generation

With an aim to quantify and characterize household solid waste as well as to observe the attitude of household and municipality towards its management a total of 180 households were randomly selected from 15 wards of the Saidpur Municipality. Daily wastes form the households were collected, segregated and weighed to quantify and characterize the waste.

Picture: Solid Waste Disposal

Picture: Weighing Solid Waste of 2 families

Based on the survey outcome, on an average, each of the household produces 1.98 kg of various types of solid waste in a day. The average family size in Saidpur municipality is 4.8.

According to the survey analysis, average waste generation rate is 0.33kg/person/day. It was reported in several studies that the waste generation rate in Dhaka city varies from 0.4 to 0.5 kg/person/day. In Pourashava areas, the reported average waste generation rate is 0.25 kg/person/day (Waste Concern 2009). It was also reported that the waste generation rates in Rajshahi, Khulna and Barishal city are 0.3, 0.27 and 0.25 kg/person/day (Waste Concern 2009).

Therefore, in 2017 estimated volume of household solid waste is 56.10 Metric Tons per day and 20,459 MT per year.

According to the conservancy department, the proportion of household waste and market waste is 3:2. Based on this assumption, around 17.80 MT solid waste is generated in 4 bazars which will be 6,497 MT in a year. Total volume of solid waste generation in Saidpur municipality is 74 MT per day which will be 26,974 MT in a year.

With the existing capacity of the municipality, they are able to collect around 71 percent of the generated solid waste every day from different areas of the town and rest 29 percent remain on the roadside which is a threat for the environment pollution.

Table 12: Projection of Household Waste Generation

Year	Population (estimated)	# Household (estimated)	HH Waste/day (MT)	HH Waste/Year (MT)
2011	127,104	26,311	52.10	19,015
2017	136,696	28,309	56.05	20,459
2025	150,621	31,210	61.80	22,555
2035	170,040	35,256	69.81	25,479
2040	180,668	37,470	74.19	27,080

5.2 Waste Generation Types and coverage under households:

Physical composition is important to characterize and classify the solid waste for its proper management. Composition of solid waste depends upon a number of factors such as food habits, cultural traditions, socioeconomic status and climatic condition.

As this survey conducted physical measurement of generated waste at the households, a list of available items is also prepared under such initiative. The survey outcome is indicating that a few items are disposing as a part of solid waste from the houses. These are as follows

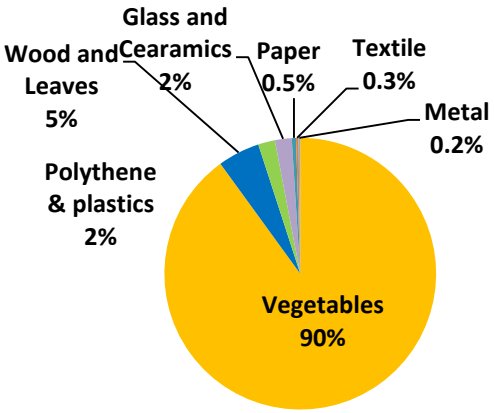
Table 13: Types of HH Waste

SL. No.	Items	SL. No.	Items
1	Vegetable residue	8	Paper
2	Fish residue	9	Medicine foil
3	Cow dunk	10	Medicine bottle
4	Animal feces	11	Food residue
5	Plastic beg	12	Fruit waste
6	Plastic bottle	13	Soap leftover
7	Wood and leaves	14	Various packets including cigarette

Seven different items of waste (viz. vegetables & food waste, wood & leaves, textile, polythene & plastics, paper, glass & ceramic and metals) segregated during the study. Vegetable/food waste was contributed the highest percentage (around 90%) whereas wood and leaves was 5%, polythene and plastic was 2% and textile as well as glass and ceramic was 2%, rest of the wastes was 1%.

From the analysis of the study it is apparent that, household waste generated in the study area is mostly compostable. The figure shows that a major portion (90%) of the total wastes are vegetables/food waste which is easily compostable, wood and leaves (5%) together, which are biodegradable. Only 5% of total wastes (i.e. polythene and plastics, textile, paper, glass & ceramics, and metals) are non-compostable but recyclable.

Figure 43: Physical Composition of Solid Waste

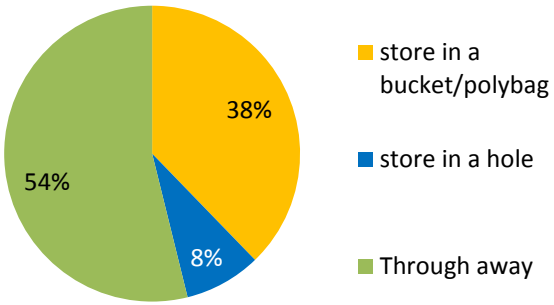


5.3 Solid Waste Management Process (generation, collection, transportation and disposal)

5.3.1 Present situation of Solid Waste Management:

Approximately 56 MT solid wastes per day are generated in Saidpur Municipality. Only formal system of waste management by the municipality was observed during the study. The formal system is based on the conventional system of collection-transportation-disposal of waste carried out by the sweepers. In this system the concept of transfer stations, resource recovery, minimization and recycling are absent. The municipality has given some open bins and constructed few dustbins in every wards where the households disposed their daily waste directly. Sweepers collected wastes from the bins, dustbins and picked up in the open truck and finally, disposed the waste to the

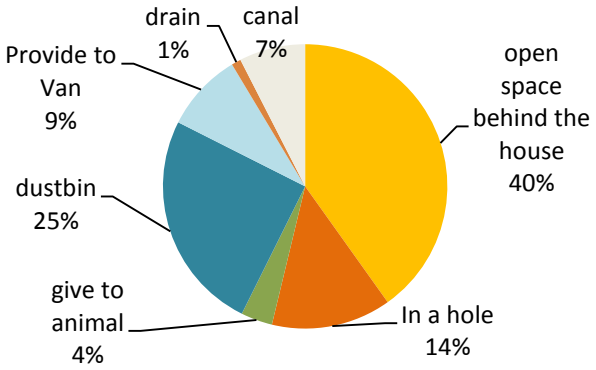
Figure 44: Solid Waste Storage at HH level



open disposal site. Due to lack of dumping place, sweepers are dumping collected wastes roadside, open places and here and there.

In general, the survey outcome has ensured that about 54 percent of the household dump their solid waste into open spaces behind the house and roadside. They do not store the waste generated in a day. They threw it away when it is generated. Around 38% of the total households store their waste in a bucket/polybag followed by 8% storing in a hole. At the end of the day they dispose the generated waste into different places such as, dustbin, drain and open place behind the house.

Figure 45: Disposal pattern of HH waste from bucket and polybag



Among the households that store waste in a bucket and polybag, 40 percent practice to dump the generated solid waste behind the house which is a very common and conventional practice all over the country. These wastes are not further transfer to anywhere rather gradually mix together with soil by polluting surrounding environment.

It is an indication of not having adequate knowledge about hygiene practice concept among the citizens and also having the necessity to take initiative from the municipality to introduce effective awareness raising campaign along with efficient mechanism process thus people would be encouraged to deliver generated solid waste in systematic and hygienic ways. Similar types of unhygienic practices of dumping solid waste are like in canal (7%). in drain (1%), etc.

Picture: Solid Waste Collection Van

On the other side, among the 34 percent of people have some kind of practices which are considered as an effective process to deliver solid waste in proper manner. Around 9 percent of the households provide the waste to municipal van in the morning. Around 25 percent of the citizens dump their generated solid waste into the municipal dustbin.

Municipality has the mandate for removing all kinds of generated wastes from the town. The conservancy department of the municipality has engaged some of the appointees for

collecting generated solid wastes from different parts of the town. The municipality has five tracks of different types and a tractor for collecting solid waste. In general, people gather their everyday waste in a bucket or bin and dispose into the nearby dustbins.

Picture: Solid Waste Collection by Sweeper

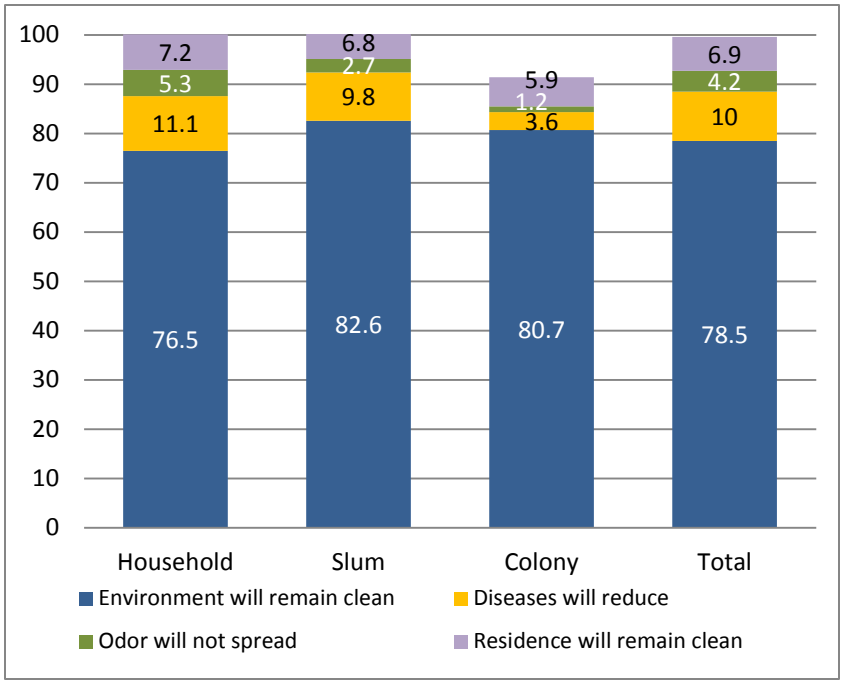
In different markets, the market/bazaar committees have selected a particular place under each of the market where all the vendors dispose their everyday generated solid wastes. Municipal sweepers collect solid waste from these secondary sources. The sweepers have a routine map for collecting solid wastes from different secondary points and from different markets. Only five trucks are their wastes transport vehicles. With this support they collect wastes on a regular basis and transport to the dumping places. The municipality has a final dumping place and all collected wastes are dumped in a conventional ways. It means there are some other sweepers who stress waste from one side to another for minimizing pileup situation. There is no management system in the final dumping place for effective and systematic dispose all collected wastes. As consequences, such practice has heavy negative impacts on environment and pollutes surrounding areas. It has given an apparent indication of having necessity to introduce appropriate technology for efficiently managing generated solid wastes.

5.4 Door to Door Solid Waste Collection System

Saidpur municipality is responsible for proper management of Solid waste but they are not able to handle the increasing quantities of waste, which results uncollected waste on road sides and public places. In this regard, Door-to-door solid waste collection system should be introduced in each and every part in the town. Such system has extremely high level of acceptance among the citizens. Around 99 percent of the respondents have expressed positive impression regarding such type of waste collection process.

The citizens have expressed reasons why they desire such type of service like door-to-door solid waste collection system in their town. Environment will remain clean if such solid waste collection process is introduced all over the city areas as mentioned by the highest proportion of 79 percent of the respondents. Around 10 percent of the respondents stated that possibility of affected by various types of diseases will be reduced. Other mentionable causes are like odor will not spread (4%), surrounding residential areas will be clean (6%) and mosquitoes will not spread and so on.

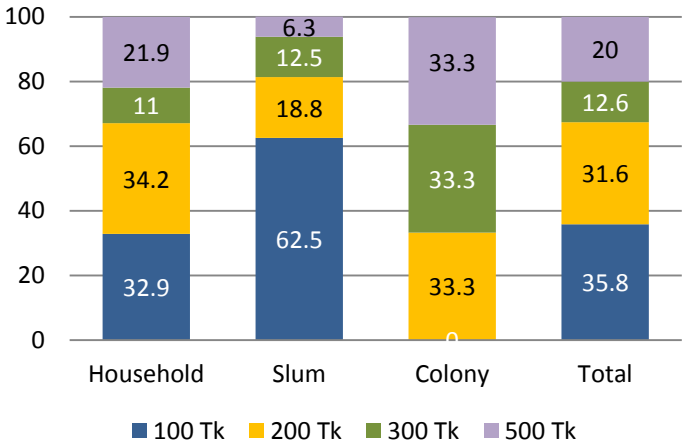
Figure 46: Reason for expectation of Door-to-Door service



5.5 Willingness to Pay for Better Service

Under faecal sludge management issue, a massive proportion of the citizens have shown positive impression on willingness to pay for better service relating to the issue. About solid waste management, same issue was raised among the respondents. Around two-third of the people have expressed positive impression about their willingness to pay for better service on solid waste management.

Figure 47: Willingness to Pay (one time) for Better Solid Waste Service

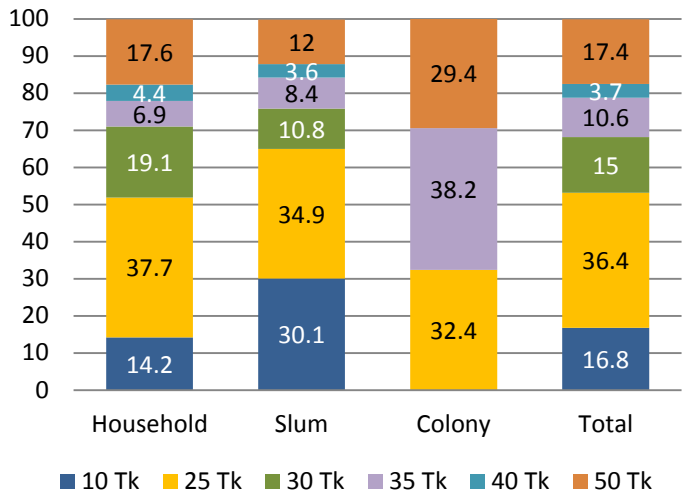


According to the survey outcome, people are found willing to pay within the range of BDT 100-500 at a time for receiving better solid waste services. Most of the people are willing to pay BDT 100 as mentioned by around 36 percent of the respondents. On the other side, 32 percent of them are interested

to pay BDT 200 at a time and 20 percent are ready to pay BDT 500 at a time. On an average, people are found willing to pay BDT 248 at a time for receiving better service on solid waste management.

After providing such amount, people are found having a mindset to pay some money on a monthly basis. Mostly, people are found willing to pay BDT 25 per month for receiving better service on solid waste issue as mentioned by around 36 percent of the respondents. Around 17 percent of the respondents stated about paying BDT 50 per month and BDT 30 mentioned by around 15 percent. On an average people are found willing to pay BDT 29 per month.

Figure 48: Willingness to Pay (monthly)



Therefore, one of the major findings is that people are very much willing to pay extra money for receiving better solid waste services.

Overall situation is providing an extreme negative impression regarding solid waste management issue. According to the survey outcome, solid waste collection through a collection van under the supervision of the municipal authority is practicing in the town but mainly in limited form. As a result, only around three percent of the people are getting such type of services. The concern authorities especially the municipal authority should have taken effective initiative for resolving such unhygienic and unacceptable practices of the citizens. An effective solid waste management mechanism should be introduced by the municipal authority with the support from other stakeholders including INGOs and the private sector.

5.6 Hospital and Clinical Waste Generation

With an aim to estimate the total volume of clinical waste and to identify the current practice to manage those waste by the hospitals, clinics, and diagnostic center. There are total 20 health care units are providing health care facilities in Saidpur Municipality area.

A total of 5 health care units (hospital-1, clinic-1, and diagnostic center-3) were visited during the study. Informal interviews were conducted with doctor, nurse, ward boy and sweeper through a semi-structured questionnaire to gather information on clinical waste storage and disposal practice. Different types of waste were identified i.e. hazardous, non-hazardous, infections, sharps etc. and weighted. Using the average volume of waste generated by different health care units we have calculated the total volume of clinical waste generation. It is estimated that, 131 Kg of clinical wastes are generated in Saidpur municipality area in a day.

Table 14: Generation of Medical waste

Health Care Unit	Number of Health Care	Estimated Waste generation/unit/day	Total Waste Generation/day (average)	Total Waste Generation/Year (average)
Hospital	3	10-20 Kg	45 Kg	16.43 MT
Clinic	6	4-10 Kg	42 Kg	15.33 MT
Diagnostic Center	11	2-6 Kg	44 Kg	16.06 MT
Total	**20**		**131 Kg**	**47.82 MT**

We have classified the wastes into two categories; hazardous/infectious and non-hazardous.

Hazardous/infectious Waste	Non-hazardous Waste
• Surgical dressings • Swabs • Needles • Syringes • Scalpels • Blades etc.	• Aerosols • Containers • Waste papers • Food wastes, etc.

We have asked the respondents about hospital/clinical waste management. Most of them are completely unaware of medical waste management. They did not have any training on handling hazardous clinical waste. Therefore, they treated medical waste as normal solid waste.

5.7 Disposal of Medical Waste:

Staffs of the hospitals/clinic do not take proper measure for the safe disposal of medical waste. Usually, all kind of medical wastes are dumped in the open land or dustbin adjacent to the hospital/clinic. After a certain period of time, they burn those waste by using kerosene. Some of the wastes are occasionally buried.

Picture: Dumping Place of Hospital

Picture: Burning of Medical Waste

They never segregate needle, blade or any sharp equipment, bandage, saline bag, chemical substances, and so on. On a regular basis, the ward boys collect various types of wastes from various departments, keep those altogether within a container and simply dispose at the backside of their premises.

Overall situation has provided indication that this sector needs expert support from outside sources to learn on medical waste management. NGOs may play an active role in this regards. External expert organizations should arrange extensive training by covering various aspects of the medical waste management for the doctors, nurses, administrative authorities and other relevant people. Such training should cover the conceptual aspects of the medical waste related issues, the process of using different types of containers for keeping different types of hazardous and non-hazardous medical waste, its transportation mechanism in safety manner and disposal mechanisms. The concern authority of the municipality should also be trained on the issue. It is going to be a completely new sector for the people that are involved with medical sector.

Extensive research on medical waste management would be required for effectively understanding where and what types of cooperation and mechanism would be effective by considering existing situation of the municipality.

6. Capacity of Municipality Authority

6.1 Policy Provision (role and responsibility)

According to the regulatory guidelines, it is a major responsibility of the municipality is to manage all kind of wastes, in particular, the issue of 'solid waste and 'liquid waste'. However due to lack of further detailing, there is no specific instruction regarding 'faecal sludge'; as a consequence, most of the municipal authority has preparation and practice on the management of solid and liquid waste. Besides that, as faecal sludge is considered as different type of waste, which covering both solid and liquid waste characteristic it is necessary to manage it in different ways by applying different kind of technologies and treatment options, time has come to focus this issue separately and specifically under waste category. The policymakers should have to take initiative for required modification upon the existing regulatory clauses.

Under the 2nd Chapter, the responsibility and function of Municipality is mentioned on the clause (50)(2) relating to WASH. The Municipality's responsibility should be fulfilled aims of (a) Water supply for residential, industrial and commercial use, (b) Water and sanitation, (c) Waste management, and (d) Issuing plan to ensure economic and social justice. It is clearly understandable that faecal sludge management issue should be laid with the clause (50)(2)(b). Therefore, the situation is providing indication of having the necessity for further reviewing the issue and explains in detail by mentioning separately the responsibility of the municipalities regarding faecal sludge management aspects under the sub-clause.

On the Paurashava Act, it has provision for the development of the Master Plan for each of the municipality. Some of the municipalities have taken such initiative however most of the municipalities are yet to take any such decision. It's a complex process and the local administrative authority may seek expert support from the external sources for the development of a Master Plan separately for each of the municipality. The Master Plan should have to incorporate FSM issue in effective ways. Besides that, presently, there is no building code for septic tank on the building control aspect, as a result people are not compelled to construct septic tank while developing multi stories buildings.

6.2 Regulatory definition of some of the issues including 'city' and 'small town'

On the Paurashava Act 2009, it doesn't provide direct definition on 'City' and 'Small Town'. Only it has provided direction about city areas. On the Paurashava (Municipality) Act 2009, the definition of 'city areas' is mentioned under that clause (2)(68); it means acquired land by municipality or cantonment board and announced 'city area'. The preconditions of declaring any area as city areas are also mentioned in detail under 1st chapter in section 3 of this ordinance. Those issues are enough to understand the meaning of city though do not have direct definition at the policy document. According to the act, following preconditions should have to meet for declaring any areas under the city areas.

1st Chapter, Clause 3(2) before publishing circular by gazette according to sub-section (1) have to be confirm about following issues that, declared area-

- ✓ Three-fourth of the people is involved with non-agricultural profession.
- ✓ 33 percent land is non-agriculture type.
- ✓ Density of population is not less than 1500 in average in each sq. km.
- ✓ Population will not be less than 50 thousand

According to the Paurashava (Municipality) Act 2009 under the clause (2)(4), it has provided definition of 'garbage' where it covers the issue of rubbish, offal, night-soil, carcasses of animals, and deposits of sewerage, residue of latrine, dirt, waste and any other polluted materials. The word 'night-soil' means faeces, which recognized under the local government policy document though not getting impression of adequately addressing entire activities relating to the specific word. It has providing indication of having necessity to concentrate on developing and including new definition of faecal sludge and its management on the policy document.

According to the Paurashava (Municipality) Act 2009 under the clause (2)(64), "Sewerage" means drainage, polluted water, rain water carried by drain and any type of polluted and dirty materials carried by canal. The definition has confirmed that faecal sludge is completely a different issue and doesn't have linkage with sewerage aspects. Similarly, under the clause (2)(27) "Drain" means a rain or storm water drain and water tables, chutes and the side drain exclusively meant to drain away the rain water falling on the surface of any street, bridge or causeway. The reason of mentioning these two definitions to provide apparent message to the concern authorities and the entire population should restrict themselves by not go for any kind of illegal practice through connecting pipelines of latrines with the existing sewerage and drainage system of the municipalities.

6.3 Human Resource Capacity

According to the administrative arrangement of the government of Bangladesh, Saidpur Paurashava is has the status as "A" category municipality. The government has a prototype organogram for all the municipalities in Bangladesh which is also applied in Saidpur municipality.

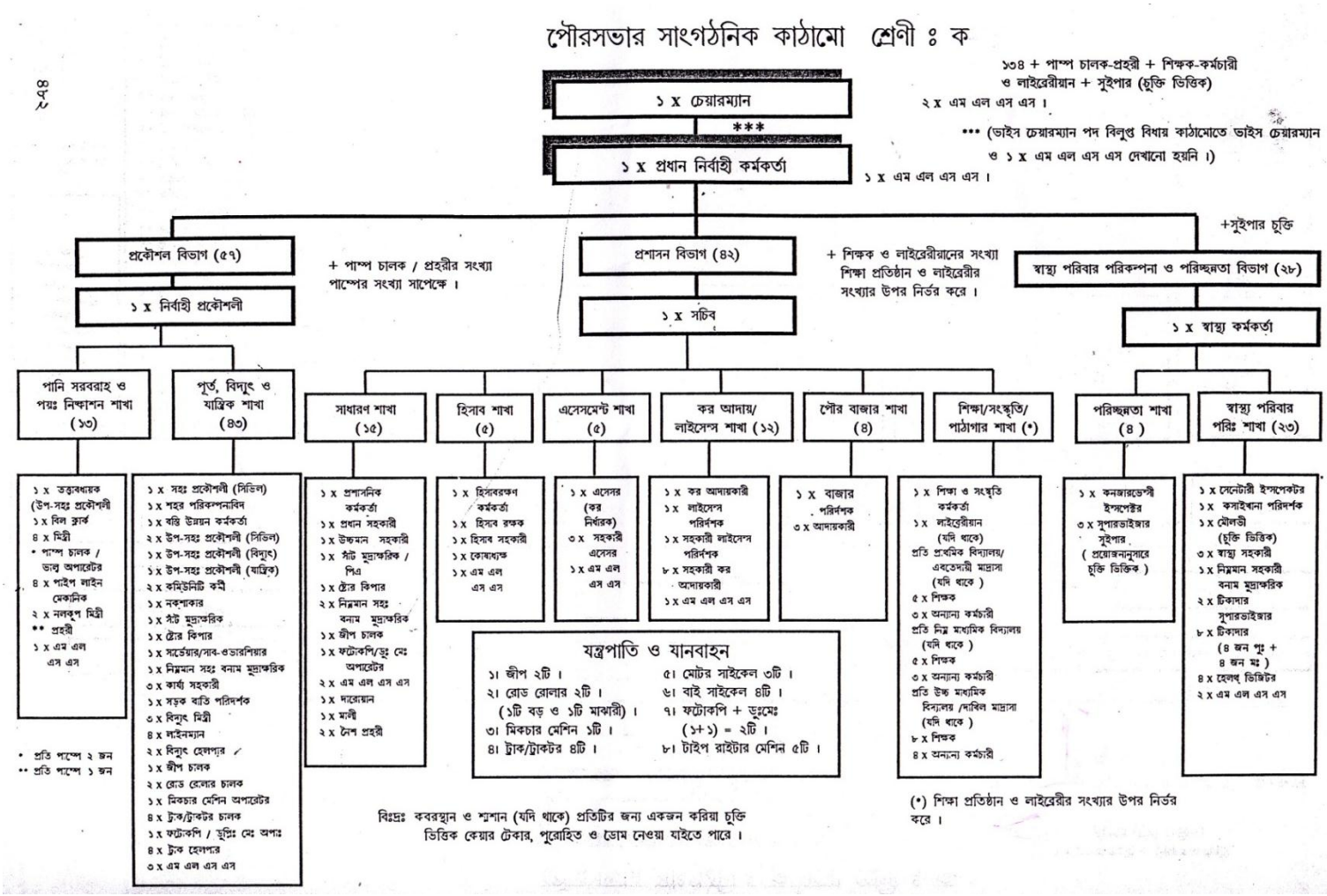
The citizens of the town are availing sanitation related services under the Health, Family Planning and Cleaning Department. Within such broader arrangement, mainly, the cleaning department is responsible to provide sanitation related services to the people. It is a small department having only two (2) provisions to serve the entire municipal areas for cleaning of the solid waste, emptying, collection and disposal of faecal sludge and so on. One of the positions is named as the Conservancy Inspector. 1 person can be appointed for this position. Second position is the Supervisor. A total of 3 persons can be appointed on this position.

It is being informed by the municipal authority that the position of conservancy inspector is vacant for the last 15 years. One of the supervisor position is vacant for 10-12 years. It means only 2 supervisors are serving the entire population in Saidpur Paurashava. Therefore, it is clearly understandable that only two supervisors will not be able to provide conservancy services to the entire citizens in the municipal areas. Moreover, around 190 sweepers are working under payroll basis under the cleaning department.

Overall situation has given an apparent indication that only filling these two position by appointing two persons wouldn't enough the serve the people in adequate manner rather the municipal authority should think around the possibility to rearrange the entire department. Under the present situation, it wouldn't be possible to promote FSM in effective ways. The external support agencies should have to take proactive initiative through advocacy to convince the authority thinking about the rearrangement on the present organogram for better serving the citizens. Moreover, create a favorable platform for discussing about the possibility for the development of a separate department for FSM.

The employment arrangement of the municipally under the conservancy department is mentioned below:

Table 15: Organogram of Saidpur Municipality

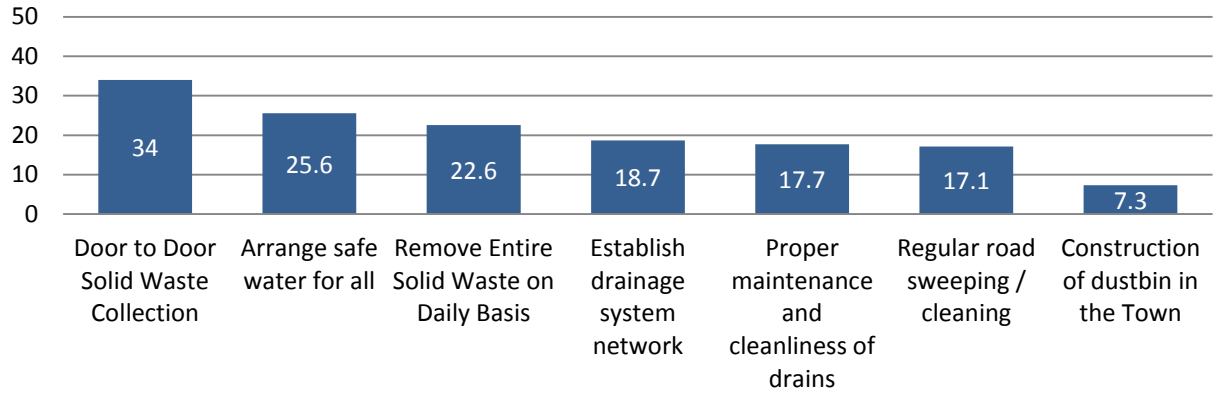


***source: Municipality of Saidpur**

6.4 Expectation from Municipality

In general, municipality authority is responsible to provide basic services to the citizens. Therefore, this study has provided efforts for identifying the issues where they have more expectation upon the municipality authority. Door to door waste collection approach should be introduced intensively throughout the town for collecting all generated waste in a systematic manner as mentioned by most of the respondents (34%). People's desire for receiving uninterrupted safe drinking water is another important issue (26%) which has a linkage with ensuring improved WASH situation. Removal of all generated waste from the roadside on a daily basis is also a significant aspect where municipal authority has to take proactive initiative to keep the environment clean and healthy as mentioned by around 23 percent of the respondents. On the other side, one of the significant issue as raised by the citizens is to development of an effective drainage system in the town and establishing network connection for resolving the situation of stagnant water within the town areas. Such statement has been made by highest around 36 percent of the respondents where expectation for establishing drainage system with network facility is found around 19 percent and ensuring maintenance of drains is around 18 percent.

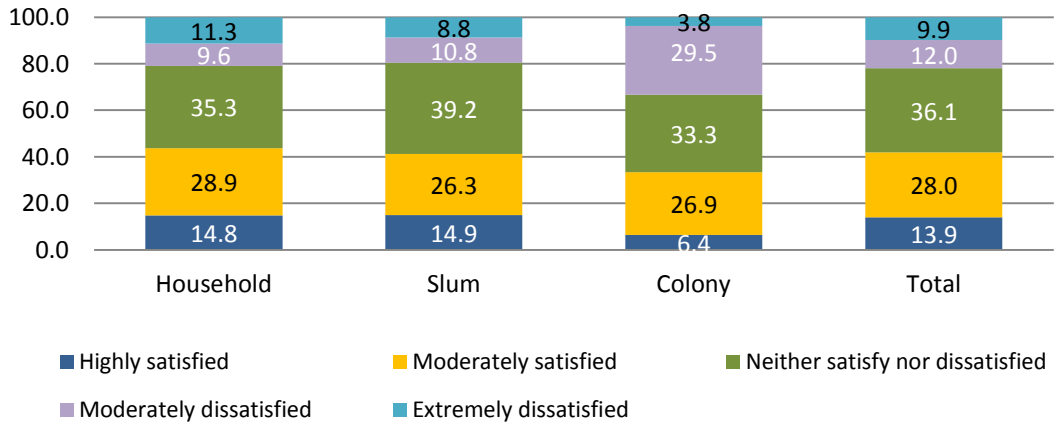
Figure 49: Expectation from Municipality



6.5 Satisfaction Level on Municipality Services

Present service of the municipality on solid waste management is not much acceptable as highest 36 percent of the respondents stated about neither satisfied nor dissatisfied. Only 14 percent of the populations are highly satisfied and 28 percent are moderately satisfied. However, 12 percent people are moderately dissatisfied and 10 percent of the populations are extremely dissatisfied on municipal services.

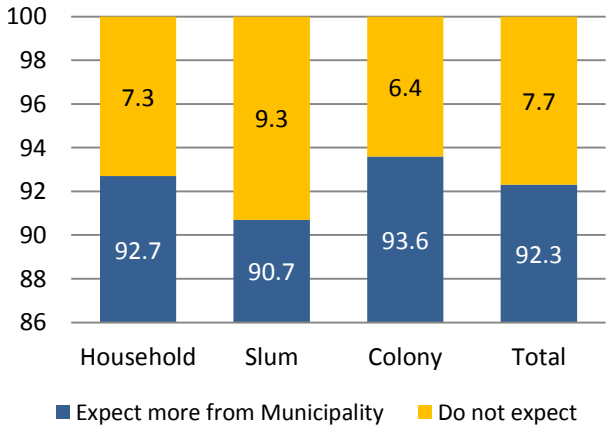
Figure 50: Level of Satisfaction on Municipal Services



6.6 More expectation from Municipal

The citizens have more expectation from the municipal authority in terms of getting better and adequate services from them. Above 92 percent of the respondents has stated such comment. Under all three categories it is significantly high as above 90 percent each.

Figure 51: More Expectation from Municipality



6.7 Available Technical/Hardware Facilities

Saidpur municipality has inadequate number of technical equipment and hardware facilities to serve the citizen properly. For the collection of solid waste, they have trucks, van, pick up but these are very inadequate. They have two vacutugs for collecting feces from the septic tanks or pits by using mechanistic device. However, the concern officials are not efficient for providing mechanical services in effective ways. As a result, the citizens have expressed their dissatisfaction for not receiving such technological based services. On the other side, municipality has only 16 rickshaw van and it is extremely

inadequate to service the citizens by collecting solid waste by following door-to-door waste collection process. Presently, by using such rickshaw vans, municipality is able to collect a tiny proportion of households. More specifically presently they are collecting solid wastes from three communities, one under a particular ward. Therefore, the study outcome has indicated that the conservancy department should receive extensive knowledge development and capacity building trainings relating to sanitation aspects including faecal sludge and solid waste. Moreover, the municipality has to take initiative for collecting more vehicles and relevant modern technology based equipment and materials for potential sources and using their internal funds.

Table 16: Capacity of Municipality

Name	Capacity	No. of Vehicle
Pick up	2 ton	2
Pick up	1.5 ton	2
Drum truck	3 ton	1
Vacutug		2
Tractor		1
Rickshaw Van		16
Hand Car		20

Table 17: Information of Vacutugs:

	Vacutug -1	Vacutug-2	Cost/month
Capacity	3,500 ltr	1,000 ltr	**Driver salary – 11,000** **Sweepers – 3 *6,000 = 18,000** **Fule – 6,000** **Total = 35,000 taka**
Use	3,000-3200 ltr	1,000 ltr	
Working days /week	3	3	
Trip/week	12-15	10-12	
Fee/trip	1,500 (within municipal area) 2,500 (outside of municipal) +20 tk/mileage	500 tk (only municipal area)	
Size of pipe	160 ft (additional 100 ft supposed to provide soon)	200 ft, they use 150 ft.	

7. Conclusion and Recommendation

7.1 Conclusion

We engaged local boys and girl from the municipality to collect reliable data from sample households. As a large portion of citizen is non-Bengali, we have trained and employed local people to ensure the easy access in households and to make the communication easy.

Most of the households in the Saidpur municipality have access to a toilet irrespective of its quality. Due to lack of following standard design of septic tanks and no treatment facilities, 100 percent of faecal sludge is discharged into environment. Due to lack of strong enforcement of existing policies and laws, public health became unsafe.

There is a large no. of toilets are illegally connected to open drains and water bodies. Municipality are convinced to cut-off this illegal connection. In spite of this action environment will never be healthy and safe unless and until a proper emptying and treatment procedure is established. Though a Vacutug service was introduced a year ago, but it is inadequate to meet the demand; hence households are compelled to practice manual emptying and disposal which is unsafe and directly affects the public health and the surrounding environment.

Due to lack of adequate dumping places, most of the solid wastes are disposed on roadside or open spaces behind house. Though a significant portion of households store their daily generated waste into a bucket or polybag but a small portion of them dump into dustbin. Door-to-door waste collection has been introduced in 2 wards of the municipality which became very popular in short time. The coverage of this service should increase within very short time to make a clean city.

7.2 Present Constrains Analysis, Challenges and Recommendations

7.2.1 Faecal Sludge Management

In general, major constraints of the current solid wastes management practices in Saidpur municipality are as follows:

1. Lack of knowledge of operation and maintenance of pit and septic tank
2. Lack of knowledge of standard design for installation of pit and septic tank
3. Lack of knowledge and public awareness about emptying process, consequences on health and environment for exposed feces into surrounding areas
4. Illegal pipeline connection of pits and septic tanks with the municipal drainage system, low laying areas, and water bodies like canals, rivers etc.
5. Commonly follow manual process for emptying pit and septic tank and open dumping of collected faecal sludge on low laying areas and water bodies
6. Lack of awareness about hygiene practices and negative consequences upon health and environment
7. Inadequate emptying, collection and disposal services by the municipality
8. Lack of knowledge about the Faecal Sludge Management (FSM) concept and approach among the municipal officials, other relevant department, stakeholders and the citizens

7.2.2 Recommendation for Improving Faecal Sludge Management (FSM)

1. Initiative should be taken to aware and encourage people on hygienic use of latrines and also persuade the citizens for the installation of improved sanitary latrines following standard design and maintaining BNBC.
2. Encourage the people to pay extra service charge for effectively managing emptying, collection and disposal system
3. Extensive training for sweeper community to aware them on necessity of safety and security measures during emptying and disposal faecal sludge.
4. Development of innovative and appropriate approaches for the emptying, collection disposal of faecal sludge in safe and environmental friendly manner
5. Strengthen the capacity of the municipality including adequate mechanical vehicle (Vacutug), manpower, and other support service.
6. Advocacy initiative for increasing sanitation budget and arrange from external sources like donor agencies, INGOs etc.
7. Allocation of specific places for safe disposal of faecal sludge.

8. Massive knowledge and awareness building on Faecal Sludge Management (FSM) concept and approaches for the citizens, municipal authority, other government departments, stakeholders and so on.
   Take initiative for building fecal sludge management capability and arrangement of necessary logistics of the municipality
9. Policy level advocacy for developing necessary laws for regular emptying of septic tanks or pit latrines and prevent dumping sludge beside road or into canal.
10. Create opportunity to develop a business model for preparing organic fertilizer from human waste through composting in a treatment plant.
11. Conducting research to identify possible ways for engaging the private sector on various parts of FSM approach; more particularly, on the issues of emptying, collection and disposal and also management aspects of the FS.

7.2.3 Municipal Solid Wastes

In general, major constraints of the current solid wastes management practices in Saidpur municipality are as follows:

1. Lack of primary collection of solid wastes system which would ensure door-to-door collection of wastes in exchange of providing additional but acceptable service charge
2. Inadequate number of disposal places and dustbins.
3. Common practices of dumping solid wastes into drains, low lands and openly on surrounding areas
4. Lack of knowledge and public awareness about negative consequences of open dumping practices of solid wastes along with health and environmental impacts
5. Inadequate manpower, equipment, and logistics support of the Paurashava
6. Lack of financial support and internal budget provision

7.2.4 Recommendation for Improving SWM System

1. Taking initiative for the establishment of a community based solid waste collection system
2. Encourage the community on willingness to pay for the waste collection system and participate on the community based monitoring system through formation of CBOs
3. Advocacy initiative with the municipal authority allocating more strategic places for the waste disposal points;
4. Construction of adequate number of dustbins in every wards of the municipality.

5. Ensure regular collection of solid wastes from roadside, dustbins etc. to remove continuous pileup situation and dump at the final disposal place;
6. Massive public awareness campaign on Solid Waste Management
7. Policy for prevent dumping solid waste on roadside and open places.
8. Extensive training on solid waste system and disposal mechanism for the sweepers and other institutions;
9. Further initiative on waste separate at source at the household level;
10. Encourage the private sector to be involve with the waste collection system;
11. Take initiative on technology transfer and encourage the private sector or the government for installation of waste recycling plant;
12. Institutional strengthening of the conservancy sector on the municipality including manpower, equipment, vehicles and other support services;
13. Conduct an extensive feasibility study on installation of SWM recycling plant and development on a Market Strategy;

7.2.5 Hospital/ Clinic/Medical Wastes Management

In general, major constraints of the current hospital/clinic/medical wastes management practices in Saidpur municipality are as follows:

1. Lack of knowledge about medical waste management
2. Medical wastes are considered as general solid waste.
3. Staffs of the medical do not take proper measure for safe disposal
4. Infectious and sharp equipment is not being segregated.
5. Lack of initiative taken by municipality for separate collection and dispose of medical waste.
6. Lack of separate disposal place for medical waste

7.2.6 Recommendations for Hospital/clinical/medical waste management

1. Massive knowledge development and awareness building training initiatives on hospital/clinic/medical waste management concept and approaches
2. Encourage hospitals, clinics and diagnostic centers to place separate containers for safely shorting different types of hazardous and non-hazardous wastes in safety ways.
3. The municipality should allocate specific place for recycling hospital wastes.

Annexes

Annex 1: ToR of the Baseline Study

Terms of Reference
Hiring for Consultant for Conducting Baseline Survey on Faecal Sludge and Solid waste Management in Saidpur Municipality, Nilphamari.

1. Organisational background

WaterAid Bangladesh (WAB) is a leading international development organisation in Bangladesh, working in the country since 1986 to improve access to safe drinking water, sanitation and hygiene (WASH) for poor and marginalised communities. WaterAid employs participatory community-led processes to promote a demand-driven service provision that creates access to safe drinking water, sanitation and hygiene facilities based on its global principle of equity, inclusion and rights.

2. Project background

Although Bangladesh has achieved remarkable improvement in sanitation coverage, reducing open defecation around one percent in two decades, sanitation is still a major challenge for the small towns and cities of Bangladesh— overlooked in government policy and in governmental and non-governmental programmes. In urban areas, the increase in sanitation coverage using septic tanks and pit latrines means sludge volume from waste water discharge has increased considerably in the last few years. The problem is worsened by an increasing trend of faecal waste generation in Bangladesh, and a significant percentage of the population having no access to proper waste disposal services. Without adequate faecal waste collection and disposal systems, it is disposed of in ways that pose serious risks of environmental degradation and health hazards to the citizens.

Saidpur of Nilphamari district is a 'A' category municipality covering an area of 34.42 square kilometres. It is located at the headquarters of Saidpur Upazila of Nilphamari district. The total number of households in the municipality is 44,450 and 1,50,800 people live in the town as of 2015. Saidpur municipality was established in the year 1958.
Among the households of the municipality, it is estimated in a preliminary survey that there are about 15800 septic tanks and more than 3500 pit latrines. Every year, an average of more than 13000 MT of sludge is generated, and the major portion is released into open

drains, water bodies and agricultural land. Open drain connection from septic tank or pit latrine is one of the general scenero in Saidpur. [1] It is also estimated that more than 40,000 M tonnes of solid waste is generated annually, including solid waste from market places. Almost all the wastes are disposed at the side of roads, open drains, landfills, or in the open. Considering the volume of faecal sludge generated in the area, there is an enormous potentials for a comprehensive faecal sludge management scheme, which will support other key areas including soil conditioner through a social business model.

As a part of environmental development initiatives, a FSM plant has been planned for construction as a part of FSM initiatives.

3. Purpose of the consultancy

The purpose of the consultancy is to conduct a baseline study to understand and analize present sanitation situation that will support to design a comprehensive faecal sludge and solid waste management plan for Saidpur municipality. The findings will open up some advocacy initiatives with municipality authority and targeted community people on faecal sludge and solid waste management issues including toilet standards, containment emptying including service delivery and willingness to pay, sludge transportation, treatment, disposal or end use, household waste collection, disposal, municipality's capacity that might play a vital role on introducing and reforming policy docuements also. Successful demonstration of this model will be considered for replication in other similar areas.

4. Objective of the consultancy

To design, prepare, conduct and complete the baseline study on faecal sludge and solid waste in Saidpur municipality. The study is expected to provide detail information and analysis of the current situation and practices related to faecal sludge considering sanitation value chain and solid waste management includes sludge generation, toilet standard, containment emptying – related available services as well as community perspectives, practices & willingness, transportation, treatment and disposal. It will also provide critical inputs regarding the scopes of a comprehensive FSM plant for Saidpur municipality, and marketing of the products generated from the plant.

5. Scope of work

The scope of work will focus on three broad issues, namely (i) faecal sludge and solid waste generation, collection, transportion and disposal, (ii) willingness and ability to pay for collection of both faecal and solid waste, and (iii) marketing potential for the output from the proposed sludge management plant.

The scopes are as follows:

(i) Estimated volume of faecal sludge and solid waste generated in Saidpur municipality in (a) households, (b) Colonies (c) slums (d) institutions (e.g. schools, colleges, mosques, clinics, hospitals, different govt. and non govt. offices etc.) (e) business unit (poultry, factories, skills training centers etc.) and (f) markets in given period of time (daily/weekly/monthly). The detail information will cover -

- No. of household/institutions/markets use pit
- No. of household/institutions/markets use septic tank
- No. of septic tank/ pit or others directly discharge sludge into the environment
- No. of HH and estimated volume of waste-water(Both black and gray water) discharge into the environment
- No. of septic tank/pit or others emptied manually/ mechanically

(ii) User wise Containment patterns, emptying mechanism (both traditional and mechanical) and frequencies, available facilities and patterns, containment connection to drain and environments, number and location of disposal sites.

(iii) Prepare a Shit Flow Diagram (SFD) of the town.

(iv) Current scenario of toilet and septic tank types compare to the set standard in Bangladesh National Building Code (BNBC), scenario of containment and emptying standard, scenario of available emptying services in both public and private sectors, scenario of community practices in regard to emptying, their perception and their preparedness, frequencies and costing of emptying, willingness to pay for emptying, transportation facilities, treatment facilities including removal efficiencies/quality of effluent and disposal practices.

(v) Estimated volume of different types of hospital and clinical waste generation, current disposal practices and facilities.

(vi) Current role and capacity of municipality authority as a service provider as well as regulatory body both in human resourses and facilities

(vii) Public sector resource allocation and involvement for city's faecal sludge management.

(viii) Assessment of formal and informal sweeper groups, their health risks and knowledge and practices

(ix) Current business practices in sanitation value chain.

(x) What are the scopes for the comprehensive FSM plan for Saidpur municipality, reuse opportunities as well as marketing opportunites of end product considering sanitation value chain.

6. Methodology

The individual/firm is expected to develop appropriate methodology to meet the objectives of the study. Appropriate triangulation in data collection methods is anticipated in the proposed methodology as per need. The methodology and relevant instruments should be adjusted in consultation of WaterAid and finalised before implementation.

7. Expected competency

Expected competency of the individual/firm includes:

- Expertise in conducting quantitative and qualitative study.
- Experience in working in the area of water, sanitation and hygiene. Experience in working with Second generation Sanitation value chain.
- Analytical skill in assessing Faecal sludge scenario of a town.
- Capacity to provide necessary training to human resource for administering data collection, quality control of data, data entry and management.

8. Activities / Issues to be considered:

The consultant should ensure the following activities are completed in close coordination with WaterAid Bangladesh (WAB) personnel. There should be regular meetings/consultation between the two parties to discuss the issues before finalising any aspects of the assignment.

- Familiarise WAB with programme and content
- Develop a plan to carry out the survey
- Furnish and finalise survey questionnaire
- Prepare checklist for FGD
- Prepare and organise field level consultations and interviews in consultation with local partner SKS.
- Consult with the Saidpur Pourashava Mayor, relevant officers and staffs.
- Design the sampling process based on different categories of respondents (e.g. households, colonies, markets, institutions and business unit)
- Submit a tabulation plan along with draft outlines for output reports.
- Mobilise enumerators and provide training
- Conduct the survey
- Process and analyse the data
- Ensure completeness and reliability of survey data

- Prepare draft report and organise a consultation/sharing meeting/workshop with stakeholders
- Prepare final report after addressing the comments.

9. Expected Outputs:

The consultant is expected to produce a comprehensive baseline study report with in-depth description, information and analysis on the current situation and practices related to faecal sludge and solid waste management in Saidpur municipality area. The report will cover, but not necessarily limit itself to, the following issues:

- Proposed methodologies, survey questionnaires, checklists developed with required sampling size etc.
- Required data collected, processed, and analysed.
- Presentation of the results of the baseline study after validation followed by a consultation meeting with stakeholders
- List of relevant references (studies and other literatures used) as annexes.

10. Timeframe and Deliverables

The total assignment should be completed within 60 days after signing of the contract. The individual/firm will submit a proposed work plan with key milestones within a week of signing of the contract. The work plan will be reviewed and approved by WAB. It is anticipated that the first draft of the report will be produced after 45 days of signing of the contract. The final reports should be submitted after 7 days of receiving feedback. During implementation of the assignment follow up meetings will be organised as necessary between the contracted agency/consultant and WaterAid Bangladesh.

The deliverables of the assignment will be:

- Inception report (digital copy).
- The final report addressing all objectives as specified on the ToR and incorporating the comments in the main text and data and other supporting information. The final report should include:
  - Digital and hardcopy of data collected and analysed; model and diagrams including photographs; contact list of interviewees and workshop participants.
  - Other relevant documents as appropriate including the filled-in questionnaires.

- Presentation of the draft findings to WAB and its partners

- Presentation of the key findings and recommendations to the wider audiences as suggested by WAB

11. Application

Based on this ToR, interested organizations are requested to submit their proposals by **04 November 2016**. The proposal should include the details on methodology including sampling, activities and milestones, budget details, time frame and CVs of experts. Also consultants are requested to attach TIN & VAT certificates and any other relevant documents.

12. Contents of the proposal

WaterAid invites proposal from consulting firm/agency/organization/individual consultant. The proposal should be in English. The technical part of the proposal should contain the following:

- Detailed methodology of the study.
- Detailed timeframe (including date of submitting the first draft and final submission).
- Detailed CV of the study team members containing experience on relevant issues.

The financial part should describe the estimated cost for the study in detailed. The individual/firm should submit the VAT registration certificate (for firm); Copy of valid TIN certificate; and Bank account detail.

13. Submission Guideline

a) Proposal needs to be submitted electronically by the 4 November 2016 at WaterAid-Tender-TA@wateraid.org

b) Proposals submitted to any other e-mail account except the above and exceeds the time limit will be treated as disqualified.

c) Attach the financial and technical proposal along with all required documents with the email, and put all attachments in one zip folder in the name of individual/firm.

d) The subject of the email should be “Baseline Survey on Faecal Sludge and Solid waste Management in Saidpur Municipality, Nilphamari.”

14. Payment

The payment will be made in three instalments:

Instalments	Percentage	Time
First instalment	30%	After submission and acceptance of the inception report
Second instalment	40%	After submission of draft report
Third instalment	30%	After submission and

		acceptance of the final report

Annex 2: Questionnaire for Household Survey

Baseline Survey on

Faecal Sludge and Solid Waste Management in

Saidpur Municipality 2017

Questionnaire for Household Survey

আমার নাম .....। আমি NewVision Solutions Ltd. থেকে এসেছি। এটি একটি উন্নয়ন গবেষণা প্রতিষ্ঠান। বর্তমানে প্রতিষ্ঠানটি আপনার এলাকাতে পায়খানার বর্জ্য ব্যবস্থাপনার উপর একটি গবেষণা করছে । এই বিষয়ে আমরা আপনার মূল্যবান মতামত জানতে আগ্রহী। আমরা নিশ্চিত করছি যে, প্রাপ্ত তথ্য শুধুমাত্র গবেষণার কাজে ব্যবহার করা হবে এবং এই বিষয়ে সম্পূর্ণ গোপনীয়তা রক্ষা করা হবে ।

নির্দেশনা: খানা/বাড়ির প্রধান কে ইন্টার্ভিউ করতে হবে (পুরুষ/মহিলা)

a. তারিখঃ _____

b. প্রশ্নপত্রের সিরিয়াল নম্বরঃ

c. উত্তরদাতার নাম: _____

d. মোবাইল: _____

e. সহজে বাড়ি চেনার জন্য নির্দেশনা: _____

f. ঠিকানা:

ওয়ার্ড নং	পাড়া/বস্তির নাম	রোড নং	বাড়ি নং	বাড়ির মালিকের নাম এবং মোবাইল নং

g. পরিবারের মাসিক মোট

মনিটরিং			নাম	স্বাক্ষর
ইন্টার্ভিউ করার সময় সাথে ছিলাম	1.হ্যাঁ	2. না		
ফিল্ড সুপারভাইসার যাচাই করেছে	1.হ্যাঁ	2. না		
ফোন করে যাচাই করা হয়েছে (কেন্দ্র থেকে)	1.হ্যাঁ	2. না		
কোডিং করার আগে যাচাই করা হয়েছে	1.হ্যাঁ	2. না		
কোডিং করা হয়েছে	1.হ্যাঁ	2. না		
ডাটা এন্ট্রি করা হয়েছে	1.হ্যাঁ	2. না		

ইনটারভিউয়ারের নাম ও স্বাক্ষর: _____

সুপারভাইসরের নাম ও স্বাক্ষর: _____

(পরিবারের তথ্য)

Q 1.1 পরিবারের প্রধানের নাম সবার আগে লিখতে হবে। এরপর বড়দের নাম তারপর ছোটদের নাম লিখতে হবে।

নং	পরিবারের **মোট সদস্য সংখ্যাঃ** _____জন **বাড়িতে অবস্থান করেঃ** _____জন	বয়স	লিঙ্গ	উত্তরদাতার সাথে সম্পর্ক	শিক্ষাগত যোগ্যতা	পেশা	বৈবাহিক অবস্থা	ধর্ম	শারীরিক বা মানসিক অক্ষম (যদি থাকে)	আদিবাসী (যদি থাকে)
	নাম		1	2	3	4	5	6	7	8
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										

লিঙ্গ: পুরুষ =1, মহিলা =2

সম্পর্ক : উত্তরদাতা নিজেই =1, স্বামী/স্ত্রী = 2, কন্যা/ পুত্র =3, ভাই/ বোন =4, মেয়ের জামাই/ছেলের বউ =5, বাবা /মা = 6, শশুর/ শাশুরি =7 অন্যান্য =99.

শিক্ষা: ১ম-৫ম শ্রেনি=1, ৬ষ্ঠ -৮ম =2, ৯ম-১০ম =3, SSC পাস = 4, কলেজ = 5, HSC পাস = 6, অনার্স/ডিগ্রী = 7, মাস্টারস= 8, NGO শিক্ষা = 9, বয়স্ক শিক্ষা = 10, অশিক্ষিত = 11, নাম লিখতে জানে = 12, শিশু (1-5 years) = 13, অন্যান্য=99.

পেশাঃ

কৃষক/কৃষিকাজ	1	রাজমিস্ত্রী	6	কামার	11	ব্যবসায়ী	16	হোমিওপ্যাঁথি ডাক্তার	21	অন্যান্য - 99
গৃহিণী	2	গাড়িচালক	7	কুমার	12	হাস-মুরগি পালনকারী	17	ইমাম	22	
কৃষিশ্রমিক	3	রিকসা/ ভ্যান চালক	8	মুচি	13	গরু পালনকারী	18	অবসরপ্রাপ্ত চাকুরীজীবী	23	
অকৃষিশ্রমিক	4	জেলে	9	দোকানদার	14	দর্জি	19	ছাত্র/ছাত্রী	24	
চাকুরীজীবী	5	নৌকা চালক	10	ছোট ব্যবসায়ী	15	কুটিরশিল্প	20	বেকার	25	

বৈবাহিক অবস্থা: অবিবাহিত-1, বিবাহিত-2, বিধবা/বিপত্নিক-3, ডিভোর্সড-4

ধর্ম : ইসলাম=1, হিন্দু=2 , বৌদ্ধ=3, খ্রিষ্টান=4, অন্যান্য=5

অক্ষম ব্যাক্তি : কানে শুনতে পায় না/কথা বলতে পারে না=1, চোখে দেখতে পারে না =2 , অন্যান্য শারীরিক অক্ষমতা=3 , মানসিক ভারসাম্যহীন =4 অন্যান্য= 5

আদিবাসী : বাঙ্গালী =1 , বিহারী=2 , অন্যান্য=3

2.0 Sanitary Latrine and Feacal Sludge Issues

	Questions	Types of coding	Skip
Q.2.1	আপানার নিজের পায়খানা আছে?	1. হ্যাঁ	Q.2.3 এ যান।
		2. না	চলবে
Q 2.2	যদি না হয়, আপনি কোথায় মলত্যাগ করেন?	1. কমিউনিটির পায়খানায়	চলবে
		2. প্রতিবেশীর পায়খানায়	চলবে
		3. পাবলিক টয়লেটে	চলবে
		4. খোলা জায়গায়	চলবে
		99. অন্যান্য	
Q 2.3	আপনার পায়খানাটি কেমন?	1. ওয়াটার সিল সহ সিঙ্গেল পিট ল্যাট্রিন (রিং স্লাব)	
		2. ওয়াটার সিল ছাড়া সিঙ্গেল পিট ল্যাট্রিন (রিং স্লাব)	
		3. অফসেট পিট ল্যাট্রিন (রিং স্লাব)	
		4. পিট ল্যাটিন (২ টা পিট)	
		5. কমিউনিটির পিট ল্যাট্রিন (ওয়াটার সিল সহ)	
		6. কমিউনিটির পিট ল্যাট্রিন (ওয়াটার সিল ছাড়া)	
		7. কমিউনিটির অফসেট পিট ল্যাট্রিন	
		8. কমিউনিটির পিট ল্যাট্রিন (২টা পিট)	
		9. সেপটিক ট্যাঙ্ক সহ ল্যাট্রিন	
		99. অন্যান্য	
Q 2.4	আপনার পায়খানাটি যদি রিং স্লাব এর হয়, তাহলে কয়টি রিং আছে?	মোট রিং..... টি (আনুমানিক)	

	Questions	Types of coding			Skip
Q 2.5	আপনার পায়খানাতে যদি সেপটিক ট্যাঙ্ক থাকে তাহলে তার আয়তন কত? বিল্ডিং _____ তলা বিল্ডিং এ মোট পরিবার সংখ্যা_____	1. দৈর্ঘ্য		ফিট	চলবে
		2. প্রস্থ		ফিট	
		3.উচ্চতা		ফিট	
		4. মোট আয়তন _____ফিট^3 (আনুমানিক)			
Q 2.6	আপানার সেপটিক ট্যাঙ্কে কয়টি চেম্বার আছে?	1. ১ টা চেম্বার			
		2. ২ টা চেম্বার			
		3. ৩ টা চেম্বার			
		4. জানিনা			
Q 2.7	আপনার সেপটিক ট্যাঙ্ক করার আগে BNBC ডিজাইনের অনুমোদন নেয়া হয়েছিল কি?	1. হ্যাঁ			
		2. না			
		3. জানিনা			
Q 2.8	আপনার টয়লেটের ময়লা টা কোথায় যায়?	1. পৌরসভার সুয়ারেজ লাইনে যায় কিন্তু লিকেজ আছে			
		2. পৌরসভার সুয়ারেজ লাইনে যায় কিন্তু লিকেজ নাই			
		3. পৌরসভার নির্ধারিত স্থানে ফেলা হয় (legally)			
		4. যেখানে সেখানে ফেলা হয় (Illegally)			
Q 2.9	আপনার সেপটিক ট্যাঙ্কের লাইন কি পৌরসভার ড্রেনের সাথে সংযুক্ত?	1. হ্যাঁ			
		2. না			
		3. জানিনা			
Q 2.10	আপনার টয়লেটের ময়লা পিট/সেপটিক ট্যাঙ্কে জমা থাকে নাকি বাইরে যায়?	1. সেপটিক ট্যাঙ্কে জমা থাকে			
		2. পিট এ জমা থাকে			
		3. বাইরে চলে যায়			
Q 2.11	যদি বাইরে চলে যায়, তাহলে কোথায় যায়?	1. পৌরসভার ড্রেনে			
		2.পৌরসভার সুয়ারেজ লাইনে			
		3. সরাসরি খাল/পুকুর/নদীতে			
		4. সোকওয়েল			
		99. অন্যান্য (উল্লেখ করুন)			
Q 2.12	আপনি কতদিন ধরে এই পায়খানাটি ব্যবহার করছেন?	1. মোট _____মাস (আনুমানিক) 2. বানানো হয়েছে _____ মাস আগে (আনুমানিক)			
Q 2.13	আপনার পায়খানাটি কে বানিয়েছে?	1. নিজে বানিয়েছি			
		2. সরকার বানিয়েছে			
		3. NGO বানিয়েছে **(নাম টা বলুন)**			
		4. জানিনা			
		99. অন্যান্য			
Q.2.14	মোট কতজন এই পায়খানাটি ব্যবহার করছে?	মোট _____জন (আনুমানিক)			
Q 2.15	আপনার পায়খানাটি রক্ষনাবেক্ষন/পরিস্কার	1. কেউনা			

	Questions	Types of coding	Skip
	করে কে?	2. নিজেই করি	
		3. কেয়ারটেকার করে	
		4. জানিনা	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.16	পায়খানা রক্ষনাবেক্ষন/পরিস্কার করার জন্য আপনি কি টাকা খরচ করেন?	1. হ্যাঁ	চলবে
		2. না	Q 2.18 এ যান
Q 2.17	যদি আপনি টাকা খরচ করেন, তাহলে প্রতি মাসে কত টাকা খরচ করেন?	মোট _____ টাকা (আনুমানিক)	কমিউনিটির ক্ষেত্রে মোট খরচ আসবে
Q 2.18	আপনি কি আপনার টয়লেটের পিট/সেপটিক ট্যাঙ্ক আগে কখনও পরিষ্কার করেছেন?	1. হ্যাঁ	চলবে
		2. না	
Q 2.19	যদি না করে থাকেন, তাহলে কেন করা হয়নি?	1. পিট পূর্ণ হয়ে গেলে মাটি চাপা দিয়ে দেই	
		2. টয়লেটের ময়লা সরাসরি বাইরে চলে যায়	
		3. টয়লেটের ময়লা সরাসরি সুয়ারেজ লাইনে চলে যায়	
		99. অন্যান্য	
Q 2.20	কতদিন পর পর আপনার পিট/সেপটিক ট্যাঙ্ক পরিষ্কার করেন?	1. ৩ মাস	
		2. ৬ মাস	
		3. ১ বছর	
		4. ২ বছর	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.21	আপনি কি জানেন কত দিন পর পর পিট/সেপটিক ট্যাঙ্ক পরিস্কার করা উচিত?	1. হ্যাঁ	চলবে
		2. না	
Q 2.22	যদি জানেন, তাহলে বলবেন কি কত দিন পর পরিস্কার করা উচিত?	1. প্রতি ৬ মাস পর একবার	
		2. প্রতি ১২ মাস পর একবার	
		3. প্রতি ৬-১২ মাসে একবার	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.23	পিট/সেপটিক ট্যাঙ্ক পরিষ্কার করতে আপনি কি কোন সমস্যায় পরেছেন?	1. হ্যাঁ	চলবে
		2. না	Q 2.25 এ যান
Q 2.24	যদি সমস্যায় পরে থাকেন তাহলে, কি ধরনের সমস্যায় পরেছেন?	1. আসে পাশে কোন জায়গা নাই	
		2. টয়লেটের ময়লা বের করার জায়গাটা ছোট ছিল	
		3. যন্ত্রপাতি ব্যবহার করা সম্ভব হয় নি	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.25	পিট/সেপটিক ট্যাঙ্ক পরিষ্কারের জন্য কোন ঋতু আপনি পছন্দ করেন?	1. গ্রীষ্মকাল (গরমকাল)	
		2. শীতকাল	
		3. বৃষ্টির সময়	
		4. যে কোন ঋতু / কোন পছন্দ নেই	
Q 2.26	ঐ ঋতু পছন্দ করার কারন টা বলবেন কি?		
Q 2.27	পিট/সেপটিক ট্যাঙ্ক পরিষ্কারের জন্য কোন সময়টা আপনি পছন্দ করেন?	1. দিনের বেলা	
		2. রাতের বেলা	

	Questions	Types of coding	Skip
		3. যে কোন সময়/ কোন পছন্দ নেই	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.28	যদি আপনি রাতের বেলা পছন্দ করেন, তাহলে কেন করেন?	1. খুব দুর্গন্ধ ছড়ায়	
		2. যে কোন জায়গায় ফেলা যায়	
		3. রাতের বেলা পায়খানা কম ব্যবহার হয়	
		4. পরিষ্কার করতে অনেক সময় লাগে	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.29	আপনার টয়লেটের পিট/সেপটিক ট্যাঙ্ক কে পরিষ্কার করে?	1. নিজেরাই করি	
		2. সুইপার দিয়ে করাই	
		3. পৌরসভা করে	
		4. NGO করে **(নাম বলুন)**	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.30	কিভাবে টয়লেটের পিট/সেপটিক ট্যাঙ্ক পরিষ্কার করেছিল?	1. যন্ত্রপাতি/ভ্যাকুটেগ ব্যবহার করে করেছিল	
		2. ম্যানুয়াল পদ্ধতিতে করেছিল	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.31	পরিষ্কার করার সময় ওরা কি কি জিনিস/ যন্ত্র ব্যবহার করেছিল? দয়া করে নাম বলুন।	প্রশ্নের অন্য পাতায় তালিকা লিখুন	
Q 2.32	পিট/সেপটিক ট্যাঙ্ক পরিষ্কারের সময় নিরাপত্তার জন্য আপনি বা ওরা কিছু পরে বা কিছু ব্যবহার করে?	1. হ্যাঁ	চলবে
		2. না	
Q 2.33	যদি কিছু পরে বা ব্যবহার করে, তাহলে কি কি পরে বা ব্যবহার করে? (একাধিক উত্তর হতে পারে)	1. হাতমোজা (গ্লভস)	
		2. গামবুট	
		3. এপ্রন	
		4. মাস্ক (মুখ ঢাকে)	
		5. কোন পারফিউম (সুগন্ধি জাতীয় কিছু)	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.34	পিট/সেপটিক ট্যাঙ্ক পরিষ্কার করতে সাধারনত কতক্ষণ লাগে?	মোট _____ঘন্টা (আনুমানিক)	
Q 2.35	পিট/সেপটিক ট্যাঙ্ক পরিষ্কার করার জন্য আপনি কত টাকা ব্যয় করেন?	সুইপারকে _____ টাকা অন্যান্য উপকরন _____টাকা মোট_____টাকা	
Q 2.36	পরিষ্কার করার জন্য কোন বকশিস দেন কি?	1. হ্যাঁ	চলবে
		2. না	
Q 2.37	বকশিস হিসেবে কত টাকা দেন?	মোট _____টাকা	
Q 2.38	সুইপারদের দিয়ে কাজ করাতে গিয়ে আপনি কি কি সমস্যার সম্মুখীন হয়েছেন? **(একাধিক উত্তর হতে পারে)**	1. অনেক বেশি টাকা চায়	
		2. ওদের কে সহজে পাওয়া যায় না/ যোগাযোগ করা যায় না	
		3. রাতের বেলা কাজ করতে চায় না	
		4. ওদের কাছ থেকে কোন সহযোগিতা পাইনা	
		5. পিট/ট্যাঙ্ক পুরোপুরি পরিষ্কার করে না	
		6. অনেক বেশি বকশিস চায়	

	Questions	Types of coding	Skip
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.39	পিট/সেপটিক ট্যাঙ্ক পরিষ্কারের পর সুইপাররা ময়লা কোথায় নিয়ে ফেলে?	1. খালে	
		2. পুকুরে	
		3. ড্রেনে	
		4. গাড়িতে নিয়ে দূরে ফেলে	
		5. মাটিতে গর্ত করে পুতে ফেলে	
		6. জানিনা	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.40	পৌরসভা বা NGO থেকে পিট/সেপটিক ট্যাঙ্ক পরিষ্কারের সেবা নিতে হলে আপনাকে কি করতে হয়? **(উত্তর একাধিক হতে পারে)**	1. মৌখিকভাবে বললেই হয়	
		2. নির্ধারিত ফর্ম পুরন করতে হয়	
		3. ব্যাংক এর মাধ্যমে সার্ভিস চার্জ আগেই পরিশোধ করতে হয়	
		4. সার্ভিস চার্জ আগেই নগদ পরিশোধ করতে হয় (রশিদ সহ)	
		5. সার্ভিস চার্জ আগেই নগদ পরিশোধ করতে হয় (রশিদ ছাড়া)	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.41	পৌরসভা/NGO কে জানানোর পর সেবা পেতে কতদিন লাগে?	মোট _____ দিন (আনুমানিক)	
Q 2.42	পিট/সেপটিক ট্যাঙ্ক পরিষ্কারের জন্য পৌরসভা/NGO কে কত টাকা দিতে হয়?	মোট _____ টাকা (আনুমানিক)	
Q 2.43	পৌরসভা/NGO থেকে সেবা পাওয়ার ক্ষেত্রে কি কি সমস্যার সম্মুখীন হয়েছেন? **(উত্তর একাধিক হতে পারে)**	1. সেবার কোন নিতিমালা/নিয়মকানুন নাই	
		2. অনুমোদন পেতে অনেক সময় লাগে	
		3. সুইপাররা সহযোগিতা করে না	
		4. পিট/সেপটিক ট্যাঙ্ক পুরোপুরি পরিষ্কার করে না	
		5. অনেক বেশি বকশিস চায়	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.44	আপনি কি জানেন আপনার প্রতিবেশী কোথায় তার টয়লেটের ময়লা ফেলে?	1. হ্যাঁ	চলবে
		2. না	
Q 2.45	যদি জানেন, তাহলে বলুন আপনার প্রতিবেশী কোথায় তার টয়লেটের ময়লা ফেলে?	1. বাড়ির পাশের ড্রেনের সাথে সংযোগ করে	
		2. জলাশয়ের সাথে সংযোগ করে	
		3. খোলা জায়গায় ফেলে	
		4. গাড়িতে করে দূরে নিয়ে ফেলে	
		5. গর্ত করে পুতে ফেলে	
		6. জানিনা	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.46	টয়লেটের ময়লা যেখানে ফেলে তা কি আইন সম্মত নাকি বেআইনী?	1. ঠিক করছে (আইনগত কাজ)	
		2. ঠিক করছে না (বেআইনি কাজ)	
Q 2.47	আপনার প্রতিবেশীর এই কাজের জন্য আপনি কি ধরনের সমস্যার সম্মুখীন হচ্ছেন?	1. দুর্গন্ধ আসে	
		2. রোগ-বালাই ছড়াচ্ছে	

	Questions	Types of coding	Skip
		3. আসেপাশের পরিবেশ দূষণ করছে	
		4. জলাবদ্ধতা তৈরি হচ্ছে	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.48	টয়লেটের ময়লা ব্যবস্থাপনায় পৌরসভার কাছ থেকে আপনি কি আরও উন্নত সেবা আশা করেন?	1. হ্যাঁ	চলবে
		2. না	
Q 2.49	আরও উন্নত সেবা পাওয়ার জন্য আপনি কি কিছু বেশি টাকা খরচ করবেন?	1. হ্যাঁ	চলবে
		2. না	
Q 2.50	উন্নত সেবা পাওয়ার জন্য আপনি কত টাকা খরচ করতে চান?	মোট _____ টাকা	
Q 2.51	বর্তমানে টয়লেটের ময়লা ব্যবস্থাপনায় পৌরসভা যা করছে তাতে আপনি কতটুকু খুশি?	1. অনেক বেশি খুশি	
		2. মোটামুটি খুশি	
		3. খুশিও না আবার অখুশিও না	
		4. মোটামুটি অখুশি	
		5. অনেক বেশি অখুশি	
Q 2.52	আপনার মতে, আপনার শহরের টয়লেটের ময়লা ব্যবস্থাপনার দায়িত্ব কোন **সরকারি প্রতিষ্ঠানের?** (উত্তর একাধিক হতে পারে)	1. পৌরসভা	
		99. অন্যান্য (উল্লেখ করুন)	
Q 2.53	পৌরসভা পয়নিষ্কাশন সংক্রান্ত কি কি দায়িত্ব পালন করে?		
Q 2.54	আপনার পৌরসভার পায়খানার বর্জ্য গুলো কি পরিশোধন করা হয়?	1. হ্যাঁ	
		2. না	
Q 2.55	যদি হয়, তাহলে বর্জ্য গুলো কি সরাসরি কোন প্ল্যান্ট এ যায়?	1. হ্যাঁ	
		2. না	
Q 2.56	যদি না হয়, তাহলে টয়লেটের ময়লা কোথায় যায়?		
Q 2.57	পরিশোধনের পরে ময়লা পানিটা কোথায় যায়?		
Q 2.58	পরিশোধনের পর শক্ত ময়লাটা কোথায় যায়/এটা দিয়ে কি করা হয়?		
Q 2.59	যদি পয়নিষ্কাশন কার্যক্রমে উন্নত সেবা প্রদানের জন্য প্রাইভেট সেক্টর/ বেসরকারি প্রতিষ্ঠানসমূহ এগিয়ে আসে তাহলে কি তাদের কাছ থেকে সেবা নিতে আগ্রহী হবেন?	1. হ্যাঁ	
		2. না	

	Questions	Types of coding	Skip
Q 2.60	উত্তর হ্যাঁ হলে, কি ধরনের সেবা নিতে আগ্রহী হবেন? অনুগ্রহ করে বলুন		
Q 2.61	পয় নিস্কাশনের সুষ্ঠু ব্যবস্থাপনার জন্য যদি কোন রকম recycle পদ্ধতি আপনাদের পৌরসভায় স্থাপন করা হয় তাহলে সেটা কি আপনাদের পরিবেশ রক্ষায় কার্যকর ভূমিকা রাখবে?	1. হ্যাঁ 2. না	
Q 2.62	উত্তর হ্যাঁ হলে, এ পদ্ধতি পরিচালনার জন্য আপনারা কি আর্থিক সহযোগিতা প্রদান করতে আগ্রহী হবেন?	1. হ্যাঁ 2. না	

3.0 Hygiene Practice Issues

	Questions	Types of coding	Skip
Q 3.1	সাস্থসম্মত পায়খানা এবং সাস্থ অভ্যাস অনুশীলন সম্পর্কে আপনি কিছু জানেন কি?	1. হ্যাঁ	চলবে
		2. না	Q 3.3 এ যান
Q 3.2	যদি জানেন তাহলে , সাস্থসম্মত পায়খানা এবং সাস্থ অভ্যাস অনুশীলন সম্পর্কে আপনি কোথা থেকে জেনেছেন? (উত্তর একাধিক হতে পারে)	1. রেডিও	
		2.টেলিভিশন	
		3.পত্র-পত্রিকা	
		4. NGO কর্মীর কাছ থেকে (NGO –র নাম বলুন)	
		5. সরকারী স্বাস্থ্য কর্মীর কাছ থেকে	
		99. অন্যান্য (উল্লেখ করুন)	
Q 3.3	টয়লেটের ময়লা ব্যবস্থাপনা সম্পর্কে আপনি কি কিছু জানেন?	1. হ্যাঁ	চলবে
		2. না	Q 3.5 এ যান
Q 3.4	টয়লেটের ময়লা ব্যবস্থাপনা সম্পর্কে আপনি কোথা থেকে জেনেছেন? (উত্তর একাধিক হতে পারে)	1. রেডিও	
		2.টেলিভিশন	
		3.পত্র-পত্রিকা	
		4. NGO কর্মীর কাছ থেকে (NGO –র নাম বলুন)	
		5. সরকারী স্বাস্থ্য কর্মীর কাছ থেকে	
		99. অন্যান্য (উল্লেখ করুন)	
Q 3.5	টয়লেটের ময়লা ব্যবস্থাপনা সম্পর্কে আয়জিত কোন অনুষ্ঠান বা সভায় আপনি কখনও উপস্থিত ছিলেন?	1. হ্যাঁ	চলবে
		2. না	Q 3.7 এ যান
Q 3.6	যদি থাকেন, কারা সেটা আয়জন করেছিল?	1.পৌরসভা 2. NGO **(NGO –র নাম বলুন)**	
Q 3.7	সেই সভা বা অনুষ্ঠান থেকে আপনি কি বিষয়		

	Questions	Types of coding	Skip
	সম্পর্কে জেনেছেন?		
Q 3.8	পায়খানার ময়লা ব্যবস্থাপনার সেবা সম্পর্কে পৌরসভা কখনও আপনাদের কে কিছু জানিয়েছে? যদি হ্যাঁ হয়, কিভাবে জানিয়েছে এবং কি জানিয়েছে?		

4. কঠিন বর্জ্য ব্যবস্থাপনা সম্পর্কিত তথ্যঃ

	Questions	Types of coding	Skip
Q 4.1	আপনার বাড়ীতে প্রতিদিনের আবর্জনা আপনি কোথায় জমা করেন?	1. নির্দিষ্ট একটি ঝুড়িতে	প্র 4.2-এ যান
		2. নির্দিষ্ট একটি গর্তে	প্র 4.3-এ যান
		3. বাড়ীর পিছনে ফেলে দেই	
		99. অন্যান্য (নির্দিষ্ট করুন)	
Q 4.2	প্রতিদিনের ঝুড়িতে জমাকৃত আবর্জনা তারপর আপনি কোথায় ফেলেন?		
Q 4.3	আপনার এলাকায় কি বাড়ী - বাড়ী থেকে আবর্জনা সংগ্রহ করার পদ্ধতি চালু আছে?	1. হ্যাঁ	চলবে
		2. না	প্র 4.6 -এ যান
Q 4.4	আপনি কি বাড়ী - বাড়ী থেকে আবর্জনা সংগ্রহ করার সেবা নিয়ে থাকেন?	1. হ্যাঁ	চলবে
		2. না	প্র 4.6 -এ যান
Q 4.5	বাড়ী - বাড়ী থেকে আবর্জনা সংগ্রহ করার সেবা নেয়ার জন্য আপনাকে প্রতি মাসে কত টাকা প্রদান করতে হয়?		
Q 4.6	বাড়ী - বাড়ী থেকে আবর্জনা সংগ্রহ করার সেবা কে প্রদান করে থাকে?	1. বেসরকারী লাভজনক প্রতিষ্ঠান	
		2. এনজিও	
		3. পৌরসভা	
Q 4.7	বাড়ী - বাড়ী থেকে আবর্জনা সংগ্রহ করার সেবাটি কেমন উদ্যোগ	1. ভাল	
		2. ভাল না	

	Questions	Types of coding	Skip
Q 4.8	যদি ভাল উদ্যোগ মনে হয়, তাহলে কেন ভাল মনে হয় অনুগ্রহ করে বলবেন?		
Q 4.9	আবর্জনা ব্যবস্থাপনার জন্য পৌরসভা কি ধরণের সেবা প্রদান করে থাকে, অনুগ্রহ করে বলুন।		
Q 4.10	পৌরসভা আবর্জনা ব্যবস্থাপনার কার্যক্রমে আপনি কতটা সন্তুষ্ট?	1. খুবই সন্তুষ্ট	
		2. মোটামোটি সন্তুষ্ট	
		3. সন্তুষ্টও না অসন্তুষ্টও না	
		4. মোটামোটি অসন্তুষ্ট	
		5. খুবই অসন্তুষ্ট	
Q 4.11	আবর্জনা ব্যবস্থাপনার সম্পর্কে আপনার এরকম মনে হওয়ার কারণ কি, অনুগ্রহ করে বলুন।		
Q 4.12	পৌরসভা থেকে আবর্জনা ব্যবস্থাপনার বিষয়ে কোন ধরণের কার্যক্রম বাস্ত্মবায়ন করলে ভাল হয়?		
Q 4.13	এ বিষয়ে বেসরকারী লাভজনক প্রতিষ্ঠানসমূহ কিভাবে অবদান রাখতে পারে বলে মনে করেন?		
Q. 4.14	আপনার এলাকায় এবং পৌরসভায় যদি উন্নততর আবর্জনা ব্যবস্থাপনা কায়ক্রম গস্থহণ করা হয় তাহলে কি আপনি আপনার সামর্থ্য অনুযায়ী অর্থনৈতিক সহযোহিতা প্রদান করতে আগ্রহী হবেন?	1. হ্যাঁ	
		2. না	
Q. 4.15	আপনি এককালীন কত টাকা প্রদান করতে আগ্রহী হবেন? এবং প্রতিমাসে কত টাকা প্রদান করতে আগ্রহী হবেন?	1. এককালীন টাকা	
		2. প্রতিমাসে টাকা	

5.0 Information on Income and Expenditure

	Questions	Types of coding
Q 5.1	প্রতিমাসে আপনার পরিবারের মোট খরচ কত?	মোট _____টাকা
Q 5.2	প্রতিমাসে আপনার পরিবারের মোট আয় কত?	মোট _____টাকা

	Questions	Types of coding
Q 5.3	আপনার পরিবারের প্রতিমাসে কোন সঞ্চয় আছে কি?	1. হ্যাঁ
		2. না
Q 5.4	যদি সঞ্চয় থাকে তাহলে বলুন প্রতিমাসে কত টাকা সঞ্চয় করেন?	মোট _____টাকা

List of Respondents of KIIs:

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1	Md Azad Ali	Civil Society Member	01716541582
2	Md. Mokselur rahman	Head Teacher, Botlagari Hign School	01719859193
3	Md. Badrul Islam	Business man	01919980553
4	Borebdro Kishore Roy	Teacher, Sunflower School and College	01712618859
5	hafez Maulana Rizwan Alam Kardi	Imam, Gaucia Jame Mashjid	01714861382
6	Md. Asaduzzaman	Teacher, Kaderia Tegia Madrasa	01763128555
7	Md. Arsad Hossain	Teacher, Kaderia Madrasa	01756541888
8	Md. Mahbubur Rahman	Employee, Railway Mechanical Department	01718837819
9	Nusrat Zaman	Teacher, Lions School and College	01816024137
10	Md. Mintu	Manager, Hotel Prince	01750453992
11	Khandakar Mokhlesur Rahman	Program Organizer Brac	01795761580
12	Md. Romjan ali	Head Teacher, Sufia Model School	01744831913
13	Ferdoushi Akhter Jahan	Head Teacher, Bashbari Govt. Primary School	01971128347
14	Mst. Halima Khatun	Head Teacher, Mistiry Para Govt. Primary School	
15	Md. Jaoynul	Business man, Secretary General (Municipality Wet Market Committee)	01963568320
16	Md. Tareq Aziz	Counselor, Ward 15	01712273976
17	Abid Hossain (laddan)	Counselor, Ward 14	01718770183