



Review of Policy

Review of Legal and other Governing Factors related to Faecal Sludge Management in Bangladesh



Demonstration of Pro-poor Market-based Solutions for Faecal Sludge Management in Urban Centres of Southern Bangladesh

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Project partners





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Disclaimer

The views expressed in this report are those of the authors and do not necessarily reflect the views of SNV Netherlands Development Organisation.



Abbreviations

ADB	Asian Development Bank
BARC	Bangladesh Agricultural Research Council
BNBC	Bangladesh National Building Code
BUET	Bangladesh University of Engineering and Technology
CC	City Corporation
CDA	City Development Authority
CLTS	Community-Led Total Sanitation
DCC	Dhaka City Corporation
DPHE	Department of Public Health Engineering
DSK	Dushtha Shasthya Kendra
FSM	Faecal Sludge Management
GDP	Gross Domestic Product
HDI	Human Development Index
INGO	International Non-Governmental Organisation
ITN	International Training Network of BUET
JMP	Joint Monitoring Programme (of UNICEF and WHO)
KCC	Khulna City Corporation
LGD	Local Government Division
LGED	Local Government Engineering Department
LGI	Local Government Institution
M	Metres
MM	Millimetres
MoLGRD&C	Ministry of Local Government Rural Development and Cooperatives
MVO	Motor Vehicles Ordinance
MAWTS	Mirpur Agricultural Workshop and Training School
NGO	Non-Governmental Organisation
OSS	On-Site Sanitation
PSTC	Population Services and Training Centre
PSU	Policy Support Unit of Local Government Division
RTTA	Road Transport and Traffic Act
SNV	SNV Netherlands Development Organisation
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WASA	Water Supply and Sewerage Authority
WASH	Water, Sanitation and Hygiene
WC	Water Closet
WHO	World Health Organization
WSS	Water Supply and Sanitation
WSUP	Water and Sanitation for the Urban Poor

Summary

This report reviews factors that govern the establishment and functioning of faecal sludge management (FSM) in Bangladesh. These governing factors include legal instruments, institutional arrangement, policies, strategies and plans. A set of recommendations is provided at the end of this report. Despite an impressive array of water supply and sanitation (WSS) sector-related legislation, policies, strategies and plans, FSM has long been neglected in the country.

Bangladesh is one of the world's most densely populated countries. Approximately 150 million people live in an area covering just 147,570 square kilometres, resulting in a population density of close to 1,000 inhabitants per square kilometre. Moreover, it is estimated that the population in 2025 will have increased to 183 million, with 41% (75 million) of the future population living in urban areas, compared to 28% at present. However sanitation services, including sustainable FSM, in urban areas are inadequate to meet the ever-growing demands of rapid urbanisation.

The country's priority, with regards to sanitation, has been reducing open defecation, which now stands at just 3%, down from 19% in 2000. However, this impressive progress has created a new challenge for FSM, as the absence of FSM systems is likely to undermine past achievements and give rise to significant public health and environmental risks. The current legislation, policies and strategies also lack clarity on the roles and responsibilities of various agencies. Consequently, FSM has yet to be institutionalised. Furthermore, appropriate technology in the urban context of Bangladesh has yet to be determined. Moreover, there is lack of awareness on adverse health impacts resulting from uncontrolled discharge of faecal sludge and on the benefits of using treated faecal sludge in agriculture and aquaculture. In summary, FSM in Bangladesh is unsystematic, unplanned, poorly regulated and mostly provided by individuals or informal private service providers.

To develop a sustainable FSM system in Bangladesh based on a legal, management and technology package that reduces costs and provides incentives to service users and providers, this study provides a number of recommendations with regards to institutional and regulatory measures. In particular, specific FSM references and guidelines in related laws and other documents are needed especially to define the roles and responsibilities of government institutions and other stakeholders. The recently approved National Water Supply and Sanitation Strategy 2014 provides an opportunity to develop a sustainable FSM programme. As a next step to mainstream FSM in the WSS sector as well as use treated faecal sludge in related sectors, particularly agriculture and fisheries, this study provides additional recommendations on related themes such as capacity building, advocacy and awareness raising as well as technical, economic and financial measures.

This study further recommends that the Local Government Division's (LGD) Policy Support Unit (PSU) for the water and sanitation sector be entrusted with facilitating the recommendations of this study. It is also suggested that the PSU be supported in this initiative by the International Training Network/ Bangladesh University of Engineering and Technology (ITN/BUET), particularly with regards to technical aspects, research and testing pilot programmes and various thematic groups established by the LGD to coordinate and support several thematic areas of WSS.



1. Introduction

Demonstration of Pro-poor Market-based Solutions for Faecal Sludge Management in Urban Centres of Southern Bangladesh is a four-year project (2014-2017) being implemented by SNV Netherlands Development Organisation, under the leadership of local authorities (Khulna City Corporation (KCC), Kushtia and Jhenaidah Paurashava) in partnership with Khulna University, Khulna University of Engineering and Technology (KUET), Khulna Water Supply and Sewerage Authority (KWASA) and WaterAid Bangladesh.

The main project objective is to demonstrate city-wide, pro-poor, accountable, safe and sustainable FSM services within the urban context in Bangladesh, contributing to improvements in living environments and contributing to the health and well-being of the urban population. The most significant results from this project will be:

- 250,000 additional people (57,000 households) to access improved sanitation facilities (environmentally safe)
- One million people (240,000 households) to enjoy an improved living environment and access to FSM services
- Sector stakeholders, including local authorities from at least two additional cities or towns, to agree to replicate key elements of the FSM approach.

The project aims to support local authorities (KCC and Khulna WASA along with Jhenaidah and Kushtia Paurashava) to address service delivery challenges in FSM and advance the sector's development as a whole, through strategic engagement with government agencies (sector ministries relevant departments and service delivery channels at local level) and partner other experienced civil society and private sector organisations in the sector. The project aims to facilitate a decisive shift in sector thinking, culture and practice through close alignment with respected sector agencies and working collectively with government and local partners to address underlying systemic issues that limit sector development. The project consists of four components: 1) sanitation demand creation and behavioural change communication, 2) strengthening sanitation supply chain development, 3) improving Water, Sanitation and Hygiene (WASH) governance and multi-stakeholder sector development and 4) introducing environmentally safe treatment and re-useable technologies.

Background of the Report

The objective of this report is to review factors that govern the establishment and functioning of FSM in the urban context of Bangladesh. These governing factors include legal instruments, institutional arrangement, policies, strategies and plans. Although the report focuses on FSM, the governing factors related to urban sanitation are also encompassed.

The report is designed to formulate project activities and assist other stakeholders engaged in FSM.

Organisation of the Report

This report contains five sections. Section 1 provides the country context, an overview of the sanitation situation in Bangladesh, definition of FSM and experiences in Bangladesh and elsewhere. Section 2 describes the institutional arrangement of the WSS sector, Section 3 analyses the legal and Section 4 the policy and strategy aspects of the WSS sector in the context of FSM. Section 5 presents the conclusions and recommendations of the report.

Country Context

Bangladesh is one of the world's most densely populated countries. Approximately 150 million people live in an area of 147,570 square kilometres, resulting in a population density of close to 1,000 inhabitants per square kilometre. Figure 1 shows the map of Bangladesh and its neighbouring countries.

Bangladesh's population growth rate has declined from 2.9% per annum in 1974 to 1.37% in 2011. The under-five mortality rate declined from 151 deaths/1,000 live births in 1991 to 41 deaths/1,000 live births in 2012. During the same period, the infant mortality rate decreased from 94 deaths/1,000 live births to 33.

In the last few years, urban population growth has increased to around 3% per annum, while rural population growth continues steadily at around 0.5%. This is consistent with increasing urbanisation. The Bangladesh Bureau of Statistics (BBS) estimates that the country's population will have increased to 183 million by 2025, with about 41% (75 million) living in urban areas compared to 28% at present.

Bangladesh has experienced sustained economic growth over the past decade, with gross domestic product (GDP) growing at an average of 6.2% annually. In 2013, GDP per capita reached USD829. The country's recent economic performance has benefited from two drivers of growth-garment manufacturing for export and remittances of close to USD1.5 billion per month originating from Bangladeshis living in the Middle East and other countries.

High economic growth rates have been accompanied by poverty reduction and increasing living standards. Bangladesh's Human Development Index (HDI) has improved from 0.361 in 1990 to 0.433 in 2000 and to 0.558 in 2013. However, ranked 142nd out of 187 countries in terms of HDI, Bangladesh remains one of the world's least developed countries. Inequality in income and across regions and genders can be vast in many instances.

Sanitation Situation

Bangladesh has made significant progress in sanitation during the last decade, mainly due to the Community- Led Total Sanitation (CLTS), a coordinated effort led by the government and supported by non-governmental organisations (NGOs) and other development partners. The 2014 WHO-UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) ¹ report shows that 57% of the population has access to improved sanitation facilities. The practice of open defecation has been reduced significantly, with only 3% of the population practicing open defecation in 2012, down from 19% in 2000. The report also reveals that in addition to the 57% (55% in urban areas) of people using improved sanitation, 28% (30% in urban areas) use shared latrines and 12% use unimproved latrines. This means that about 97% of population has access to some form of latrine, irrespective of quality.

Water-borne sewerage systems only cover 20% of Dhaka city's population (about 2% of the country's population). The vast majority (about 94%) of Bangladesh's population is served by on-site sanitation (OSS) systems like septic tanks, improved and unimproved pit latrines.

Faecal Sludge and On-Site Sanitation Systems

Faecal sludge comprises a mix of solid and liquid waste contents of pits and vaults accumulated in OSS installations, such as pit latrines and septic tanks. These liquids are normally several times more concentrated in suspended and dissolved solids than wastewater^{2,3}.

Figure 1 : Bangladesh and its neighbouring countries.



1. UNICEF and World Health Organization, Progress on Drinking Water and Sanitation: 2014 Update.

2. Doulaye Koné and Sylvie Peter (2008): Faecal Sludge Management (FSM: Sandec Training Tool 1.0-Module 5, Eawag/Sandec 2008).

3. Water and Sanitation Programme (2014). The Missing Link in Sanitation Service Delivery: A Review of Faecal Sludge Management in 12 Cities.

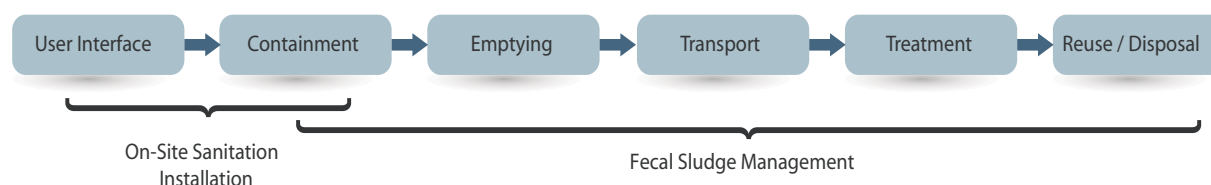
FSM deals with OSS systems, while wastewater management is concerned with sewerage sanitation. Faecal sludge may be treated in separate treatment works or co-treated with sludge produced in wastewater treatment plants⁴

OSS is a system of sanitation whose storage facilities are contained within a plot occupied by a dwelling and its immediate surroundings. For some systems, such as double-pit or vault latrines, faecal matter treatment is conducted on-site and also by extended in-pit consolidation and storage. With other systems, such as septic tanks and single-pit latrines, the sludge must be collected and treated off-site.⁵

Sanitation Service Chain

A sanitation service focuses on sustainable sanitation services for all and at scale, by providing access to sanitary latrines, ensuring continuous hygienic use, adopting maintenance and emptying when full, disposing of faecal sludge safely and/or using it for productive purposes. The steps in the sanitation service chain for an OSS system are shown in Figure 2 which is adapted from International Water Association (IWA) 2014: FSM Systems Approach for Implementation and Operation. The first step is user interface (the toilet), which is achieved by OSS installations. The focus of this report is on the next steps, which are storage (containment), collection (emptying), transport, treatment and reuse/disposal of faecal sludge, collectively known as faecal sludge management, or FSM.

Figure 2: Steps in sanitation service chain



Elements of Sound Faecal Sludge Management

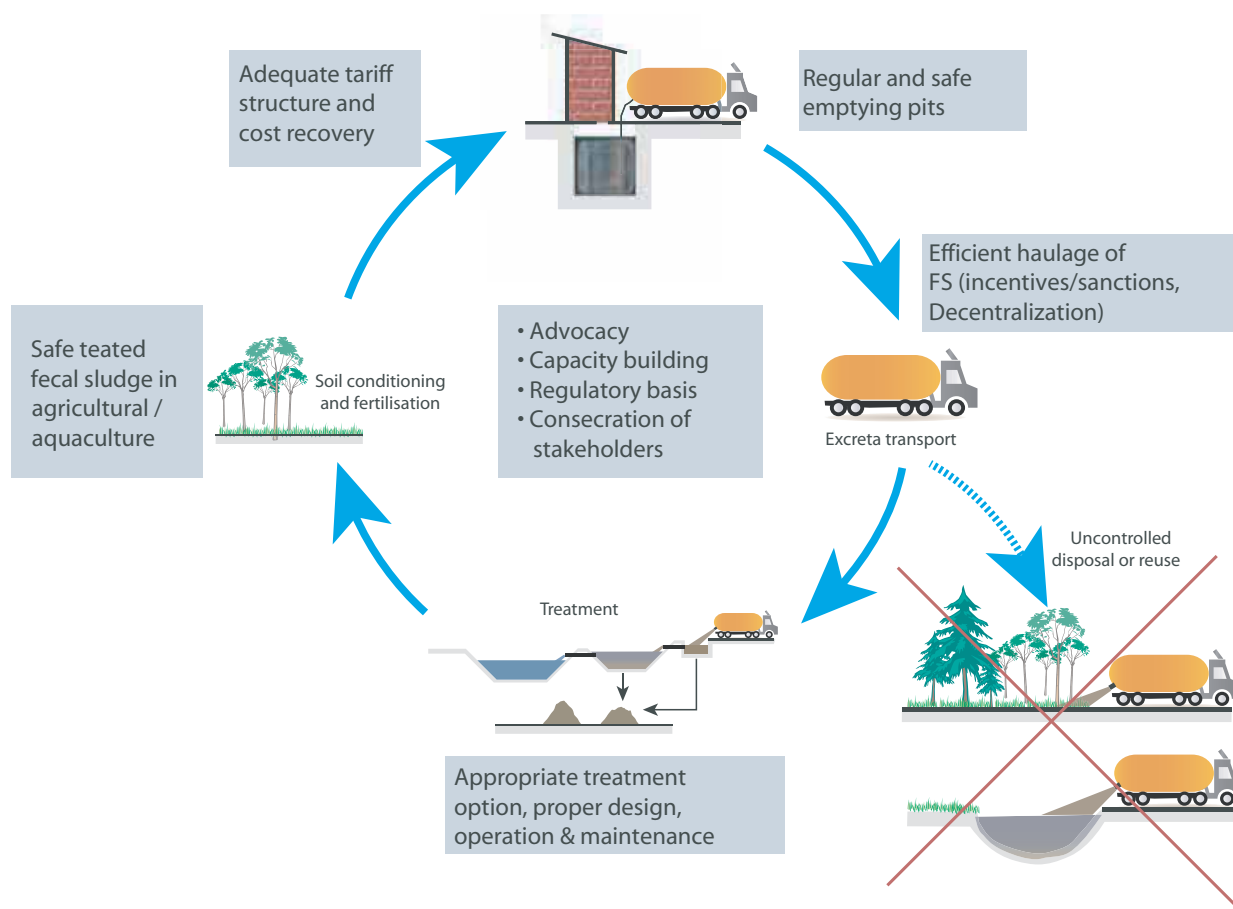
It is widely recognised by WSS sector policy-makers, practitioners and academia that the goal of a sustainable FSM programme should be to ensure that all faecal sludge generated in an urban environment is discharged at designated storage or treatment sites, that illegally and indiscriminately dumped untreated faecal sludge is stopped and that faecal sludge is subjected to adequate treatment prior to agriculture/aquaculture use or landfilling (Figure 3). While political will or commitment must be available or created at various government levels to attain sustained improvements in FSM, a number of measures are also required to achieve this goal:

- a) Advocacy: awareness-raising among all stakeholders
- b) Capacity building : technical and non-technical competence (financial, legal, institutional socio-economic and urban planning)
- c) Technical measures: choice of the best faecal sludge treatment option
- d) Institutional and regulatory measures : legal framework with defined roles and responsibilities
- e) Economic and financial measures : design of financial schemes (including business models) and appropriate tariff structure with subsidy provisions for low-income communities.

4. Steiner, M., Montangero, A., Koné, D. and Strauss, M. (2002): Economic Aspect of Low-cost Faecal Sludge Management – Estimation of Collection, Haulage, Treatment and Disposal/Reuse Cost. Eawag/Sandec.

5. WHO (Ed.) (2006): Safe Use of Wastewater, Excreta and Greywater. Volume IV. Excreta and Greywater Use in Agriculture. WHO Guidelines. WHO, IV, Geneva, 182 pp.

Figure 3: Elements of faecal sludge management⁶



Global Experience of Faecal Sludge Management

A desk study⁷ of 12 cities in Asia, Africa and South America revealed that an estimated 64% of households use OSS installations, whereas 34% use sewerage systems and 2% practice open defecation. The corresponding usage figures for Dhaka city, one of the cities studied, were 79%, 20% and 1%, respectively. The percentage of households using OSS installations is higher in secondary cities and small towns. As sewerage systems are

OSS with proper FSM is an effective sanitation technology and compared to a conventional sewerage system, it could be five times less expensive. Like many other developing countries, the coverage of urban sanitation in Bangladesh has increased dramatically during the last decade, mostly through the use of OSS. A few countries like India, Malaysia, Nepal, Sri Lanka, the Philippines, Thailand and Vietnam in Asia; Nigeria and Senegal in Africa and Argentina in South America have made substantial progress in implementing FSM. However, the majority of developing countries suffer from poor FSM standards. In such countries, faecal sludge is collected in an unhealthy manner, usually manually by 'sweepers'. Again, as in other similar countries, collected sludge in urban areas of Bangladesh is dumped indiscriminately in nearby drains, open ditches and water bodies. Apart from its unpleasant odour, this practice has serious impacts on public health and the urban environment. Both surface and ground water being polluted. It is estimated that 5 cubic metres of untreated faecal sludge disposed into the environment is equivalent to 5,000 people practicing open defecation⁸.

The urban sanitation situation, in terms of the sanitation service chain, is shown in Figure 4. It can be seen that nearly all waste is effectively collected at household level, but improper FSM combined with highly inadequate sewerage and wastewater treatment means faecal matter is distributed throughout the city's environment.

6. (Source: Doulaye Koné and Sylvie Peter (2008): Faecal Sludge Management (FSM) - Sandec Training Tool 1.0-Module 5, Eawag/Sandec 2008

7. Water and Sanitation Programme (2014). The Missing Link in Sanitation Service Delivery: A Review of Faecal Sludge Management in 12 Cities.

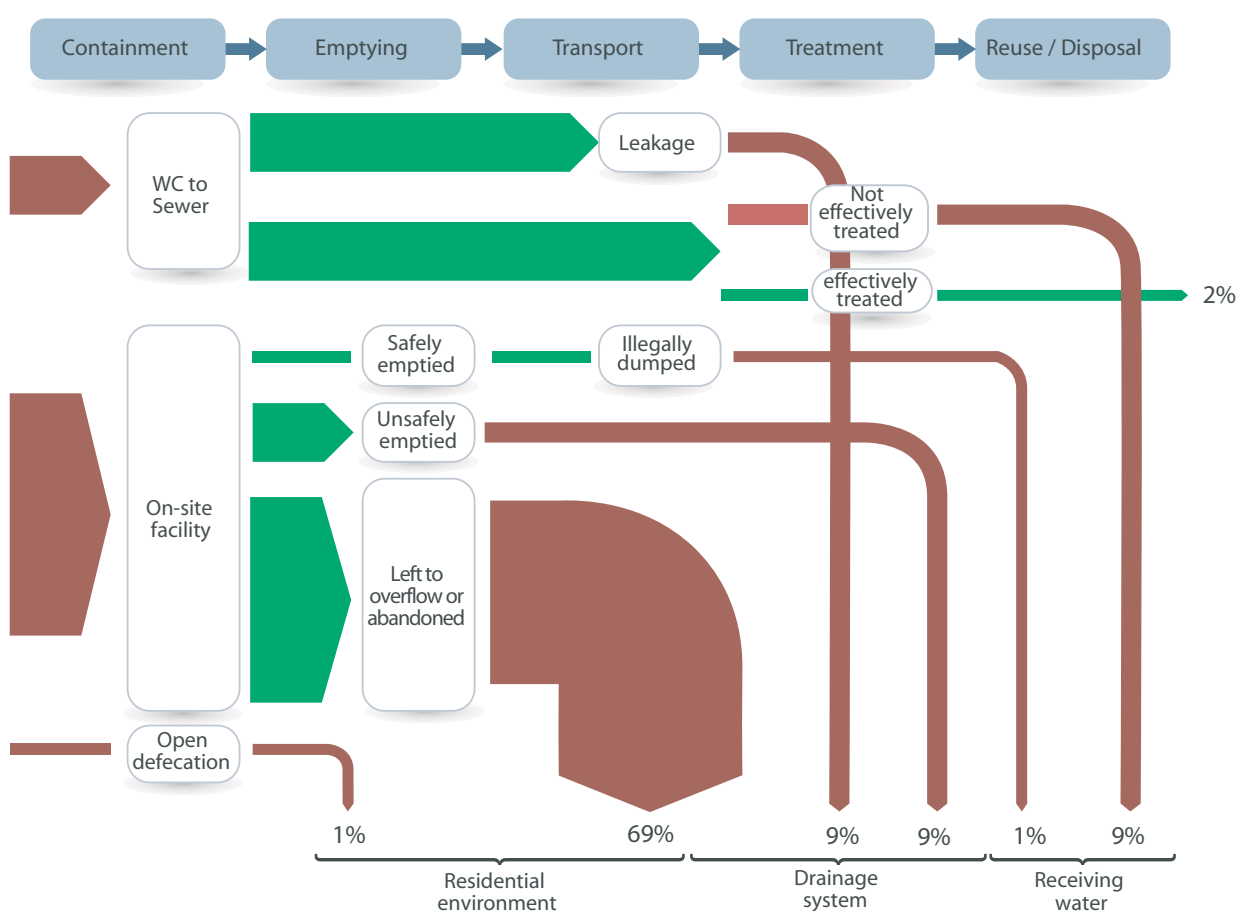
8. Strande et al. (eds.) (2014). Faecal Sludge Management Systems Approach for Implementation and Operation, IWA Publishing, London, UK.

Faecal Sludge Management Initiatives in Bangladesh

Although the WSS sector has an impressive array of legal instruments, policies, strategies and plans in place, FSM has long been neglected and is yet to be institutionalised, considering the National Policy for Safe Water Supply and Sanitation became effective in 1998. Generally FSM is unsystematic, unplanned, poorly regulated and mostly provided by individuals or informal private service providers.

However, in recent years there has been increased interest in FSM in Bangladesh. The just approved National Strategy for Water Supply and Sanitation 2014 provides specific strategic directions to address faecal sludge-related issues as well as design and implement a comprehensive FSM programme.

Figure 4: Faecal waste flow in Dhaka city⁹



There are also a number of ongoing initiatives to implement small-scale or pilot FSM programmes at a local level. For example, the Department of Public Health Engineering (DPHE) with ADB assistance is implementing a water and sanitation service project, with FSM facilities introduced in 11 towns. The municipalities are provided tractor-towed tanks with suction pumps for emptying and transporting faecal sludge from septic tanks and pit latrines. Sludge treatment plants are constructed on the outskirts of towns where the sludge is disposed of. Some 1,000 to 1,500 taka (USD12-20) is charged for emptying a septic tank and residents are reported to be satisfied with this service as they pay less and do not need to dispose of sludge in an improper way.

9. Source: The Missing Link in Sanitation Service Delivery: A Review of Faecal Sludge Management in 12 Cities, WSP2014

Another example of an appropriate technical and institutional approach is a demonstration project in Khulna, the country's third biggest city - located in the southwest, funded by the Bill & Melinda Gates Foundation. In Dhaka city two NGOs - Dushtha Shasthya Kendra (DSK) and Population Services and Training Centre (PSTC) - with financial and technical support from WaterAid provide mechanical faecal sludge emptying services. Recently, UNICEF provided one truck/vacutug to DSK in Dhaka city to expand its services. Dhaka WASA allowed DSK and PSTC to dispose of collected sludge into its sewerage networks. Different fees are charged for different economic groups, with low-income groups in slums getting a subsidised rate. UNICEF also provided two trucks/vacutugs to Dhaka WASA for implementation of services by small-scale private operators. Water and Sanitation for the Urban Poor (WSUP) is supporting Dhaka WASA to develop a business model around this service, while WSUP is introducing small-scale pit emptying devices in Dhaka city. Mirpur Agricultural Workshop and Training School (MAWTS) has been manufacturing trucks/vacutugs locally for supply to different agencies within Bangladesh and export to a number of African countries.

In Khulna city, under an Asian Development Bank (ADB)-funded project, the KCC uses two tank lorries towed by tractors and equipped with suction pumps for mechanical emptying purposes. While the corporation charges households a fee to provide services, the collected sludge is usually deposited into a recently dug trench. In Faridpur town, a mechanical emptying service is provided by the municipality with a vacuum tug procured with funds provided by INGO Practical Action and the municipality¹⁰. WaterAid and Practical Action also piloted an innovative solar drying approach to faecal sludge treatment in Faridpur. The Urban Partnership for Poverty Reduction Project, a UNDP project, has provided a number of trucks/vacutugs to different urban centres, including Khulna. Waste Concern is supporting Kushtia Paurashava to establish a co-compost plant, where human sludge is mixed with kitchen waste. However, there is a need for assessment of the performance of the initiatives and standardisation of the FSM processes¹¹.

Besides these initiatives, Bangladesh is a participating country in an ongoing World Bank-funded study on FSM issues. The Local Government Engineering Department (LGED) has taken up an urban sanitation strategy preparation task with ADB financing. The National Forum for Water Supply and Sanitation recently assigned ITN-BUET to coordinate the ongoing initiatives.

10. Aftab Opel, M.Kairul Bashar and M.Feroze Ahmed (2011). Landscape Analysis and Business Model Assessment in Faecal Sludge Management: Extraction and Transportation Models in Bangladesh. Final Report. WaterAid, Bill & Melinda Gates Foundation.

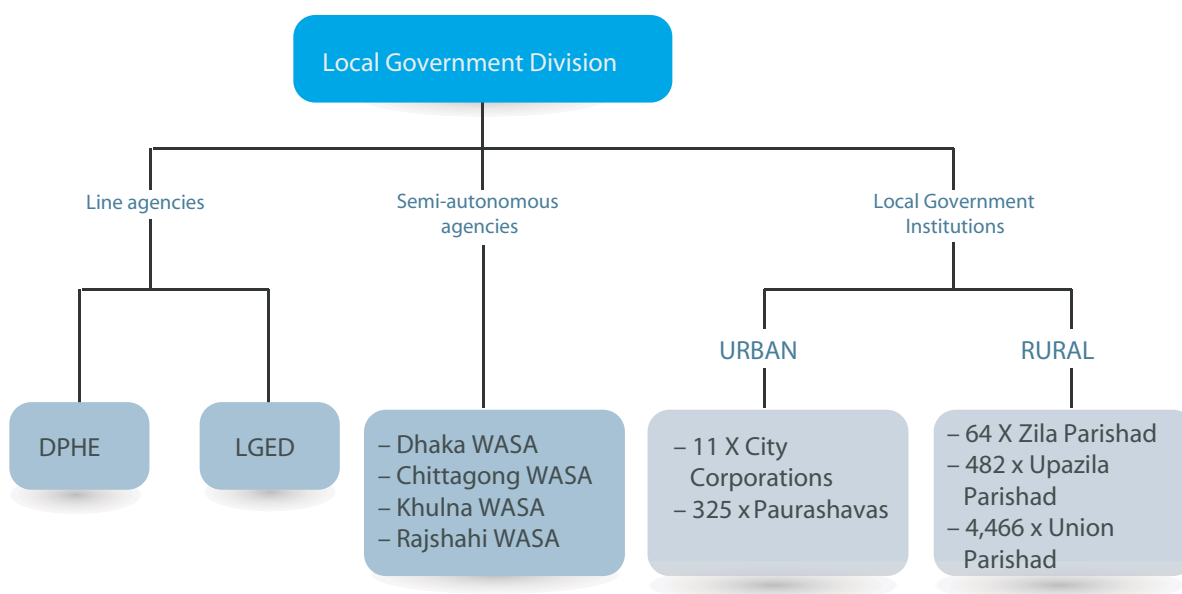
11. Prof. Md. Mujibur Rahman (2014). Keynote presentation on Faecal Sludge Management on World Toilet Day in DPHE Auditorium, Dhaka.



2. Institutional arrangement

The LGD, part of the Ministry of Local Government, Rural Development and Cooperatives (MoLGRD&C), is responsible for the overall governance and development of the WSS sector. Specifically, it focuses on the development of policies, strategies, plans and legal instruments, identification of investment projects and coordination and monitoring of sector activities. The other key sector actors, engaged in providing WSS services, are shown in figure 5 and their roles and responsibilities are briefly described in Table 1.

Figure 5: Key sector actors, engaged in providing WSS services



Bangladesh has 11 city corporations (CCs) (two for Dhaka city – Dhaka North City Corporation and Dhaka South City Corporation) and 325 Paurashavas (municipalities). Six of the 11 CCs have separate WASAs: Dhaka (Dhaka North, Dhaka and Narayanganj CCs), Chittagong, Khulna and Rajshahi. The five other CCs and Paurashavas manage water and sanitation services in cooperation with DPHE.

Table 1: Roles and responsibilities of organisations related to urban water supply and sanitation

Public Sector Institutions		Roles and Responsibilities
Ministry of Planning		Under this ministry, the Planning Commission reviews, appraises and approves sector plans, programmes and projects received from the line agencies through the MLGRD&C and includes those in five-year plans and annual development programmes.
Ministry of Finance		Mobilises, allocates and releases funds for WSS sector plans, programmes and projects appraised and approved by the Planning Commission.
Ministry of Local Government, Rural Development and Co-operatives	Local Government Division	Provides overall guidance to the WSS sector. Performs a wide range of functions, including policy-making, strategic planning, financial mobilisation and allocations, supervision, monitoring and evaluation. The PSU, under the LGD, assists in formulation and implementation of policies and strategies. The PSU is implementing the recent sector development plan and with ADB assistance, has initiated the formulation of a regulatory framework for the WSS sector.
	Department of Public Health Engineering	Provides advisory services to government in framing policy and action plans for WSS. Provides water and sanitation services in rural and urban areas not served by WASAs. Provides technical assistance to local bodies responsible for water and sanitation. Prepares WSS development projects and implements them in consultation with WATSAN Committees.
	Water Supply and Sewerage Authorities	Dhaka WASA's mandate covers water supply, subsurface drainage and sewerage. Chittagong WASA only deals with water supply. WASAs have been recently established for Khulna (2008) and Rajshahi (2010) cities.
	City Corporations	DCC's mandate covers solid waste management, surface drainage and implementation of OSS. The other CCs are responsible for surface drains, solid waste management and maintenance of water supply implemented by DPHE and LGED.
	Paurashavas	Responsible for development and maintenance of social services and physical infrastructure. The Paurashavas collect and dispose of solid waste and are mandated to maintain a sanitary environment.
	Upazila Development Coordination Committees	Responsible for planning, implementation and evaluation and development of programmes at Upazila (sub-district) level. Water and sanitation provisions of the Upazila centres are the responsibility of Upazila WATSAN (Water Supply and Sanitation) committees.
	Local Government Engineering Department	Responsible for rural infrastructure and assists municipalities in implementing infrastructure, including water and sanitation in development partner-supported urban projects. Its function overlaps with DPHE.

Of the sector institutions, the CCs and Paurashavas are mandated to deal with FSM in urban areas based on the Local Government (CC and Paurashava) Act 2009, including amendments and the National Sanitation Strategy 2005. According to the National Sanitation Strategy 2005, CCs are required to establish a Sanitation Division to plan, implement and monitor sanitation programmes in cities. However while the divisions have been established, there is no specific focus on FSM. Likewise, Paurashavas in small and medium-sized towns must establish sanitation units for planning, implementing and monitoring sanitation programmes.

With regards to FSM, the City Development Authorities (CDA) are required to adhere to the Bangladesh National Building Code (BNBC)¹². The Housing and Building Research Institute, under the Ministry of Housing and Public Works, formulated this building code.

12. For planned development, improvement, extension and management of the four major cities in Bangladesh - Dhaka, Chittagong, Khulna and Rajshahi - the government established four CDAs under the Ministry of Housing and Public Works. For Dhaka, the Rajdhani Unnayan Kartripakkha (RAJUK) was established in 30 April, 1987. The Khulna Development Authority was established in 1961, the Chittagong Development Authority in 1959, while the Rajshahi Development Authority covers Rajshahi was established in 1976.



3. Legal review

This section reviews the position of FSM in the context of acts, ordinances and rules that apply to the water and sanitation, environment, agriculture, fisheries and transport sectors.

Water and Sanitation Sector

The legal documents related to the water and sanitation sector are:

- Bangladesh Water Act, 2013
- Local Government Act 2009 (amended 2010 for Paurashavas and 2011 for CCs), which describes the functions and responsibilities of Local Government Institutions (LGIs) amongst others
- Water Supply and Sewerage Act 1996, which describes the roles and responsibilities of WASAs
- Environmental Conservation Act 1995 and Environmental Conservation Rules 1997, which set requirements for disposal of effluent into water bodies
- Bangladesh National Building Code 1993/2006

Bangladesh Water Act, 2013

The objectives of the Bangladesh Water Act are to coordinate, develop, manage, extract, distribute, use, protect and preserve water resources. To fulfil the Act's objectives, the government will form the National Water Resource Council, which will be the highest decision-making body and engage in policy-making and policy direction for coordinated development of water resources, proper use, safe extraction, distribution, protection and preservation.

Article 3(2) mentions potable water and use of water for hygiene and sanitation to be considered as a universal right. Thus, this Act does not have any practical implication on urban sanitation or FSM.

Local Government (City Corporation and Paurashava) Act 2009 and Local Government (Amendment) Act, for Paurashavas 2010 and CCs 2011

There are two similar, but separate Acts for urban LGIs, one for Paurashava and another for CCs. The Acts present the roles and responsibilities of the two LGIs. An analysis of the Act from the perspective of Paurashavas, with findings related to urban sanitation and FSM being the same as the other Act for CCs, is as follows:

The main responsibilities of Paurashavas are outlined in the Act (Part three, Chapter 2, Article 50). The sub-section 1, serial (c) of Article 50 mentions: "Infrastructural development, implementation and issuing urban development plans, including building controls to provide municipal services to the citizen of the municipal area". It implies that as FSM is one of the municipal services, Paurashavas are responsible to render this service.

The roles, responsibilities and authorities of Paurashavas are narrated in different sections of the Act. A thorough review of the Act with respect to urban sanitation and FSM is given in Annex 1. In summary, the Act gives Paurashavas the responsibility of urban sanitation and FSM. The Act assigns responsibility to households for construction and maintenance of latrines and garbage disposal (including faecal sludge). The Act also gives Paurashavas the authority to impose taxes on FSM, with prior government approval. Improper disposal of faecal sludge is treated as an offence under the Act.

The specific roles and responsibilities of FSM may be further formulated in rules, regulations and government circulars under the purview of the Act. Under the purview of the Act (Article 100), the LGD under the LGRD&C has drafted the Paurashava Model Tax Schedule 2014. Clause 25 of this schedule mentions the following:

25) Excreta disposal rate – If the services for excreta disposal are provided by a Paurashava, the Paurashava authority may impose a maximum 12% rate on the annual valuation of building(s) and land. This clause and rate may be used for FSM.

Water Supply and Sewerage Act 1996

The objective of the Water Supply and Sewerage Act is to provide for construction, improvement, expansion and maintenance of water and sewerage works and other facilities relating to environmental sanitation. The roles and responsibilities of WASAs are limited to water supply and waterborne sewerage systems. The Act does not specifically mention WASAs to provide for any other types of sanitation technology or FSM.

However, Article 50 (regarding offences and penalties) refers to the schedule, which gives a list of activities considered offences. The following two items (serial numbers ii and xvii) in the schedule are related to proper maintenance of sanitation systems (including OSS) and FSM:

- Serial ii) Without the permission of the authority, causing or knowing or negligently allowing the content of any sink, sewer, drain or cesspool or any other offensive matter to flow, or into any irrigation channel or any sewer or drain not set apart for the purpose
- Serial xvii) Failure to provide, close, remove, alter, repair, clean, disinfect or put in proper order any latrine, urinal, drain, cesspool or other receptacle for filth, sullage, water or refuse when so required by the authority.

Article 52 Serial no 3 outlines the following penalties for the earlier listed offences:

- “will suffer not more than 2 months imprisonment or a fine not more than 2,500 taka or punishable by both”

The Act implies the restriction of activities related to improper maintenance of OSS and proper FSM. The Act, however, does not give responsibility for OSS or FSM to the WASA.

Environment Conservation Act 1995

The Act provides for conservation of the environment, improvement of environmental standards and control and mitigation of environmental pollution. The Act mainly provides for: (i) remedial measures for injury to ecosystems - including prevention of discharge of excessive environmental pollutants, (ii) formulation and publishing of environmental guidelines relating to control and mitigation of environmental pollution, conservation and management of the environment, (iii) issuance of environmental clearance certificates for an industrial unit or a project, (iv) inspection of any activity or plant for ensuring compliance with the Act, including power to take samples for compliance, (v) power to make rules and standards with reference to the environment and (vi) penalties for non-compliance with the various sections of the Act.

The Act is applicable to urban sanitation in terms of obtaining environmental clearance of infrastructure construction and operations of facilities like wastewater treatment plants.

Environment Conservation Rules 1997 and its subsequent amendments in 2002 and 2003

In line with provisions of the Environment Conservation Act 1995, the Environmental Conservation Rules 1997 have been framed.

The Rules outline the processes and requirements of environmental clearances for specific types of projects indicated therein and stipulate that “no industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate from the Director General of the Department of the Environment”. Schedule 1 of the Rules classifies industrial units and projects into four categories according to their site and impact on the environment, namely (i) green, (ii) orange-A, (iii) orange-B, and (iv) red. The rules specify the procedures for issuing certificates for the various categories of projects.

According to Schedule 1, public toilets are classified as Orange-B and sewerage treatment plants as Red. Faecal sludge treatment plants similar to sewerage treatment plants can be treated as a Red category project.

Rule 12, Schedule 9 gives standards for sewerage discharge, also applicable for discharge from faecal sludge treatment plants.

In the case of FSM, the Environmental Conservation Act and Rules are applicable for obtaining

clearance for construction of faecal sludge treatment plants and effluent quality standards of such treatment plants. The Act and Rules do not cover other elements of FSM like sludge collection and transportation.

Bangladesh National Building Code 1993/2006

The BNBC specifies minimum requirements for dwellings abutting a public sewer or a private waste disposal system as follows (details provided in Annex 2):

- Specification of at least one water closet and one kitchen sink or washing facilities
- Detailed design specifications for a drainage system to convey wastewater to the sewer or private disposal systems
- Appropriate venting to prevent odours and pressure build up
- Provision of adequate access for inspection and maintenance.

The BNBC specifies that the desludging of a septic tank (or inhoff tank) should take place at six month intervals, and once per year at a minimum. It also gives requirements for sanitation in buildings, including connection to sewers or use of septic or Inhoff tanks, discharge of effluent to soak-pits or land and frequency of sludge removal. The BNBC, however, does not mention any other technologies like pit latrines or sludge disposal. Faecal sludge collection, transportation and treatment are also not covered by the BNBC.

Agriculture Sector

In the context of agriculture, bio-solids are used as fertiliser in farming. Bio-solids are nutrient-rich organic matter resulting from the treatment of sewage sludge¹³. When treated and processed, bio-solids can be recycled and applied as valuable fertiliser to stimulate plant growth and improve and maintain productive soils. The use of bio-solids for agricultural purposes can have significant improvements on crop growth and yield. Furthermore, bio-solids can reduce farmers' production costs and replenish organic matter in the soil that gets depleted over time.

In Bangladesh, notwithstanding cultural and social reservations, faecal sludge is used in agriculture. Although information on the extent and magnitude of faecal sludge usage is not available, it is recognised that it is limited, usually promoted by NGOs. Under the BRAC WASH programme, safe production of marketable fertiliser from single and double-pit systems was promoted. Initial studies indicated that bio-solids complied with Bangladesh's organic fertiliser standards regarding total organic carbon, nitrogen and phosphorous, but not for potassium, pH and moisture content. To address these challenges, the BRAC WASH II programme (2013-14) has undertaken research on production of faecal sludge-based fertiliser that meets WHO guidelines for commercially viable faecal sludge reuse in agriculture and Bangladesh standards for agriculture¹⁴. BRAC has submitted a proposal to allow faecal sludge-based compost to be marketed as fertiliser, which is being reviewed by the Bangladesh Agriculture Research Council (BARC), under the Ministry of Agriculture.

Bangladesh's Fertiliser Management Law (2006) provides the legal framework for use of organic fertiliser in agricultural. The Law specifies the physical and chemical parameters and contents or range for each parameter. The Law also lists agencies responsible for quality control and testing of samples at designated laboratories. There are, however, no specific references to or instructions on use of faecal sludge as fertiliser in agriculture. The BRAC WASH II research results will be useful in formalising use of faecal sludge and providing legal, technical and financial guidelines to potential entrepreneurs, NGOs and farmers.

13. <http://water.epa.gov/polwaste/wastewater/treatment/biosolids/genqa.cfm>

14. <http://www.ircwash.org/news/introducing-vesv-project>

Fisheries Sector

Production of fish in ponds fertilised by faecal sludge is practiced in many countries in Asia, especially China, but it is not widespread in Bangladesh due to socio-cultural prejudices¹⁵. Moreover, faecal sludge application in fishponds has become rare due to food safety-related health concerns with the advent of the export-oriented shrimp industry. Despite a dearth of research, literature and market surveys, it is believed there is considerable demand for faecal sludge-based products from fish farmers interested in growing fin fish species for the domestic market.

Presently, there are four major sets of laws and regulations to protect and encourage the development of the fisheries sector in Bangladesh:

- i) The Protection and Conservation of Fish Act (1950), as amended by the Protection and Conservation (Amendment) Ordinance (1982) and implemented by the Protection and Conservation of Fish Rules (1985) as amended in 2014
- ii) Tank Improvement Act (1939) as amended in 1986
- iii) Fish and Fish Products (Inspection and Quality Control) Ordinance of 1983 and implemented by the Fish and Fish Product (Inspection and Quality Control) Rules (1997) as amended in 2008
- iv) The Marine Fisheries Ordinance (1983), as implemented by the Marine Fisheries Rules (1983).

In addition to these laws, aquaculture development is governed by the Fish Feed and Animal Feed Act (2010) and the Fish Hatchery Act (2010) and Rules (2012).

An evaluation of aquaculture sector-specific laws reveals they do not specifically mention the use of faecal sludge in any form or prohibition thereof in aquaculture operations. However, in the case of export-oriented shrimp farming, the practice is prohibited although not explicit in legal terms. The Department of Fisheries Manual on Aquaculture, National Residue Control Plan and Post-Harvest Compliance has a section entitled “Concerns in use of human and animal waste, poultry litter and other organic manure in shrimp ponds”, which says various organic fertilisers during pond preparation and post stocking of shrimp post larvae were promoted in the past to boost natural food production. However, the use of such fertilisers is no longer encouraged due to harmful effects on food safety.

This section further claims that human and animal excreta not only creates serious pollution in shrimp farms, but also poses serious health threats to farmers. The manual ends, however, by saying use of organic fertilisers could be considered through composting in a controlled way without specifying the method and whether it would be applicable to human and animal waste.

Given the current limited and unplanned use of faecal sludge in aquaculture, it is essential that prior to designing a treatment and resource recovery scheme, a combination of measures must be adopted. Such measures include the need to evaluate market demand of faecal sludge-based products, research varieties of fish and aquatic plants with different application rates of faecal sludge, make fisheries laws more specific on the use of faecal sludge and create social awareness and acceptance by transforming faecal sludge into an aesthetically more pleasant form, for example by co-composting it with other organic waste.

Transport Sector

In Bangladesh the Motor Vehicles Ordinance (MVO) 1983, modified to November 29, 1990, provides a legal framework for the transport of waste, including hazardous waste. The MVO will soon be replaced by the proposed Road Transport and Traffic Act (RTTA), which incorporates provisions on compliance measures applied for issuance of driver's licenses and registration of vehicles used to transport waste. However, there are no specific references or guidelines with respect to transport of faecal sludge. The PSU of the LGD could form a committee to develop such guidelines. The experiences of municipalities, in using tractor-towed tanks and working with NGOs (DSK and PSTC) in pilot programmes involving trucks/vacutugs to transport faecal sludge, may provide valuable evidence for policy formulation.

15. This section is based on a companion report prepared by Dr. Ahsan. Dr. Md. Nazmul Ahsan (2014). Review of existing policies, laws and strategies for use of faecal sludge in aquaculture. Fisheries and Marine Resource Technology. Khulna University.



4. Policies, strategies and plans

The WSS sector is governed by a number of policies, strategies and plans. The sector has three national policies¹⁶ and there are five national strategies in the sector.¹⁷ These strategies were prepared for specific purposes and periods of time. However, to streamline all five strategies and incorporate emerging sector issues, the LGD recently formulated the National Strategy for Water Supply and Sanitation 2014. The five strategies will coexist and be consulted for further directions related to specific topics. However, the national strategy will prevail in case of any contradictions. Regarding sector-planning documents, the Sector Development Plan for the Water Supply and Sanitation Sector in Bangladesh 2011-2025 was prepared in 2011 and is used by stakeholders.

This section analyses the policies, strategies and plans for the sector relevant to FSM and makes references to it. These are: i) National Policy for Safe Water Supply and Sanitation 1998, ii) National Sanitation Strategy 2005, iii) recently approved National Water Supply and Sanitation Strategy 2014 and iv) Sector Development Plan (2011-2025). An analysis is given in Table 2.

Table 2: Analysis of policies, strategies and plans relevant to faecal sludge management

Policies, Strategies and Plans	Reference	Observations
National Policy for Safe Water Supply and Sanitation, 1998	Section 3.viii Taking measures in urban areas for removal of solid and liquid waste and use for various purposes. Ensuring the use of waste for the production of organic fertiliser (compost) in rural areas. Section 5. Definition Sanitation means human excreta and sludge disposal, drainage and solid waste management. Section 8.4.2. Urban sanitation The CCs or Paurashavas shall be responsible for solid waste collection, disposal and management. These organisations may transfer, where feasible, the responsibility of collection, removal and management of solid waste to the private sector. Where WASAs exist, they shall be responsible for sewerage and storm water drainage systems. Section 8.4.9. Measures will be taken to recycle, as much as possible, waste materials and to prevent contamination of ground water by sewerage and drainage.	There is specific reference to disposal of solid waste. However, there is only passing reference to FSM in the context of a definition for sanitation.

16. Three policies are: i) National Policy for Safe Water Supply and Sanitation 1998, ii) National Policy for Arsenic Mitigation and Implementation Plan 2004 and iii) National Water Policy 1999.

17. Five strategies are: (i) National Sanitation Strategy 2005, (ii) Pro-Poor Strategy for Water and Sanitation Sector 2005, (iii) National Cost Sharing Strategy for Water Supply and Sanitation in Bangladesh 2011, (iv) National Hygiene Promotion Strategy for Water Supply and Sanitation in Bangladesh 2012 and (v) National Strategy for Hard to Reach Areas and People of Bangladesh 2012.

Table 2: Analysis of policies, strategies and plans relevant to faecal sludge management

Policies, Strategies and Plans	Reference	Observations
National Sanitation Strategy, 2005	Section 8.6: Strategies for improved urban sanitation Technologies for urban sanitation: Sewage treatment technologies with greater emphasis on resources recovery and recycling must be given top priority in improving urban sanitation. Emphasis should be on less energy intensive technologies: e.g. constructed wetlands, oxidation ditches, extended aeration and stabilisation ponds. Appropriate desludging of septic tanks and pit latrines must be enforced and effluent disposed of in a proper manner. Sludge emptying services by CCs and Paurashavas must be in place. Institutional arrangements for urban sanitation: All CCs must establish a fully-fledged Sanitation Division to plan, implement and monitor sanitation programmes in cities. All Paurashavas in small and medium-sized towns must establish Sanitation Units for planning, implementing and monitoring sanitation programmes. Public agencies like WASA, DPHE and LGED will provide technical assistance to LGIs in urban areas.	There is emphasis on disposal of faecal sludge by CCs and Paurashavas in a "proper manner". However, the latter is too general as it does not refer to the various stages of FSM (i.e. from collection to treatment).

Table 2: Analysis of policies, strategies and plans relevant to faecal sludge management

Policies, Strategies and Plans	Reference	Observations
National Strategy for Water Supply and Sanitation, 2014	Strategy 5: Establish faecal sludge management: 1. Give priority to management of faecal sludge from septic tanks and pit latrines, so all sludge is collected, transported, treated and disposed safely in an environmentally friendly manner. 2. LGIs to allocate land at suitable locations for faecal sludge treatment and disposal by all urban areas and Upazila headquarters. 3. Build capacities of LGIs to develop a framework and enabling conditions for managing and regulating activities related to FSM. 4. Support research and demonstration projects for recycling faecal sludge, such as use of compost or treated sludge as fertiliser to recycle nutrients back into nature and on generation of biogas. 5. Encourage use of double pit latrines to enable proper composting of sludge and safe disposal or use as fertiliser. 6. Make arrangements, such as bylaws for regular emptying of septic tanks and pit latrines. 7. Establish FSM in trains, launches and boats. 8. Provide technical and business support to the private sector in sludge collection, treatment, disposal and sale of compost or other products.	Implementation of strategic directions based on an agreed action plan will help to establish a proper FSM system in the country. The strategy also sets milestones with specific timeframes and responsibilities.
Sector Development Plan (FY 2011-2025) for Water Supply and Sanitation Sector in Bangladesh	Annex 6. Agreed Statements: WASAs, CCs and Paurashavas: Improved urban sanitation, including installation of appropriate technologies and safe disposal of sludge.	While the statements stress safe disposal of sludge, the agencies have yet to prepare a comprehensive plan to implement it. This plan is expected to be prepared and implemented in line with the National Water Supply and Sanitation strategy 2014.

5. Conclusions and recommendations

Conclusions

Sanitation services, including sustainable FSM, in urban areas of Bangladesh are inadequate to meet the growing demands of rapid urbanisation, with the country's urban population expected to almost double in the next decade. Despite an impressive array of WSS sector-related legislation, policies, strategies and plans, FSM has long been neglected in the country. Instead, priority has been given to reducing open defecation, which now stands at just 3%. The legislation, policies and strategies also lack clarity on the roles and responsibilities of various agencies. Consequently, FSM has yet to be institutionalised. Furthermore, appropriate technology in the urban context of Bangladesh has yet to be determined. Moreover, there is lack of awareness on the adverse health impacts resulting from uncontrolled discharge of faecal sludge and on the benefits of using treated faecal sludge in agriculture and aquaculture. In summary, FSM is unsystematic, unplanned, poorly regulated and mostly provided by individuals or informal private service providers.

There are, however, a number of ongoing initiatives to implement FSM programmes on a small-scale or pilot basis at a local level. The subsequent lessons learnt will provide foundations to design a sound FSM programme. The recently approved National Water Supply and Sanitation Strategy 2014, which provides specific strategic directions to address faecal sludge-related issues, also provides an opportunity to design and implement a comprehensive FSM programme.

Recommendations

The study's recommendations are elaborated on further in this report, starting with its key objectives - institutional and regulatory measures. As next steps to mainstream FSM into the WSS sector and use treated faecal sludge in related sectors, particularly in agriculture and fisheries, this study provides additional recommendations on related themes including capacity building, advocacy and awareness raising as well as technical, financial and economic measures. This study further recommends that the LGD's PSU for water and sanitation sector be entrusted with facilitating this study's recommendations. It is further suggested that the PSU be supported in this initiative by ITN-BUET, particularly with regards to technical aspects, research and testing pilot programmes and various thematic groups established by the LGD to coordinate and support several thematic areas of WSS.

Institutional and Regulatory Measures

The roles and responsibilities of Paurashavas and CCs need to be made clear with respect to FSM, along with the supporting roles of central government agencies (DPHE and LGED). Depending on the categories of Local Government of Institutions (LGIs), different institutional setup may be necessary. The National Water Supply and Sanitation Strategy 2014 provides an opportunity to address such shortcomings, based on strategic directions and an action plan provided by the strategy.

While WSS sector-related legislation, policies and strategies are in place, they are mostly implicit regarding FSM and lack clarity. Under the purview of the Local Government Act 2009 for Paurashavas and CCs, regulations and bylaws should be prepared to explicitly define faecal sludge and describe the scope of FSM. Action should also be taken to include FSM-related clauses in the Model Paurashava Tax Schedule 2014, drafted by the LGD. The clauses should include the roles of Paurashavas/CCs and citizens in urban sanitation, specifications for OSS installations and maintenance, frequency of sludge emptying, licencing and sanctioning procedures for sludge collection, transportation and disposal, sludge emptying charges and taxation rates for FSM. The PSU, of the LGD, may take on the responsibility to update the Model Tax Schedule.

There are also laws, outside the WSS sector, relevant for FSM. For the agriculture sector, the Bangladesh Fertiliser Management Law (2006) provides a legal framework for agricultural use of organic fertiliser. While faecal sludge is used in a limited manner as organic fertiliser in agriculture, there are no specific references or instructions in the Law on use of faecal sludge. The PSU could



assist in providing legal, technical and financial guidelines to entrepreneurs, NGOs and farmers. The PSU could also draw on lessons learnt from the ongoing BRAC WASH II research programme.

The second law is the proposed RTTA, currently the MVO 1983, which will provide a legal framework for the transport of waste, including hazardous waste. However, the Act makes no specific reference to the transport of faecal sludge. The PSU could form a committee to review the Act and develop guidelines for the transport of faecal sludge. The experiences of municipalities, in using tractor-towed tanks and working with NGOs in pilot programmes involving trucks/vacutugs to transport faecal

For the fisheries sector, four major sets of laws are applicable, but there are no explicit references on use of faecal sludge for fish culture. Similar to the agriculture and transport sectors, the PSU could form a committee to review the laws and develop guidelines for use of faecal sludge. The PSU is also advised to learn from other Asian countries in the use of faecal sludge for aquaculture.

Capacity Building

Capacities need to be built for technical and non-technical features of FSM, encompassing financial, legal, institutional, socio-economic and urban planning aspects. This requires an assessment of the need for additional staff and training in FSM for cities and Paurashavas in conservancy and other relevant departments. Private entrepreneurs involved in emptying and transporting faecal sludge will also need to be trained in technical and management aspects.

There is also a need to build a resource pool in universities, research institutes and government agencies to provide skills training and education to professionals and practitioners in government, NGOs and private sectors. National and local workshops should be organised to promote FSM and disseminate local and international best practice experiences. FSM guidelines should be prepared and include technical and institutional aspects as well as possible business models.

Advocacy and Awareness Raising

All stakeholders, including policy-makers and planners at national and town levels, need to be made aware of the importance of FSM, particularly in terms of its health implications and well-being of the population, economic benefits and protection of the environment.

Awareness raising campaigns should be aimed at town communities to motivate them to take and pay for the emptying services at regular intervals to avoid overflowing septic tanks or pit latrines. Town and Ward Level Coordination Committees could be involved in community awareness campaigns. There is also a need to create social awareness and acceptance of the benefits of using treated faecal sludge in the agriculture and fisheries sectors.

Technical Measures

While there are several good examples of faecal sludge treatment in developing countries, the selection of the most suitable sludge treatment option to suit Bangladesh's needs must be determined. Factors to consider include capital and operating costs, energy requirements, compatibility with the available expertise and prevailing institutional frameworks.

There is also a need to expand and promote new and ongoing research, pilots and small-scale demonstration projects implemented by government and NGOs. Incorporating FSM into master plans of towns and cities should be pursued. Provisions should be made to allocate land for constructing sludge treatment plants. Necessary technical measures are optimisation of faecal sludge collection, haulage and number and size of treatment plants (e.g. centralised or decentralised).

Economic and Financial Measures

To promote FSM in Bangladesh, government financial assistance is necessary for Paurashavas and CCs. DPHE and LGED could prepare development and technical project proposals for FSM demonstration projects run by Paurashavas and CCs.

For a sustainably functioning FSM system, all stakeholders must be motivated and carry out their stipulated roles and responsibilities. While formulating appropriate tariff structures (emptying charges and taxation for FSM), a number of factors need to be considered. These include tariff structures that cover treatment plant expenses (likely operated by local government authority), collection and haulage payments adequate to encourage proper disposal at treatment plants (likely by a private operator) and users able and willing to pay fees.

Subsidy and loan mechanisms need to allow low-income communities to participate in FSM programmes. Communities could also be linked to microcredit facilities to install appropriate OSS installations. Private operators could be matched with appropriate financial institutions, like the SME Foundation, which may provide support packages comprising technical training, business development expertise and low interest loans. Based on market demand analysis, financial models on the use of faecal sludge in agriculture and fisheries need to be prepared and disseminated among potential farmers.

Annex 1

Relevant portions in the Local Government (Paurashavas) Act 2009 and subsequent Amendment in 2010 related to urban sanitation and FSM

Section Numbers in the Act	Relevant Sections of the Act	Relationship to urban sanitation and FSM
Part I – Preamble		
Section 2; sub-section (4)	Explanations “Garbage” means rubbish, offal/ scraps of food, night-soil, carcasses of animals and deposits of sewerage, residue of latrines, dirt, waste and any other polluted materials	Definition of garbage implies faecal sludge
Part III Chapter 2: Responsibilities and functions of Paurashavas and committees		
Section 50		
Section 50; sub-section (2) – b	The responsibilities of Paurashavas shall be - (b) Water supply and excreta disposal	Responsibilities include sanitation and FSM
Section 50; sub-section (5)	Beside these functions, a municipality shall perform functions described in Schedule-II according to its fund	Refers to Schedule II, regarding its responsibilities
Section 55; sub-section (1)	Formulation of Standing Committee: Paurashavas should form standing committees for several activities	Refers to formation of standing committees. A set of 10 activities are mentioned. But, none are on water supply, sanitation or solid waste management
Section 55; sub-section (2)	In addition to the standing committees, each Paurashava may form additional standing committees, which include: – Water supply, sanitation, garbage removal – (Several other services are mentioned)	Committees for sanitation and garbage removal (garbage definition includes faecal sludge)
Part IV Chapter 3: Infrastructural services		
Section 97	Functions of Paurashavas and other agencies: Functions like water supply, drainage and excreta disposal, solid waste management, roads and commercial infrastructure are related to the environment of Paurashava infrastructural services. Paurashavas can implement such projects in the interests of Paurashava dwellers in the following two ways: – Use Paurashava budgets or – Use government budgets or private partnership agreements.	Source of finance for sanitation including FSM

Relevant portions in the Local Government (Paurashavas) Act 2009 and subsequent Amendment in 2010 related to urban sanitation and FSM

Section Numbers in the Act	Relevant Sections of the Act	Relationship to urban sanitation and FSM
Part IV Chapter 4: Municipal taxation		
Section 98	A Paurashava, with Government approval, may levy in the prescribed manner all or any of the taxes, rates, cesses, tolls and fees mentioned in Schedule III	Refers to Schedule III for taxes or other forms of cost recovery for services (including sanitation and FSM)
Part IV Chapter 5: Other local authorities, offences and punishment		
Section 108	Every act or omission specified in the Fourth Schedule shall be an offence under this Act	Refers to Schedule IV for offences
Schedule II (see Section 50-71) (Public Health)		
Section 1	Responsibility for Health Systems: A Paurashava shall be responsible for health management and may take such measures as required	Refers to health-related functions of Paurashavas which may include measures such as sanitation and FSM
Section 2; sub-section 1	Insanitary Buildings: Paurashavas may, by notice, require the owner or occupier of any building or land in an insanitary or unwholesome state: (a) To clean or otherwise put it in a proper state (b) Not keep it in an unhealthy state (c) To lime wash the building(s) and make essential repairs as may be specified by notice (d) Take other steps in regard to such building(s) or land as specified.	Refers to maintaining sanitary conditions
Section 2; sub-section 2	If any requirement of a notice issued under sub-section (1) is not complied with within such period as may be specified in the notice, the Paurashava may take the necessary steps at the expense of the owner or occupier and costs incurred by the municipality shall be deemed to be a tax levied on the owner or occupier under this Act	Power of Paurashavas to impose tax or cost recovery related to (Section 2; sub-section 1)

Relevant portions in the Local Government (Paurashavas) Act 2009 and subsequent Amendment in 2010 related to urban sanitation and FSM

Section Numbers in the Act	Relevant Sections of the Act	Relationship to urban sanitation and FSM
Section 3 Garbage Removal, Collection and Management		
Section 3; sub-section 1	A Paurashava shall make adequate arrangements for the removal of garbage from all public streets, latrines, urinals, drains and all buildings and land vested in the Paurashava and for the collection and proper disposal of such refuse/ garbage	Responsibility of Paurashava for garbage collection (includes faecal sludge)
Section 3; sub-section 2	Occupiers of all other buildings and land within Paurashavas shall be responsible for the removal of garbage from buildings and land subject to the control and supervision of the Paurashava	Responsibility of households for garbage disposal from their premises (includes faecal sludge)
Section 3; sub-section 3	Paurashavas may provide public rubbish bins or other receptacles at suitable places and in streets or other public places. Where such rubbish bins or receptacles are provided the municipality may, by public notice, require all garbage accumulating in any premises or land be deposited by the owner or occupier of such premises or land in such rubbish bins or receptacles	Responsibility of households for garbage transportation and disposal removal from their premises (includes faecal sludge)
Section 4 Public Toilets		
Section 4; sub-section 1	A municipality shall provide and maintain, in sufficient number and in proper state, gender-specific public latrines and urinals	Refers to public toilets
Section 4; sub-section 2	The occupier of any premises where a latrine or urinal is kept shall keep such facilities in a proper state to the satisfaction of the municipality and employ staff if necessary or specified by the municipality	Refers to household sanitation and need to maintain them, implying FSM
Section 4; sub-section 3	If any premises is without a latrine or urinal, or a latrine or urinal is in any objectionable location, the Paurashava can ask the owner of such premises by notice to: (a) Make a latrine or urinal as specified in the notice (b) Remove the latrine or urinal (c) Where there is an underground sewerage system, connect such latrine or urinal to sewerage pipelines.	Refers to repair, upgrade or maintenance of sanitation installations, implying FSM

Relevant portions in the Local Government (Paurashavas) Act 2009 and subsequent Amendment in 2010 related to urban sanitation and FSM

Section Numbers in the Act	Relevant Sections of the Act	Relationship to urban sanitation and FSM
Schedule III (see Section 98) (Taxes, rates, tolls, fees and other sources levied by Paurashavas)		
Section 15	Rate for removal of garbage	Implies the Paurashava authority imposes rates for removing excreta or FSM
Schedule IV (see Section 108) (Crime under law)		
Section 10	Without permission of the Paurashava, cause or knowingly or negligently allow the contents of any sink, sewer/ sewerage, drain, cesspool or any other offensive matter to flow or drain upon any street, public place, irrigation channel, sewer or drain not set apart for such purpose	Implies restricting improper disposal of faecal sludge
Section 13	Leave refuse on any street or place not provided or appointed for such purposes by the Paurashava	As above
Section 26	Failure to provide, close, remove, alter, repair, clean, disinfect or put in proper order any latrine, urinal, drain, cesspool or other receptacle for filth, sewerage, water or refuse when so required by the Paurashava.	As above

Annex 2

Bangladesh National Building Code (BNBC) specifications (1993/2006)

Drainage and Sanitation Requirements

Each family dwelling unit abutting a public sewer or with a private waste disposal system shall have at least one water closet and one kitchen sink or washing area. At least one bathroom with a bath or shower is recommended to meet basic sanitation and personal hygiene requirements. In such a case, the bath and water closet shall be separately accommodated. There shall be one water tap and arrangement for drainage in the vicinity of each water closet or urinal in all buildings. Rooms containing water closets or urinals shall be separated by a partition wall from places where food is prepared and served. All water closets and urinals shall be provided with flushing systems.

Installation of Drainage System

Any soil pipe conveying solid or liquid filth to a drain shall be circular with a minimum diameter of 100mm. The waste branch from bathroom, wash basin or sink shall be 32-50mm in diameter and be trapped immediately beneath such wash basins or sinks by an efficient siphon trap with adequate means of inspection and cleaning. The minimum recommended size of the waste stack is 75mm. The soil and waste stack shall be continued upward undiminished at a size of 0.6m above the roof surface, when the roof is only used for weather protection. If the roof is used for purposes other than weather protection, the soil and vent stack shall run at least 2m above the roof surface. The soil and waste stack shall be firmly attached to the wall with a minimum clearance of 25mm from the wall. All soil, waste and vent (ant siphoning) stacks shall be covered on top with a cowl of the same pipe material.

Installation of Venting System

Any vent stack or main vent shall be installed in conjunction with a soil or waste stack in a building. One vent stack shall not serve more than two soil or waste stacks. Ventilating pipes shall be installed so water cannot be retained and be fixed vertically. Whenever possible, horizontal runs shall be avoided. Buildings with drains shall have at least one 100mm vent stack or stack vent carried outdoors above the roof. The diameter of a vent stack shall not be less than 50mm. The diameter of a branch vent pipe on a waste pipe shall not be less than 25 mm or two-thirds of the diameter of the branch waste pipe ventilated. The branch vent pipe on a soil pipe shall not be less than 32mm in diameter. All main vents or vent stacks shall connect fully sized at their base to the building drain, to the soil or waste stack or below the level of the lowest drainage connection to them. All vent stacks shall extend undiminished in size above the roof or be reconnected to a vent header, stack vent portion of the soil or waste stack at least 150mm above the flood level of the highest fixture connection discharging into the soil or waste stack. The building drain intended to carry wastewater and sewage from a building shall be provided with at least one ventilating pipe situated as near as practicable to the building and as far away as possible from the point at which the drain empties into the sewer.

Clearance of Blockages

There shall be sufficient and suitable access points at every change of alignment, gradient or diameter or at bends and junctions for clearing blockages from drains which cannot be reached by any other means. In case of a straight run of pipes, access points shall be provided at 15m intervals. Inspection chambers and manholes shall have removable, non-ventilating covers of a durable material and suitable strength.

Septic Tank

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 places where public sewers are not available. Such disposal methods shall be designed by a licenced professional in accordance with BNBC provisions and regulations of respective authorities. The design of such a system shall be on the basis of location with respect to wells or other sources of water, soil permeability, ground water elevation, area availability and maximum occupancy of the building. Sullage water shall not be discharged into septic tanks. Effluent from septic tanks shall not be discharged into open water courses. The minimum distance for various disposal system components shall be in accordance with Table 3.

Table 3: Location of Components of Sewage Disposal System

System Component	Distance (m)				
	Building Foundation	Well	Stream	Seepage Pit	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	-

A septic tank shall have a minimum liquid capacity of 2,000 litres, a minimum width of 1m and minimum liquid depth of 1m. The minimum length of a septic tank shall be at least thrice its width and the maximum length of a septic tank shall not be more than four times its width. The maximum size of a septic tank shall be limited to its number of users, not exceeding 300 persons for residential buildings. The volume required for digested sludge and scum may be computed on the basis of 0.04m³/capita/year. There shall be clearance between the top of the liquid level and bottom of the tank cover slab, which shall be at least 300mm. The septic tank shall be constructed of corrosion resistant material and be of permanent water tight construction. The manhole cover and tank roof shall be designed for at least a 7kPa live load. The inlet compartment shall be provided with a manhole and the outlet compartment shall also be provided with a manhole.

The liquid retention time of a septic tank shall be at least one day.

It is recommended that a two-chamber septic tank be used when the capacity of a septic tank exceeds 3,000 litres. The inlet compartment of a two-chamber septic tank shall have a capacity not less than two-thirds of its total capacity.

Imhoff Tanks

Imhoff 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 places where public sewers are not available. Imhoff tanks shall be used where more than 300 people from residential buildings are to be served. The settling chamber shall be designed for a detention period of 1.5 to 4.0 hours and an overflow rate of 0.95 to 1.4m/hr. The slot at the bottom is 0.15 to 0.25m measured along the slope of the hopper.

Maintenance of Conveyance Systems

The following operations shall be carried out during periodical cleaning of a drainage and sanitation system:

- a) The covers of inspection chambers and manholes shall be removed and the side benching and channels scrubbed
- b) All lengths of main and branch drains shall be rodded by means of drain rods and a suitable rubber or leather plunger. After rodding, the drains shall be thoroughly flushed with clean water
- c) The ladders/rings in deep manholes and manhole covers shall be painted
- d) All surface drains shall be cleaned
- e) All subsoil drains shall be examined for obstruction at the open joints
- f) The refuse chute system shall be cleaned.

Disposal in Field and Seepage Pits

A distribution box shall be provided to receive effluent from septic or Imhoff tanks to assure equal distribution to each individual disposal field line. The distribution box shall be connected to the septic or Imhoff tank by a watertight sewer line and be located at the upper end of the disposal field. Soil percolation tests (for at least three holes) shall be performed at the site of a proposed individual sewage disposal system installation to determine soil and site suitability. The liquid capacity (volume below inlet line) of seepage units (disposal field or seepage pit) shall be at least twice that of a septic or Imhoff tank. No seepage unit shall be directly extended into the water table. The bottom of seepage unit shall be at least 1m above the highest water table. Each disposal field shall have at least two outlet distribution lines from the distribution box. No portion of the disposal field shall be installed under a pavement or area where there will be vehicular traffic or parking. Seepage pits (soak pits) shall be lined with stone, brick or concrete blocks laid up dry with open joints backed with at least 75mm coarse aggregate. The joints above the inlet shall be sealed with cement mortar and a reinforced concrete cover shall be provided. For cover areas exceeding 0.75m², a pit shall have an access manhole. The bottom of the pit shall be filled with coarse gravel or crushed stone/brick to a depth of 0.3m. For small dry wells handling limited quantities of wastewater, the pit may consist of a 2.0m deep and 1.0m diameter pipe filled with crushed bricks/stone.

Demonstration of Pro-poor Market-based Solutions for Faecal Sludge Management in Urban Centres of Southern Bangladesh

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