Asian Development Bank
Local Government and Engineering Department

Final Report

June 2014

Sanitation Plan

Mathbaria

Waste Concern Consultants

EXECUTIVE SUMMARY

Mathbaria, is one of the rapidly growing coastal town of Bangladesh, with an estimated present population of 18,375 in the municipal area. The rapid growth in population over the last one decade has created tremendous pressure on urban services and utilities affecting the low-income people adversely. It is estimated that about 9.6% of the household of Mathbaria poursahava earn upto Tk. 10,000 per month.

Government of Bangladesh (GoB) has declared the goal of 100% sanitation coverage by the year 2014. In pursuance with this goal, the GoB has prepared a National Sanitation Strategy which recommends that in order to reach 100% sanitation coverage, each municipality should have a local level action plan. In accordance with GoB's strategy, this action plan for Mathbaria Pourashava has been prepared with a view to achieve the target on time.

Before preparing the action plan, a representative sample survey was conducted amongst the low, lower-middle, middle and high income groups of the population to analyze the current sanitation situation, awareness level of the people regarding sanitation, type of toilet used by different income groups, faecal sludge disposal practice as well as problems faced by those households who do not have access to sanitation facility and their willingness to pay for faecal sludge collection and treatment. Moreover, an institutional survey was also conducted to assess the institutional and financial capacity of the pourshava. Following are the key findings of the study:

Key Findings

- It has been found from the field survey that 100% of the households in Mathbaria pourashava have access to toilet. However, 43.62% of the household has unhygienic toilet.

- In terms of type of onsite sanitation system, 55.32% of the toilets are pit latrines while 1.06% is twin pit and 43.62% is septic tank.

- Low-income people who have unhygienic toilet/hanging toilets has identified lack of fund as the major barrier to upgrade their existing unhygienic toilet to hygienic one followed by shortage of land as well as lack of awareness.

- It was also revealed from the field survey that 30.85% of the households clean pit/septic tank every year. Average filling time for pit latrine was found to be 1.88 years while for septic tank it was found 4 year.

- At present, Mathbaria pourashava does not provide any service for collection and disposal of faecal sludge. No vacutug is available at the pourashava for collection and transportation of the sludge. Hence, all the households requiring pit/septic tank cleaning have to depend upon manual cleaners known as methors.

- Cost of pit and septic tank cleaning per household varies from Tk. 200 to Tk. 1500. The average cost of cleaning pit/septic tank is Tk. 574.45 using manual method using the methors.

- It was found from the field survey 100% of the surveyed households are not happy with the current faecal sludge collection and disposal system and suggested for an improved system for collection and disposal of faecal sludge.

- 93.62% of the households are willing to pay Tk.336 extra in addition to their current expenditure of Tk. 574.45 on faecal sludge removal provided an improved service is introduced by the pourashava.

- Based on the field survey the average daily volume of faecal sludge generated for collection is 2.87 cubic meter. However, 93.6% of the respondents prefer to pay for the faecal sludge collection program at a fixed cost determined by the pourashava. As such, a conservative daily estimated demand for faecal sludge collection is 2.67 cubic meters per day. This demand may increase if the poursahava is able to convert unhygienic toilets into hygienic one.

- It is estimated that 967.25 cubic meters of untreated human excreta per year is disposed in an unsanitary manner mainly to low-lying areas, khals and water bodies creating severe environmental and health problems. As a result, residents of the municipality are affected by water and sanitation related diseases especially due to exposure to faecally contaminated water. Discharge of human excreta on land and water bodies should be immediately controlled to protect public health and environment.

- It has been also found from field survey that 71.28% of household of the pourashava fell sick due to water borne and excreta related diseases during the last one year. Cost of treatment of illness due to water and sanitation related diseases is estimated at Tk 6.05 million (USD 77,615) for the last year. This is excluding the productivity losses due to sickness.

- Awareness and technical expertise regarding proper faecal sludge collection and management is lacking amongst the health and conservancy staff of the pourashava. At present there is only one sanitary inspector in the pourashava under health section.

In order to achieve 100% sanitation coverage with proper and environmentally sound faecal sludge management system, the following strategy has been recommended.

Sanitation Strategy

The present sanitation approach being followed is mainly concentrated on increasing the sanitation coverage to reach 100%. However, this approach may lead to another environmental problem which has not been perceived by the policy planners. With increase in the sanitation coverage, i.e. more toilets mainly single pits (more than 55.32%) due to space constraint in the urban areas, there is a consequent increase in the faecal sludge accumulation. Absence of proper faecal sludge collection and treatment can lead to severe water pollution, thus leading to adverse health impacts. As such, the sanitation strategy for Mathbaria should focus on the following issues:

- Increasing sanitation coverage to 100% with hygienic toilets only ;

- Guarantying an environmentally sound faecal sludge collection, treatment and recycling system along with increase of sanitation coverage with full cost recovery for feacal sludge management;

- Prioritizing on-site sanitation system with environmentally sound faecal sludge management over conventional water borne sewerage system with cost recovery mechanism;

- Arranging financing facilities without interest low-income households to install hygienic toilets;

- Promoting private sector participation in faecal sludge collection and treatment as well as NGOs participation in awareness raising on use of hygienic toilets and personal hygiene;

- Awareness raising campaign should clearly demonstrate the close link between lack of proper faecal sludge management and incidence of diseases; and

- Institutional strengthening and capacity building of the sanitation and conservancy units of the pourashava with adequate staff fully trained to on sanitation/feacal sludge management and environmental sanitation issues.

In order to implement the aforesaid strategies, measures for short-term (2014-2015) and medium term (2016-2019) are recommended with time limit. The key feature of the action plan for the short-term is as follows:

Key Features of Action Plan

Mathbaria pourashava is not in a position to increase its expenditure on sanitation. During 2013-14 financial year, the GOB through its ADP allocated Tk. 200 per capita for WSS in the coastal districts. Based on this, total allocation for WSS for Mathbaria pourashava is estimated at Taka 3.74 million. Based on the past trend, around 85% of this allocation is for water supply while 10-15% for sanitation. As such total allocation for sanitation works out at Tk. 0.56 million. However, this allocation is not enough to achieve 100% sanitation coverage along with environmentally sound faecal sludge management. In order to improve sanitation situation in Mathbaria pourshava there is a need for more allocation of resources from the government through development project to build the infrastructure.

- 42% of the broken trap/ring or leakage or getting inundated from the ring belongs to households having monthly income upto Taka 15000. Out of this 42%, 14.63% of the households have an income upto Taka 10,000 per month. It is therefore recommend that pourashava should provide some financial support/grant to low-income groups (income upto Tk. 10,000/month) to install sanitary toilets which would obviously motivate them to adopt hygienic practice. However, an awareness building campaign should go parallel with the support to convert the aforementioned toilets into a hygienic one. Pourashava can engage NGOs such as BRAC, CARE, DSK, WaterAid or NGO Forum for Public Health to repair such toilets for the low income groups. Estimated amount of grant required to repair the unhygienic toilet is Taka 405,000

- Faecal sludge collection and disposal can be improved by introducing vaccu tugs for regular cleaning of pits/ septic tanks. Households have to pay for pit cleaning. From field survey it has been found that 93.62% households are willing to pay extra for this kind of service if started by the pourashava. Based on the field survey, an estimated amount of 967.25 cu.m of faecal sludge has to be collected per year. Considering the road condition and width of Mathbaria pourashava, vacutug mounted a three wheeler (1.0 cu.m) is recommended with up to 400 ft hose pipe. Specification of vacu tug is given in the Annex 3. Private sector/NGO participation in faecal sludge collection should be encouraged by giving them operation and management contract for faecal sludge collection. For details see section 6.7.2 and 6.7.4.

- Faecal sludge treatment can be improved by introducing drying beds at the landfill site for primary treatment of faecal sludge and co-composting of dried faecal sludge with municipal solid waste at landfill site. The co-composting plant can be operated by private sectors/NGOs under a management contract based on business approach. At present there are 50 companies/organization which has the license to produce and market compost. As per the Fertilizer Act 2008 of the GoB, only licensed operator can produce and market compost. As such, it is recommended that the pourashava should engage the compost plant operator which has both the license.

- Total capital cost for establishment faecal sludge collection and treatment system is estimated at Taka 11.40 million (USD 146,198). This includes the price of the land. Land price is extremely high in Mathbaria. Without land cost capital cost is estimated at USD 84,871. Per household capital investment is estimated at Tk.2,681 (USD 34.37) with land cost while the per capita investment without land cost is estimated at Tk. 1463.29 (USD 18.76).

- Total annual operation cost for faecal sludge collection and treatment including depreciation as well as incentives to the informal sector collectors (methors) for bringing new customers for vacu tug services as well as incentives to the vacu tug drivers is calculated at Tk. 1.65 million (USD 21,144).

- In order to recover the operational cost including depreciation and minimum 15% profit for the private operator, there are two options for cost recovery. Firstly, the pourashava can fixed a rate Tk. 693 per pit latrine cleaning and Tk. 3394 per septic tank cleaning. The second option is to charge Tk. 484 per household per year as a faecal sludge management fee which can be charged with the holding tax or conservancy charge. However, to impose any fee or rate for faecal sludge management, permission from Ministry of Local Government is required. Without the approval of the Ministry of Local Government, pourashava can not impose such fee or rate. Details of cost recovery mechanism is described in section 6.6.

- It is interesting to note that currently households are spending an average on Taka 574 per year, which is 0.34 % of their average monthly income for removal of faecal sludge. It is interesting to note that by providing vaccutug services as well as faecal sludge treatment services, it will actually lower the cost currently incurred to the lower income group of people. With the vaccutug services, the feacal sludge collection and treatment cost shall be lower to Taka 368 per year which is 0.16% of their average monthly expenditure.

- Analysis of cash flow indicates that without income tax and land cost, the project is attractive, since the IRR of the project is 15% and NPV is USD 17,514 and pay back period is 5.17 years. However, with income tax, payback period is 9 years and NPV is negative. This calculation indicates that to encourage participation of private sector in faecal sludge collection and treatment there is a need for tax holiday, concessional loan, long term agreement with pourashava. Details of the cash flow without income tax and and land price and with land price is described in section 6.6.8.

In order to sustain the faecal sludge management system with full cost recovery, it is very important to raise awareness about the link between proper faecal sludge management health and disease. At present households spent Tk. 1980 per annum for treatment of sanitation related disease. For raising awareness political leadership of the Mayor along with the ward commissioner is again very vital. Awareness campaign should be undertaken by engaging NGOs/CBOs involving door to door campaign, ward level meetings as well as involving imams of mosques focusing on change from manual to mechanical system of faecal collection and its proper management and need for payment for the aforesaid services. Raising awareness and social mobilizing is the key along with political leadership for improvement. Details of awareness raising strategy is described in section 6.4 Table 6.1.

GLOSSARY

Clean Development Mechanism (CDM): Under the Kyoto Protocol, CDM is a mechanism that allows developed countries to achieve part of their green house gas emissions reduction obligations through investment in projects in developing countries that reduce green house gas or fix or sequester carbon dioxide from the atmosphere.

Certified Emission Reduction (CERs): Green House gas reduction of any CDM project is measured according to internationally agreed methods and are quantified in standard units called Certified Emission Reductions (CERs). These are expressed in tons of carbon dioxide (CO_2) equivalents.

Composting: The controlled biological decomposition of organic solid waste under aerobic conditions.

Co-composting: Co-composting means composting of feacal sludge (after dewatering using drying beds) and municipal organic waste together using aerobic method.

Compost: The relatively stable decomposed organic material resulting from the composting process. Also referred to as humus.

Faecal Sludge: It is the sludge removed from different on-site sanitation systems (e.g. septic tanks, pits latrines etc.)

Feacal Sludge Management: Faecal sludge management means collection, treatment, recycling or disposal of faecal sludge using environmentally sound methods with no adverse impact on health.

Green House Gas (GHG): Many gases present in the atmosphere are known as green house gases (GHG) because these prevent heat from escaping from the earth. The gases are: carbon dioxide, methane, nitrous oxide, hydroflurocarbons, perflurocarbons and sulphur hexafluoride. If the amount of these gases increases in the atmosphere, earth's temperature will increase. Scientists have named this phenomenon `Global Warming' and the associated changes to the atmosphere are known as `climate change'.

Hanging Toilet: Hanging toilet/latrine is a toilet, built over the sea, a river or other water body, into which excreta drops directly.

Hygienic Toilet: It means the following:

- Confinement of faeces,
- Sealing of the passage between the squat hole and the pit to effectively block the pathways for flies and other insect vectors, thereby breaking the cycle of disease transmission, and
- Venting out of foul gases generated in the pit through a properly positioned vent pipe to keep the latrine odor free and promote continual use of the hygienic latrine.

Pit latrine: Pit latrine with slab is a dry pit latrine whereby the pit is fully covered by a slab or platform that is fitted either with a sqatting hole or seat. The platform should be solid and can be made of any type of material (concrete, logs with earth or mud, cement, etc.) as long as it adequately covers the pit without exposing the pit content other than through the sqatting hole or seat.

Pourashava: It is a Bangla (local) term for municipality.

100% Sanitation: According to National Sanitation Strategy of Government of Bangladesh it means the following:

- No open defecation
- Hygienic latrines available to all
- Use of hygienic latrines by all
- Proper maintenance of latrines for continual use, and
- Improved hygienic practice

Septic Tank: Septic tank is an excreta collection device consisting of a water-tight settling tank, which is normally located underground, away from the house or toilet. The treated effluent of a septic tank usually seeps into the ground through a leaching pit. It can also be discharged into a sewerage system.

Twin Pit Latrine: Twin pit latrine is constructed with two alternating pits to maximize the. Once a pit gets filled up, the alternating pit is used for storing faecal sludge, while the liquid portion of the filled up pit penetrates down into ground, and allows more sludge to be filled up in the first pit in future, after the second pit gets filled up.

Unhygienic Toilet: Any toilet, which is not hygienic, is called unhygienic. Examples are toilets connected to drains instead of pits, toilets with broken pits, rings etc.

Vaccu Tug: A motorized vehicle equipped with a mechanical device to remove faecal sludge and sewerage by suction process.

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ADP	Annual Development Programme
BBS	Bangladesh Bureau of Statistics
BMDF	Bangladesh Municipal Development Fund
BNBC	Bangladesh National Building Code
BOO	Built Operate and Own
BOT	Built Operate and Transfer
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CBOs	Community Based Organizations
CSR	Corporate Social Responsibility
CWASA	Chittagong Water and Sewerage Authority
DAE	Department of Agriculture Extension
DCC	Dhaka City Corporation
DPHE	Department of Public Health and Engineering
DOE	Department of Environment
DSK	Dushtha Shashthya Kendra
DWASA	Dhaka Water and Sewerage Authority
ECA	Environment Conservation Act
ECR	Environment Conservation Rules
FS	Faecal Sludge
FSM	Faecal Sludge Management
FY	Financial Year
GoB	Government of Bangladesh
GHG	Green House Gas
Ha	Hectare
HH	Households
ITN	International Training Network
KWASA	Khulna Water and Sewerage Authority
LGD	Local Government Division
LGI	Local Government Institutions
LGED	Local Government and Engineering Department
MDG	Millennium Development Board
MLG	Ministry of Local Government
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forest
MoLRD&C	Ministry of Local Government Rural Development & Cooperatives
NGO	Non Government Organization

NILG	National Institute of Local Government
O & M	Operation and Maintenance
PDB	Power Development Board
PPE	Personal Protective Equipment
PRSP	Poverty Reduction Strategy Paper
RDF	Refused Derived Fuel
RMSU	Regional Municipal Support Unit
RWASA	Rajshahi Water and Sewerage Authority
SBSUAP	Support for Basic Service in Urban Area Project
SRDI	Soil Resource Development Institute
SS	Suspended Solid
SWM	Solid Waste Management
Tk.	Taka
UN	United Nations
UNCRD	United Nations Centre for Regional Development
UNDP	United Nations Development Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
WSS	Water and Sanitation Sector

Conversion Equivalent

1 Bigha	14,400 square feet (20 Katha)
1 Katha	720 square feet
1 Acre	43,560 sq.ft
1 Hectare	2.47 acre
1 Lac	100,000
1 US Dollar	Approximately Taka 78

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CHAPTER 1

INTRODUCTION

1.1 Background

Bangladesh has one of the highest population densities in the world (1,125 per sq km) and has been rapidly urbanizing. While the country's total population has been increasing at about 1.4% per annum, its urban population has been growing at about 4% per annum. It is expected that Bangladesh's urban population will increase from the currently estimated figure of 39 million, accounting for about 26% of the country's total population, to about 116 million by 2040, accounting for about 50% of the country's total population (BBS 2012).

This rapid urbanization has resulted in most of the urban local bodies, that are mandated to provide urban health and environment related services which includes solid waste management and sanitation, facing a severe strain in keeping up with the increased demand on its infrastructural facilities and urban services. The urban local bodies do not have the requisite institutional and financial capacities to address such a worsening situation of solid waste management sanitation situation due to rapid urbanization. Besides, Climate change and variability are critical development issues for the rapidly growing urban areas, particularly at the low lying coastal urban areas, which are naturally exposed to sea level rise, storm surges, and more frequent and intense storm events.

The coastal towns, with population of around 7 million, include both smaller pourashavas (secondary towns) and larger cities such as Khulna, Chittagong, and Barisal, Infrastructure is currently inadequate in these areas as they are either damaged by natural disasters or otherwise no longer functioning effectively. Weak local governance and municipal management coupled with high poverty incidence, and remote locations, create persistent development challenges to these areas. Climate change, variability, and natural disasters further aggravate development in coastal towns, with disproportionate impacts to women and the poor. The increased incidence of drought and saline intrusion (from sea level rise and storm surges) into groundwater, coupled with high non-revenue water, is posing serious risks to drinking water supplies, requiring the potential for developing new, but costlier, water supply sources located at far distances. Poor access to sanitation in coastal towns is also posing serious public and environmental health risks (Bangladesh is currently behind in achieving its MDG Target 10 indicators for urban sanitation). Drainage systems are underdeveloped and poorly maintained, and would be made further obsolete under more intense and frequent storm events.

In the light of this scenario, Coastal Towns Infrastructure Improvement Project being funded by Asian Development Bank (ADB) aims to take a holistic and integrated approach to urban development and environmental improvement in vulnerable coastal towns of Bangladesh which suffer deficits in basic urban services and are severely at risk to the impacts of climate change. The Project will provide climate resilient municipal infrastructure, and strengthen institutional capacity, local governance and knowledge based public awareness, for improved urban planning and service delivery considering climate change and disaster risks. The key infrastructure investments include drainage, water supply, sanitation, cyclone shelters and other municipal infrastructures including emergency access roads and bridges, solid waste management, bus terminals, slum improvements, boat landings, and markets. All these investments will benefit the poor and women. The Project will be implemented in 2 Batches in eight vulnerable coastal towns (Batch I Towns: Amtali, Galachipa, Mathbaria and Pirojpur. Batch II Towns: Barguna, Bhola, Daulat Khan and Kalapara). Ministry of Local Government, Rural Development and Cooperatives (MLGRDC) acting through its Local Government Engineering Department (LGED) and Department of Public Health Engineering (DPHE) will be the Executing Agencies for the Project.

Figure 1 below presents the locations of the above mentioned Batch I pourashavas included under the Project.

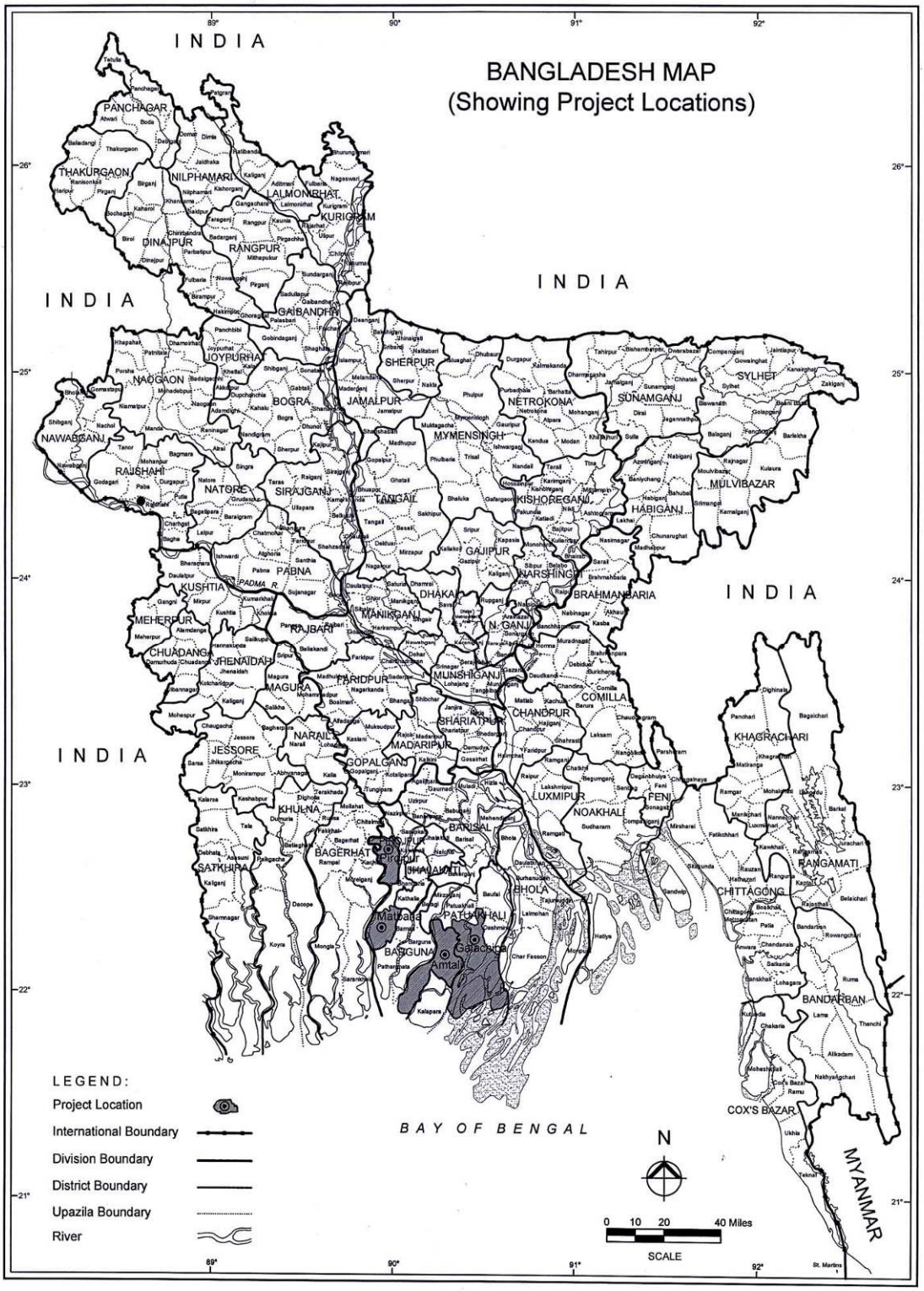

Figure 1.1: Locations of the Batch I Pourashavas included under the Project.

1.2 Goal

The main goal of this consultancy assignment is to develop a sanitation plan for the Mathbaria pourashava. It is expected that the sanitation plan will guide the Mathbaria pourashava to manage the sanitation problem especially related to faecal sludge in environmentally sound manner.

1.3 Objectives of this Study

- Assess existing sanitation systems and gaps including current septage and wastewater management practices, institutional arrangements, and regulatory and or socio-economic barriers;
- Evaluate various technology options and management approaches for septage and decentralized sanitation management including collection, conveyance, treatment and disposal;
- Assess land availability for such requirements;
- Assess existing private operations in sanitation, and explore opportunities for private sector participation including possible incentives and contract structure (rental/lease of emptying vehicles and associated equipments, etc);
- Assess financial arrangements (tax and fees) for cost recovery and O&M arrangements;
- Assess awareness levels, cultural acceptability towards proposed septage management practices and willingness to pay for the service, and identify communication/awareness building strategy;
- Incorporate findings of baseline study, prepare sanitation plans.
- Design the complete value chain model for septage management.
- Include institutional, financial, and operational arrangements.
- Business strategy and plan for engaging private sector.

1.4 Methodology

In order to achieve the above mentioned objectives, two types of data were collected which are as follows:

1.4.1 Primary Data

In order to assess the existing sanitation condition, awareness of the community about sanitation and their willingness to pay for improvement of sanitation condition, household sample survey was conducted in different income groups, using structured questionnaire survey. Apart from household questionnaire survey, structured questionnaire survey was also conducted to record the views of municipal staff to identify institutional weakness regarding sanitation and their views to improve it. Questionnaire format is attached as Annex-I.

For collection of primary data from field, an institutional survey format and a questionnaire survey format were developed to collect baseline data from the four Batch I towns. The institutional survey was conducted to collect all relevant data from the concerned Pourashava authorities, while baseline questionnaire survey was carried out at individual households for collection of necessary relevant data for preparation of the sanitation plans. The Formats have been attached in Annex-1 and Annex-2 respectively.

To draw the sample size of households from the respective pourashavas, the calculation of sample size (n) was decided based on general statistical methods like the ones described by Salant (1994) and Rea (1997) and on the equation below:

$$n = \frac{t_p^2 * p * (1-p) * N}{t_p^2 * p * (1-p) + (N-1) * y^2}$$

Where, N stands for population size, y for sampling error, p for the tune proportion set as 0.5 and t_p is equal to 1.96 for 95% confidence level.

Table 1.1 below depicts the already calculated sample sizes under pre-defined sampling errors for household surveys. This table can give guidance on the number of households to be assessed to obtain reliable results.

Table 1.1: Calculation of Sample Sizes for Household Surveys

Total No. of HH	Required Sample Size Allowing 95% Confidence Level		
	±5% Sampling Error	±7% Sampling Error	±10% Sampling Error
100	50	50	49
250	152	110	70
500	217	141	81
750	254	156	85
1,000	278	164	88
2,500	333	182	93
5,000	357	189	94
10,000	370	192	95
25,000	378	194	96
50,000	381	195	96
100,000	383	196	96
1,000,000	384	196	96
100,000,000	384	196	96

Now, considering 95% confidence Level and ±5%, ±7% and ±10% sampling errors, the sample sizes for Mathbaria Pourashava and the actual no. of households surveyed at Mathbaria is shown in Table 1.2 below:

Table 1.2: Sample Sizes for Household Surveys in Four Batch I Town: Mathbaria

Pourashava	No. of Household	Sample Size			Actual No. of HH Surveyed
		±5% Sampling Error	±7% Sampling Error	±10% Sampling Error	
Mathbaria	4,254	357	189	94	94

1.4.2 Secondary Data

In addition to the primary data, secondary data for preparation of the sanitation plan was collected from the pourashava, previous studies for the Costal Town Improvement Project, pourashava budget, Bangladesh Bureau of Statistics and other relevant studies as well as field observation. Moreover, all government policies and strategies regarding sanitation were reviewed and analyzed.

1.4.3 Data Collection and Analysis

Comprehensive data collection requires a good number of investigators and data collectors. Four Field Investigators (Junior Urban Planners) have been engaged for data collection. They have been recruited from the respective professional sectors. Field Investigators (supervisor and surveyors) have been given training on the questionnaires and they have been explained each and every section of the questionnaire before going to the field test and thereafter the actual data collection will be started in the field. The Field Investigators (Junior Urban Planners) were guided and closely monitored by the Senior Urban Planner at the field level and the Consultant.

After field survey, the collected data were entered into computer by using SPSS and then analyzed by both SPSS and Microsoft Excel. Maps for the report were prepared using GIS Arc View and Auto Cad.

1.5 Time Line for the Assignment

As per the contract the consultant has to complete the work in 66 man days spread over six months. The consultant had the plan to start field work from the first week of January, 2014. However, due political unrest, field work could not be started in time – the field work was started from the last week of January. Table 1.3 shows the time line for the assignment:

Table 1.3: Time line for the Assignment

SL. No.	Item	Dec 2012	Jan 2013	Feb 2013	Mar 2013	April 2013	May 2013
1	Collection of Relevant Secondary Data, e.g. BBS Census Data, Master Plan Data and Maps						
2	Preparation for the Questionnaire and Formats and Finalize Study Methodology						
3	Recruitment and Training of Field Investigators						
4	Inception Report						
5	Field Survey (Questionnaire & Institutional Survey)						
6	Preparation of Outline for Sanitation Plans for Four Batch I Towns						
7	Data Checking and Compilation						
8	Data Review and Cross Checking						
9	Preparation of Draft Sanitation Plans for Four Batch I Towns						
10	Final Report						

CHAPTER 2

EXISTING GOVERNMENT POLICIES AND STRATEGIES FOR SANITATION

2.1 Key Actors for Water, Sanitation and Solid Waste Management Sub-sectors

As regards water supply, sanitation and solid waste management sub-sectors in Bangladesh, the Local Government Division (LGD) under the Ministry of Local Government Rural Development and Cooperatives (MoLRD&C) at the national level is responsible for overall planning, identification of investment projects, monitoring and observance of rules governing urban local bodies i.e. city corporations and municipalities and agencies under it (viz. Department of Public Health Engineering, Local Government Engineering Department and WASAs), private sector and NGOs/CBOs. However, each organization is responsible for its own activities. In the following sections role of different agencies is described:

Department of Public Health Engineering (DPHE): It is the oldest department under the LGD. It gives municipalities' technical assistance for water supply, sanitation, and drainage services except in Dhaka and Chittagong in accordance with the National Policy for Safe Water Supply and Sanitation 1998. DPHE constructs water systems for municipalities and transfers ownership of infrastructure to the municipality concerned after three years of joint operation without any charge for the capital cost recovery. Non-recovery of capital leads to low tariff charge by the municipalities for the service.

Local Government Engineering Department (LGED): It is currently responsible for a number of development projects throughout the country covering besides physical interventions, service oriented interventions in water supply, sanitation and solid waste management, socio-economic development of slum dwellers and other development activities in the city corporations and municipalities. Its prime responsibility is of a nodal agency for rural development and has also been associated with urban sector development. According to the National Policy for Safe Water Supply and Sanitation 1998, in particular foreign aided projects where it is specifically required as a component of overall infrastructure development package, LGED may also undertake water supply and sanitation related activities. In such project-based cases, LGED assists the municipalities in implementation and provides technical assistance. The role of LGED in water and sanitation project is similar to DPHE, i.e. technical assistance to poursahavas (municipalities).

Water and Sewerage Authorities (WASAs): There are four WASAs, Dhaka Water and Sewerage Authority (DWASA), Chittagong Water and Sewerage Authority (CWASA), Khulna Water and Sewerage Authority (KWASA) and Rajshahi Water and Sewerage Authority (RWASA). Under recent Water Supply and Sewerage Authority Act, 1996, the main responsibilities of WASAs are:

- Construction, operation and maintenance of water treatment plants, water extraction facilities and water distribution systems;
- Development, operation and maintenance of sewerage systems and sewerage treatment plants;
- Development, operation and maintenance of storm drainage system to remove water logging;
- Disposal of industrial waste.

However, the WASAs are responsible for water supply and sanitation in Dhaka, Chittagong, Rajshahi and Khulna City areas only.

City Corporations and Pourashavas (Municipalities)

At present there are eleven city corporations in Dhaka (North and South), Chittagong, Khulna, Rajshahi, Barisal, Sylhet, Rangpur, Gazipur, Narayanganj and Comilla, and 315 municipalities called pourashavas. The city corporations are now governed by Local Government (City Corporation) (Amended) Act, 2011, while the municipalities are governed by Local Government (Paurashava) (Amended) Act, 2010. Pourashavas are solely responsible for water supply, sanitation and solid waste management under their jurisdiction. Pourashavas collect tax for conservancy from the building property owners and manage solid waste. Water tax is collected only where piped water supply is available and is provided by Pourashava. In general, DPHE develops the necessary piped water supply infrastructure and then handovers to Pourashava, and afterwards the Pourashava maintains it and expands it. Pourashava does not take any tax/rate or service charge for sanitation or faecal sludge management, and does not provide any service on this regard as well. There is a post of 'Sanitary Inspector', who only takes care of providing notices against unsanitary latrines and illegal connections of the latrines to the drains.

NGOs/ CBOs/ Private Sector: According to ADAB, it is estimated that there are 13,000 welfare NGOs and over 600 development NGOs in Bangladesh. Majority of NGOs are working on rural sectors, only few NGOs (approximately 40-50) are working in the urban sector (GoB-UNDP, 1994). NGO Affairs Bureau states that a total of 2,298 NGOs have been enlisted under them as on February 28, 2014.

According to different researches the growth of NGOs in terms of both number and amount of funding is explained by the fact that NGOs are more responsive to their communities than the government agencies for delivering services in respective areas. In general, NGO roles are seen as complementary to those of government organizations with NGOs providing services catering for local needs, knowledge, communications, and resources.

Although NGOs and the private sector are currently not fully engaged in provision of municipal services, there are opportunities for their increased involvement in doing so and in helping to improve efficiency of municipalities through technical support, training, and other services. Already, there are good examples of active involvement of NGOs in water, sanitation, and solid waste management projects with government agencies.

International NGOs (Water Aid, CARE and Plan Bangladesh) as well as few national NGOs (BRAC, Dhaka Ahsania Mission, NGO-Forum, DSK, VERC and PSTC) are working actively in sanitation sector in Bangladesh. These NGOs have been working at grassroots level in different fields, with participation of the local people and local partner NGOs. The NGOs have also been supporting DPHE with motivation and education programs targeting the communities.

National Policy for Safe Water Supply and Sanitation 1998 has also put emphasis on participation of private sector and NGOs in water supply and sanitation projects in urban areas.

Most important feature of NGOs operating in the urban sector is that they are mainly concerned with organizing and mobilizing the poor so that they are empowered to meet the challenges they have to face. Part of this process is to provide small credit for income generating activities and to provide programs aimed at delivering better facility in health, nutrition, education, literacy, sanitation and so on.

2.2 National and Local Government Policies and Plan for Water, Sanitation and Solid Waste Sub-sector

Some important government policies and plans with regard to water and sanitation sub-sector are as follows:

National Policy for Water Supply and Sanitation 1998 has been prepared by the Local Government Division of the Ministry of Local Government Rural Development & Cooperatives. According to this policy the government shall follow the following strategies:

- Development of water supply and sanitation[1] sector through local bodies, public-private sector, NGOs, CBOs and women groups;
- Gradual cost-sharing and introduction of economic pricing for services;
- Promotion of private sector participation through BOO/BOT and other arrangements for urban water supply. For this purpose opportunities will be created for involving the private sector in billing and collection;
- Local Government Bodies (City Corporations and Pourashava) may transfer, where feasible collection, removal and management of solid waste to the private sector;
- Measures to be taken for recycling of waste as much as possible and use of organic waste materials for compost and bio-gas production;
- Private sector including NGO participation in sanitation to be encouraged;
- Setting up of community latrines by urban local government bodies and leasing them out to private sector for operation and maintenance; and
- WASAs and relevant agencies shall support any collective initiative by the poor living in slums and squatter settlements in having access to water services on payment.

Urban Management Policy Statement 1998, prepared by the Government of Bangladesh has clearly recommended the pourashavas (municipalities) for privatisation of services as well as giving priority to development of slums including provision of water supply, sanitation and solid waste disposal. Some of the key features of this policy are:

- In the interest of providing economic, efficient and reliable services, Pourashavas shall endeavor to contract out solid waste disposal, public sanitation, drain cleaning and road maintenance;

- In development works, Pourashava shall give adequate priority to improvements of slums including provision of water, sanitation, solid waste management, footpaths, and street lighting. Self-help shall be the basis of such development but the pourashava will provide necessary facilitation; and

- The government support to pourashavas activities shall be closely linked with the pourashavas' effort towards implementing the government policy. Local Government Division shall monitor the performance and implementation of this policy.

National Sanitation Strategy 2005, prepared by the Local Government Division of the Ministry of Ministry of Local Government, Rural Development & Cooperatives has set-up national sanitation goal to achieve 100% sanitation coverage by 2010. In the Strategy "Sanitation" means total sanitary condition for healthy living which includes hygienic latrine facilities, proper management of solid waste and proper disposal of household wastewater and storm water. The term "100% sanitation" means to include the following:

[1] According to this policy sanitation means human excreta and sludge disposal and solid waste management

- No open defecation;
- Hygienic latrines available to all;
- Use of hygienic latrines by all;
- Proper maintenance of latrines for continual use; and
- Improved hygienic practice.

The national sanitation strategy focuses on the following six major issues:

- Open defecation;
- Hardcore poor remaining unserved;
- Use of unhygienic latrines;
- Lack of hygiene practice;
- Urban sanitation; and
- Solid waste & household wastewater disposal not duly addressed

Institutional, financial, technological and social aspects are considered in formulating strategies to address each of the issues listed above.

To overcome a number of technological challenges for achieving adequate sanitation coverage the following strategies are recommended:

- Low cost technology options;
- Sewage treatment technologies with greater emphasis on resource recovery and recycling must be given top priority in improving urban sanitation situation;
- Appropriate desludging of septic tanks and pit latrines must be enforced and effluent disposed of in a proper manner. Sludge emptying services by City Corporation and Pourashava must be in place; and
- Multiple technology options must be considered including decentralized wastewater management option.

The national sanitation strategy broadly guides the respective institutions e.g., LGIs, NGOs, public utilities and government agencies to develop their own action plans for achieving 100% sanitation in their implementation areas with the help of the following broad actions:

- Development of national sanitation mapping;
- Review and updating of national sanitation mapping; and
- Assessment of sector progress.

Pro-Poor Strategy for Water and Sanitation Sector 2005, has been prepared by the Local Government Division of the Ministry of Ministry of Local Government, Rural Development & Cooperatives. The Pro-poor strategy for sanitation is based on identifying all hardcore poor households whose basic minimum need for sanitation is not met and then providing them the basic minimum service level by giving them preference in resource allocation. In the strategy, to define hardcore poor households two sets of criteria are used: i) eligibility criteria and ii) exclusion criteria. Eligibility criteria are as follows:

- Landless households;
- Pavement dwellers/ homeless;
- The main earning person or the head of the family is a day laborer, owning less than 50 decimal of agriculture land or residing in a rented premise less than 200 square feet and having no fixed source of income; and
- Households headed by disabled or females or old (65+ years) persons.

If answer to any of the criteria is ‘yes’, the household will be treated as hardcore poor to get priority unless excluded by the ‘exclusion -criteria’. Exclusion criteria are as follows:

- The households owning more than 1 acre of land (cultivable and homestead) will be excluded from the list.; and

- The households with income level greater than the income corresponding to the 'Poverty-line' definition would be excluded from the list. The poverty line is defined by Bangladesh Bureau of Statistics (BBS) on the basis of 'Household Income and Expenditure Survey'.

Local Government (Paurashava) (Amended) Act, 2010 has been prepared for administering the activities of the Pourashavas, and it has replaced previously prepared Paurashava Ordinance, 1977. According to the Chapter 2 (Clauses 50-61) of Local Government (Paurashava) (Amended) Act, 2010, urban local government bodies (pourashavas) are responsible for such functions as preparation of development plans, implementation of the development plans, land use planning, building control, public infrastructure development (e.g. roads, drains, bus & truck terminals etc.), water supply, drainage & faecal sludge removal, solid waste management, street lighting, traffic control, regulation of markets, birth & death registration etc. The City Corporations also carry out similar types of functions.

Although Clause 50 (2) (kha) states drainage & faecal sludge removal as an important function of the Pourashavas, specific measures have not been mentioned regarding sanitation or faecal sludge removal/disposal in the 'Second Tafsil (Detailed Functions of the Pourashavas)' – the statements under the heading 'Public Toilet' depict that the individual holdings would have to construct and maintain their toilets and remove faecal sludge according to the requirement of the Pourashava.

Relevant Water, Sanitation and Waste Management Functions of Pourashava according to Local Government (Paurashava) (Amended) Act, 2010 have been depicted as follows with the notation of the concerned section numbers:

50 **Responsibilities and Functions of Pourashava.** –

(1) The main responsibilities of Pourashava include –

(a) On the basis of this act and other regulations established by other laws, ensure provision of all sorts of citizen facilities for the citizens of their concerned jurisdictions;
(b) Ensure coordination among municipal administration and government officers and staff, and ensure coordinated actions;
(c) Infrastructure development, building control, preparation of urban development plan and its implementation, with the vision of ensuring municipal services to the citizens within municipal area;
(d) Ensure citizens' safety and security, and maintain public discipline;

(2) To fulfill the objectives of Sub-section (1), the functions of Pourashava include –

(a) Supply of water for use in residential, industrial and commercial purposes;
(b) Storm water drainage and sewerage;
(c) Waste management;
(d) Preparation of plan to ensure economic and social justice;
(e) Construction of roads and footpaths for improvement of the transportation system, and construction of terminals for convenience in public movement as well as transportation of passengers and goods;
(f) Activities mentioned in 'Birth and Death Registration Act, 2004 (29 No. Act of 2004);
(g) Preparation of 'Traffic Management Plan' for transportation management, ensure passenger shades, streetlight, vehicle parking places and bus stand or bus stop for the convenience of the street movers.
(h) Citizens' health and environmental protection, tree plantation and protection;
(i) Establishment and management of markets and slaughter houses;

(j) Promotion of education, sports, recreation, entertainment and cultural facilities, and beatification of municipal area;
(k) Other functions imposed by laws, acts, rules, sub-rules, bylaws or government orders.

(3) The abovementioned functions can not be postponed, even if Pourashava does not have its own technical management and financial capacity.

(4) If any function mentioned in Sub-sections (1) and (2) is not accomplished, Government will be able to provide necessary instructions on this regard.

(5) In addition to the abovementioned functions, Pourashava will also accomplish the functions mentioned in 'Second Tafsil' according to its financial capacity.

95 **Infrastructural Services Projects.** – (1) Whatever said under this act, based on other laws/rules/regulations on environment, development planning, project implementation, operation, maintenance and management, Pourashava will be able to make partnership contract agreement with any public or private organization and ensure finance, implementation, maintenance and operation of any relevant project, thereby ensure the concerned service oriented functions.

96 **Categories or types of agreements regarding participation of private sector**

(1) To ensure municipal infrastructural services, Pourashava will be able to contract private sector in defined procedure.

(2) Keeping the objective of the abovementioned section, Pourashava will be able to make following types of contracts, such as:

(a) Build, own and transfer;
(b) Build, own, operate and maintain;
(c) Build and transfer;
(d) Build, lease and transfer;
(e) Build, transfer and operate;
(f) Lease and management;
(g) Management;
(h) Rehabilitate, operate and transfer;
(i) Rehabilitate, own and operate;
(j) Service provision agreement;
(k) Deliver, operate and transfer.

97 **Functions of Pourashava or Other Organizations.** – Water supply, storm water drainage and sewerage, waste management, roads and commercial infrastructures – functions that are relevant with the municipal environmental infrastructures, Pourashava will be able to implement projects on these aspects for the convenience of the citizens in the following two ways:

(a) Through own funding of Pourashava; or
(b) Through partnership agreement with government or private organizations.

98 **Municipal Tax Imposition.** – According to the prior approval received from the government, Pourashava will be able to impose all or any tax, sub-tax, rate, toll and fees etc. as mentioned in 'Third Tafsil'.

However, it is conditioned that Pourashava will have to take permission from government in case of imposing any new tax.

101 **Instructions for imposition of tax** –

(a) Government will be able to instruct Pourashava to impose tax, sub-tax, rate, toll or fees etc. as mentioned in 'Section 98'; Or
(b) Government will be able to instruct Pourashava to fix tax, sub-tax, rate, toll or fees etc. of any such type;
(c) Government will be able to instruct Pourashava to release any person or persons or any property or categorized property from imposing any tax, sub-tax, rate, toll or fees etc. of any such type, or postpone or abolish such any tax, sub-tax, rate, toll or fees etc.

120 **Power to prepare rule.** –

(1) To fulfill the objective of this act –

(a) According to Dafa (kha), government will be able to prepare rule through government gadget notification;

(2) Not undermining the power under sub-section (1), government will be able to prepare rule regarding any or all aspects as well as regarding those aspects considered relevant and complementary, mentioned in 'Sixth Tafsil'.

121 **Power to prepare sub-rule.** –

(1) To fulfill the objective of this act, through taking prior approval from government gadget notification, Pourashava will be able to prepare sub-rules that do not become incompatible with this act or rule.

(2) Specifically, and not undermining the collectiveness of the previous power, the sub-rule will include any or all aspects mentioned in 'Seventh Tafsil'.

122 **Power to prepare bylaw.** –

(1) To fulfill the objective of this act, Pourashava will be able to prepare bylaws regarding the aspects mentioned in 'Eighth Tafsil'.

(2) Specifically, and not undermining the collectiveness of the previous power, such bylaws will be able to prepare regulations regarding any or all aspects as well as regarding those aspects considered relevant and complementary, mentioned in 'Eighth Tafsil'.

Second Tafsil (Section 50-71): Detailed Functions of Pourashava (Public Health) mentioned in Local Government (Paurashava) (Amended) Act, 2010

1. Health Management Responsibility

Pourashava will be responsible for health management under its jurisdiction, and will take necessary measures following this act.

3. Waste Removal, Collection and Management

(1) Pourashava will take appropriate measures to collect and remove waste from all streets, general toilets, urinals, drains, buildings and places under its jurisdiction.
(2) Under overall control and supervision, occupants of all buildings and places within municipal jurisdiction will be responsible for removal of waste from their concerned premises.
(3) Pourashava will ensure placement of bins at different places of the city, and wherever such waste bins will be placed, through issuance of notices, Pourashava will be able to instruct the occupants of the neighboring buildings and lands to discard their wastes into such waste bins.

(4) The waste removed or collected by municipal staff or under their supervision and the waste stored in the bins placed by the Pourashava, will be considered as the property of the Pourashava.

4. Public Toilet

(1) Pourashava will ensure provision of sufficient numbers of separate latrines and urinal for men and women at appropriate locations, and will ensure maintenance and cleanliness.

(2) The building owners of the buildings having latrines or urinals, will keep them in the condition satisfactory to Pourashava, and will have to engage the number of personnel for the purpose as deem necessary or defined by the Pourashava.

(3) If any building does not possess any latrine or urinal or sufficient concerned facility, or possesses the latrine or urinal at an unacceptable place, Pourashava will be able to issue notice to the concerned building owner to accomplish the following–

(a) To ensure latrines and urinals as mentioned in the notice.

(b) To remove the waste from the latrines and urinals as mentioned in the notice.

(c) Where there is provision for underground sewerage line, Pourashava will be able to instruct the concerned building owners to provide connection of the latrine or urinals to the sewerage line.

12. Drainage

(1) To drain out water, Pourashava will construct sufficient drains under its financial capacity, and considering public health and facility, will construct, maintain, protect and clean the drains.

(2) Any owner of a building or land will be able to connect his/her drain with the municipal drain, under the approval of the Pourashava, and under the conditions defined by the Pourashava and after payment of the fee defined by the Pourashava.

(3) All the private drains within the jurisdiction of the Pourashava will be under control and supervision of the Pourashava, and Pourashava will be able provide instructions to maintain and close them.

2.3 Existing Legal Framework for Water and Sanitation

The overall regulatory framework for water and sanitation sector consists of the acts and ordinances specifying the functions and responsibilities of the various sector institutions, the most important being:

- The 'Rules of Business 1996' allocating responsibilities to the various government departments and ministries;
- The Local Government Acts and Ordinances specifying the responsibilities of the different levels of Local Government Institutions;
- The Acts and Ordinances establishing the Pourashavas and City Corporations as well as the WASAs;
- The Environment Conservancy Act, 1995 and the Environment Conservation Rules, 1997, establishing the framework for environmental management and setting the environmental quality standards including water quality standards;
- Acts and ordinances related to public health and hygiene; and
- 'Bangladesh Water Act 2001' has been promulgated which deals with the following aspects: ownership, appropriation and water usage right; permissible use of water; general authorization and license for water use; control over water conservation and efficient use of water; protection of water and watersheds and related land resources, protection of environment; financial provisions; water sector institutions and water user associations; access to and rights over land.

Regulatory framework for urban water and sanitation sector encompasses the acts and ordinances specifying the functions and responsibilities of the Pourashavas, City Corporations and WASAs. The framework includes:

- The 'Rules of Business 1996' allocating responsibility of urban water supply and sanitation to LGD through DPHE in urban areas not declared municipalities;
- The Local Government (City Corporation) (Amended) Act, 2011 and Local Government (Paurashava) (Amended) Act, 2010 have defined the power, functions and responsibility in the WSS sector of Pourashavas and CCs as I) sanitation and control of environmental pollution, ii) provision and regulation of water supply, iii) removal, collection and disposal of refuse from public places, iv) provision and maintenance of public toilets, v) promotion of public health and health education and vi) provisions and maintenance of drainage systems; and
- The 'WASA Ordinance, 1963' giving GoB power to establish WASAs and permitting them to do any work relating to water supply, sewerage systems, solid waste management and drainage. The 1963 ordinance presently regulates Chittagong WASA while the Dhaka WASA is regulated by the 'WASA Act, 1996' which provides greater autonomy to DWASA, establishing a representative board with women representatives, new rules for recruitment of Chief Executives, management accountability and performance targets etc.

2.3.1 Legal Framework on Septic Tanks under Bangladesh National Building Code (BNBC) 1993

Clauses on septic tanks have been found in Chapter 7: Drainage and Sanitation of BNBC 1993. These clauses have been depicted as follows:

- Septic tanks discharging into either a subsurface disposal field or one or more seepage pits shall be required for the approval of drainage and sanitation plans for the places where public sewers are not available.
- Such disposal method shall be designed by a licensed professional in accordance with the requirement of the provisions of this code.
- The design of such system shall be on the basis of location with respect to wells or other sources of water, soil permeability, ground water elevation, area available and maximum occupancy of the building.
- Rainwater or ground water shall not be discharged into the septic tank.
- Septic tanks shall not discharge into open water courses.
- The minimum distance for various components of the disposal system shall be in accordance with.

Table 2.1: Location of Components of Sewerage Disposal System

System Component	Distance (m)				
	Building Foundation	Well	Stream	Seepage	Dry Well
Septic Tank	1.5	8	-	1.5	-
Disposal field	3	15	7.5	6	6
Seepage pit	4.5	15	15	6	6
Dry well	3	15	-	6	-

- The flow into a septic tank may be calculated on the basis of water consumption rate or on the basis of plumbing fixtures discharging simultaneously into it.
- The septic tank shall have a minimum liquid capacity of 2000 litres, minimum width 1m and minimum liquid depth 1m. The length of a septic tank shall be at least twice its width. It is recommended that the length of a septic tank be not more than 4 times its width.
- The maximum size of a septic tank shall be limited to the number of users not exceeding 300 persons for residential buildings (occupancy A, C, and D) and 1000 persons for all other occupancy groups. It is recommended to use independent parallel chamber septic tank for a population more than 100 persons for residential buildings (for occupancy groups A, C, and D) and 300 persons for all other occupancy groups.
- The diameter of a circular septic tank shall not be less than 1.4m and shall have an operating liquid depth not less than 1m.
- The volume required for digested sludge and scum may be computed on the basis of $0.04m^3$/capita/year.
- The liquid retention time of a septic tank shall be at least 1 day.
- The desludging frequency of a septic tank at least once a year.
- It is recommended to use two chamber septic tank when the capacity of a septic tank exceeds 3000 litres. The inlet compartment of a two chamber septic tank shall have a capacity not less than two-third of its total capacity.
- The septic tank shall be constructed of corrosion resistant material and be of permanent water tight construction. The manhole cover and the roof of the tank shall be designed for at least 7 kPa live load. The inlet compartment shall be provided with a manhole. Outlet compartment may also be provided with a manhole.

2.3.2 Environment Conservation Rules 1997

Environment Conservation Rules (ECR), 1997 has fixed standard for discharge of sewage into surface and inland water bodies. Following table shows the standards for discharge of sewage:

Table 2.2: Standard for Sewage Discharge

Parameter	Unit	Standard Limit
BOD	miligram/l	40
Nitrate	miligram/l	250
Phosphate	miligram/l	35
Suspended Solids	miligram/l	100
Temperature	Degree Centigrade	30
Coliform	number per 100 ml	100

As per ECA, construction and operation of sewage treatment requires site clearance certificate and thereafter an environmental clearance certificate which has to be renewed every year. It is under red category of the project which requires prior approval of site before construction.

2.4 Existing Financing Mechanism for Sanitation

Financing in the water supply and sanitation (WSS) sector is done by various partners - the government, donors, NGOs and by the private sector or private individuals. The government's support to the development projects undertaken by government agencies comes in the form of Annual Development Programme (ADP) allocations. The donor contributions to the project are also mentioned in the ADPs. The donors also finance NGOs directly. The private sector involvement so far in the WSS sector can be said to be only by the individuals who buy tubewells and latrines directly from the market.

The ADP allocations (government and donor) in the WSS sector till FY 2007-08 was in between 2.5% to 3.0% of the National ADP. For example, in financial year (FY) 2006-07 and FY 2007-08 allocations to the WSS sector was 2.34% and 2.59%, respectively. However, increased allocations are observed in recent years. In FY 2008-09, the allocation increased to 3.6%. Again a significant increase is made in the present FY 2009-10, enhancing the allocation to 4.86% which is about double of what was allocated two years back. Within the total allocations in ADP the urban water supply get average 45%, followed by rural water supply (40%). Both urban and rural sanitation receive very low allocations, only 10% and 5%, respectively.

The substantial increase in the budget of FY 2009-10 possibly reflects the political commitment of the present government to achieve 100% coverage of water supply and sanitation 2013 respectively.

A recent analysis of budget for FY 2013-2014 by NGO Forum – a national NGO shows that per capita allocation in the ADP for WSS for Dhaka city is Tk. 900 whereas it is Tk. 11 for char land people, Tk. 22 for Chittagong Hill Tracts and Tk. 200 for coastal people.

2.5 Policy Gaps and Issues

It is evident from review of National Sanitation Strategy that faecal sludge collection and its management are the responsibility of the pourashavas. However, so far there has been no guideline, policy or rules from Ministry of Local Government – the nodal ministry dealing with sanitation regarding how to manage the faecal sludge. As per rule of business of Government of Bangladesh issuance of such rules or guideline is under the purview of Ministry of Local Government while Ministry of Environment is responsible for framing discharge standards. Moreover, there is no allocation from ADP specifically on faecal sludge management which falls under WSS sub sector of the ADP. Without proper guideline/rules followed by allocation of financial resources as well as human resources by the government, it is very difficult for pourashavas to initiate and execute faecal sludge management project. So far, the ADP allocation for sanitation has been focusing on building pit latrines to increase sanitation coverage in the country.

Review of the Pourashava Act reveals that under the public health section (Tafsil -2 section 50) which describes the services to be provided by the pourashava does not explicitly say anything about faecal sludge collection and its management. The section on waste management describes about collection process and disposal process of solid waste. However, the definition of waste in Pourashava Act includes human excreta as a part of waste. There is a need for more clarity regarding faecal sludge in the Pourashava Act. Using this Act, Ministry of Local Government can makes rules for faecal sludge collection and management. Although there is no mention in section 50(2) of the Pourashava Act 2009 about faecal sludge collection and treatment, however, this service can be provided as a part of waste management services (since the definition of waste mentioned in the Pourashava Act 2009 consists of human excreta also). Moreover, pourashava may provide faecal sludge collection and treatment service using section 50(2) (h) which says citizen's health and environmental protection as the responsibility of the pourashava. Since uncontrolled disposal of faecal sludge is an environmental and public health hazard, and as such under this clause, pourashava can provide the aforementioned services.

It has been found from review of the Pourashava Act that at present there is no provision to charge a fee for sanitation or faecal sludge management in case Pourashava provides such services. In order to charge a service charge or fee/rate for faecal sludge collection and management, pourashava has to get approval from the Ministry of Local Government. Alternatively, Ministry of Local Government can amend the Pourashava Act and include sanitation fee or charge as a separate fee similar to water rate or conservancy charge as mentioned in the Act. Cost recovery is very important for sustainability of municipal services.

CHAPTER 3

AN OVERVIEW OF MATHBARIA POURASHAVA

3.1 Background

Mathbaria Pourashava was established in 1993. At present, Mathbaria Pourashava covers an area of 4.1 sq. km and consists of 9 wards. According to 2011 census report, the population was 18,375. The Pourashava belongs to category 'A' class.

Average monthly minimum temperature of Mathbaria town is 13.72°C occurring in January and the average monthly highest temperature is 32.74°C occurring in May. The annual rainfall ranges from 4 cm to 379 cm (average 137 cm). Mathbaria Town suffers from inundation caused by high tides, especially during full moon, no moon and in rainy season. Map of Mathbaria Pourashava has been presented in Fig 3.2.

3.2 Chronology of Population Growth

Past census data of Mathbaria Pourashava reveals that there has not been that much increase in the population from 2001. Table 3.1 shows the chronology of population growth of Mathbaria Pourashava since 2001.

Table 3.1 Population of Mathbaria Pourashava

Year	Population	Average Annual Growth Rate (%)
2001	15,407	
2011	18,375	1.78%

Source: BBS Census 2001 and BBS Census 2011

Table 3.1 depicts that total population of Mathbaria Pourashava in the census the year 2001 and 2011 were 15,407 and 18,375 respectively, which shows a average annual growth rate of 1.78%. During the same period national urban population growth rate was 4.12%. Using the growth rate 2001-2011 census year of Mathbaria, the projected population for the year 2014 stands at 19,374. A comparison of this growth rate with the national population growth and the urban population growth rate is presented in Fig 3.1 below:

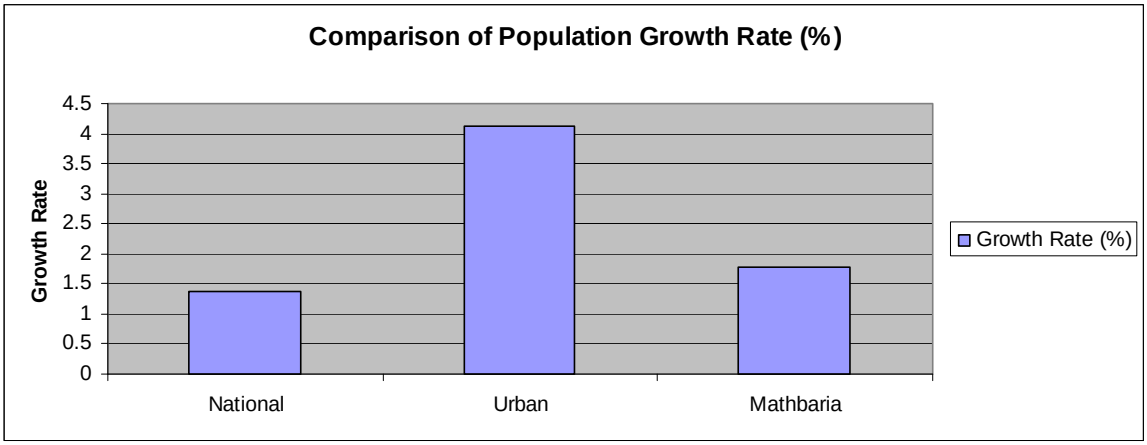

Fig 3.1: Comparison of Population Growth Rate

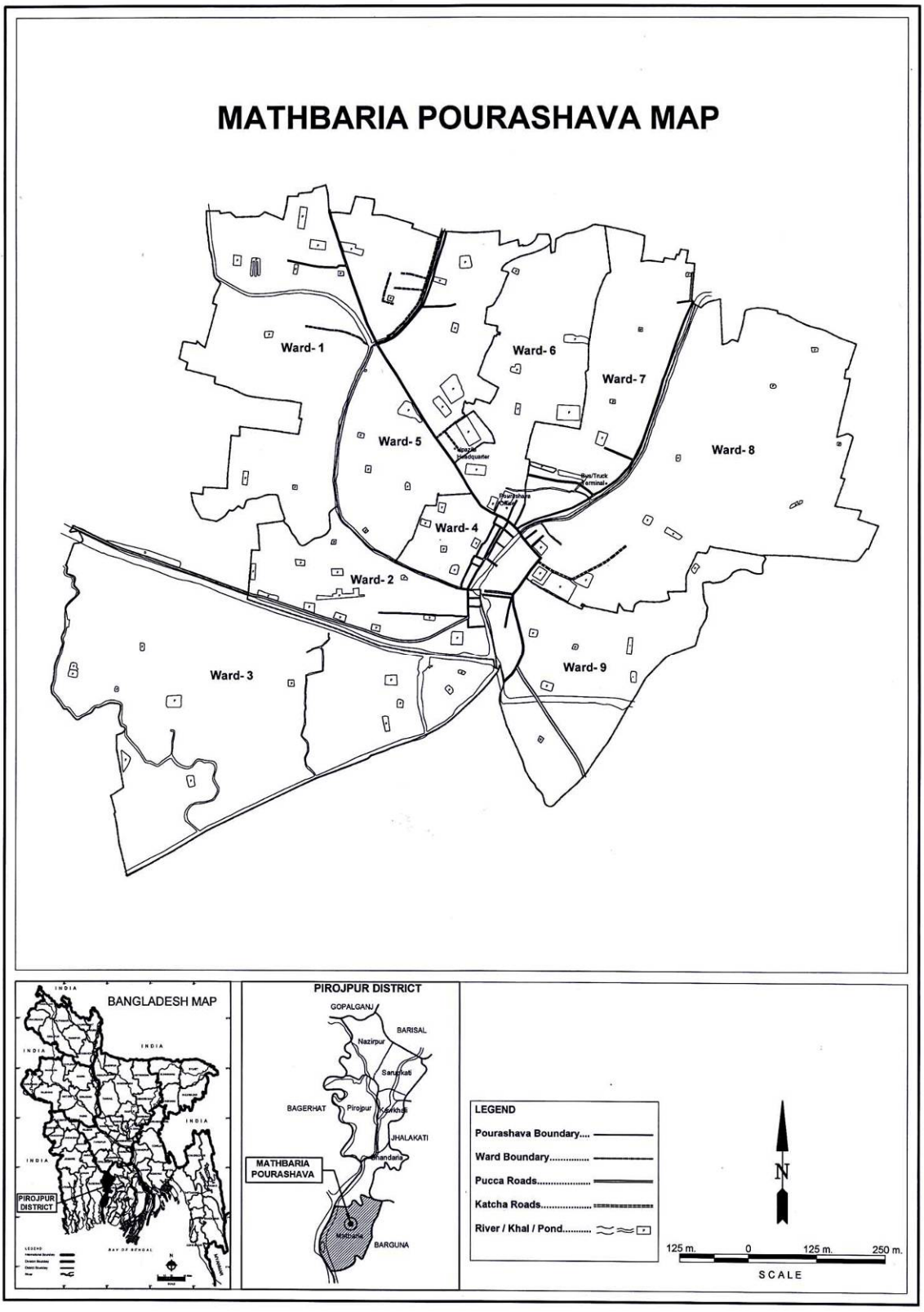

Fig 3.2: Map of Mathbaria Pourashava

3.3 Population Projections for Mathbaria Pourashava

For preparation of action plan for sanitation, 2011 census population of Mathbaria Pourashava (18,375) has been considered as the base year population, and it has been projected up to 2035, based on certain assumptions. Three types of annual growth rates have been considered in this process, i.e. low, medium and high growth rates. The annual growth rate under low growth rate has been assumed 1.78 percent (considering 2001-2011 annual growth rate of Mathbaria Pourashava); for medium growth rate, it is assumed 3 percent (considering high in-migration due to infrastructure improvement under CTIIP); and for high growth rate it is assumed 4.12 percent (at national average urban growth rate 2001-2011 considering much higher in-migration to the town). Table 3.2 shows the projected population of Mathbaria Pourashava during for the period 2014 to 2035.

Table 3.2 Projected Population of Mathbaria Pourashava

Year	Low Annual Growth Rate (1.78%)	Medium Annual Growth Rate (3%)	High Annual Growth Rate (4.12%)
2014	19,374	20,079	20,741
2015	19,719	20,681	21,596
2020	21,537	23,975	26,426
2025	23,523	27,794	32,337
2030	25,693	32,221	39,571
2035	28,062	37,353	48,422

Estimated by the Consultant

In the event of rapid development, a high growth rate of population may be anticipated, which will cause rise of population to 48 thousand by the year 2035. Under the medium population growth, the projected population is estimated at 37 thousand, while the population under low growth rate is estimated at 29 thousand.

3.4 Road and Drainage Condition:

The overall road condition of the Mathbaria Pourashava is not so good. Most of the roads in Mathbaria Pourashava are earthen (kutcha). Table 3.3 below shows the length of the roads of Mathbaria Pourashava under different categories:

Table 3.3: Road Length by Type at Mathbaria Pourashava

Type of Road	Length of Roads (Km)			%
	3 Meter or Less Width	3.5 Meter Width	Total	
Earthen/Kutca	44.28	-	44.28	46.47
Brick Soiling	17	-	17	17.84
HBB	8	-	8	8.40
CC	8	-	8	8.40
Bituminous Carpeting	-	18	18	18.89
Total	77.28	18	95.28	100.00

Source: Field Survey, February 2014

It can be seen from Table 3.3 that the total length of road at Mathbaria Pourashava is about 95.28 km, of which 44.28 km is earthen/kutcha roads. Most of the roads of the Pourashava are narrow – 77.28 km roads of the Pourashava have the width of 3 meter or less. Mathbaria Pourashava possesses only 18 km bituminous carpeting roads.

The overall condition of drains at the Mathbaria Pourashava is not satisfactory as well. Table 3.4 below shows the length of drains at Mathbaria Pourashava under different categories:

Table 3.4: Drain Length by Type at Mathbaria Pourashava

Type of Drain	Length (Km)	%
Earthen/Kutca	20	93.01
Brick	0.5	2.33
CC	0.5	2.33
RCC	0.5	2.33
Total	21.5	100.00

Source: Field Survey, February 2014

Table 3.4 illustrates that most of the drains of Mathbaria Pourashava are earthen/kutcha, having a total length of about 20 km. The lengths for RCC, CC and Brick drains are approximately 0.5 km for each type. The total length of drains at Mathbaria Pourashava is about 21.5 km.

3.5 Source of Water for Drinking and Other Purposes

There is no piped water supply facility being provided by Mathbaria Pourashava. Numerous attempts for finding salinity free source of drinking water through installation of shallow or deep tube wells has been unsuccessful at many points of the Pourashava. People have been found to use tube well and Pond Sand Filter (PSF) water for drinking, cooking, bathing, washing and other purposes. Since, water supply has not been ensured by pourashava, a good number of households installed pumps and converted their shallow tube wells into tap water facility. However, still there is huge scarcity of drinking water at Mathbaria Town – even many people buy drinking water from different Non Governmental Organizations like BRAC. Table 3.5 below shows the number and percentage of households using different sources of water at Mathbaria Pourashava:

Table 3.5: Different Sources of Water at Mathbaria Pourashava

Description	Population	HH	Tap Water		Tube Well Water		Other	
			HH	%	HH	%	HH	%
Ward 1	1,565	322	98	30.4	99	30.7	125	38.8
Ward 2	2,281	555	11	2	46	8.3	498	89.7
Ward 3	2,844	693	0	0	11	1.6	682	98.4
Ward 4	1,047	271	22	8.1	110	40.6	139	51.3
Ward 5	2,507	591	15	2.5	149	25.2	427	72.3
Ward 6	1,711	401	85	21.2	190	47.4	126	31.4
Ward 7	2,268	515	0	0	29	5.6	486	94.4
Ward 8	2,207	504	145	28.8	169	33.5	190	37.7
Ward 9	1,945	402	44	10.9	179	44.5	180	44.5
Total	18,375	4,254	420	9.9	982	23.1	2,853	67

Source: BBS Census 2011

3.6 Expenditure on Electricity services

87 households out of 94 sample surveyed households had electricity connection. Table 3.6 below depicts the numbers of individual households under two criteria – income groups vs amount of electricity bill paid by an individual household.

Table 3.6: Electricity Bills by Income Groups at Mathbaria Pourashava

Household Income	No. of HHs under Different Electricity Bill Ranges (Taka)						Total No. of HH
	Upto 500	501-1000	1001-1500	1501-2000	2001-2500	2501-3000	
5001-10000	6	2	-	-	-	-	8
10001-15000	10	-	-	-	-	-	10
15001-20000	16	7	1	1	-	-	25
20001-25000	5	6	1	1	1	1	15
25001-30000	4	2	-	-	-	-	6
30001-35000	7	1	1	2	1	-	12
35001-40000	1	3	1	2	-	-	7
above 40000	-	1	-	2	-	1	4
Total	49	22	4	8	2	2	87

Source: Field Survey, February 2014

It can be observed from Table 3.6 that most of the households from different income groups pay in the range of Taka 0-500 as monthly electricity bill. Average monthly electricity bill per household at Mathbaria Pourashava is Taka 741. It becomes evident from the above table that higher income groups tend to consume more electricity and thereby pay more bills.

3.7 Manpower Used in Sanitation and Solid Waste Management

There is a Sanitary Inspector at Mathbaria Pourashava. The Sanitary Inspector plays key role in the activities of the WATSAN Committee, e.g. motivation towards construction, maintenance and use of sanitary latrines, taking actions against non-sanitary latrine owners and illegal connections to canals/drains, awareness generation on safe drinking water etc. However, he does not have any support staff. On the other hand, the engineering section of the pourashava is served by two engineers only – an Executive Engineer and a Sub-Assistant Engineer. The post of Assistant Engineer is currently vacant.

The municipal solid waste management work of the Pourashava is served by a Conservancy Inspector, a Conservancy Supervisor, 20 Conservancy Workers and 3 Drivers. With 2 garbage trucks (one is 5 tons capacity and the other is 1.5 tons capacity) and 3 vans, the conservancy personnel collect waste from different points of the Pourashava, sweep streets and clean the drains.

Previously, under the support of a program of LGED named ‘Regional Municipal Support Unit (RMSU)’, a house to house waste collection system was introduced. Under this program, a Community Based Organization (CBO) was formed for collection of municipal solid waste from the doorway of individual households of Ward 7. Monthly fee from each household was Taka 10. However, the door to door waste collection activity is no longer continuing as necessary continual support was not provided from Municipal Support Unit.

None of the conservancy worker work as local methor. About 6-7 self-employed local methors reside at Mathbaria Town, who serve the citizens of the pourashava in cleaning the filled up pit latrines and septic tanks. Their monthly income ranges between Taka 3,000 to Taka 10,000.

It is to be noted that none of the current staff of Mathbaria Pourashava possesses any training on sanitation.

3.7.1 Amount of Solid Waste Generated in Mathbaria

A recent survey conducted by Department of Environment (DOE) in 2012 has found that small towns of Barisal division generate around 0.16 kg of solid waste per capita per day. Based on this data, it is estimated that 2.94 tons/day of solid waste is generated per day in Mathbaria. DOE survey has also found that in Class B pourashavas upto 87% of municipal solid waste is organic in nature and pourashavas can collect 50-60% of the generated waste. Based on this data, collected solid waste in Mathbaria is estimated at about 1.5-1.75 tons per day.

3.8 Landfill Site and Faecal Sludge Treatment Facilities

Mathbaria Pourashava does not possess any landfill site or faecal sludge treatment facility. Even, the Pourashava does not have any vacuum tug for collection and disposal of faecal sludge. Presently, Pourashava Authority is dumping municipal solid waste at low lying river side area about 8 km away from the core town outside Pourashava jurisdiction – this practice is directly contaminating river water. Plate 3.1 below shows the current unauthorized dump site of Mathbaria Pourashava.

During Institutional Survey, Pourashava personnel were asked to identify a plausible landfill site for Mathbaria Pourashava. They opined for a land located at Dakhxin Mithakhali about 2 km away from the core town. It is a private land, and is considerably far away from any human habitation. However, the land and its adjoining road get inundated by high tides during rainy season. Maximum depth of inundation is 2 feet. The road has been included under the future road improvement sub-projects of CTIIP. Plate 3.2 shows the photograph of the proposed landfill site. Land price is considerably very high at Mathbaria Pourashava. Land price of the proposed landfill site at Dakhxin Mithakhali is about Taka 0.8 to 1 million per katha. It is to be noted that land price of the proposed landfill cum treatment plant site might become further higher as soon as tender work for the road gets interested. So, it would be wise to acquire necessary amount of land for the proposed landfill cum treatment plant site before beginning of the concerned tender works.

Plate 3.1: Current Unauthorized River Side Dump Site

Plate 3.2: Proposed Dump Site at Dakhxin Mithakhali

3.9 Annual Budget, Actual Income and Expenditure of Mathbaria Pourashava

Table 3.7 below depicts the actual income-expenditure of 2011-12, revised budget of 2012-13 and budget of 2013-14 at Mathbaria Pourashava:

Table 3.7: Actual Income-Expenditure of 2011-12, Revised Budget of 2012-13 and budget of 2013-14 at Mathbaria Pourashava

Sectors		Actual 2011-12		Revised Budget 2012-13		Budget 2013-14	
		Income	Expenditure	Income	Expenditure	Income	Expenditure
Revenue	Tk.	24,288,248	23,400,039	32,890,856	30,961,000	45,110,769	39,272,320
	%	27.30	26.65	23.99	23.28	24.95	22.70
Development	Tk.	61,177,341	61,058,530	97,100,000	97,500,000	123,600,000	124,000,000
	%	68.77	69.54	70.83	73.30	68.35	71.69
Other	Tk.	3,445,909	3,351,026	5,105,000	4,550,000	10,125,000	9,700,000
	%	3.87	3.82	3.72	3.42	5.60	5.61
Year Starting Balance		52,815		2,000,000		2,000,000	
Total		88,964,313	87,809,595	137,095,856	133,011,000	180,835,769	172,972,320

Source: Field Survey, February 2014

Table 3.7 reveals that the actual expenditure of Mathbaria Pourashava in 2011-12 was Taka 87.81 million in comparison to the income of Taka 88.96 million. The revised budget of year 2012-13 stands with income of Taka 137.10 million and expenditure of Taka 133.01 million. The budget for the current year has been prepared with income of Taka 180.84 million and expenditure of Taka 172.97 million. The proportion of Revenue and Development budget was around 25:70.

3.10 Income and Expenditure of Mathbaria Pourashava in Water Supply, Sanitation and Solid Waste Sectors

Mathbaria Pourashava does not possess any piped water supply facility. Table 3.8 below shows actual income of 2011-12, revised budget income of 2012-13 and budgeted income of 2013-14 in the fields of sanitation and solid waste management at Mathbaria Pourashava:

Table 3.8: Actual and Budgeted Income in Sanitation & SWM at Mathbaria Pourashava

Sectors	Actual Income 2011-12	Revised Budget Income 2012-13	Budget Income 2013-14
Conservancy (Current)	560,000	1,981,375	2,077,549
Conservancy (Arrear)	811,000	1,007,549	1,707,549
Slaughter House	25,300	30,000	30,000
Total	1,396,300	3,018,924	3,815,098
% of the Total Budget Income	1.57%	2.20%	2.11%

Source: Field Survey, February 2014

Table 3.8 depicts that total actual income of Mathbaria Pourashava from conservancy and slaughter houses in 2011-12 was Taka 1.40 million. However, the incomes from the same sectors shown in revised budget 2012-13 and budget seem quite ambitious, i.e. Taka 3.01 million and Taka 3.82 million respectively. Although the budgeted incomes in Sanitation & SWM have been shown more than 2% of the total budgeted incomes of the concerned years, the actual Sanitation & SWM income was only 1.57% of the total actual income in 2011-12.

Table 3.9 below shows actual expenditure of 2011-12, revised budget expenditure of 2012-13 and budgeted expenditure of 2013-14 in the fields of sanitation and solid waste management at Mathbaria Pourashava:

Table 3.9: Actual and Budgeted Expenditure in Sanitation & SWM at Mathbaria Pourashava

Sectors	Actual Expenditure 2011-12	Revised Budget Expenditure 2012-13	Budget Expenditure 2013-14
Drain Cleaning	190,000	200,000	300,000
Purchasing Conservancy Equipments	32,888	75,000	200,000
Mosquito and Dog Killing	22,146	75,000	200,000

Waste Disposal / Sanitary Toilets	110,000	150,000	300,000
Salary of Workers	1,775,952	1,700,000	2,000,000
Total	2,130,986	2,200,000	3,000,000
% of the Total Budget Expenditure	2.43%	1.65%	1.73%

Source: Field Survey, February 2014

Table 3.9 reveals that total actual expenditure of Mathbaria Pourashava regarding drain cleaning, purchasing conservancy equipments, mosquito and dog killing, waste disposal & sanitary toilets and salary of conservancy workers in 2011-12 was Taka 2.13 million. The expenditures regarding the same sectors shown in revised budget 2012-13 and budget are a bit higher, i.e. Taka 2.2 million and Taka 3.0 million respectively. Although the budgeted expenditures in Sanitation & SWM have been shown less than 1.75% of the total budgeted expenditures of the concerned years, the actual Sanitation & SWM expenditure was considerably higher – 2.43% of the total actual expenditure in 2011-12.

Comparison between income and expenditure as shown in Table 3.8 and Table 3.9 reveals that the total budgeted incomes in 2012-13 and 2013-14 from sanitation and solid waste management were higher than the relevant expenditures. However, the actual income in 2011-12 from sanitation and solid waste management was significantly much lower than the relevant expenditures – it is the crude reality of income and expenditure in sanitation and solid waste management sectors. Special emphasis is needed to be provided to improve the income from these sectors to meet the concerned expenditures. Besides, planned measures are also required to reduce the relevant costs.

3.11 Role of Government, NGOs and Private Sector in Mathbaria

Currently, Coastal Towns Infrastructure Improvement Project being funded by Asian Development Bank is providing necessary infrastructure improved support at Mathbaria Pourashava, which includes preparation of a Sanitation Plan for the Pourashava and its successful implementation.

Operationally important NGOs at Mathbaria Pourashava are BRAC, PROSHIKA, ASA, Jubuk, Songram, Sold, Hido etc. These NGOs have very limited activities on sanitation at Mathbaria Pourashava. However, no mechanism has yet been established by the Pourashava Authority to monitor which NGO is doing what within the Pourashava jurisdiction.

CHAPTER 4

SANITATION SCENARIO OF MATHBARIA

4.1 Introduction

In order to assess sanitation condition of Mathbaria Pourashava, a sample household survey was conducted. Total number of samples was 94, which was surveyed randomly at 9 wards in proportionate to the population size (census 2011) of the concerned ward. Since, there were a good numbers of sanitation oriented questions in the questionnaire that could only be answered by the concerned house owner, each of the survey respondents were either a house owner or his/her representative. In this chapter, analyses of current sanitation situation, reasons of not having sanitary toilets, faecal sludge disposal practice as well willingness to pay for efficient faecal sludge management system etc. have been done and summarized in the following sections.

4.2 Socio-Economic Condition of the Households Surveyed

Basic socio-economic data were collected regarding all the household members of the survey household. Occupations of the surveyed household members varied as shown in Fig 4.1. Majority of the household members of the surveyed families were students (31%) followed by housewives (24%), old/disabled/retired persons (12%), businessmen (8%), service holders (7%) and the rest were different other occupational groups. It is to be noted that 3% family members of the surveyed households were unemployed.

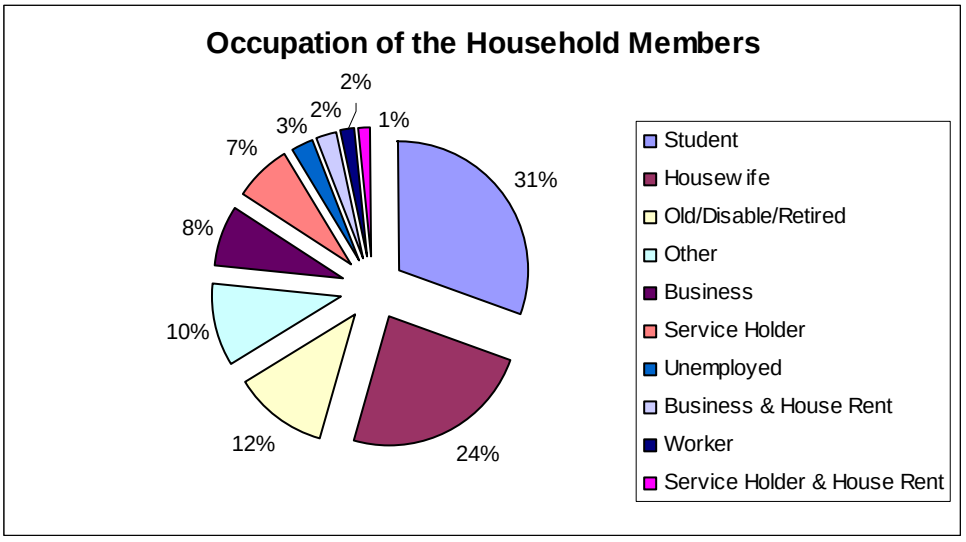

Fig 4.1: Occupation of the HH Members

Educational attainment of the respondents reveals that 65.9% respondents had at least high school going educational attainment, while only 3.2% had primary educational qualification. However, it is to be noted that 30.9% of the respondents were illiterate.

Average family size of the household has been found at 5.26. Income data reveals that maximum number of households fall under the income range of Tk. 15,001-20,000, followed by Tk. 20,001-25,000 and Tk. 10,001-15,000 income ranges respectively. Table 4.1 below shows the incomes of the respondents and households under different income groups:

Table 4.1: Respondents' Income and their Family Income in Mathbaria Pourashava

Respondent's Income	Frequency	Percentage	Family Income	Frequency	Percentage
No Income	17	18.1			
Up to 5000	18	19.2	Up to 5000	1	1.1
5001-10000	17	18.1	5001-10000	8	8.5
10001-15000	21	22.3	10001-15000	12	12.8
15001-20000	25	26.6	15001-20000	26	27.7
20001-25000	7	7.4	20001-25000	16	17
25001-30000	1	1.1	25001-30000	7	7.4
30001-35000	3	3.2	30001-35000	12	12.8
35001-40000	1	1.1	35001-40000	8	8.5
above 40000	1	1.1	above 40000	4	4.3
Total	94	100.00	Total	94	100.00

Source: Field Survey, February 2014

Table 4.1 reveals that 9.6% households had income up to Taka 10 Thousand, 40.5% households had income within the range of Taka 10 to 20 Thousand, 24.4% households fall under the income range of Taka 20 to 30 Thousand, and the rest 25.5% households had income more than Taka 30 Thousand. Average HH income of Mathbaria Pourashava is Taka 19,654.

4.3 Disease Occurrence Rate

Fig 4.2 shows the occurrence rate of water and sanitation related diseases to the family members amongst different income groups in last one year – the purple bars depict the percentage of the households in which none of the family members were affected by any water and sanitation related disease, while the blue bars show the percentage of households in which at least one family member suffered from similar diseases. In terms of disease occurrence rate in last one year, it was the highest among the Tk. 15,000-20,000 income group, followed by Tk. 20,001-25,000 and Tk. 30,001-35,000 income ranges respectively. It is to be noted that household members from the lowest and highest income strata were not affected by any water and sanitation related diseases.

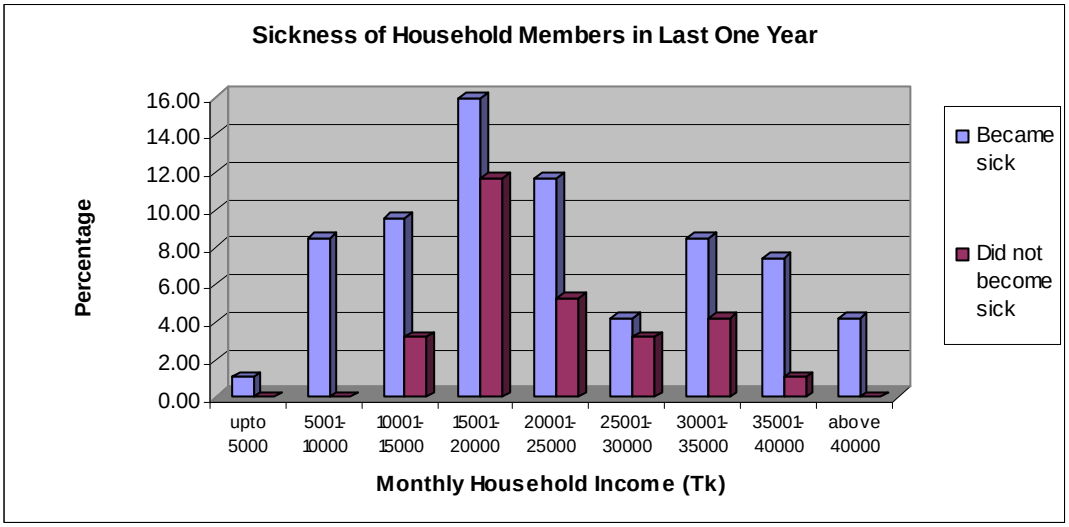

Fig 4.2: Percentage of Occurrence of Diseases by Different Income Groups

Table 4.2 shows the number and percentage of family members of the 94 sample households – whether or not they suffered from any water and sanitation related disease.

Table 4.2: HH Members Suffering from Water & Sanitation related Diseases in Last One Year

Suffering from Water and Sanitation related Diseases in Last One Year	No. of HH	Percentage
HH Members did not suffer from any disease	27	28.72
HH Members Suffered in Last One Year	67	71.28
Total	94	100

Source: Field Survey, February 2014

It is evident from Table 4.2 is that 71.28% households had at least one member, who suffered from any disease related to sanitation. On the other hand, the members from the rest 28.72% households did not suffer from any sanitation borne disease. Table 4.3 below depicts percentage of the household members who suffered from different types of water and sanitation related diseases.

Table 4.3: Types of Diseases the HH Members Suffered in Last One Year

Different diseases in Last One Year	Percentage
Diarrhea, dysenteries	8.73
Typhoid, paratyphoid	3.97
Worms	0.79
Jaundice	0.79
Scabies & Other skin diseases	41.27
Fever	13.49
Diarrhea, dysenteries & Scabies & Other skin disease	13.49
Diarrhea, dysenteries, Jaundice & fever	0.79
Diarrhea, dysenteries & fever	14.29
Jaundice & Scabies & Other skin disease	0.79
Jaundice & Fever	0.79
Scabies & Other skin disease & fever	0.79
Total	100.00

Source: Field Survey, February 2014

It is evident from the above Table 4.3 that scabies and other skin diseases (41.27%) were the most prevalent disease amongst the sample household members at Mathbaria Pourashava. High prevalence of skin disease might be caused by contact of feacally contaminated water – through water-washed transmission route. Diarrhea, dysenteries were the second most occurring disease – 47 household members (37.31%) suffered from diarrhea, dysenteries plus other diseases, was caused mainly due to faecal-oral route of transmission.

4.4 Economic Loss Due to Sickness Caused by Water and Sanitation Related Diseases

It has been found from the field survey that the family members from 67 sample households, who suffered from water and sanitation related diseases, remained sick for about 8.84 days on an average in last year. Table 4.4 below shows the treatment cost for the water and sanitation related diseases borne to the affected households.

Table 4.4: Treatment Cost for Water and Sanitation Related Diseases

Treatment Cost (Tk)	No. of HHs	Percentage
Upto 2500	47	70.15
2,501-5,000	15	22.39
5,001-7,500	3	4.48
7,501-10,000	2	2.99
Total	67	100.00

Source: Field Survey, February 2014

Table 4.4 depicts that 71.28 % households (among the affected 67 HHs) had to spend somewhat up to Taka 2,500 for the treatment of sanitation related diseases in last year, followed by 22.39% HHs with the treatment cost range of Taka 2,501-5,000. The average annual expenditure of these 67 families for the purpose of treatment was Taka 1979.85.

A study by Water Sanitation Program (2012) has found that annual economic impact due to inadequate sanitation is estimated to be Tk. 295.48 billion equivalent to US$ 4.23 billion. This impact is equivalent to 6.3% of the GDP of Bangladesh.

Total health impact of the inadequate sanitation is equal to Tk. 249,186 million which is 84% of the total economic impact and equivalent to 5.3% of the GDP in 2007. Of the total health related impact 13% (Tk. 31,941 million) consists of productivity losses. The cost of treatment for illness makes another 9 percent (Tk. 22,144 million).

Based on the field survey it is estimated that the cost of treatment for illness of 71.28%of the household in Matbaria pourashava is estimated at Taka 6.05 million (USD 77,615). This is excluding the productivity related losses due sickness.

4.5 Access to Sanitation

With vision of assessing the sanitation situation at Mathbaria Pourashava, three categories were defined, e.g. no latrine, unhygienic latrine and hygienic latrine. The field survey analyses reveal that there was no household without any latrine, 41 households had unhygienic latrines, while 53 households had hygienic sanitation facility at their households. Figure 4.3 below shows the over all sanitation situation of Mathbaria Pourashava prevailing in February, 2014.

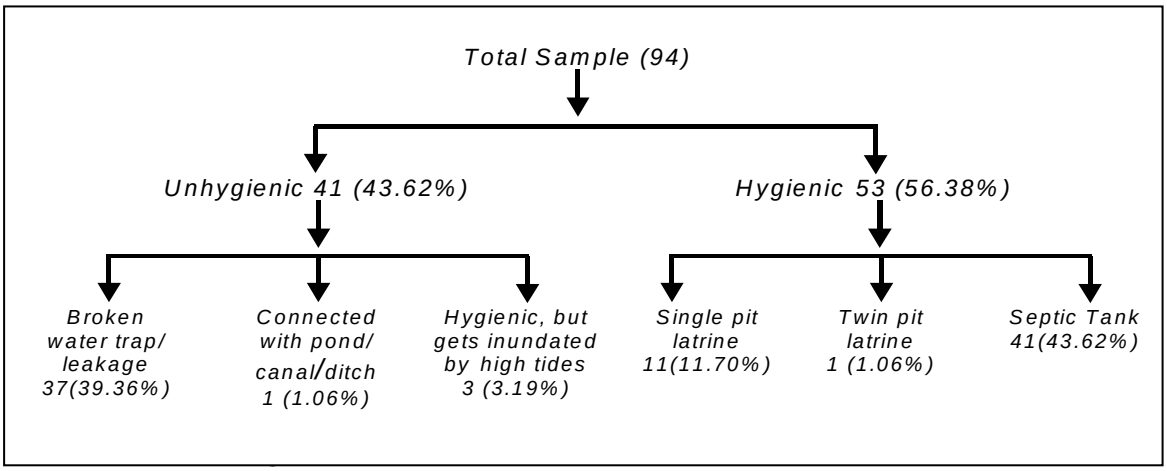

Fig 4.3: Sanitation Situation of Mathbaria Pourashava.

During the field survey, three types of unhygienic latrines have been observed, e.g. firstly, single pit latrines with broken water trap or leakage in the ring slabs (39.36%); secondly, single pit latrine directly connected with pond/canal/ditch (1.06%), and thirdly, hygienic/sanitary latrines that get inundated during high tides (3.19%). On the other hand, the observed hygienic toilets were under three categories, e.g. single pit latrine (11.70%), twin pit latrine (1, 1.06%), and latrines with septic tanks (43.62%). Table 4.5 below shows the comparison of sanitation coverage of 2003 national average, 2011 census survey at Mathbaria Pourashava and 2014 sample household sanitation survey at Mathbaria Pourashava.

Table 4.5: Comparison of Sanitation Coverage in 2003, 2011 and 2014

Access to Sanitation	Urban Average (2003)* National	Census Survey (2011)** Mathbaria	Sample Survey (2014)*** Mathbaria
Hygienic Toilet	59.77%	68.8%	56.38%
Unhygienic Toilet	27.66%	30.8%	43.62%
No Toilet	12.61%	0.4%	0%
Total	100%	100%	100%
Access to Toilet (including unhygienic)	87.43%	99.6%	100%

Source: * GOB et.al. 2004 ** Census Survey, 2011 *** Field Survey, February 2014

From Table 4.5, it is interesting to note that access to toilet has been increased considerably in last one decade, but the sanitation coverage has not been improved. Although the census data reveals a bit better sanitation situation, the sample survey results depict even worse scenario in relation to the national average sanitation data of last decade. At present, although all the sample surveyed urban dwellers of the town have access to toilets, only 56.38% have hygienic toilet facility and the reset 43.62%have unhygienic toilets. Table 4.6 below shows the cross tabulation between house construction type and toilet type:

Plate 4.1: There is Leakage in the Ring – So the Latrine is no Longer Hygienic

Table 4.6: Type of Toilets Vs House Construction Types

House Construction Type	Hygienic Type			Hygienic Latrine Total	Unhygienic Latrine	Total
	Single Pit Latrine	Twin Pit Latrine	Septic Tank			
RCC Building	1	0	24	25	2	27
Brick Wall, Tin Shade	4	0	10	14	11	25
Tin Wall, Tin Shade	6	1	7	14	27	41
Katcha House	0	0	0	0	1	1
Total	11	1	41	53	41	94

Source: Field Survey, February 2014

Table 4.5 reveals that there is high correlation between house construction types and toilet types – buildings with better construction tend to possess more hygienic latrines. Most of the RCC buildings have latrines with septic tanks (24 out of 27), and most of them are hygienic (25 out of 27). On the other hand, houses with brick wall and tin roof possess 14 hygienic latrines in comparison to 11 unhygienic latrines. The third house type, tin wall and tin shade possess the maximum numbers of unhygienic toilets (27) with 14 hygienic toilets (50% of which are pit latrines). The only Katcha house also possesses unhygienic toilet. Table 4.7 below depicts the cross tabulation between monthly household income and toilet type:

Table 4.7: Type of Toilets Vs Monthly Household Income

Household income	Hygienic Type			Hygienic Latrine Total	Unhygienic Latrine	Total
	Single Pit Latrine	Twin Pit Latrine	Septic Tank			
Up to 5000	0	0	0	0	1	1
5001-10000	2	0	1	3	5	8
10001-15000	1	0	1	2	10	12
15001-20000	5	0	10	15	11	26
20001-25000	0	0	10	10	6	16
25001-30000	1	0	4	5	2	7
30001-35000	1	1	8	10	2	12
35001-40000	0	0	5	5	3	8
above 40000	1	0	2	3	1	4
Total	11	1	41	53	41	94

Source: Field Survey, February 2014

Like Table 4.6, Table 4.7 also reveals good linkage between household income range and type of latrine; however the correlation is comparatively less here. For the first three income groups (up to income of Taka 15,000), possession of unhygienic latrine was higher than that of hygienic toilets. On the other hand, for the rest of the 6 income groups (above Taka 15,000), the numbers of hygienic toilets were higher than that of unhygienic toilets.

The southern part of the county is highly vulnerable to climate change impacts and rise of sea level. The pit latrines and septic tanks of low lying areas of Mathbaria Pourashava go under water during high tides, especially during monsoon. Table 4.8 below depicts the number of surveyed households whose latrines become inundated during high tides.

Table 4.8: Pits or Septic Tanks getting drowned during High Tides:

Type of Toilets	No.
Constructed as sanitary but not hygienic now	6
Hygienic toilets	3
Total	9

Source: Field Survey, February 2014

Survey data reveals that the above mentioned toilet types, e.g. households with septic tanks or pit latrine slabs getting inundated during high tides are located at Ward 2 and Ward 9. Even if the existing toilets are sanitary in those areas, high tide flooding over the slab or septic tank turns the whole locality unsanitary and unhygienic. Special structural measures are needed to be taken to solve the problem.

4.6 Reasons for Not Having Latrine or Unhygienic Latrine

Those respondents who have unhygienic latrine were asked to prioritize reasons behind such condition. Table 4.9 shows the reasons for not having hygienic latrine.

Table 4.9: Reasons for not Having Hygienic Latrine

Reason	Rank 1	Rank 2	Total	Priority
No money	14	2	16	II
No land	0	2	2	III
Lack of awareness	23	7	30	I
Total	37	11	48	

Source: Field Survey, February 2014

Table 4.9 depicts that few respondents (4) did not mention any reason, while 37 respondents identified two reasons under rank 1, and 11 opined for three reasons under rank 2. It is clearly evident from the above table that lack of awareness is main cause of having unhygienic latrines; while no having money is the second important reason. Close monitoring of Table 4.9 and Table 4.7 provides the feedback that necessary support has to be ensured for the lower income groups, while massive awareness generation is highly necessary for all to achieve complete sanitation at the town. For preparation of action plan to improve sanitation in the Pourashava, these reasons should be given due importance and consideration

4.7 Dimensions of Septic Tanks and Pits and their Average Filling Period

The size of the septic tank of a house is determined on the basis of the number of future users of the under construction building, and the septic tank is accordingly constructed following the specification given the by government. On the other hand, the ring sizes of the pit latrines vary depending upon the choice/requirement of the concerned house owner. The user specified dimensions of the septic tanks as well as ring sizes of the pit latrines and their areas are shown in Table 4.10 below:

Table 4.10: Dimensions and Volumes of Different Sizes of Septic Tanks and Pit Latrines

Description	Dimension	Volume (cft)	Volume (m^3)
Septic Tanks			
Type 1: 10 Users	6 ft *2.5 ft * 3.125 ft	46.88	1.33
Type 2: 20 Users	8 ft * 2.5 ft * 4.5 ft	90.00	2.55
Type 3: 30 Users	9 ft * 2.5 ft * 4.5 ft	101.25	2.87
Type 4: 50 Users	11 ft * 4.17 ft * 4.17 ft	190.98	5.41
Type 5: 100 Users	17.42 ft * 4.17 ft * 5.42 ft	393.09	11.13
Type 6: 200 Users	22.17 ft * 6 ft * 5.42 ft	720.42	20.40
Single Pit Latrines			
Type 1: Medium	Ring Dia = 2.5 ft, Ring h = 1 ft, Ring No. = 6	29.45	0.80
Type 2: Large	Ring Dia = 3 ft, Ring h = 1 ft, Ring No. = 6	42.41	1.15
Twin Pit Latrines			
Type 1: Medium	Ring Dia = 2.5 ft, Ring h = 1 ft, Ring No. = 6	58.90	1.59
Type 2: Large	Ring Dia = 3 ft, Ring h = 1 ft, Ring No. = 6	84.82	2.29

Source: Field Survey, February 2014

It is to be noted that most of the respondents failed to mention the size of their septic tanks or pit latrines. The dimensions shown in Table 4.10 were collected during Institutional Survey at Mathbaria Pourashava. Besides, the large size pit latrines are very rarely used at Mathbaria Pourashava. Fig 4.4 shows the duration versus percentage of pit/septic tank cleaning at the Pourashava.

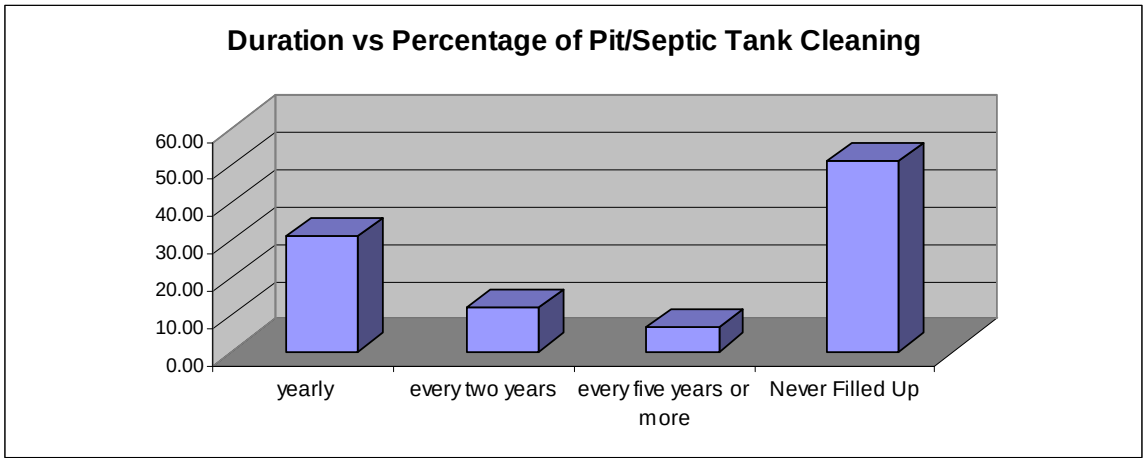

Fig 4.4: Duration versus Percentage of Pit/Septic Tank Cleaning

Fig 4.4 shows that 30.85% households clean the pit/septic tank every year, while 11.70% in every two years followed by 6.38% in every five years or more. The most interesting finding was that 51.07% pits/septic tanks were never filled up, which will later be analyzed whether these latrines have connection to drain/canal or have leakage on the basis of average filling time of the concerned pits or septic tanks. Table 4.11, Table 4.12, Table 4.13 and Table 4.14 below shows the average filling time of unhygienic pit latrines, hygienic single pit latrines, hygienic twin pit latrines and hygienic septic tanks.

Table 4.11: Average Filling Time of Unhygienic Pit Latrines

Filling time	HH No.	Filling Time (year) [Filling Time* HH No.]	Average Filling Time (year)
Yearly	24	24.00	1.32
Every Two Years	6	12.00	
Every Five Years or More	1	5.00	
Total	31	41.00	

Source: Field Survey, February 2014

Table 4.12: Average Filling Time of Hygienic Single Pit Latrines

Filling time	HH No.	Filling Time (year) [Filling Time* HH No.]	Average Filling Time (year)
Yearly	4	4	1.88
Every Two Years	3	6	
Every Five Years or More	1	5	
Total	8	15	

Source: Field Survey, February 2014

Table 4.13: Average Filling Time of Hygienic Twin Pit Latrines

Filling time	HH No.	Filling Time (year) [Filling Time* HH No.]	Average Filling Time (year)
Yearly	1	1	1.00
Total	1	1	

Source: Field Survey, February 2014

Table 4.14: Average Filling Time of Hygienic Septic Tanks

Filling time	HH No.	Filling Time (year) [Filling Time* HH No.]	Average Filling Time (year)
Every Two Years	2	4	4.00
Every Five Years or More	4	20	
Total	6	24	

Source: Field Survey, February 2014

It is evident from the above tables that the average filling time of unhygienic pit latrines is 1.32 years, while the filling times for hygienic single pit latrines, hygienic twin pit latrines and septic tanks are 1.88 years, 1 year and 4 years respectively. With analogy, it might be assumed that the unhygienic pit latrines were constructed previously as hygienic latrines with smaller rings, but have become unhygienic now, due to lack of necessary maintenance. Since, these latrines were mostly constructed with smaller rings, they use to get filled up in comparatively less time. Table 4.15 below shows the numbers of the different types of latrines that never filled up with their construction age:

Table 4.15 Numbers of Latrines that Never Filled Vs Their Construction Age

Type of Latrine	Construction Age									Total No.
	1 Year	2 Years	3 Years	4 Years	5 Years	7 Years	8 Years	10 Years	15 Years	
Single Pit Latrine	1	0	1	0	1	0	0	0	0	3
Septic Tank	3	5	12	1	7	2	1	3	1	35
Unhygienic Latrine	7	2	1	0	0	0	0	0	0	10
Total	11	7	14	1	8	2	1	3	1	48

Source: Field Survey, February 2014

Table 4.15 reveals very interesting situation – 35 latrines out of 48 that never got filled up were with septic tanks. While the average filling time of the septic tanks is 4 years, 12 septic tanks (among 35) were constructed before more than 4 year; more specifically, 7 out of 35 septic tanks have the construction age of 7 years or more. Analogically it might be assumed that a great percentage of these septic tanks with more than 4 years of construction age are illegally connected to adjoining canals or drains. It is to be noted that septic tanks are used by more literate and more affluent groups of the society. However, connecting their septic tanks to drains or canals, and thereby polluting the environment just for saving the cost of cleaning the tanks is not acceptable at all.

From Table 4.15, similar analogy might be drawn regarding the hygienic pit latrines and unhygienic latrines – 2 out of 3 hygienic single pit latrines and 3 out of 10 unhygienic latrines might have leakage or illegal connection to drains or canals.

4.8 Collection and Disposal of Faecal Sludge

At present, there is no formal or environmentally sound faecal sludge collection and disposal system at Mathbaria Pourashava. Mathbaria Pourashava does not provide any service for collection and disposal of the sludge. No vacuum tug is available at the Pourashava for collection of the sludge, as such all the households requiring pit cleaning depend upon sweepers to clean the pits/septic tanks manually.

When the pit latrine or septic tank of any individual household gets filled up, the concerned owner of the house hire local sweepers (methors) for emptying the pit or tank. Generally, the sweepers empty the pits and tanks manually, and the extracted sludge is buried under soil at the place of the concerned house owner. However, when the owner can not provide any place for disposing the sludge, or even when the owner intends to minimize his/her cost (for digging hole and burying

sludge), it is disposed in nearby river/ canal/ drain/ low lying area. Table 4.16 below depicts the frequency and percentage of the households regarding the ways the withdrawn sludge is disposed at Mathbaria Pourashava:

Table 4.16: Present Practice of Sludge Disposal at Mathbaria Pourashava

Disposal of Faecal Sludge	No. of HHs	Percentage
Buried under Soil	43	93.48%
Put in to Adjacent Drain	1	2.17%
Put in to Canal	2	4.35%
Total	46	100.00%

Source: Field Survey, February 2014

Faecal sludge of less than two year is not fully decomposed and contains high pollution load. Table 4.16 shows that 93.48% households dispose the withdrawn sludge by burying under soil, while 4.35% households leave the sludge in to canals, and 2.17% households put it in to adjacent drains. The partially decomposed faecal sludge being poured in to canals or drains eventually reach to the river, and pollute the surface water. On the other hand, the partially decomposed sludge being buried under soil pollutes the soil and ground water. Figure 4.5 below shows the cost of cleaning of pit / septic tank per household.

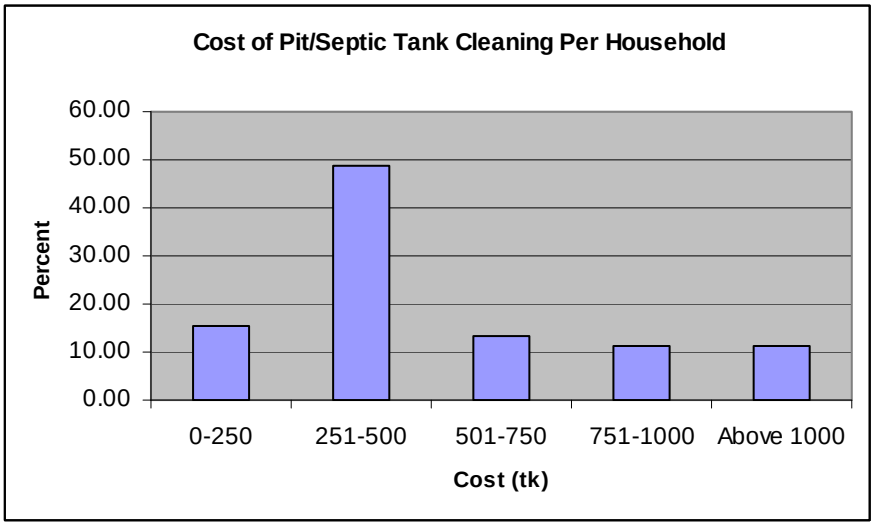

Fig 4.5: Cost of Pit /Septic Tank Cleaning

Field survey data reveals that only one out of 46 households remove sludge from the filled up pits/tanks and dispose it on their own, while the rest hire local methors for the purpose. At present the cost of pit/septic tank cleaning per household varies between Taka 200 to Taka 1500. The average cost of cleaning the filled up pit or septic tanks is Taka 574.45. Fig 4.5 shows that 48.89% households' cost of removing and disposing the sludge lies within the cost range of Taka 251-500, while the 4 other cost categories lie between the ranges of 11% to 16%.

It is quite evident that Mathbaria Pourashava does not possess any effective mechanism regarding environmental quality control on how sludge of the emptied pit or tank is disposed. Although there is a position of Sanitary Inspector in all the Pourashavas, he does not have any work force for maintenance of sanitation works. As emptying pit latrines and septic tanks is done by local sweepers, the Sanitary Inspector does not have any direct control over them. Besides, the Sanitary Inspector has to do a lot of other tasks in addition to sanitation activities.

4.9 Satisfaction Level with Present FSM Practice and Expenditure

When the respondents were asked whether they were happy with the present fecal sludge management (FSM) service of Mathbaria Pourashava, all of them (100%) responded that they were not happy with the current practice. Table 4.17 below shows the summary of the comments made by the respondents regarding the way of improving the current services on FSM:

Table 4.17: Respondents' Opinion on the Ways of Improving FSM Services by the Pourashava

Way of improving FSM Service by the Pourashava	No. of Respondent	Percentage
No Comment	66	70.21%
Ensure Availability of Pourashava Methors	19	20.21%
Introduction of Innovative, Effective & Mechanized Service	9	9.58%
Total	94	100.00%

Source: Field Survey, February 2014

Table 4.17 depicts that about 30% respondents opined how the present FSM service of the Pourashava might be improved, while 70.21% respondents did not make any comment on this regard – this reveals lack of awareness of the respondents regarding effective FSM management at urban areas. 20.21% respondents stated that Pourashava Authority should employ methors / sweepers for cleaning the pits/ septic tanks, who will work under the sanitary inspector – then citizens would easily get quality service from Pourashava Authority at acceptable fee by applying to Pourashava Authority. On the other hand, 9.58% respondents opined for introduction of innovative, effective and mechanized FSM services with collection and transportation vehicles and treatment facility of the collected sludge. Table 4.18 below shows the summary of the comments made by the respondents regarding payment modality on FSM at Mathbaria Pourashava:

Table 4.18: Respondents' Opinion on the Payment Modality for FSM Services to be provided by the Pourashava

Payment Modality for FSM Service to be provided by the Pourashava	No. of Respondent	Percentage
No Comment	54	57.44%
Fixed Cost	20	21.28%
Lower Cost	20	21.28%
Total	94	100.00%

Source: Field Survey, February 2014

In Table 4.18, like the previous table, majority of the respondents did provide any opinion. 20 respondents (21.28%) suggested that Pourashava Authority should provide the service, and there should be fixed cost for different types of latrines and sizes of pits/septic tanks. On the other hand, same number of respondents (20, 21.28%) opined that the cost should be lower than what they are currently paying to the local methors.

4.10 Willingness to Pay for Improved FSM System

The current FSM practice entails whole day long digging of hole, then whole night long manual collection of pits/septic tanks, and afterwards burying it under soil – it is a cumbersome practice that wastes time and money of the concerned households, generates odor and air pollution, and the practice is not environment friendly at all. The respondents were informed that environment friendly and efficient FSM system will be developed at Mathbaria Pourashava through mechanized collection of the sludge, carrying the sludge by vacuum tugs to the treatment plant, and ensuring efficient treatment of the sludge. They were also informed that the improved sludge collection system will consume negligible time, and will safeguard the household environment, and finally, will ensure environmental safety of their town as a whole through effective treatment of the sludge. The respondents were then asked whether and how much they were willing to pay

more in addition to their current FSM expenditure – the results have been summarized below in Table 4.19 below:

Table 4.19: Respondents' Willingness to Pay in Addition for Improved FSM Service

Household Income	Respondents' Willingness to Pay in Addition to Current FSM Expenditure (Taka)						No. of Respondent	%
	No Contribution	Up to 250	251-500	501-750	751-1000	Above 1000		
Up to 5000		1	0	0	0	0	1	1.06%
5001-10000		6	2	0	0	0	8	8.51%
10001-15000	2	9	1	0	0	0	12	12.77%
15001-20000	2	13	9	2	0	0	26	27.66%
20001-25000	1	6	7	1	1	0	16	17.02%
25001-30000	1	2	2	2	0	0	7	7.45%
30001-35000		5	3	2	2	0	12	12.77%
35001-40000		2	2	3	1	0	8	8.51%
above 40000		1	1	0	0	2	4	4.25%
Total	6	45	27	10	4	2	94	100.00%

Source: Field Survey, February 2014

Table 4.19 depicts that the maximum number of respondents (45) were willing to make additional payment of Taka up to 250 for improved FSM services was followed by 27 respondents who wanted to pay in addition Taka 251-500. The table also reveals that willingness to pay higher is slightly related with higher household income, though a good number of high incoming households opined to additional payment of Taka 250 and Taka 500.

The Average amount of willingness to pay in addition for improved fecal sludge management service was Taka 336.70 – the amount is 58.61% of the current average cost (Taka 574.45) of cleaning pits/septic tanks.

It is quite interesting to observe that only 6 respondents out of 94 were not willing to pay extra money, whereas 20 respondents opined for lowering the FSM cost in previous table (Table 4.18). Only the little motivation work of the surveyor during household survey on how they will be benefited from improved and innovative FSM service at the Pourashava, changed their mind. In a nutshell, awareness generation and motivation work will play a massive role in introducing improved FSM facility and its successful economic operation at Mathbaria Pourashava.

4.11 Estimation of Daily Demand for the FS Collection and Disposal

Census 2011 results depict that there are 4,254 households at Mathbaria Pourashava. On the other hand, the sample household survey states that 46 households' latrines become filled up in different time periods. On the basis of the numbers of sample pit/septic tank latrines, the weighted figures of concerned pit/septic tank latrines of Mathbaria Pourashava have been calculated. Then based on average filling time and average pit/septic tank sizes, the daily demand for each type of latrine and total daily demand have been calculated. Table 4.20 below depicts the estimation of daily demand for removal of faecal sludge at Mathbaria Pourashava:

Table 4.20: Estimation of Daily Demand for Removal of Faecal Sludge

Description	Pit Latrine	Twin Pit Latrine	Septic Tank	Total Filled Up Latrines	Latrines Never Filled Up	Total HH
Sample Survey HHs	39	1	6	46	48	94
Estimated Pourashava HHs	1765	45	272	2082	2172	4254
*Avg. Filling Time (year)	1.88	1	4			
**Pit/ Septic Tank Size (m^3)	0.87	0.87	2.87			
Daily Demand (m^3)	2.23	0.11	0.53	2.87		
Monthly Demand (m^3)	66.9	3.7	16.00	86.12		
No. of Latrines to be cleaned per month	76	4	6	86		

Estimated by the Consultant

*Avg. Filling Time (year): For pit latrine, weighted average value of unhygienic and hygienic pit latrines is considered.

**Pit/ Septic Tank Size:

- Weighted average volume of pit latrines calculated considering 80% medium size rings and 20% large size rings.
- Volume of the septic tank for 30 persons considered.

Table 4.20 depicts that at least 6 septic tanks, 76 single pit latrines and 4 twin pit latrines would be needed to be cleaned every month at Mathbaria Pourashava. Total monthly generation for faecal sludge is estimated at 86 cubic meters and daily demand will be 2.87 cubic meters.

However it has been found that 42.56% respondents opted for fixed cost or even lowering the cost of faecal sludge collection (see Table 4.18), while little motivating comments of the surveyors received far better response from the same respondents, as 93.62% of them were willing to pay Taka 336.70 in addition to their current FS collection expenditure for effective, time saving and environment friendlier FS collection facility. In a nutshell, massive awareness generation and motivation work needs to be done at Mathbaria Pourashava for establishing a sustainable faecal sludge collection and treatment facility at the Pourashava. As such, conservative estimated demand for faecal sludge collection is estimated at 2.65 cubic meter per day (considering 93.62% of the household paying for the services)

Considering the volume of pits latrines and septic tank, the average daily volume generated per day for collection is 2.87 cubic meter. Based on this data, sludge accumulation rate is calculated at 0.057 cubic meter/cap/year. The sludge accumulation rate will increase with the conversion of unhygienic toilet into hygienic toilet. Other studies have shown that sludge accumulation rate in pits and tank varies between 0.04-0.07 cubic meter/cap/year considering upon storage and digestion for at least 1 year in pits or vaults in hot climate (EWAG, 2002). For design of facial sludge management facility 2.65 cubic meter per day can considered as a demand.

4.12 Key Issues of Sanitation in Mathbaria

Based on the field survey following problems have been identified which need to be addressed to improve the sanitation situation of the pourashava:

i) *Discharge of Faecal Sludge to Open Land & Water Bodies:* It is estimated that 1047.55 cubic meters of untreated human excreta per year is disposed in an unsanitary manner mainly to low-lying areas, khals and water bodies creating severe environmental and health problems. As a result, residents of the municipality are affected by water and sanitation related diseases especially due to exposure to faecally contaminated water. Discharge of human excreta on land and water bodies should be immediately controlled to protect public health and environment. It has been found from the survey that 71.28% of the households were affected with water and sanitation related diseases. Based on the field survey it is estimated that the cost of treatment for illness of 71.28%of the household in Matbaria pourashava is estimated at Taka 6.05 million (USD 77,615). This is excluding the productivity related losses due sickness.

ii) *Lack of Awareness is the Major Barrier to Sanitation for Low-income People:* Low-income people who have unhygienic toilet/hanging toilets has identified lack of awareness followed by shortage of fund as the major barrier to upgrade their existing unhygienic toilet to hygienic one ..

iii) *Prevalence of Unhygienic Toilets:* It has been found from the field survey that 100% population has access to toilet facility. However, about 43.62% of the households have unsanitary toilets out of which 75.61% is unhygienic due to broken water trap, ring or leakage and 21.95 % due to getting inundated by high tides, while 2.44 % is directly connected to drain, pond or canals. About 60.98% of the unhygienic toilet belongs to lower middle to upper income groups. Lack of awareness and technical knowledge is a constraint for these households.

iv) *Absence of Faecal Sludge Collection and Treatment System*: There is no faecal sludge collection truck in the pourashava. As a result, all the households requiring sludge removal depend upon traditional sweepers who clean it manually. Moreover, due to absence of treatment facility of faecal sludge coupled with absence of regulation to control it, all the sludges are disposed in drains in water bodies and low-lying areas.

v) *Lack of Technical Expertise & Awareness Regarding Faecal Sludge Management:* Awareness and technical expertise regarding proper faecal sludge collection and management is lacking amongst the health and conservancy staff of the pourashava. At present there is only one sanitary inspector in the pourashava under health section. None of staff in the health section of the pourashava dealing with sanitation and conservancy do not have any training on sanitation or faecal sludge management.

CHAPTER 5

OPTIONS TO IMPROVE FAECAL SLUDGE MANAGEMENT SYSTEM

5.1 Strategy for Sanitation

The present sanitation approach being followed is mainly concentrating on increasing the sanitation coverage to reach 100%. However, this approach may lead to another environmental problem which has not been perceived by the policy planners. With increase in the sanitation coverage, there is a subsequent increase in the faecal sludge accumulation. Absence of proper faecal sludge collection and treatment can lead to severe water pollution, consequently leading to adverse health impacts. As such, the sanitation strategy for Mathbaria should focus on the following issues:

- Increasing sanitation coverage to 100% with hygienic toilets only ;
- Providing technical and financial support the household's who are facing problem with inundation of toilets during high tide.
- Guarantying an environmentally sound faecal sludge collection, treatment and recycling system along with increase of sanitation coverage with full cost recovery for feacal sludge management;
- Prioritizing on-site sanitation system with environmentally sound faecal sludge management over conventional water borne sewerage system with cost recovery mechanism;
- Arranging financing facilities without interest low-income households to install hygienic toilets;
- Promoting private sector participation in faecal sludge collection and treatment as well as NGOs participation in awareness raising on use of hygienic toilets and personal hygiene;
- Providing technical support to households to install septic tanks as well as financial incentives through tax rebates to household who will install septic tanks.
- Awareness raising campaign should clearly demonstrate the close link between lack of proper faecal sludge management and incidence of diseases; and
- Institutional strengthening and capacity building of the sanitation and conservancy units of the pourashava with adequate staff fully trained to on sanitation/feacal sludge management and environmental sanitation issues.

5.2 Options for Improvement of Sanitation System

5.2.1 Increasing the Sanitation Coverage

It has been found from the field survey that 100% population has access to toilet facility. However, about 43.62% of the households have unsanitary toilets out of which 75.61% is unhygienic due to broken water trap, ring or leakage and 21.95 % due to getting inundated by high tides, while 2.44 % is directly connected to drain, pond or canals. Sanitation situation of the pourashava is shown in the following table.

Table 5.1: Unhygienic toilets by Income Groups in Mathbaria Pourashava

Household income		Connected with drain/ pond/ canal/ditch	Broken Water Trap / Ring or Leakage	Get Inundated by High Tides		Total	
				Broken Water Trap / Ring or Leakage	Hygienic but gets inundated	No.	%
Up to 5000			1			1	2.44
5001-10000			4	1		5	12.19
10001-15000			8	2		10	24.39
15001-20000			8	3		11	26.83
20001-25000		1	4		1	6	14.63
25001-30000			2			2	4.88
30001-35000			1		1	2	4.88
35001-40000			2		1	3	7.32
above 40000			1			1	2.44
Total	No.	1	31	6	3	41	100
	%	2.44	75.61	14.63	7.32	100	

42% of the broken trap/ring or leakage belongs to households having monthly income upto Taka 15000. Out of this 42%, 14.63% of the households have an income upto Taka 10,000 per month. It is therefore recommend that pourashava should provide some financial support/grant to low-income groups (income upto Tk. 10,000/month) to install sanitary toilets which would obviously motivate them to adopt hygienic practice. However, an awareness building campaign should go parallel with the support to convert the aforementioned toilets into a hygienic one.

Pourashava can engage NGOs such as BRAC, CARE, DSK, WaterAid or NGO Forum for Public Health to repair such toilets for the low income groups.

Table 5.2: Fund Required for Low Income Groups to Repair their Unhygienic Toilets

Grant Amount	Number of Household	Total Fund Required
Tk. 1500	270	Taka 405,000 (USD 5,192)

5.2.2 Options for Converting Unhygienic Toilets into Hygienic Ones

43.62% of toilets are found to be unhygienic as they are directly connected to drain, broken traps/ rings or with leakages in the pits as well as gets inundated during floods. About 60.98% of these toilets belong to lower middle to upper middle income groups. Money and space are not barriers for middle income group to convert the unhygienic toilet into hygienic one. Following strategies may be undertaken to discourage unhygienic toilets in the pourashava:

- Bangladesh National Building Code 1993 as well as Local Government (Pourashava) (Amended) Act 2010 can be used/applied by the pourashava to ban the unhygienic toilets.

- Since 60.98% of the unhygienic toilets belong to lower middle to upper middle income groups which are directly connected to open drains, water bodies or low-lying areas or broken water trap or rings as well as gets inundated during high tides should be given specific time limit of maximum 3 months for converting them into hygienic one. In addition to fines, Pourashava can give 5%-7% of reduction in municipal tax for households converting the unhygienic toilet into hygienic one. Moreover, in case of failure to convert it, pourashava can charge 10-15% higher municipal tax to such households to comply with the deadline.

- 135 households belonging to upper income group have hygienic toilets but it gets inundated during high tides. As such technical support should be provided by the project

to ensure that these toilets are not inundated during the high tides. One option is to promote raised pit latrines to avoid the toilets getting inundated.

- In order to raise awareness in this regard pourashava should engage NGOs for door-to-door awareness campaign to convert unhygienic toilets into hygienic one.

- From the field survey, it has been found that desludging rate for septic tank is minimum 4 years. As such, before approving construction plans for new buildings, pourashava should enforce that new household must have septic tank and design for such septic tank must follow BNBC design or DPHE/LGED design. For new buildings, after construction and subject to verification by concerned engineering section, pourashava may allow tax rebate for 2-3 years for new buildings having septic tanks. This will encourage the owners to opt for construction of septic tanks instead a pit latrine. Promotion of septic tank will reduce the amount of faecal sludge to be collected every day which will in turn help to reduce the operation and maintenance cost of faecal sludge management system.

5.3 Options for Faecal Sludge Management in Mathbaria

Currently, the management of fecal sludge in Mathbaria is quite unsatisfactory because:

- Faecal sludge is dumped into the environment;

- Pits and septic tanks are emptied manually, faecal sludge is handled carelessly and dumped into the drainage system and the environment; and

The situation in Mathbaria is typical of secondary towns in Bangladesh.

Future Situation

It is expected that faecal sludge volume will increase considerably within a few years with the increase in sanitation coverage. While the present situation is still bad, it will soon change dramatically entailing great problems with collection and the disposal of faecal sludge in the coming years. Following Table shows estimated amount of faecal sludge to be generated in the Mathbaria pourashava:

Table 5.3: Estimated Amount of Faecal Sludge Generation in Mathbaria Pourashava

Year	Population*	Faecal Sludge** Generated Per Year (cu.m)	Faecal Sludge Generated Per Day (cu.m)
2020	23,975	1366.58	3.74
2025	27,794	1584.26	4.34
2030	32,221	1836.59	5.03
2035	37,353	2129.12	5.83

*Population projection is based on considering medium growth rate
**FS is calculated based on rate of 0.057 cubic meter/cap/year

Impacts

The handling of fecal sludge which is currently practiced has two principal negative impacts. These will become much worse in future, with expected increase of faecal sludge produced:

- *Risk for public health due to lacking treatment or safe disposal:* Sludge accumulated in septic tanks/pits contains pathogen organisms like bacteria causing diarrhea, dysentery, cholera, typhoid, etc. and intestinal parasites. Whenever human beings come in direct contact with faecal sludge, these diseases can be transmitted. The risk of transmission of

diseases becomes grave when faecal sludge is handled without protective measures, when faecal sludge is spread in the environment or when used in agriculture.

- *Solids accumulation in drainage system due to lacking maintenance of septic tanks/pits:* If septic tanks/pits are not emptied at regular intervals, they loose their main function, the retention of solids. Increased solid accumulation in the drainage system results and contributes to blockage of drains and flooding. The efforts for sewer cleaning have to be intensified.

Problems

Improved faecal sludge management requires increased emptying frequency of septic tanks/pits, extended coverage of the service to all households, and eliminating untreated faecal sludge polluting the environment. The main problems to overcome are:

- Lacking awareness of municipality and population of the problem and the needs for improvement;
- Lack of financial, technical and operational capacity of the pourashava for improved faecal sludge collection; and
- Lack of a treatment facility or a safe disposal site for faecal sludge.

5.3.1 Faecal Sludge Collection Option and Transportation Option

Several types of vaccum tanks of 1 to 8 cu.m capacity are available. Moreover, there are small capacity vaccum tugs of 300 to 500 liter which can be hand-pushed.

Plate 5.1: 4 cu.m capacity Vaccutug, the Vaccum tank is installed on a truck

Plate 5.2: 2 cu.m capacity Vaccutug, the Vaccum tank is installed on a pick-up van

Plate 5.3: 2 cu.m capacity Vaccutug, the Vaccum tank is fixed with a tractor trolley

Based on the field survey, an estimated amount of 967.25 cu.m of faecal sludge has to be collected per year. It has been found from the field survey about that 56.38% of the households with hygienic toilets clean their pits/septic tanks within a year. Considering the road condition and width of Mathbaria pourashava, a small truck (1 cu.m) is recommended with up to 400-450 ft hose pipe

It has been found that 30.65% of the households clean their pits within a year and spend on average Tk. 575 per year. The percentage of household cleaning their pits is low mainly because 43.62% of the households have unhygienic toilets, i.e. it connected to drains, water bodies. Once the pourashava starts disconnecting this type of illegal connection, the frequency of pit cleaning will increase.

5.3.2 Faecal Sludge Treatment and Reuse Options

Faecal sludge management is in early stage in Bangladesh. Few urban local government bodies such as Dhaka, Khulna, Faridpur, Kushtia, Lakxmipur and Mymensingh has started faecal sludge collection through vaccutugs. Two examples of faecal sludge collection and treatment is described in Annex-3 and Annex-4.

National Sanitation Strategy 2005 recommends sewage treatment technologies with greater emphasis on resource recovery and recycling must be given top priority in improving urban sanitation situation. Using the aforementioned strategy, following technologies are available for faecal sludge management:

- Anaerobic Digestion;
- Co-composting of faecal sludge with municipal solid waste; &
- Refuse Derived Fuel from dried faecal sludge.

A comparison of different options is shown in Table 5.5:

Table 5.4: Different Options for Faecal Sludge Management Based on Resource Recovery Approach

Sl.	Features	Co-composting	Anaerobic Digestion	Refuse Derived Fuel
1	Description	In this technology FS and MSW is co-composted and used in agriculture. Technology used is aerobic thermophilic composting.	In this technology FS converted into biogas in anaerobic condition and biogas used as fuel or for generation of electricity.	In this technology FS is dried up to moisture content of 15%. Dried FS is used as solid fuel.
2	Infrastructure Required	F.S drying bed, percolated treatment system/co-co peat filter, compost plant and vaccu-tug;	Biogas digester, drying bed for slurry/drier, pipe for distribution of gas, generator for electricity generation and percolated treatment system/coco peat filter and vaccu tug.	FS drying bed with percolate treatment system /coco peat filter and vaccu-tug.
3	Applicable Regulations	Environment clearance certificate from DoE to operate FS treatment plant. License to produce and marketing of compost from DAE. Approval from MLG to charge fee/tax for FS collection Compliance with discharge standard of DOE for reuse waste water in agriculture or discharge to surface water.	Environment clearance certificate from DoE to operate anaerobic digestion plant. Power purchase agreement with PDB to sell electricity. License to produce and marketing of slurry as organic fertilizer. Approval from MLG to charge fee/tax for FS collection Compliance with discharge standard of DOE for reuse of waste water in agriculture or discharge to surface water.	Environment clearance certificate from DoE to operate RDF plant as FS treatment plant. Approval from MLG to charge fee/tax for FS collection Compliance with discharge standard of DOE for reuse waste water in agriculture or discharge to surface water.
4	Current Status of Regulations	Compost standards in place since 2009 MoA issued 50 license up to December 2013 for production and marketing of compost to private sector and government organizations. No guideline or regulation from MLG/MoEF for FSM No tax/fee set by MLG for FSM	No feeding tariff set yet for renewable energy projects by Ministry of Energy. As per standard slurry from biogas plant must be dry with moisture content of 20%. Marketing of liquid slurry is not allowed. No guideline or regulation from MLG/MoEF for FSM No tax/fee set by MLG for FSM	No guideline regulation on FSM by MLG /MoEF yet. No circular from government yet allowing charging of fee/tax for FS collection and usage.
5	Potential Source of Revenue	1. FS collection and management fee/tax 2. Sales of compost	1. FS collection and management fee/tax 2. Sale of electricity (no feed-in tariff yet). 3. Sale of slurry after drying upto 20% moisture content. Liquid slurry cannot be sold.	1. FS collection and management fee/tax. 2. Dried FS may be sold to brick kiln. Currently 2-3 million tons of coal is used in brink kilns. Piloting is required.
6	Emission Reduction Potential	Yes (in line with low carbon strategy of government). UNFCCC methodology is available to claim carbon credits through CDM	Yes (in line with low carbon strategy of government). UNFCCC methodology is available to claim carbon credits through CDM	Yes (in line with low carbon strategy of government). UNFCCC methodology is available to claim carbon credits through CDM

F.S= Feacal Sludge, F.S.M= Feacal Sludge Management, LGED= Local Government Engineering Department, MLG= Ministry of Local Government, MSW=Municipal Solid Waste
MoA= Ministry of Agriculture

5.3.3 Recommended Option for Faecal Sludge Treatment and Reuse

It is evident from the above Table 5.5 that anaerobic digestion, RDF and co-composting are the treatment technologies in line with the National Sanitation Strategy as well as National 3R Strategy for Waste Management.

Anaerobic digestion is technically possible, However, the major challenge is the use of biogas such as for electricity generation or use as fuel for cooking. Since feed-in tariff has not yet been finalized by the Ministry of Energy, it would be difficult to sell the electricity generated from use of this technology. Moreover, in case biogas is to be used as fuel for cooking purpose, the biggest challenge is the distribution system as well as pricing of gas for cooking. The third issue with anaerobic digestion project is marketing and sale of slurry. As per the organic fertilizer standard 2008 of the Government of Bangladesh, the maximum permissible moisture content for organic fertilizer/compost is 20%. Biogas slurry is in liquid form, as such without drying and reducing the moisture content, it would not be possible to market it. If sun drying is to be done, then it would require large area and incase mechanical drying is used then additional energy (electricity or diesel) would be required which will increase the operational and maintenance cost of the project.

Refused Derived Fuel (RDF) is also possible to be manufactured from dried faecal sludge. The required moisture content for RDF should be around 10-15%. Based on the amount of faecal sludge to be collected per day in Mathbaria, the total amount of RDF which can be produced is 10 tons in year. The potential users of RDF are brick kilns owners. However, the amount which can be produced in Mathbaria is too low for brick kiln uses.

Co-composting of dried faecal sludge seems to be the most attractive option since it will be able to treat and recycle both the faecal sludge as well as municipal organic waste in the same site. This will result in optimal use of the proposed new landfill site. Mathbaria municipality collects around 1.5 to 1.75 tons of waste per day out of which 87% is organic in nature. This waste can be treated effectively with faecal sludge from the drying bed. However, the most critical issue for co-composting project is the engagement of competent operator. As per the Government of Bangladesh regulation, operation of composting plant and marketing of compost requires license from the Ministry of Agriculture. As such it would be extremely important to engage compost plant operator who hold both the license. There are 50 operators in the private sector in Bangladesh who have the license to produce and market compost in the country. Although co-composting is an attractive option, the major barrier is that the pourashava does not have any landfill site. Pourashava has to purchase land for management of waste as well as faecal sludge.

CHAPTER 6

ACTION PLAN

6.1 Vision

The main vision of the action plan is to bring Mathbaria town under 100% sanitation coverage and thereby decreasing water and sanitation related diseases, along with protection of its environment by establishing and operating a sustainable faecal sludge management system that promotes resource recovery.

6.2 Scope

This action plan sets out a 5-year plan for sanitation improvement of Mathbaria poursahava area. This plan is divided into two parts- short term (2014-2015) and medium term (2016- 2019). Short term of the plan focuses on faecal sludge collection, treatment and reuse with participation rate of 73% household while medium term focuses on participation rate of 100% with no unhygienic toilet in the pourashava.

6.3 Objectives

The main objectives for improvement of the sanitation system over the next five years are:

- Institutional strengthening of sanitation committee of the pourashava;
- Promoting 100% sanitation coverage with hygienic toilets;
- Improving the unhygienic toilets into hygienic toilets .
- Improving faecal sludge collection and treatment based on full cost recovery ; and
- Improving public education and awareness about health and sanitation issues linked with lack of proper faecal sludge management.

6.4 Priority Measures

- The first priority is strengthening of the institutional and organizational capacity of the pourashava in terms of sanitation focusing on need for promotion of hygienic toilet and faecal sludge management. It is has been found that there is knowledge gap amongst the elected representatives of the pourashava as well as pourashava staff about faecal sludge management. It is very important to provide exposure training to Mayor and ward commissioners on different aspects of faecal sludge management including cost recovery aspects and benefits of involvement private sector or social business enterprises for operation and maintenance of such facilities. The exposure training should also include field demonstration of sludge collection and treatment system within Bangladesh and if possible in some neighboring countries. This training is important since political leadership of mayor and ward commissioners is crucial for start of the project as well as its sustainability. The second training should be for the pourashava engineers (Executive Engineer and Assistant Engineer) as well as Health Officer, Sanitary Inspector and Conservancy Inspector. This training should be more on the technical side dealing with operation and maintenance of faecal sludge collection and treatment system. Moreover, training should also focus on design of toilets in flood prone coastal areas. ITN-BUET along with NILG can organize these trainings and develop necessary course materials.

- The second priority is to raise awareness about the link between proper faecal sludge management health and disease. At present households spent Tk. 1980 per annum for

treatment of sanitation related disease. For raising awareness political leadership of the Mayor along with the ward commissioner is again very vital. Awareness campaign should be undertaken by engaging NGOs/CBOs involving door to door campaign, ward level meetings as well as involving imams of mosques focusing on change from manual to mechanical system of faecal collection and its proper management and need for payment for the aforesaid services. Raising awareness and social mobilizing is the key along with political leadership for improvement. Field survey has shown that 42 % of the residents are willing to pay fixed cost for faecal sludge collection if the service is provided by the pourashava .However only the little motivation work of the surveyor during household survey on how they will be benefited from improved and innovative FSM service at the Pourashava, changed their mind and 93% of the respondents were willing to pay extra compared to what they are paying currently which is Tk. 574.45 per annum for FSM. In a nutshell, awareness generation and motivation work will play a massive role in introducing improved FSM facility and its successful economic operation at Mathbaria Pourashava It is also important to involve and get support from Ministry of Environment and Ministry of Local Government in such awareness campaign. Since pourashava has limited budget for sanitation as such in order to have the awareness campaign support from the National Government or external agencies is required. . Table 6.1 shows the awareness raising strategy

- The third priority is conversion of unhygienic toilets into hygienic one .It has been found from the field survey that 100% population has access to toilet facility. However, about 43.62% of the households have unsanitary toilets out of which 75.61% is unhygienic due to broken water trap, ring or leakage and 21.95 % due to getting inundated by high tides, while 2.44 % is directly connected to drain, pond or canals. About 60.98% of the unhygienic toilet belongs to lower middle to upper income groups. Lack of awareness and technical knowledge is a constraint for these households. Remaining unhygienic toilets belonging to lower income have also identified lack of awareness and financing as a problem for use of unhygienic toilets. It is also important for the pourashava to prepare a vulnerability mapping of the areas where toilets get inundated during high tides and provide technical support to households to improve the design of the toilets such as raise toilets to avoid inundation.

- The fourth priority measure is to initiate a mechanical collection and treatment system of faecal sludge on full cost recovery basis. It is important to note that from field survey it has been found that 73% of the household are willing to pay fixed cost for faecal sludge collection and treatment if the service is initiated by the pourashava. Without cost recovery and proper operation and maintenance the faecal sludge would be difficult to sustain. Since the pourshava has limited manpower for sanitation, it is advisable to involve private sector or social business enterprises for the operation and maintenance

6.5 Resource Allocation

Mathbaria pourashava is not in a position to increase its expenditure on sanitation. During 2013-14 financial year, the GOB through its ADP allocated Tk. 200 per capita for WSS in the coastal districts. Based on this, total allocation for WSS for Mathbaria pourashava is estimated at Taka 3.87 million. Based on the past trend, around 85% of this allocation is for water supply while 10-15% for sanitation. As such total allocation for sanitation works out at Tk. 0.58 million. However, this allocation is not enough to achieve 100% sanitation coverage along with environmentally sound faecal sludge management. In order to improve sanitation situation in Mathbaria pourshava there is a need for more allocation of resources from the government through development project to build the infrastructure. In the business plan described in the following section, the total capital cost is considered as grant from the Government to the pourashava.

Table 6.1: Strategy for Awareness Raising

Purpose	Audience	Communication Elements	Medium	Actors	Type of Approach
• To sensitize towards proper faecal sludge collection and treatment as part of 100% sanitation coverage • To provide information regarding options for private sector involvement in FSM and associated benefits • To provide information regarding importance and methods of cost recovery for sustainability of FSM	• Mayor • Ward Councilors • Chief Executive Officer	• Information booklet • Power Point Presentation • Video documentary	• Workshop • Exposure Visit	ITN - BUET & NILG	Advocacy
• To sensitize towards different technical aspects of FSM (estimation of demand for FS collection, collection and transportation of FS, treatment and reuse of FS) • To enhance technical and management capacity regarding O&M of FS collection and treatment system • To provide tools (KPIs) for monitoring of FSM projects	• Pourashava Engineers • Medical Officer • Sanitary Inspector • LGED Engineers • DPHE Engineers	• Information booklet • Step by step manual on FSM • Video documentary	• ToT • Exposure visit	• ITN – BUET • Local/International Expert	Education
• To high light need for FS collection using vaccutug and its treatment. • To highlight the advantage of use of mechanical vaccutug for pit or septic tank cleaning compared to manual cleaning. Key message should include that mechanical cleaning will lower their cost of cleaning compared to manual cleaning as well as associated health benefits and time saving and solve disposal problem • To highlight the need for payment for cost recovery with focus that vaccutug service will lower the cost compared to manual cleaning • To highlight the FS collection process, payment procedure, how to contact FS collection service provider, register complains etc.	• Households	• Presentation • Leaflet • Video Documentary • Posters • Bill boards • Local cable channel • SMS	• Ward level meetings/seminar • Door-to-door awareness campaign • Distribution of leaflets	• Local Member of Parliament , Mayor, Ward Councilors, Religious leaders • NGOs, CBOs & female ward councilors. should be involved in door-to-door campaign along with	Mass Communication & Personal Communication

6.6 Business Plan

As discussed in Chapter 5, currently the most appropriate method for improved faecal sludge collection and treatment involves collection of faecal sludge by vaccutugs based on cost recovery basis. Treatment also involves further treatment of collected faecal sludge in drying bed and co-composting of dried sludge with municipal organic waste. This project has two potential revenue streams: firstly, service fee/charge for clearing pit/tank, and the second stream is from sale of co-compost. This type of pilot project has already been tested in Bangladesh. The following section describes diverse aspects of the project.

6.6.1 Volume of Faecal Sludge to be Collected

Based on survey, the total amount of faecal sludge available for collection is 2.65 cubic meters per day (see section 4.11 of Chapter 4).

6.6.2 Number of Vehicles (Vaccutug) for collection of Faecal Sludge

In the Mathbaria Pourashava, 77.28% of the roads are less than 3 meters wide. Moreover, 46.47% of road is earthen while 17.84% of the road is brick soling. Considering the road condition (especially width), it is advisable to procure one three wheeler mounted vaccutug of 1 cubic meters capacity. Considering total maximum amount of sludge to be collected 2.65 cubic meters maximum, three trips are required. Specification of small three wheeler mounted vaccutug is shown in Annex-3.

Plate 6.1: Three wheeler mounted vaccutug

Figure 6.1 shows the proposed landfill site where faecal sludge treatment plant of Mathbaria can be established, as well as distance from each ward to the proposed site for treatment plant. The average distance calculated from different wards to the proposed treatment plant is estimated at 2 kilometres maximum. After faecal sludge collection, the maximum travel time to the proposed plant is 30 minutes (considering a speed of 25 kilometres per hour). Sludge collection and disposal time are calculated at 1 hour total. The total time required is 1.5 hours per trip. As such, it is possible to make three trips per day to the faecal sludge treatment plant.

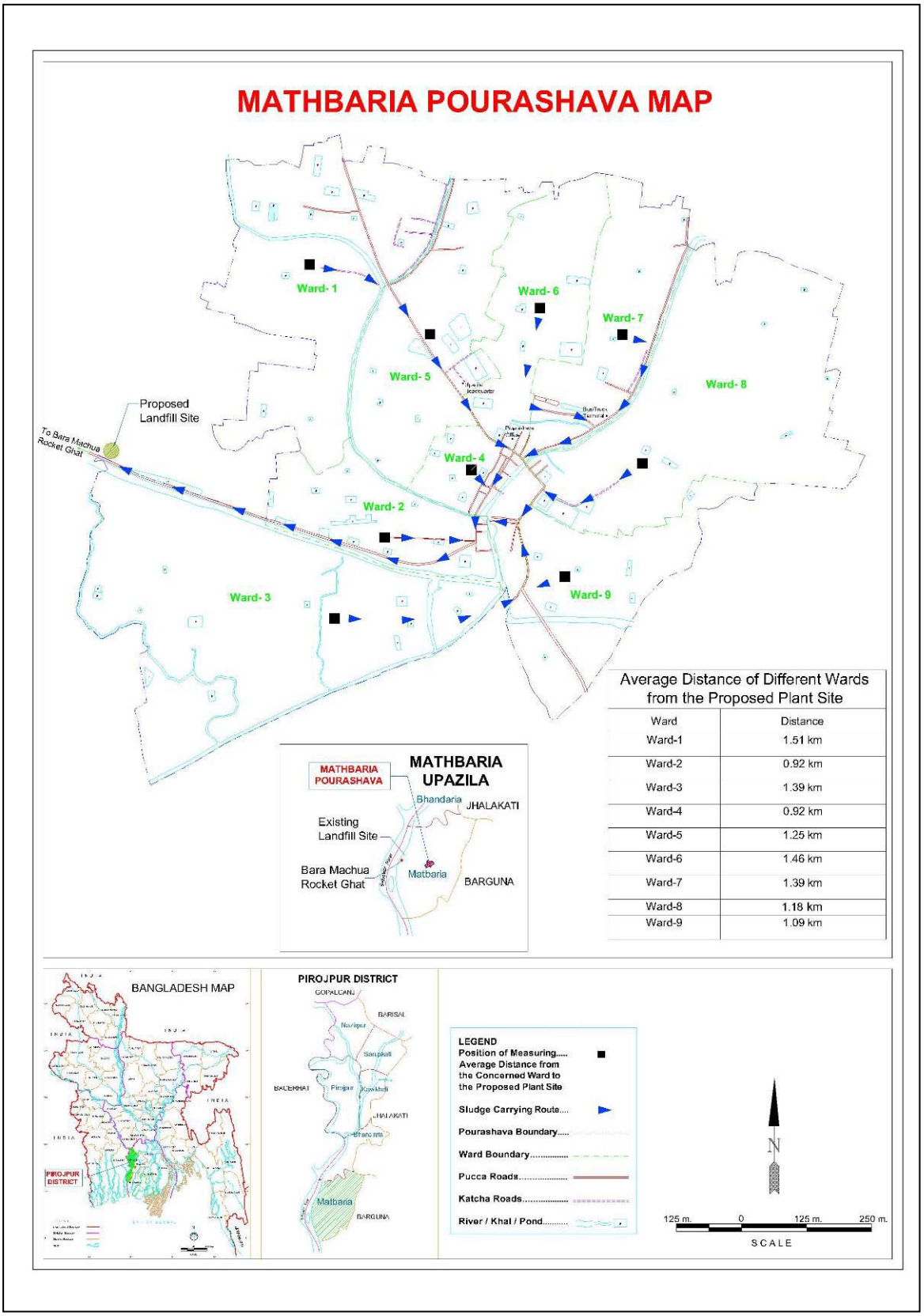

Figure 6.1: Map showing proposed site for faecal sludge treatment plant and distance from different wards to the proposed site

6.6.3 Capital Cost for Faecal Sludge Collection and Treatment

Capital cost for the faecal sludge collection and treatment system involves the following:

Land: For establishment of faecal sludge treatment plant land measuring 400 square meter is required for facilities such as drying bed with roof, percolate treatment plant as well as co-compost plant. Land for faecal sludge treatment plant is not available and pourashava has to purchase it. A suitable site at ward 3 has been proposed by the pourashava as landfill site. The site is suitable for such operations. Current market price of land varies between Taka 0.8- 1 million per katha. Land price in Mathbaria seems extremely high.

Vaccutug: For collection of faecal sludge from household, one vaccutug of 1 cubic meter capacity is required. Vaccutugs can be purchased from Bangladesh from local company called MAWTS. Following Table shows capital cost required for collection and treatment of faecal sludge.

Table 6.2: Capital Cost for Establishment of Faecal Sludge Collection and Treatment System in Mathbaria

Sl.	Items	USD
1	Vaccutug of 1 cubic metres capacity, mounted on a three wheeler (also taking into consideration carrying and training costs)	19,871.00
2	Construction cost of drying bed (100 sq. m) with roof a@ USD 160 per sq. m.	16,000.00
3	Co-peat filter with motor for treatment of percolate (10 sq. m)	9,000
4	Compost 1.5 tons/day capacity per day with necessary equipment (225 sq. m of land is required) @ USD 20,000/ton	30,000.00
5	Land cost for 400 square meters	61325.00
6	Contingency /Site Development	10,000.00
	Total	146,196

6.6.4 Operation Costs for the Faecal Sludge Collection and Treatment System

Operational cost for faecal sludge collection and treatment system involves salary for vaccutug driver and workers, salary for project manager, compost plant supervisor and workers. The operation and maintenance cost involves fuel for the faecal sludge collection, electricity and water bill, repair and maintenance of the vaccutugs and co-compost plant as well as PPE.

Two additional expenditure heads have been included to incentives collection and disposal of waste at the faecal sludge treatment facility as well as pay compensation to sweepers who will have reduced income due to shifting from manual to mechanical method of faecal sludge collection. These incentives will be provided based on performance by the operators of the faecal sludge collection system and co-compost plant.

The following table illustrates the operation costs for running the faecal sludge collection and treatment system.

Table 6.3: Operation and Maintenance Cost for Faecal Sludge Collection and Treatment System in Mathbaria

Sl.	Heads	Taka /Year	USD/Year
1	Salary of vaccutug driver @ Tk.10,000/month plus one month's bonus	130,000	1,666
2	Salary of two laborers @ Tk.7,000 each, plus one month's bonus	182,000	2,333
3	Project Manager cum Accountant @ Tk. 15,000/month plus one month's bonus	195,000	2500
4	Fuel for three wheeler	62,500	801.28
5	Fuel for vaccutug	37,444	480
6	Salary of 3 compost plant workers @Tk. 7000/month plus one month's bonus	273,000	3,500
7.	Salary of Co-compost plant supervisor @ Tk. 15000/month plus one month's bonus	195,000	2500
7	Electricity, water bills, dress, PPE and equipments	50,000	641
8	O & M of vehicle and plant	78000	1000
9	Depreciation	369,494	4737.1
	Sub-total	15,72,438	20,159.38
11.	Incentive for vaccutug driver and workers for each trip (1 cubic meter) of faecal sludge collected and brought to the treatment plant	76,800	985
12	Total	16,49,238	21,144

6.6.5 Cost Recovery

In order to sustain faecal sludge management services, it is essential to recover the operational costs and make profits. Total estimated operational cost including incentives for faecal sludge collection and treatment is estimated at USD 21,144. In order to sustain the operation a profit of 15% should charged on top of the expenditure. As such profit should be around USD 3,272 per year with 15% profit while with 20% profit it should be USD 4,229 per annum. The cost for faecal sludge collection and treatment can be imposed with either conservancy tax or as a separate charge as sanitation fee, subject to approval by the Ministry of local government, or at the time of clearing each pit/tank. The following table shows per households charge for faecal sludge collection and treatment services to be paid at the time of cleaning.

Table 6.4: Pit Cleaning and Treatment Charge

Total O & M including profit	Cost per Pit Cleaning (Taka)	Cost per Septic Tank Cleaning (Taka)	Per Year Cost for Pit/Year (Taka)	Per Year Cost for Septic Tank/Year (Taka)
USD 24,716 with depreciation and 15% profit	Taka 693 (cleaned every 1.88 years)	Taka 3394 (cleaned every 4 years)	368	849
USD 25,373 with depreciation and 20% profit	Taka 750 (cleaned every 1.88 years)	Taka 3434 (cleaned every 4 years)	399	858

It is interesting to note that currently households are spending an average on Taka 574 per year, which is 0.24 % of their average monthly income for removal of faecal sludge. The following table shows the current expenditure per month for water supply, electricity, and improved faecal sludge management services. It is interesting to note that by providing vaccutug services as well as faecal sludge treatment services, it will actually lower the cost currently incurred to the lower income group of people.

Table 6.5: Average Household Income Vs Monthly Expenditure on Utility Services

Average HH Income (Taka)	Electricity Bill Paid		Payment for Better FS Service (Pits)		Payment for Better FS Service (Septic Tank)	
	Taka	%	Taka	%	Taka	%
19,654	741	3.77	31	0.16	71	0.36

The other option in order to recover the cost for faecal sludge management service is to impose a fee or rate like conservancy by the pourashava. However, this can only be implemented subject to the approval of the local government ministry. The pourashava has to announce that it will provide services to all residents for removal of sludge for pits and septic tanks after getting approval from the Local Government Ministry. The total holdings in the Mathbaria Pourashava are 4254 out of which 93.62% is willing to pay if the service is provided by the town. As such, total household willing to pay the services is 3982. Following table shows sanitation fee per or rate household per year based on 15% and 20% profit margin on top of the operational cost.

Table 6.6: Sanitation Fee or Rate per Household (93 % of Holding Paying for the Services)

Total O & M including profit	Fee Per Year/HH	Fee Per Month/HH
USD 24,716 with depreciation and 15% profit	Taka 484	Taka 40.34
USD 25,377 with depreciation and 20% profit	Taka 497	Taka 41.42

Source: Calculated by Consultant

Table 6.7: Sanitation Fee or Rate per Household (100% of Holding Paying for the Services)

Total O & M including profit	Fee Per Year/HH	Fee Per Month/HH
USD 24,716 with depreciation and 15% profit	Taka 453.18	Taka 37.76
USD 25,377 with depreciation and 20% profit	Taka 465.23	Taka 38.76

Source: Calculated by Consultant

It is evident that households have to spend a negligible portion of their income for improved sludge management. The second option is to charge a flat charge of Taka 484 per year at all the holdings in the city for faecal sludge management, or Taka 40.34 per month with the conservancy tax. The third option towards recovering the cost is linking the sludge bill with water bill; this option is not viable for Matbaria since there is no piped water supply provided by the pourashava.

6.6.6 Recommended Tariff for Cost Recovery

It has been found from review of the Pourashava Act that at present there is no provision to charge a fee for sanitation or faecal sludge management in case pourashava wants to provide such services. In order to levy a service charge or fee/rate for faecal sludge collection and management, pourashava has to get approval from the Ministry of Local Government. Alternatively, Ministry of Local Government can amend the Pourashava Act and include sanitation fee/rate or charge as a separate fee similar to water rate or conservancy charge as mentioned in the Act. Cost recovery is very important for sustainability of municipal services. The options for cost recovery are as follows:

- The first option is a fixed charge for all holdings under the poursahava. This will amount to Taka 484 per annum (USD 6.20 per household per annum) or Taka 40.34 (USD 0.52 per household per month). This amount is based on the field survey indicating that 93% of the households are willing to pay for the services if provided by the pourashava. Moreover, from the field survey it was also found that households prefer to pay a fixed rate for faecal sludge collection and management. It is important to note that this amount is based on their willingness to pay as found from the field survey. This flat rate can be charged with the conservancy charge or as a separate sanitation fee.

- The second option is to charge a fee for pit latrine and/or septic tank cleaning. In this scenario a fee of Tk 693 (USD 8.8) per pit should be charged and Tk. 3394 (USD 43.51) for septic tank should charged. It may be added here that, from the field survey it has been found that households with septic tank desludge their tanks every four years interval. As such the per year cost would be for septic tank USD 10.08.

All the aforementioned options are viable and within the range of what household are paying now for manual cleaning of pits. However, based on the survey, it has been found that households are interested to pay a fixed cost for faecal sludge collection and management and considering the results of field survey that 93% of the households are willing pay, the first option seems more attractive. It is also important to note that all the option will actually reduce the cost of faecal sludge management which is currently incurring to the households.

6.6.7 Revenue Potential

The actual operational costs for collection of faecal sludge and treatment including depreciation are $ 21,144, The revenue potential is $24,716 (considering first option of the proposed tariff) with 15% profit which includes incentive for faecal sludge collection truck drivers.

Apart from faecal sludge collection, the revenue potential from 1.5 tons day co-compost plant which can produce 72 tons of compost per year. The current price of compost is $102 per ton. The total revenue potential is $ 7344 per year. As such, the total revenue potential from operation of the project, including composting, is $ 32,060 per year. Total revenue after deducting the expenditure is calculated at US $ 10,916 per year. Total revenue potential with 20% profit after deducting the expenditure is US $ 11,573.

Following Tables show the cash flow analysis of the project with three scenarios; scenario -1 (15% profit over O& M cost) and scenario-2 (20% profit margin over the O& M cost) and scenario -3 without land cost (assuming central government giving free land to the pourashava).

Table 6.8: Project Income Statement (scenario-1)

Particulars	Year 1	Year 2	3	4	5	6	7	8	9	10
Revenue	32,060	32,060	32,060	32,060	32,060	32,060	32,060	32,060	32,060	32,060
Operation & Maintenance Cost	16,407	16,407	16,407	16,407	16,407	16,407	16,407	16,407	16,407	16,407
Depreciation	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737
Earning before Income Tax (Net Income)	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916

Table 6.9: Project Cash Flow (scenario 1)

Particulars	1	2	3	4	5	6	7	8	9	10
Investment	(146,196)									
Net Income	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916
Add Depreciation	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737
Free cash flow to Firm	(130543)	15,653	15,653	15,653	15,653	15,653	15,653	15,653	15,653	15,653

Table 6.10: Project Cash Flow (scenario 1, without land price)

Particulars	1	2	3	4	5	6	7	8	9	10
Investment	(84,871)									
Net Income	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916	10,916
Add Depreciation	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737
Free cash flow to Firm	(69,218)	15,653	15,653	15,653	15,653	15,653	15,653	15,653	15,653	15,653

Based on the aforementioned tables, IRR of the project is 2%, NPV is negative. The investment cost of the project is high due to extremely high land price. In case the central government provides land free of cost to the pourashava, the project seems very attractive with IRR of 17%, positive NPV and payback period of 4.4 years.

Table 6.11: Project Income Statement (scenario-2)

Particulars	Year 1	Year 2	3	4	5	6	7	8	9	10
Revenue	32,721	32,721	32,721	32,721	32,721	32,721	32,721	32,721	32,721	32,721
Operation & Maintenance Cost	16,407	16,407	16,407	16,407	16,407	16,407	16,407	16,407	16,407	16,407
Depreciation	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737
Earning before Income Tax (Net Income)	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577

Table 6.12: Project Cash Flow (scenario 2)

Particulars	1	2	3	4	5	6	7	8	9	10
Investment	(146,196)									
Net Income	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577
Add Depreciation	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737
Free cash flow to Firm	(129882)	16,314	16,314	16,314	16,314	16,314	16,314	16,314	16,314	16,314

Table 6.13: Project Cash Flow (scenario 2, without land price)

Particulars	1	2	3	4	5	6	7	8	9	10
Investment	(84,871)									
Net Income	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577	11,577
Add Depreciation	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737	4,737
Free cash flow to Firm	(68,557)	16,314	16,314	16,314	16,314	16,314	16,314	16,314	16,314	16,314

Based on the aforementioned tables, IRR of the project is 3%, NPV is negative. The investment cost of the project is high due to extremely high land price. In case the central government provides land free of cost to the pourashava, the project seems very attractive with IRR of 19%, positive NPV and payback period of 4.2 years.

6.6.8 How to Involve Manual Pit Emptier (Sweepers) and Incentivize Faecal Sludge Disposal to Treatment Facility

At present, about seven local sweepers (also known as methors) are undertaking pit cleaning or septic tank cleaning work at night.. A sweeper earns Taka 7,000-10,000 per month. The cleaning of pits or septic tanks is a part-time job, and it is their main income. With the operation of the vaccutug, the income earning opportunity of the methors will be reduced. As such, it is necessary to compensate the sweepers for their loss of income. Since households contact these sweepers when their pits or tanks are filled up, it would be advantageous to involve the sweepers in the process by hiring them as workers for faecal sludge collection and treatment.

Apart from incentives for the sweepers, a second incentive is required for the vaccutug drivers which will help to ensure that collected faecal sludge is brought to the treatment facility, and not disposed to low-lying areas or canals. Usually, the truck drivers of solid waste collection dispose their waste in unauthorized areas to reduce the trip distance (in order to pilfer the fuel). As such, in order to ensure that collected faecal sludge reaches the treatment plant, a per trip incentive can be provided to the driver, as well as to the two workers (in addition to their monthly salaries). The per trip incentive would amount to Taka 80 per trip which will be distributed as Taka 40 for the driver and the remaining Taka 40 for the two workers. These incentives will ensure transportation of the faecal sludge to the treatment plant.

6.7 Operation and Maintenance (O&M) of Faecal Sludge Collection and Treatment System

There are three options for operation and maintenance of the faecal sludge collection and treatment systems namely:

Option-1: Municipally Owned and Operated System

This option considers faecal sludge collection and treatment as part of municipal services provided by the pourashava as a work to be done under the public health section of the Pourashava Act 2010.

Option-2: Municipally Owned and Privately Operated System

This option considers faecal sludge collection and treatment as part of the municipal services provided by the Pourashava, but operated by a private sector under lease and management contract. Such lease and management contract is admissible under section 96 Pourashava Act 2010.

Option-3: Privately Owned and Operated System

This option considers faecal sludge collection and treatment provided by private sector as a commercial activity. This type of service is allowed under build, own, operate and maintain (BOO) system or as a service provision agreement under section 96 of the Pourashava Act 2010.

Details of each option are given below in the following paragraphs:

6.7.1 Option-1: Municipally Owned and Operated System

This option focuses on faecal sludge collection and treatment as an integral part of the municipal services as mentioned in section 50 (responsibilities and function of pourashava) under the

Pourashava Act 2010. Although there is no mention in section 50(2) of the Pourashava Act 2010 about faecal sludge collection and treatment, however, this service can be provided as a part of waste management services (since the definition of waste mentioned in the Pourashava Act 2010 consists of human excreta also). Moreover, pourashava may provide faecal sludge collection and treatment service using section 50(2) (h) which says citizen's health and environmental protection as the responsibility of the pourashava. Since uncontrolled disposal of faecal sludge is an environmental and public health concern, and as such under this clause, pourashava can provide the aforementioned services.

Driving Force

The main driving force for this option is to reduce illegal disposal of faecal sludge on land and water bodies and thereby improve overall public health and environmental situation of Pourashava.

Key Feature of this Option

The service provided under this option can be a non-commercial (no profit no loss) basis, but can be developed into a commercial operation with full cost recovery and marginal profit. However, to charge a fee/rate for faecal sludge collection and treatment approval of the Ministry of Local Government will be required

Main Actor and Responsibility

The main actor for this option is the Pourashava. It will be also responsible for implementation as well as operation and maintenance of the services.

Mode of Implementation

Pourashava may start collection of faecal sludge from households using vaccu types and then further treatment of the collected faecal sludge using staff of conservancy unit under health section.

Households have to pay a fee or service charge for collection and treatment of faecal sludge at the time of pit/tank cleaning or it can be linked with conservancy tax. An estimated fee for pit and septic tank cleaning is shown in section 6.6, in Table 6.3 and Table 6.5.

The capital cost for the establishment of the faecal sludge collection and treatment system can be provided by national government through a project. Alternatively, pourashava may take loan from Bangladesh Municipal Development Fund (BMDF) to implement such project. The other option is to raise the capital cost from CSR activity of large private sector companies or banks; since sanitation and waste management are part of approved CSR project list of National Board of Revenue which is entitled to tax rebate.

Risks

The major risk involved with this option is that the operational efficiency which may be low due to lack of trained manpower in the pourashava as well as experience in O& M. At present there is only one sanitation inspector for the sanitation activity of the Pourashava. There is a risk that faecal sludge collection service may not be reliable and there might be delay in providing services by the municipality which may discourage the use of service by the residents.

6.7.2 Option-2: Municipally Owned and Privately Operated System

This option focuses on faecal sludge collection and treatment as an integral part of the municipal services as mentioned in section 50 (responsibilities and function of pourashava) of the Pourashava Act 2010. Although there is no mention in section 50(2) of the Pourashava Act 2010 about faecal sludge collection and treatment, however, this service can be provided as a part of

waste management services (since the definition of waste mentioned in the Pourashava Act 2010 consists of human excreta also). Moreover, pourashava may provide faecal sludge collection and treatment service under section 50(2) (h) which says citizen's health and environmental protection as the responsibility of the pourashava. Since uncontrolled disposal of faecal sludge is an environmental and public health concern, using this clause, pourashava can provide the aforementioned services.

This option further focuses that the pourashava will finance and build all the necessary infrastructure, but the management and operation will be handed over to the private sector using section 96 (2)(h) of the Pourashava Act which is lease and management type of the services.

Driving Force

The main driving force for this option is to reduce illegal disposal of faecal sludge on land and water bodies and thereby improve overall public health and environmental situation of Pourashava.

Key Feature of this Option

The service provided under this option will be of commercial nature with full cost recovery and with reasonable profit margin (15-20% over the operational cost). For cost recovery, service charge or collection fee has to be recovered from the users. However, to charge a fee/rate for faecal sludge collection and treatment approval of the Ministry of Local Government will be required.

Main Actor and Responsibility

The main actors for this option are the Pourashava and the private sector. Pourashava will be also the lead agency and responsible for financing of the capital cost as well as building the infrastructure. Private sectors can be involved in the collection of faecal sludge from the households and operation and maintenance of the treatment facility (such as co-compost plant along with the drying beds). Pourashava will monitor and supervise the active of private sector operator.A model contract for faecal sludge collection and transportation is shown in Annex-6.

Mode of Implementation

Private sector may start collection of faecal sludge from households using vaccu types and then further treat the collected faecal sludge.

Households have to pay a fee or service charge for collection and treatment of faecal sludge to the pourashava. Poursahava will pay the private sector operator an operation and management fee based on the number of pits/tank cleaned per month or based on the volume of faecal sludge collected and transported to the treatment facility. The other option is that the operator will collect the fee from the households at the time of cleaning the pit/tank and pay an annual lease fee to the pourashava for using the infrastructure. An estimated fee for pit and septic tank cleaning is shown in section 6.6, in Table 6.3 and Table 6.5.

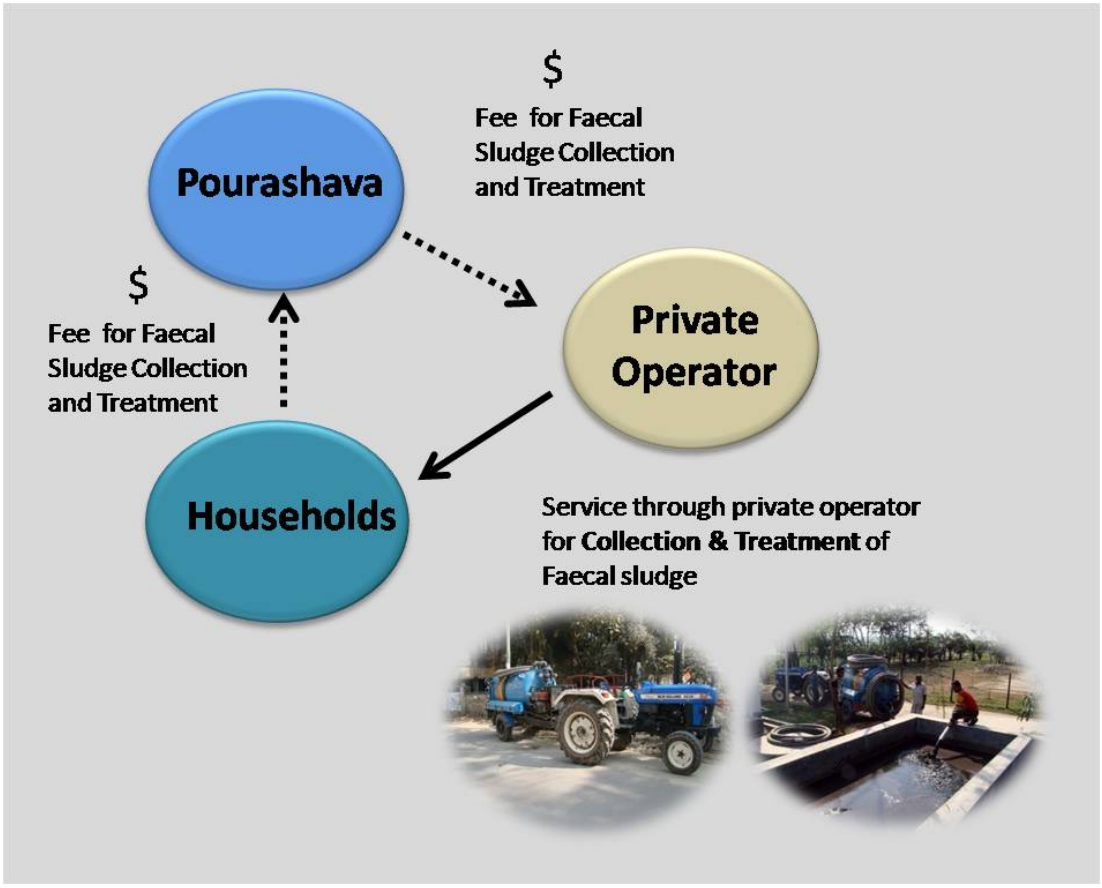

Figure 6.2: Financial Flow for Municipally Owned and Privately Operated Model

The capital cost for the establishment of the faecal sludge collection and treatment system can be provided by national government through a project. Alternatively, pourashava may take loan from Bangladesh Municipal Development Fund (BMDF) to implement such project. The other option is to raise capital cost from CSR activity of large private sector companies or banks; since sanitation and waste management are part of approved CSR project list of National Board of Revenue which is entitled for tax rebate.

Risks

There is a minimum risk in this approach for the pourashava. However, selection of right type of private sector/social enterprise with experience in urban service delivery especially sanitation is essential. For treatment of faecal sludge with co-composting approach, it is important to involve private sector which has the license to operate and market compost from the government. Moreover, it is also important to have the appropriate contract document which will make payment from the municipality to private sector based on the number pits or tanks cleaned.

6.7.3 Option-3: Privately Owned and Privately Operated System

This option focuses on faecal sludge collection and treatment as an integral part of the municipal services as mentioned in section 50 (responsibilities and function of pourashava) of the Pourashava Act 2010. Although there is no mention in section 50(2) of the Pourashava Act 2010 about faecal sludge collection and treatment, however, this service can be provided as a part of waste management services (since the definition of waste mentioned in the Pourashava Act 2010 consists of human excreta also). Moreover, pourashava may provide faecal sludge collection and treatment service under section 50(2) (h) which says citizen's health and environmental protection as the responsibility of the pourashava. Since uncontrolled disposal of faecal sludge is an environmental and public health concern, using this clause, pourashava can provide the aforementioned services.

This option further focuses that the pourashava will give contract to private sector to build operate, own and maintain the faecal sludge collection and treatment for the municipality for certain period under a concession agreement using section 96 (2) (a)(b) of the Pourashava Act .

Driving Force

The main driving force for this option is to reduce illegal disposal of faecal sludge on land and water bodies and thereby improve overall public health and environmental situation of Pourashava.

Key Feature of this Option

The service provided under this option will be of commercial nature with full cost recovery and with profit margin for the private sector. For cost recovery, service charge or collection fee has to be recovered from the users by the private sector

Main Actor and Responsibility

The main actor for this option is the private sector. Role of pourashava will be to prepare the guideline and regulation for collection and treatment of faecal sludge and providing long term contract to the private sector and arranging suitable site for the treatment facility.

Mode of Implementation

Private sector may start collection of faecal sludge from households using vaccu types and then further treat the collected faecal sludge.

Private sector will invest the required money for purchase of vaccu tugs and treatment facility and operation and maintenance.

Private sector will recover the costs by charging user fee directly to the households.

Risks

There is a minimum risk in this approach for the pourashava. However, selection of right type of private sector/social enterprise with experience in urban service delivery especially sanitation is essential. For treatment of faecal sludge with co-composting approach, it is important to involve private sector which has the license to operate and market compost from the government.

Since there is no regulation on faecal sludge management as well as no incentives for private sector such as tax holiday for certain period as well as low interest rates for financing such projects from the commercial bank, it is unlikely that private sector will show invest in this type of project in the beginning.

6.7.4 Recommended Options for Operation and Maintenance of Faecal Sludge Collection and Treatment System in Mathbaria

It is evident from section 6.7 that there are three possible options for operation and maintenance (O&M) of the faecal sludge collection and treatment system. However, considering the present condition of Mathbaria Pourashava in terms of availability of skilled manpower and experience in operation and maintenance of such project, municipally owned and operated system could not be recommended. Risks are high for lower quality of services.

Fully privately owned and operated system is also not possible at the moment since there is no regulation or guideline for faecal sludge management in place now. Since there are no incentives for private sector such as tax holiday for a certain period neither low interest rate for financing such projects from banks, it is highly unlikely that private sector will be interested to invest capital cost which amounts to USD 146,196 for the Mathbaria pourashava. Moreover, private sector would require a concession period of at least 15 years with a provision of land from the pourashava to initiate the project. Since all these issues are not clear at the moment, privately owned and operated system is not a viable option now. In order to promote private sector participation in the such projects, following incentives are required:

(i) Tax holidays to provide incentive for private investment including; exemption of value added tax (VAT) on products such as co-compost, RDF or energy for at least 10-12 years;
(ii) Exemption of customs duty on import of capital machineries;
(iii) Concessionary rates for utilities such as electricity, diesel, and water;
(iv) Concessionary rates for bank loans with low interest rates;
(v) Subsidy on compost similar to chemical fertilizer;
(vi) Promotion of products such as compost, biogas, RDF by the government;
(vii) Provision of land on long term lease from the government;
(viii) Fixation of feed in tariff for biogas to electricity project.

Tax Holidays: Entrepreneurs setting up a faecal sludge management plant (which includes collection, transportation and treatment and re-use of faecal sludge) should be considered for a tax holiday for 10 to 12 years, and should be allowed an exemption on customs duty, excise duty, value added tax, sales tax, and other local taxes on equipment (vaccutugs), machinery, processing plant, etc. This exemption should also include products such as co-compost and RDF to promote private sector participation in the production of compost from faecal sludge, biogas, biogas to electricity or RDF.

Low Interest Loan: Entrepreneurs should be charged lower interest rates for faecal sludge collection and treatment plants. Moreover, the loan should be of longer term ranging from 7-8 years. On May 20, 2014, Bangladesh Bank has given a circular confirming inclusion of faecal sludge management project as green project and eligible for green financing with interest rate of maximum 9%. Public and private sector banks can finance up to Tk. 3 crore (USD 384,615) for such projects depending upon the capacity of the facility.

*Concessionary Rates for Utilities***:** The entrepreneur should be supplied electricity and diesel, at the same rates as provided to the agricultural sector or at a concessional rate, whichever is less.

*Long Term Lease of Land***:** One of the major barriers for implementation faecal sludge treatment plant is the lack of the availability of land. Entrepreneurs should be provided land at existing dumpsites on a long term lease, free of cost, for setting up treatment plants. The private sector (in case of BOO) or municipality (in case of joint venture) should be allowed to raise loans from commercial banks and others by jointly mortgaging the land if required.

*Feed in Tariff***:** Another the major barrier for implementation of large scale biogas to electricity project is non fixation of feed in tariff for waste to electricity project. In order to promote biogas to electricity project using faecal sludge and other waste, there is an urgent need for fixation of the feed in tariff.

Municipally owned and privately operated model seems to be a viable option. In this model, Mathbaria municipality will invest and own all the infrastructure and they will lease it for private sector to operate and manage it. Pourashava will pay the private sector a fee based on the number of pits/tanks cleaned per month or based on the volume of faecal sludge collected and transported to the treatment facility. It may be mentioned here the private sector will have pay incentives as mentioned in section 6.7.1 to vaccu tug drivers to ensure that faecal sludge is collected and delivered to treatment facility. Moreover, private operator may have to give incentives to sweepers each time they find a new order from households for vaccutug services as mentioned in section 6.7.1.

For selection of private sector, pourashava may select or negotiate with NGOs/social business enterprises active in sanitation sector such as Water Aid, DSK, BRAC, Ahsania Mission, NGO Forum who are involved in faecal sludge management. For operation of the treatment plant, poursahava may select private sector from 50 companies who already have license to produce and market compost as operator of co-compost based treatment plant. For the co-compost plant, apart from the collected faecal sludge, pourashava will deliver sorted organic waste to the plant (agreed amount 1.5 tons/day) free of cost and allow the private sector to operate the plant and market the compost. Pourashava can get a percentage of the sales proceed from the operator based on negotiation.

6.8 Steps for Implementation of Faecal Sludge Management Project

In order to start a faecal sludge collection and treatment project, it is essential to follow steps mentioned in Table 6.7. The table describes the activities along with the responsibility and time line required to complete the steps.

Table 6.14: Steps for Implementation of Faecal Sludge Collection and Treatment System in Mathbaria

Step	Action	Responsibility	Time Line
1	Training and exposure visit of the mayor and ward commissioners on need and importance of faecal sludge management, cost recovery issue and benefits of public-private partnership in faecal sludge management.	LGED Project. Training and exposure visit can be arranged and facilitated by ITN-BUET.	Month 1
2	Training of poursahava engineers, sanitary inspectors and conservancy inspectors, NGOs, private sector on different aspects of operation, maintenance and management of faecal sludge collection and treatment system as well as monitoring of performance of private sector operator. Participants for the training can include engineers from DPHE and LGED. Tentative outline of the training is attached in the Annex	LGED Project. Training and exposure visit can be arranged and facilitated by ITN-BUET.	Month 2
3.	Awareness campaign on faecal sludge management	Pourahava Mayor, NGOs/CBOs, local media, LGED project in association with Local MPs, Ministry of LGD, Ministry of Environment	Month 1-Month 24
4.	Vulnerability mapping of toilets getting inundated during the high tides and support to households to improve the design of the toilets. Moreover, support to households with toilets having broken ring, water traps etc.	Pourshava with support from LGED project.	Month 1-Month 6
5	Apply and obtain permission from Ministry of Local Government for charging a fee/rate for faecal sludge collection and treatment.	Pourashava will apply to Ministry of Local Government. LGED Project will provide necessary support.	Month 1 – Month 3
6	Arrangement of suitable land for faecal sludge treatment	Pourashava	Month 2-Month 4

7.	Site clearance and environment clearance certificate from DOE for construction, operation and maintenance of faecal sludge (Step 7 should be implemented after getting permission from Ministry of Local Government to impose a fee /charge/rate for faecal sludge collection and treatment)	Pourshava with support from LGED project.	Month 5-Month 6
8.	Selection of vaccutug and design of treatment facility (Step 8 should be implemented after getting permission from Ministry of Local Government to impose a fee /charge/rate for faecal sludge collection and treatment and site clearance certificate from DOE).	LGED Project and Pourashava	Month 7-Month 8
9	Tender to purchase vaccu tug and construction of treatment facility as per public procurement rules (Step 9 should be implemented after getting permission from Ministry of Local Government to impose a fee /charge/rate for faecal sludge collection and treatment)	LGED Project and Pourashava	Month 9-Month 10
10	Purchase of vaccutugs and construction of treatment facility for collected faecal sludge..	LGED Project and Pourashava	Month 11-Month 15
11.	Selection of operator for faecal sludge collection and operator for co-compost plant/treatment plant (operator of co-compost plant should be selected from 50 companies approved by MoA and DAE and have license to produce and market compost). Selection will be based on lease and manage option as mentioned in the Pourashava Act 2010 for involvement of private sector.	LGED Project and Pourashava	Month 10-Month 12
12.	Start of pilot operation by the operators in selected wards	Pourahava and private operators	Month 15-Month 18
13.	Start of full operation by the operators	Pourahava and private operators	Month 15-Month 19
14	Monitoring of operational performance of the private operators and as well as financial performance in terms cost recovery.	LGED Project and Pourashava	Month 20 on wards

6.9 Targets for Improvement

Overall targets for improvement are shown in Table 6.15 below:

Table 6.15: Targets for Improvement

Aspects	Indicators	Baseline Condition	Targets	
			Short Term (2014-2015)	Medium Term (2016-2019)
Sanitation coverage	percentage of household with hygienic toilet	56.38%	100%	100% (maintain)
Unhygienic toilets (connected to drains)	percentage of household	43.62%	0%	0% (maintain)
Faecal sludge collection using vaccu tugs	Percentage of household served	None	93.62%	100%
Treatment of faecal sludge using co-composting using drying beds at landfill site	Amount of faecal sludge co-composted	None	93.62%	100%
Community toilets at slums	Number of toilets	None	Identify slums having no space for establishment of toilets. Establish at least community toilets at 3 slums	More toilets based on survey.

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ANNEX I

Questionnaire for Institutional Survey on Sanitation and Fecal Sludge Management

Date: .....

Completed by:
Name.....
Designation:.....

1. Name of Pourashava.....
2. Total Area of the Pourashava (Sq. Km).....
3. Number of wards.....
4. Total Population and holding in your municipality?
5. Total Road length (Km) kutcha ..... pucca .....
6. Total length of drain (Km): kutcha..... pucca.....
7. Any Sanitation Committee Y / N; If Yes,

Who are the members (composition) of the committee?
.....
.....
What are their current activities?
.....
.....

8. Pourashava's total budget.....
9. Pourashava's budget for Sanitation.....
10. Government's grant for Sanitation.....
11. Internal revenue spent for Sanitation.....
12. What is amount of revenue collection for last financial year?
    How much was the total revenue collection for street lighting and water supply and conservancy?

Item wise revenue:

Item	Revenue (Taka)
street lighting	
water supply	
conservancy	
Total	

13. Total Number of holdings of the Pourashava .....
14. Number of holdings paying tax .....
15. Number of holdings having access of piped water supply? .....
16. What is the average rate for water Taka/liter

Type	No.	Unite Price (Taka)

17. Please describe Pourashava's organogram for Sanitation and Feacal Sludge Management (FSM) System:

Pourashava's organogram for Sanitation and Feacal Sludge Management (FSM) System

18. Current methods for collection, treatment and/or disposal facilities for wastes from pit latrines, septic tanks etc.
    .....
    .....
    .....
    .....
    .....
    .....
19. Do you have any feacal sludge collection system in your pourashava. Yes / No
20. If yes, do you charge households for feacal sludge collection? Yes / No
21. If yes please mention the amount in Taka.....
22. Do you have feacal sludge collection vehicles Yes / No
23. If yes what is the capacity of vaccutag .....
24. Operational and maintenance cost of vaccutag per month.....
25. How many staff including driver, worker and supervisor is engaged for feacal sludge collection as well as sanitation activities .....

Feacal sludge collection:

Staff Category	Male	Female	Employment Type (Permanent/ Temporary/ Master Role)	Experience

Other sanitation activities:

Staff Category	Male	Female	Employment Type (Permanent/ Temporary/ Master Role)	Experience

26. Govt. or local govt. (public sector e.g., DPHE, LGED etc.) activities/ projects on Sanitation & FSM sector:
    ……
    ……
    ……
27. Names & activities/ projects of national, international and local NGOs working on Sanitation & FSM sector:
    ……
    ……
    ……
28. Private sector activities/ projects on Sanitation & FSM sector:
    ……
    ……
    ……

29. Do you have compost plant or biogas plant or any other FSM facility in your pourashava? If yes, please mention the capacity of the such plants and who is operating it and since when?
    ……
    ……
    ……

30. Do you have waste disposal site in your pourashava Yes / No
    If yes, information about landfill site:

Number	Area (unit)	Depth (unit)	Currently in operation or not	How long in operation	Percentage (%) filled up	Design Life Time

31. Please suggest, how an efficient environment friendly fecal sludge management system might be established in your pourashava. How private entrepreneurs or NGOs might be engaged in this system? Please provide some names of such private entrepreneurs or NGOs of your town.
    ……
    ……
    ……
    ……
    ……

Pourashava Staff Engaged in Sanitation Activities

Sl. No.	Name	Designation	Employment Type	Details of Sanitation Training if attended

ANNEX II

Preparation of Sanitation Plans for Batch I Towns

Questionnaire for Sanitation Survey

Date:…… Code: no:…….

Name of Surveyor:…….……

1. Name of Pourashava……..
2. Name of Area/ Mahalla……. Ward No…….
3. Holding No……Landlord / rented house No of toilets in the house.....
4. Name of the head of the HH……..
5. Household information:

Serial no.	1	2	3	4	5	6	7	8	9	10
age										
sex										
Educational level										
Profession										
Income/month										
Disease in last 1yr										
How many days remained sick in last 1yr										

Age	**Sex**	**Educational level**	**Profession**
1) 0-4	1) Male	1) Illiterate	1)Service holder
2) 5-9	2) Female	2) Primary	2)Business
3) 10-14		3) High school	3)Worker
4) 15-17		4) SSC	4)Student

5) 18-34	5) HSC	5)Housewife
6) 35-59	6) Graduate	6)Unemployed
7) 60+	7) N/A	7)N/A

Disease in last 1yr

0) No disease	4) Malaria, dengue	8) Fever……
1)Diarrhoea, dysenteries	5) Jaundice	9) ……..……..
2) Typhoid, paratyphoid	6) eye infections	10) ……..…….
3) Worms	7) Scabies & other skin disease	12) ……..……..……....

6. In last one year, how much money you and your family members had to spend for the treatment of the above mentioned diseases

7. Do you have piped water supply in your household? Y / N

   If Yes,

   What is the source of water supply?

   i. Pourashava ii. DPHE iii. Other Govt. Agency iv. NGO v. Own

   What is the type of connection?

   i. Metered ii. On the basis of pipe diameter iii. Other

   ……..…..

   How much Water Bill do you have to pay per month? Taka …….

   Do you have electricity connection in household? Yes / No

   If yes, how much is your electricity bill per month

   ……

8. Type of latrine: *(Put tick mark)*

   (a) No latrine;

   (b) Un-hygienic: *(please specify the type)*

i. Latrine connected with pond/canal, ditch or broken ring

ii. Open/hanging latrine iii. Others……..……..

(c) Hygienic: *(please specify the type)*

i. Ring-slab latrine (single pit) ii. Single pit latrine iii. Twin pit latrine

iv. Septic Tank v. Others…….

9. (in case of a & b in Q. 8) Reasons for not having any/hygienic latrine: (Put tick mark/marks)

Reasons	***No.***
No money	
No land	
Lack of awareness	
Prefer open defecation	
Unavailability of latrine construction materials	
Unavailability of water	
others……..	

10. (In case of c in Q. 8), Please specify if the latrine is connected with drain/water body/canal/river. Y / N

If Yes, Did you get any instruction from the Pourashava or DPHE to disconnect it? Y/N

11. (In case of c in Q. 8), Have you ever emptied your Septic tank/ pit latrine? Y / N

If No, what is the construction age of your Septic tank/ pit latrine?.....

If Yes, What is done when the Septic tank/ pit latrine gets filled up?

i. Emptying and disposal is down by own ii. Seek service from Pourashava Authority iii. Hire local methors iv. Other……..

How often do you remove the sludge (in six months or yearly or every two years or every five years or more)? …….

Who removes the sludge (is it you or local methor or Pourashava methor or vaccu tug of Pourashava or other private operator)? .....

Where is the sludge disposed?

i. In adjacent drain ii. In canal iii. In river iv. In low land v. Burying under soil vi. Other (Please specify): ……..

How much do you have to spend for it?

Fee of Pourashava ……

Additional Payment (tips or others)……

12. In case the faecal sludge is collected by the pourashava are you happy with your current expenditure in fecal sludge management service (emptying pit/septic tank and disposing sludge) of the Pourashava? Y / N

If No, how the payment modality might be improved?

……

……

13. Are you satisfied with the current fecal sludge management service (emptying pit/septic tank and disposing sludge) of the Pourashava? Y / N

If No, how the service might be improved?

……

……

14. If the Pourashava intends to establish an efficient environment friendly fecal sludge management system for the sludge of your septic tank or pit latrine, how much additional payment are you willing to make for the improved fecal sludge management system?

……

……

……

ANNEX III

SPECIFICATION OF VACCUTUG

Vaccutug MK-VI, capacity 1000 liter, mounted on a three wheeler suitable to run on 12 Hp diesel engine, with maximum speed of 30 Km/hour. Vacuum pump operated by 10 hp (minimum) auto electric start diesel engine. The vacutug should also include following accessories:

1. 3 inch dia hosepipe with quick release coupler - 3 sets (30 m length hose pipe)
2. 3 inch brass ball valve with quick release coupler -3 sets
3. 1.5 inch pressure valve – 1 set
4. 1.5 inch compressor valve – 1 set
5. Vacuum pump and engine – 1 set

Terms for quotation of vaccutug should include carrying cost as well as training cost for operation and maintenance of vaccutug.

ANNEX IV

Case Study 1: Faecal Sludge Collection Program of Dushtha Shashthya Kendra in Dhaka City with Support from Dhaka WASA

Dushtha Shashthya Kendra (DSK) has been collecting faecal sludge from the septic tanks and pit latrines in Dhaka City since 2000. A 2,000 liter capacity vaccutug was provided to DSK by WaterAid for operating in Dhaka City. The vaccutug is towed by a pick-up van. DSK has been continuing the vaccutug service by setting the suction pump and generator on a pick-up van, and connecting the sludge tank with it. The pick-up van has already become too old to continue its service, and regular O&M cost of DSK for maintenance of the van has gone very high. Plate 5.4 and Plate 5.5 below show the pictures of the vaccutug. Recently, DSK has received another vaccutug of same capacity from UNICEF as grant, and is going to start its operation after completion of necessary registration and other paper works.

Plate A1: Vaccutug of DSK

Plate A2: Sludge carrying tank

Currently, DSK operates its services from its Mirpur Branch Office mainly at Mirpur, Ibrahimpur, Kafrul, Mohammadpur, Kalyanpur and other neighboring areas. Besides, sludge collection is also done from Karail Slum and other parts of Dhaka City. For operation of the vaccutug, DSK has engaged one driver, one vaccutug operator and one helper. DSK collects Taka 1,200 for each trip for septic tanks, and Taka 1,500 for pit latrines. Although the rate for pit latrines is Taka 1,500, most of the pit latrine owners are not well off, and pay less than the specified rate.


Plate A3: 100 meter pipe being stretched from the vaccutug to the pit latrine


Plate A4: Sludge is being collected from a pit latrine

When the septic tank or pit latrine of any household gets filled up, the concerned owner searches for methors (sweepers) for removing the sludge. Only a negligible percentage of such owners have information about vaccutug service, and they call at DSK Office for service.

Plate A5: After receiving payment, receipt is provided to the serviced person by the driver

Plate A6: Sludge is disposed at the designated point near Begunbari

After collecting the faecal sludge from septic tanks or pit latrines, it is disposed off at the designated outlets of DWASA, mainly at Begunbari and Asad Gate. Concerned Sanitary Inspectors of DWASA monitors whether sludge disposal is done properly or not. Everyday, it is possible to make up to 10 trips by the vaccutug on average. Although, DSK has been operating this service for more than one decade, the information of such service has not yet been disseminated among the city dwellers effectively. Hence, still demand for work is much less than the service provision capacity of DSK.

DSK has been sustainably operating its vaccutug service on its own. Last two years financial data shows that the vaccutug service is making marginal operational profit.

Key Lessons

Financial support or subsidy may be required to start the project

DFID and Water Aid provided the initial capital costs of vaccutug, which meant that the operation could not have been started, without the support of these donors. The vaccutug operation aims to operate on a commercial basis and therefore full cost recovery is imperative for sustainability. However, although revenue is sufficient to cover the costs of staff salary and majority of operational and maintenance costs, it is not enough to pay back the capital investment or cover the depreciation.

Need for market promotion and equipment and trained staff to operate such projects

Water Aid, DFID and DSK recognizes that the weakness of the operation lies in promotion and there is a general consensus that effective publicity would create demand not only to make the vaccutug operation profitable, but would also to create space for interested private sector operators to invest.

However, at the same time, an additional important consideration is the fact that there are limits to how much DSK would be able to respond to a greatly increased demand. The ability to respond to demand is constrained by the availability of equipment (requiring considerable capital investment) and trained staff and there are also limitations set related to the final disposal points of the faecal sludge.

Final treatment and disposal site as well as agreement with public agencies is essential

The final disposal site for feacal sludge is perhaps the most difficult problem that requires active cooperation and co-ordination with Dhaka City Corporation (DCC) and Dhaka Water Supply and Sewerage Authority (DWASA). Fortunately, DWASA directly supports the operation through its permission to DSK to use two sewage pumping stations for disposal of sludge. However, this is not a permanent agreement, and there is always a possibility that DWASA might decide not to

accept the sludge or introduce a charge for disposal, which would affect the viability of the vaccutug operation. At present DSK is disposing the collected faecal sludge at sewage pumping station free of cost.

Policy support from government is essential

DSK initiative can be seen to be successful at the local level, however, the lack of higher lever institutional support and a policy framework to promote an enabling environment means that it may remain as isolated case. The absence of a comprehensive policy framework for faecal sludge management in Bangladesh is a critical issue. A strong government initiative is required to take necessary policy and regulatory measures and begin to identify projects and plan their proper implementation, cost recovery mechanism under a transparent and strict regulatory framework that draws from local resources and is accountable to local stakeholders.

ANNEX V

Case Study 2: Municipally Owned and Operated Faecal Sludge Collection, Treatment and ReusePilot Project at Baradi, Kushtia Municipality, Bangladesh

In order to establish a comprehensive system of faecal sludge management i.e. collection of faecal sludge from households, transportation, treatment and reuse, a pilot research project was initiated in December 2012. The project's duration is up to June 2015. Waste Concern is providing technical support to Kushtia Municipality in implementing the project. In this regard an agreement for technical support between Kushtia Municipality and Waste Concern in October 2012. UN ESCAP is providing financial support to conduct this research. The main aim of the project is to develop a sustainable faecal sludge management system having full cost recovery and which can be replicated in secondary towns. The project focuses on following aspects:

Phase -1: (December 2012- June 2014)

The activities under phase I

1. Capacity building and training of municipality staff on collection and treatment of faecal sludge from household and co-composting;

2. Conducting of survey to assess the demand for faecal sludge collection, current expenditure of the households for faecal sludge and willingness to pay for improved faecal sludge management system;

3. Starting of collection of feacal sludge from households using vaccu tugs through payment for the fuel cost for the faecal sludge collection services by the households as well as treatment of faecal sludge;

4. Testing of quality of faecal sludge before treatment and after treatment;

5. Testing of the co-compost in laboratory for compliance with the GoB's standard of compost/co-compost as checking of yield of different crops using produced compost;

6. Testing of quality of percolate before and after treatment with coco peat filter to check compliance with DOE standards;

7. Assisting the municipality to obtain license from Department of Agriculture Extension (DAE) to market co-compost;

8. Estimation of emission reduction by avoiding landfilling and use of co-compost in the agriculture

Phase -II: (July 2014- September 2015)

The activities under phase –II of this project are as follows:

1. Recommendation of a tariff for faecal sludge collection, transportation and treatment which can be charged for 100% cost recovery by the municipality subject to the approval of the tariff by the Ministry of Local Government.

2. Recommendation of a Public-Private Partnership model for scaling-up of the operation after approval of the faecal sludge management tariff by the Ministry of Local Government and approval of the production and marketing license of co-compost by the Ministry of Agriculture and Department of Agriculture. Extension (DAE).

3. Dissemination of the results of the project for policy reform for faecal sludge management data

Description of the Pilot Project

Human excreta are a rich source of nutrients such as nitrogen, phosphorus and potassium. In human excreta, most of the organic matter is contained in faeces, while most of the nitrogen (70-80%) and potassium are contained in urine. Before using human excreta as a fertilizer, it must be made safe. Co-composting is the controlled aerobic degradation of organics using more than one material (faecal sludge and organic municipal solid waste). Faecal sludge has a high moisture and nitrogen content, while bio-degradable solid waste is high in organic carbon and has good bulking properties (i.e. it allows air to flow and air to circulate). By combining the two, the benefits of each can be used to optimize the process and the output product. Co-composting is a natural process allowing good sanitization of sludge in a relatively short time. This is due to high temperature of 50 to 70ºC, which is reached during thermophilic degradation process. Co-composting of pre-treated and thickened faecal sludge with solid waste might be a good solution, even for large sludge volumes.

In the year 2008, Kushtia City Corporation with the support from the Institute for Global Environmental Strategies (IGES) and United Nations Centre for Regional Development (UNCRD) initially established a 1.5 tons/day compost plant at the same site later Local Government and Engineering Department LGED) of the Goverment of Bangladesh established a drying bed facility along with a 2.5 ton/day capacity composting plant to receive faecal sludge collected from the city. During this time Waste Concern provided all the necessary technical support to establish the compost plant and drying bed. Under the present pilot co-composting project, Waste Concern connected these stand alone facilities (compost plant and faecal sludge drying bed) in an innovative way with an additional coco peat filter to properly treat the faecal sludge with municipal organic waste.

Plate A7: Vaccutug collecting faecal sludge from the households of Kushtia Municipality.

Plate A8: Municipal Staff providing faecal sludge collection service on payment basis.

Plate A9: Septic tank located inside the household premise being emptied with vaccutug.

Plate A10: Collected faecal sludge emptied in the drying bed of co-composting plant at Baradi, Kushtia

This pilot project is established in a land of 668 m^2 area, dedicated by Kushtia Municipality in landfill site, out of which 165 m^2 is used for feacal sludge drying bed as well as treatment of percolate using coco peat filter. Total quantity of municipal solid waste brought to the plant amounts to 2 to 3.5 tons per day. Under this project, faecal sludge is directly collected from the septic tanks or pit latrines of households using mechanical vacuum-tugs. Total quantity of faecal sludge collected per day is 2 to 6 cubic meters per day depending upon the demand. The municipality collects faecal sludge for 20-22 days in a month. The collected sludge is directly sent to the treatment facility (Plate 5.10, Plate 5.11 and Plate 5.12). The liquid sludge (faecal sludge) is poured into the sludge tank, from where it is passed into the sludge drying bed by natural gravity (Plate 5.13). When the drying bed gets filled up, it is kept there for a few days (7-12 days depending upon season) so that sludge gets dried and the percolate is transferred into the connected percolate tank. The percolate is pumped into the coco peat filtration unit for further treatment. The filtered water coming out from the coco peat has high nutrient, and can be safely released into agricultural land for irrigation purpose. On the other hand, dried layer of the fecal sludge is collected up from the drying bed and is mixed with the municipal organic solid waste in 1:3 ratios, and compost is produced in the co-composting plant using aerobic theomorphic composting method to be used as organic fertilizer. Waste Concern is training municipal staff on collection and maintenance of all operational data as well as on operation and maintenance of the faecal sludge treatment plant.

At present Kushtia Municipality is charging Taka 350 as fuel cost of vaccu tug for desludging of latrine while Taka 500 for desludging of septic tanks. Fuel cost for the tractor pulling the vaccu tug and staff salary is borne by the municipality. In order to charge a fee or charge for collection of faecal sludge as per Municipal Ordinance 2010, approval of Ministry of Local Government is required. Without approval from the Government it is not possible for the local government to impose any fee or charge for collection of faecal sludge. Moreover, for marketing of compost approval of compost is required from the Ministry of Agriculture and Department of Agriculture Extension (DAE). The approval of compost is a two stage process; first test of compost in Government certified laboratory and in case the compost complies with the Government Standard, the field trail is done for two seasons to check the yield of different crops using the compost. Test results of the co-compost produced at Kushtia is complying with the standards of government and already cleared stage -1 of the licensing process. Now, the compost will be used for field trail process. It will take 9-12 months to obtain the license for commercial production and marketing of compost.

The analysis of compost produced in the co-compost plant as well as treated waste water using the coco peat filter has been conducted at the laboratory of Waste Concern and both the compost and waste water are complying with the standards for use in agriculture and organic fertilizer and for irrigational purposes. Laboratory analysis of compost sample was also conducted at Dhaka University to check the pathogen level in the compost sample. It was found from the laboratory analysis that the sample has acceptable levels of helminthes and salmonella. Moreover, compost has also been tested at SRDI laboratory of the Government which has also confirmed the compliance with the standards.

Since the inception of the project Waste Concern has been carrying out a multi-year field trial on the impact of compost produced from the co-composting plant to validate the safety and agronomic value of compost on different types of crops. The main objectives of this field trial are the following:

- To assess the effects of the application of compost to arable land through replicated field trials over two years;
- To analyze composts use, and soils and crops on each year;
- To assess the effects on soil microbiology;
- To carryout trials to assess the effects of composting on soil pathogens;
- To assess the economic benefits of using compost;

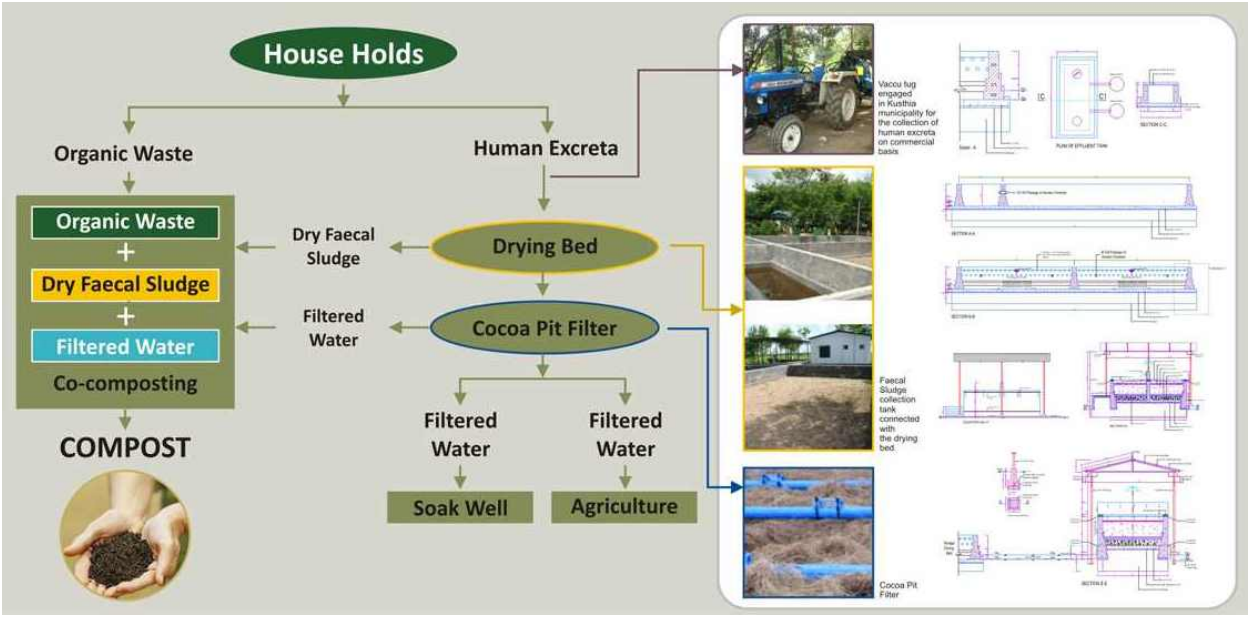

Figure A1: Method of Co-composting in Kushtia Municipality

Figure A2: Site Plan of the Co-composting Facility, Kushtia

Lessons Learnt from First Year of Operation of FSM Plant in Kushtia Municipality

Political Will is Crucial: The Mayor of the Kushtia is fully supporting the project and he is convinced about the benefit of the project and he is time to time monitoring the activity. Without political will it is difficult to implement such project. Apart from support from Mayor, for full cost recovery of project support from National Government is very crucial for allowing municipalities to provide such services against a fee or a charge.

Awareness Raising and Capacity Building It has been found that there is low level of awareness amongst the municipal staff dealing with sanitation, conservancy and engineering on different aspects of FSM. Waste Concern has been working with conservancy section staff and providing them on job training on different aspects of FSM. Waste Concern has developed a manual for O&M of the treatment plant

People Are Willing to Participate and Pay for Feacal Sludge Collection Waste Concern conducted a survey to get feed back from the residents regarding how do they dispose the faecal sludge and satisfaction with the services provided by the municipality. Following table shows the results of the survey:

Table A1: Process of cleaning the filled up pits/septic tanks in Kushtia Municipality

What is done when the septic tank/pit latrine gets filled up			How the fecal sludge is removed		
Description	Frequency	Percentage	Description	Frequency	Percentage
Apply to Municipality	200	66.7	Vaccu tug	192	64.0
			Manual labor	8	2.7
Don't Apply to Municipality	41	13.7	Manual labor	33	11.0
			Self	8	2.7
Never filled up	49	16.3	N/A	49	16.3
Unhygienic toilet	10	3.3	N/A	10	3.3
Total	300	100.0	Total	300	100.0

Above mentioned table illustrates the process of cleaning the filled up pits/septic tanks in Kushtia Municipality. 66.7% households apply to Municipal Authority for taking necessary actions to clean up their pits or septic tanks. At present the municipality collects between 2-6 cubic meters of faecal sludge for treatment which is equivalent to serving one to four households daily. Municipal Authority serves almost all of them with vacuum tug, except where the vacuum tug can not move due to poor accessibility. Municipal Authority sends cleaners to those houses. The cleaners either carry the cleaned sludge to a nearby point where the vacuum tug is kept, or dump the sludge by digging a hole if the vacuum tug can not come to a nearby point. It is to be noted that 13.7% households still do not apply to the Municipality Authority for cleaning the filled up pits/septic tanks. They either call in sweepers or clean the pits by themselves. Furthermore, 16.3% of septic tanks, latrines, or pit latrines of the Municipality never became filled up after being constructed. About 70% of the residents are happy with the services. The reasons identified with them are as follows:

- Operators are well behaved ;
- Service is quick and efficient;
- Tension free operation and does not break rings/slab in the process;
- Less problems between neighbours. Costs less and is risk free;
- Households do not have to stay awake at night. No mess in the home and less more hygienic Smells much less than traditional cleaning.
- Decreased the sufferings of women

***Intermediary May Be Required to Start FSM System*:** Initial support (financial and technical) is required for the municipality to assist them with the operation and maintenance of the treatment plant. Proper operation is essential for compliance with environmental and agricultural standards

of the government. Findings of the operation of the co-compost plant for the last fourteen months show that treatment of faecal sludge along with segregated municipal organic waste is technically feasible and use of aerobic theomorphic composting is essential to make the compost pathogen free. Moreover, use of coco peat filter shows the improvement of the quality of waste water especially in terms of DO and COD and compliance with ECR 97 and also with the standards for use in agriculture.

ANNEX VI

AGREEMENT FOR FAECAL SLUDGE COLLECTION & TRANSPORTATION

BETWEEN

XXXX MUNICIPALITY

AND

XXXXX ORGANIZATION

THIS AGREEMENT is made at (insert name of city/town) this (insert day) th day (insert month) 2014 by and between (insert name) Municipality, (insert address),, a municipal corporation, herein called "FIRST PARTY" and (insert name and address of organization) herein referred to as " SECOND PARTY".

XXX Municipality grants XXX organization, an Agreement relating to faecal sludge collection originating from pit latrines and septic tanks of households, commercial and institutional buildings and public toilets and other locations in the municipal area and its transportation to the designated treatment facility located at ******** .

Scope of Work

The scope under this Agreement shall consist of the works and services to be performed in collection of faecal sludge generated in the municipality from pit latrines and septic tanks of households, commercial and institutional buildings and public toilet and transportation of the collected faecal sludge to designated treatment facility. For collection and transportation of faecal sludge, the FIRSTY PARTY will lease the vacuum tugs with necessary equipments to SECOND PARTY.

Now, therefore, in consideration of mutual benefits, the parties hereto agree as follows:

1. Duration of this Agreement shall be ****** years from the date of the signing of the Agreement and shall be renewed thereafter on mutually agreed terms and conditions.

2. SECOND PARTY agrees to collect and transport faecal sludge to the treatment facility from designated areas and other areas allocated by the FIRST PARTY. For collection and transportation of the faecal sludge to the treatment facility the FIRST PARTY shall pay Taka ****** per cubic meter of faecal sludge collected from households and other premises and unloaded at the designated treatment facility or Taka ******* per pit/septic tank (using **** cubic meter truck) of faecal sludge unloaded at the designated treatment facility on a monthly basis. No payment shall be made by the FIRST PARTY, in case the SECOND PARTY fails to unload the collected faecal sludge in designated facility and a penalty shall be imposed on the SECOND PARTY.

3. FIRST PARTY shall lease vacuum tug to SECOND PARTY at agreed monthly fee with all necessary equipments (list enclosed) which shall be fully compatible to carry out faecal sludge collection and transportation. FIRST PARTY shall establish a "faecal sludge collection information center" at the municipality where households can apply for pit or septic tank cleaning services in writing in a prescribed format or through emails or sms which shall be operated by the SECOND PARTY. SECOND PARTY shall be responsible for providing services to the applicants within 36 hours of

the receipt of the application. The information center shall be open six days a week from 9 AM to 6 PM (except Fridays and national holidays). The SECOND PARTY has to maintain a register for all the applications received with date and time along with date when the pit or septic tank was cleaned. Moreover, the SECOND PARTY shall also maintain complaint register. In case the SECOND PARTY fails to collect the faecal sludge within 36 hours of the application, a penalty shall be imposed.

4. SECOND PARTY agrees to furnish all labor, tools, fuel and services required and necessary for the collection and transportation of faecal sludge to designated treatment facility and shall provide qualified supervisory personnel to direct the activities under this Agreement.

4. The SECOND PARTY will bear the repair cost of the vacuum tug upto Tk XXXXX per annum and any amount over the agreed repair cost shall be paid by the SECOND PARTY.

5. The SECOND PARTY has to involve the local sweepers involved in the manual cleaning of pit latrines and septic tanks in the municipality with the vacuum tug services . Since households contact these sweepers when their pits or tanks are filled up, it would be advantageous to involve the sweepers in the process by providing them with incentives such as payment to bring new households for vacuum tug services.

6. The FIRST PARTY shall allow the SECOND PARTY to collect faecal sludge during 7.30 AM to 6 PM and this duration may vary from time to time as per requirement of FIRST PARTY.

7. THE SECOND PARTY shall collect the faecal sludge six days a week (except Friday and national holidays).

8. In case the SECOND PARTY fails to collect faecal sludge from designated collection areas due to flood, cyclone, war, fire, accident, act of God and other natural calamity as well as strike, political disturbance and violence, the SECOND PARTY shall not be liable to pay any compensation to the FIRST PARTY. However, SECOND PARTY shall collect the faecal sludge in the next available opportunity.

9. THE FIRST PARTY and THE SECOND PARTY shall jointly asses the volume of faecal sludge generated or number of households to be served at different designated faecal sludge collection areas which shall be recorded in writing before commencement of waste collection and transportation by THE SECOND PARTY. The amount recorded in the joint survey by the authorized representatives of THE FIRST PARTY and the SECOND PARTY shall be the basis of faecal sludge collection by SECOND PARTY from the designated collection areas. Cost involved in the assessment/survey will be borne by the FIRST PARTY.

10. The SECOND PARTY shall provide a bank guarantee to the FIRST PARTY based on the volume of faecal sludge to be collected and transported to the designated treatment facility or number of trips to made to the designated treatment facility by the SECOND PARTY, in case the SECOND PARTY fails to collect and transport it to the designated treatment facility, on any ground not covered by those described in clause 9 and Force Majeure vide clause 12 of this Agreement. The amount of bank guarantee will be equivalent to collection and transportation of one months volume of faecal sludge to be paid by FIRST PARTY to the SECOND PARTY or any amount mutually agreed by the PARTIES.

11. Entire Agreement

This Agreement constitutes the entire agreement between the parties hereto with respect to the subject matter hereof, and it supersedes all prior oral or written

agreements, commitments or understandings with respect to the matters provided for herein.

12. Force Majeure

Each party is excused from performance of this Agreement and shall not be liable for any delay in whole or in part caused by the occurrence of any contingency beyond the reasonable control of such party. These contingencies include, war, sabotage, insurrection, riot or other act of civil disobedience, act of public enemy, failure or delay in transportation, judicial action, labor dispute, accident, fire, explosion, flood, severe weather or other act of God.

13. Confidentiality

The Parties shall keep strictly confidential all technical or non-technical information regarding the other party's business divulged in the course of the performance of this Agreement. In particular, the Parties shall keep in strict secrecy any confidential business and end-customer information divulged to them in the course of this Agreement. Notwithstanding anything herein to the contrary, information shall not be deemed confidential for the purpose of this Agreement if the Agreement partner furnishes proof that:

i) it is already publicly known without this being attributable to an act of the party,

ii) it was lawfully obtained from third parties and is not subject to confidentiality,

iii) it was independently developed or obtained by the respective party prior to a disclosure through the party. The terms and conditions of this Agreement shall be kept confidential.

The obligations contained in this Section 13 shall remain in force after the termination of this Agreement for whatever reason.

14. Arbitration

All disputes and differences covering this Deed of Agreement between the two parties, which cannot be settled by mutual discussion, shall be be referred to arbitration under the Arbitration Act. 2001.

IN WITNESS WHEREOF, the undersigned have executed this Agreement, or have duly caused this Agreement to be duly executed on their behalf, as of the date first written above.

For and on behalf of The FIRST PARTY

Signature:

Name:

Title: Chief Executive Officer

Witnessed by(signature):

Witness' name:_____

Witness' title:_____

For and on behalf of
THE SECOND PARTY

Signature:_____

Name

Title: Witness by(signature):_____

Witness' name:

Witness' title:

ANNEX

Details of equipments leased by the Municipality to the private sector operator