Terms of Reference for a Feasibility Study for "Combined Faecal Sludge Treatment Plant (FSTP) and Material Recovery Facility (MRF) in Narayanganj"

1 Background

The Bangladesh Red Cross Society was constituted on 31 March 1973 by the President's Order No.26 of 1973 with retrospective effect from the 16th of December 1971. The Society was recognized by ICRC on 20 September 1973 and admitted to the International Federation of Red Cross and Red Crescent Societies on 02 November 1973. The name and emblem were changed from Red Cross to Red Crescent on 4th April 1988 vide Act 25 of 1988.

The British Red Cross (BRC), in collaboration with the Bangladesh Red Crescent (BDRCS), is actively implementing nationwide resilience-building programmes spanning urban and rural settings. The BRC team started a project in Narayanganj, "Climate Change Adaptation Programme". As part of this project, the need for WASH improvements in urban slum communities has been identified. BDRCS, with the support of BRC, is planning to conduct a WASH Assessment to identify the specific needs of the population living in the identified communities in Narayanganj, including the needs of women, girls and persons with disabilities.

2 Context and Motivation

Solid waste management (SWM) and fecal sludge management (FSM) are becoming increasingly problematic issues in Bangladeshi urban areas, including Narayanganj. The lack of proper waste management and sanitation infrastructure disproportionately affects low-income communities.

In response to the lack of adequate FSM and SWM within the Sumil Para community, the Bangladesh Red Crescent Society is considering the provision of a combined FSTP and MRF compound, an option that has been implemented in similar circumstances elsewhere in Bangladesh, such as Sakhipur[1].

Benefits of Combined Material Recovery Facilities and Faecal Sludge Treatment Plants

In Bangladesh, the combination of Material Recovery Facilities (MRF) and Faecal Sludge Treatment Plants (FSTPs) is a growing focus for improving sanitation and environmental health, particularly in urban areas. Projects are integrating FSTPs with MRF and decentralized wastewater treatment systems to manage the entire sanitation chain, moving beyond just disposal of waste to include collection, treatment, and potential reuse of treated sludge. Examples like the FSTP in Sakhipur demonstrate a model for smaller towns, while larger municipal initiatives are underway to scale up FSM services across the country.

These **Terms of Reference** are concerned with commissioning an upfront **high-level feasibility study** into the **design**, **construction, operation, and maintenance** for a combined demonstration **faecal sludge**

[1] https://washmatters.wateraid.org/sites/g/files/jkxoof256/files/faecal-sludge-management-landscape-in-south-asia-case-studies.pdf

treatment plant (FSPT) and **material recovery facility** (MRF) compound located at **Jalkuri**[2] to serve the Shumilpara settlement. The target population to be served by the compound is approximately 10,000.

This feasibility study represents the first stage in the overall delivery of the project, with subsequent stages being outline design, detailed design, procurement, construction, commissioning, and hand-over to the NCC.

We are combining two technologies (FSTP & MRF) for several reasons:

i. **An Integrated Approach to Waste Management:**
By handling both liquid (faecal sludge) and solid waste in one place, the FSTP and MRF work together to promote a comprehensive waste management system. The idea of a circular economy, in which various waste streams are processed jointly to maximize recovery and reduce environmental impact, is supported by this integration.

ii. **Efficient Use of Land and Resources:**
Due to land scarcity, it makes sense to build a shared location for several waste management facilities in urban areas like Narayanganj. The land footprint, construction expenses, and infrastructure duplication (such as roads, utilities, and boundary walls) are all decreased when FSTP and MRF are located together.

iii. **Cost Reduction in Operations and Maintenance:**
Compared to operating separate facilities, shared administrative offices, security, utilities, and access infrastructure result in lower overall operational and maintenance costs.

iv. **Improved Coordination and Management:**
It is easier for waste management teams to coordinate when both facilities are in one place. To improve resource recovery, solid waste residues from the MRF, such as organic fractions, may be treated or co-composted with faecal sludge.

v. **Environmental Benefits:**
By centralizing treatment procedures, the risk of contaminating soil and water is decreased by minimizing uncontrolled dumping or leakage from numerous smaller sites. Joint environmental parameter monitoring is also made possible by proper integration.

vi. **Exhibition of Eco-Friendly Urban Methods:**
The construction of a combined FSTP–MRF complex in Narayanganj, a developing urban centre, serves as an example of integrated and sustainable waste management that other cities can follow.

3 Background and Baseline

In 2022 the Bangladesh Red Crescent Society (BDRCS) started working with the residents of the Shumilpara community to improve their living conditions[3].

A key component of the work has been addressing the community's low level of safe **faecal sludge management** [FSM] and insufficient facilities to adequately **manage solid waste**.

[2] Located about 3 km from Sumil Para.

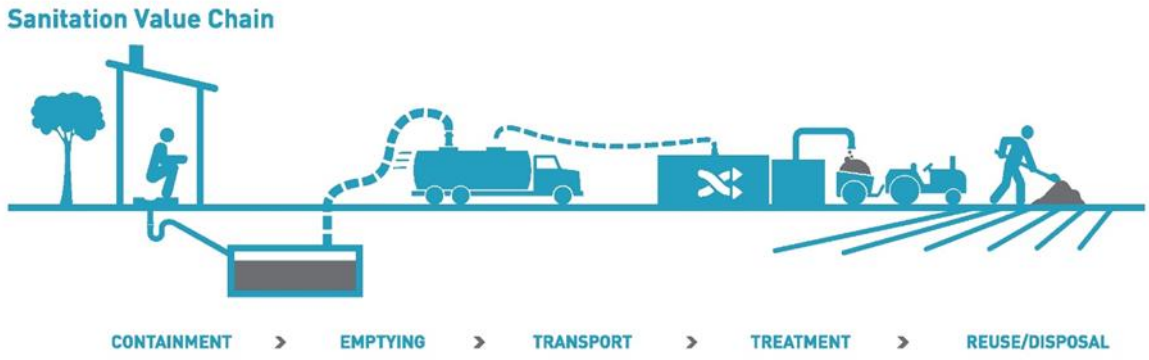
[3] 2023 Baseline Survey of occupations and income in Shumilpara found that predominant occupations of community members was barber, rickshaw pulling, garment worker and day labour. Reported average annual income was between 120,000-130,000 BDT (median was 120,000 BDT)

3.1 Faecal Sludge Management Baseline

A 2025 **baseline survey** of the FSM practises of 627 households in Shumilpara revealed that as much as 80% of the community's blackwater is not contained and instead discharges – untreated - straight to the environment[4], and that only 5% of faecal sludge is both contained and then disposed of in a safe manner.

The on-going efforts by the BDRCS to improve FSM within the community are best analysed within the widely accepted framework of the **Sanitation Value Chain** as shown below in Figure 1.

Figure 1. The Sanitation Value Chain[5]



To date, the BRDCS has focused upon the first link in the **sanitation value chain** (SCV), namely improving the levels of faecal sludge containment within the community by:

i. constructing community latrine blocks with dedicated septic tanks
ii. encouraging households with latrines but without pits to – where possible – install a pit.

The intended result of these interventions is to significantly reduce the number of individuals using a latrine lacking adequate faecal sludge containment.

The BDRCS recognises that by **improving the levels of faecal sludge containment**, there will be an **increased need for the emptying, transportation and treatment of contained faecal sludge**, most notably from the septic tanks connected to the newly constructed community latrine blocks, but also the community's existing pits from which FS is emptied (by mathors) but not currently disposed of in a safe manner.

3.2 Solid Waste Management Baseline

A critical challenge lies in the extremely low level of waste segregation, **with an alarming 91% of the population not separating their waste.** This figure reflects a serious gap in household waste management practices and suggests deeper systemic issues, including limited awareness, inadequate incentives, or ineffective policy enforcement. **Compounding this problem is the lack of designated disposal sites in 61% of the area,** highlighting significant deficiencies in infrastructure and urban planning that further hinder effective waste management.

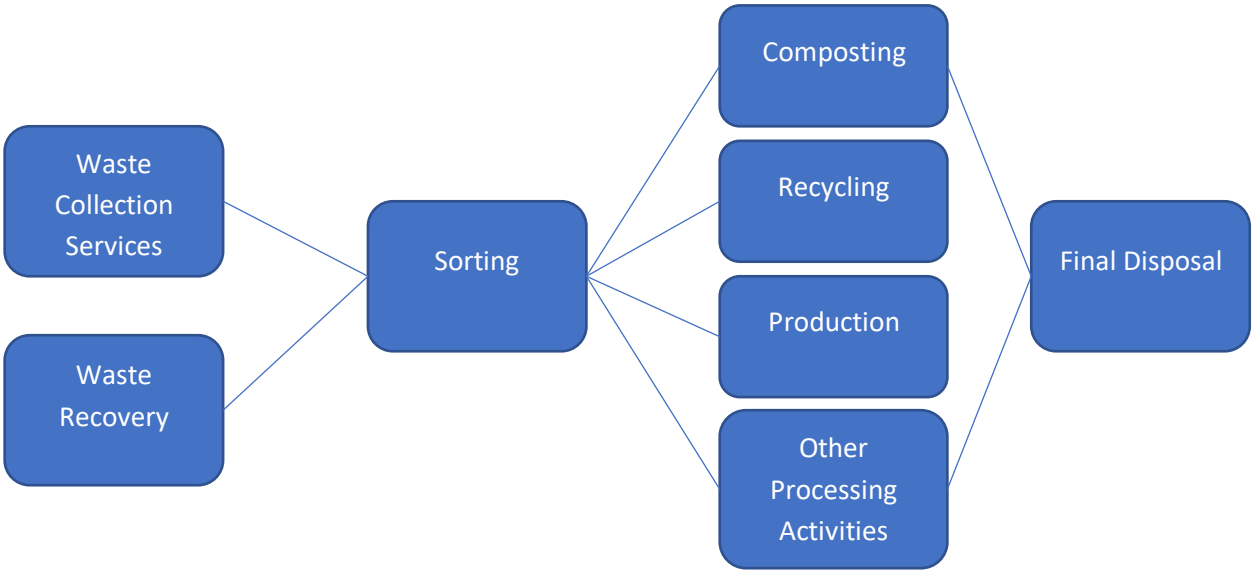
Approximately 61% of households (HHs) pay for waste collection services. Among these, the vast majority around 90% pay **100 BDT or less**, while the remaining households pay **between 101 and 200 BDT**. Additionally, **35% of households** reported that the **drains near their homes are not cleaned regularly**,

[4] Blackwater is discharged either to community's surface drainage canals, a central pond or the neighbouring canal
[5] The sanitation chain *Bill & Melinda Gates Foundation (BMGF).*

indicating deficiencies in local sanitation management and maintenance services. Those data are collected from our Baseline Survey & Midline Survey.

Now, BDRCS working on their Hygiene behaviour practices such as Participatory Hygiene And Sanitation Transformation Cascade through Hygiene messages like waste collection, segregation, recycling, composting, Transportation, safe disposal and other processing activities. We already provided 3 (2 for Shumilpara & 1 for Char Shumilpara) waste collection try cycles (Van) to the community for accelerating the transportation system of the waste from the community to the Secondary Transfer Points.

Figure 1. The Waste Management Value Chain[6]



4 Objectives

The overall objective of this study is to assess the feasibility and viability of a combined FSTP and MRF compound serving the Shumilpara community situated on NCC land at Jalkuri.

Acknowledging that one of the most common reasons globally why FSTP and MRF projects fail is that **insufficient attention is given during the feasibility phase to establishing whether a project will be financially viable**, i.e., can operational and maintenance costs can be covered (through a combination of user fees and third-party support), **this feasibility** study will focus heavily on the economics of the project.

Specific objectives are as follows:

- To determine the footprint of the combined FSTP and MRF compound and establish whether sufficient and suitable land is available at Jalkuri
- To estimate the capital and operating costs[7] of the combined FSTP and MRF unit.
- To establish how solid waste and faecal sludge can be collected and transported from Shumilpara to the FSTP / MRF compound.
- To establish whether a financially viable and sustainable cost model exists to meet the operational and maintenance costs of providing the solid waste management and faecal sludge management services associated with this project.

[6] https://complexcitywaste.wordpress.com/2011/07/12/the-waste-value-chain/

[7] It is expected that estimated costs established during the feasibility study will be within 50% of the final actual costs. Greater accuracy of the costs will be determined as the project moves through its outline design, and detailed design phases.

- Recommend the most appropriate institutional arrangements between the Shumilpara community, the BDRCS, and NCC and the private sector for managing the long-term sustainability and financial viability of the project.
- Identify opportunities for resource recovery and uses of final products from the FSTP and MRF.
- Conduct an outline Environmental and Social Feasibility study in compliance with government regulations.
- To identify any significant blockers that could preventing the successful delivery of the project.

5 Exclusions

Note that the technical design of the FSTP and MRF itself is outside of scope of this **feasibility study**, and the consultant is not being asked to design the FSTP or MRF. Note, a reference technical design of the FSTP is given in ***Appendix A***. It is sufficient for this feasibility study to generate a simple **process block diagram** (PBD) and high-level general arrangement (**GA**)

6 Assumptions

The two key assumptions under-pinning this feasibility study are that:

- the **Narayanganj City Corporation** (NCC) will make sufficient land available at Jalkuri on which to construct the combined FSTP and MRF compound.
- the **BDRCS** will fund the design and construction costs, as well as contribute to operating costs for the first two years of operation, by which time the NCC will have secured sufficient funding from central government to allow the BDRCS to withdraw from providing operational budget support.

7 Scope

The main areas to be covered and questions to be addressed by the feasibility study are given below.

7.1 Land

Based on a target population of approximately 10,000 PE, the feasibility study will establish the area required for the FSTP and MRF units.

In addition, the feasibility study should establish

- Is sufficient suitable land physically available on which to construct the FSTP and MRF?
- Would any ground improvements (such as piling) be required?
- Is the land prone to flooding?
- Is the site reasonable accessible by road.

7.2 Ownership

Recognising that the cost and design and construction of the FSTP and MRF would be handled by BDRCS in collaboration with NCC, the study needs to establish to whom the plant's ownership would be eventually transferred across to once the BDRCS's project ends. Key questions to address are:

- Upon construction of the FSTP and MRF, will the NCC then officially adopt the asset?
- Upon adopting the asset, will the NCC expect any form management fee (and from whom) for allowing it to be used by the community?

One of the biggest risks regarding the sustainability of the proposed FSTP/MRF compound is that the NCC is unable secure operational budget support from the central government, meaning that point at which the BDRCS ends its operational budgetary assistance could trigger the facility falling into disrepair and being abandoned.

7.3 Business Model

One of the most important success criteria for the proposed FSTP and MRF is that of **economic sustainability**. Sufficient income must be generated cover the costs of:

- Emptying the household pits and community septic tanks and transporting the collected FS to the FSTP;
- Collecting, transporting and separating solid waste;
- Maintaining the FS emptying and transportation equipment;
- Maintaining the SWM collection equipment;
- Operating and maintaining the FSTP and MRF.

Whilst it may be assumed that the upfront capital costs for design and construction of the FSTP and MRF plus provision of emptying and transportation equipment will be provided by BDRCS, the on-going operational and maintenance costs (O&M) will need to be generated through a combination of fees paid by Shumilpara community itself and external "top-up" support. To begin with this "top-up" operational budget support will be provided by the BDRCS, but with responsibility transferring to the NCC within 2 years of commissioning.

Key questions to address by the feasibility study are

- What is the community's collective and individuals' ability and willingness to pay for the provision of SWM and FSM services. Attention should be given to the current demand and cost of emptying pits.
- What proportion of the operating and maintenance costs can reasonably be covered via a user fee, and what proportion would need to be need assistance from a third party (initially from the BDRCS but eventually from the NCC)
- Will the community be able to generate sufficient user fees from the communal latrine blocks and households to cover the operational and maintenance costs of the FSTP and MRF?
- Can the user fees for the community latrine blocks raise sufficient funds to keep a reserve for maintenance of the FSTP and MRF, and collection and transportation equipment.
- What is the risk that very low-income families are unable to afford access to the proposed FSM and SWM services, and what mechanisms exist to ensure equitable access is achieved?
- How will the existing private sanitation sector (the so-called "sweepers") who currently empty household pits be affected by the proposed changed in provision of FSM services, and how can the livelihoods of "mathors" potentially be improved through the intervention?

7.4 Service Area and Coverage

A recognised common issue with FSTPs is that, once constructed, very little FS is in fact delivered to the plant, especially if a **gate fee** and/or **trip fee** is charged and/or there are no enforced regulations prohibiting dumping of FS into the environment. To ensure this is not the case for Shumilpara, the following key questions need to be addressed:

- How would the NCC and the community ensure that FS collected from the community was taken to the FSTP rather than being dumped directly to the environment?
- Would a gate fee or trip risk disincentivising transporting FS to the FSTP.
- Would a gate fee or trip be avoided if the costs of collection and transportation from the community septic tanks were included in a "user fee" managed by the community?
- How would "mathors" emptying private household pits be encouraged to deliver FS to the FSTP rather than discharging to the environment?

7.5 Emptying and Transportation

The study will explore the available options for emptying and transporting faecal sludge from household pits and community septic tanks to the faecal sludge treatment plant

It is recommended that recent research by the EAWAG into appropriate options for emptying and transporting FS - as summarised in ***Appendix B –*** are taken into consideration.

Attention is drawn to the fact that in congested settings like Shumilpara, transport options based around **motorised tricycles** can prove to be very attractive, as set out in ***Appendix B***. There is also growing interest in emerging emptying technologies such as Pupu Pumps, which can easily be paired with motorised tricycles.

Key questions to be addressed:

- Would motorised tricycles paired with an established de-sludging pump (such as the Pupu pump) offer a practical solution to the emptying of community septic tanks and transportation to the FSTP? Consideration should be given to safety and accessibility.
- If the answer to the above question is yes, what would be the best ownership model for the equipment (for example – owned, operated and maintained by the local community)?
- How to ensure the provision an emptying and transportation service would be financially sustainable.

It is noted that Bangladesh is the home of the Vacutug, manufactured and sold by the Mirpur Agricultural Workshop and Training School. Given that the Vacutug is specifically designed for desludging in congested urban setting, and is manufactured locally, its suitability and feasibility for this project should be investigated as a matter of priority.

7.6 End Use for Treatment Faecal Sludge

The study will investigate options for the safe disposal and re-use of the treated faecal sludge. including landscaping, horticulture, and agriculture. Consideration is to be given to the safety and reliability of any disposal route. Options should also be explored for adding value to the treated faecal sludge (such as fertiliser or briquette manufacturing) to create a product that could be sold and thus generate an income stream

7.7 Commercial Evaluation

Recognising that the eventual scale-up of FSTP and MRF technology in NCC will require robust financial modelling, this feasibility study will generate outline economic data of sufficient accuracy to allow NCC to calculate internal rates of return, net present value, and benefit-to-cost ratio.

Specifically, the feasibility study will provide estimates of

- the capital cost of the FSTP and MRF, and emptying and transportation equipment
- the operating costs of the FSTP and MRF, and emptying and transportation of the FS
- Income from fees for emptying and transportation of FS.

7.8 Environment and Social Management Plan

The feasibility study will include an outline Environmental and Social Management Plan in line with expectations of a project of this scale and nature as set out by Bangladeshi planning regulations.

8 Methodology

The consultant will be expected to plan and facilitate a series of meeting between the four main stakeholders (BDRCS, NCC, the community and the private sector) to discuss and agree the most feasible solutions to the above questions.

The expected time frame for delivering the feasibility study is 120 Calander days after signing the agreement between both party.

8.1 Key deliverables and timeframes

- Inception report within 2 weeks of contract signed
- Weekly progress meetings with BDRCS and NCC
- Draft final report within 3 months of consultancy
- Final report within 4 months of consultancy
- Workshop to share finding and conclusions of feasibility study to incorporate feedbacks
- 2 days training on FSM and SWM

8.2 Key Outputs and Deliverables

- Report on availability and suitability of land at Jalkuri
- Report on the financial feasibility of the project
- Report on the proposed institutional arrangements for the sustained long-term success of the project
- Report on the technical options for collecting and transporting the FS
- High level process block diagram and general arrangement (GA) drawing of the combined
- A risk and opportunities register for the project
- A high-level environmental and social impact assessment.
- A high level operational and maintenance plan for the facility
- Transfer of all files, drawings, maps and data collected or generated during the study
- 10 copies of the final report.

9 Expected consultant's qualification

9.1 Education

i. Master's degree (preferred) in Environmental Engineering/ Sanitation/ Public Health Engineering/ Civil Engineering/ Urban/Environmental Planning, or related field.

9.2 Professional Experience:

i. Minimum **7–10 years of experience** in water, sanitation, and hygiene (WASH) or urban environmental infrastructure.
ii. Proven track record in **feasibility studies, project design, or evaluation** of sanitation or waste management projects.
iii. Demonstrated experience with **faecal sludge management (FSM)**, small-scale treatment plants, or similar decentralized systems.

9.3 Technical Expertise:

i. Strong understanding of the **Sanitation Value Chain,** FSM service models (containment, emptying, transport, treatment, reuse/disposal) and Solid Waste Management service models.
ii. Familiarity with **innovative desludging and transport technologies** (e.g., Vacutug, Pupu Pump, motorized tricycles), including those currently available in the country or region.
iii. Familiarity with **innovative waste collection and transport technologies** (e.g., waste truck, motorized tricycles), including those currently available in the country or region.
iv. Knowledge of **economic/financial modelling for sustainability**, including user fees, O&M cost recovery, and ownership models.
v. Awareness of **institutional arrangements** in FSM & SWM (city corporation, communities, private sector).

vi. Demonstrated experience in collaborating with Government, Semi-government, NGO's, INGO's and Private sectors.

9.4 Skills:

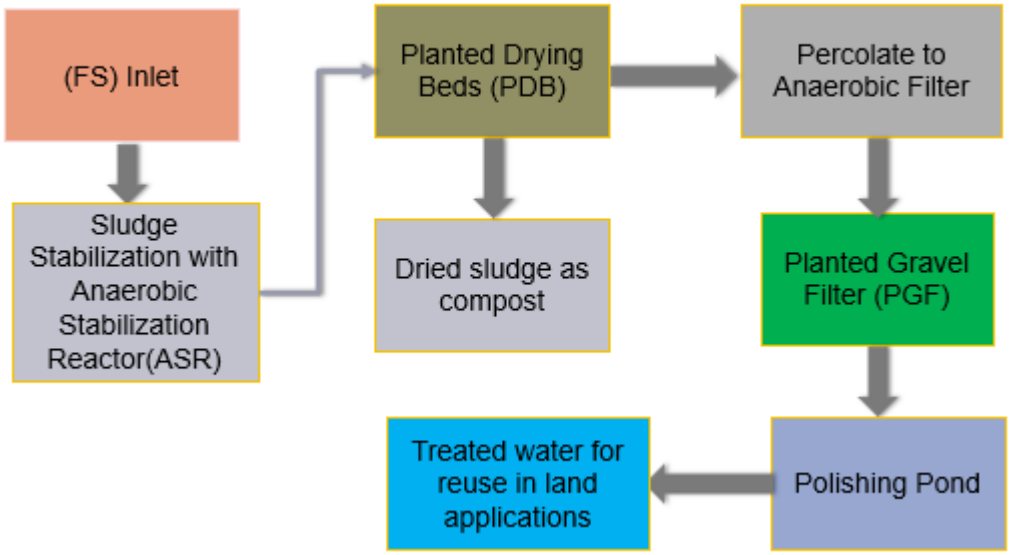
i. Excellent **stakeholder facilitation and engagement skills**, especially with communities, local government, and service providers.
ii. Previous Experience in Similar Work specially in Urban and Slum Context.
iii. Strong **analytical and report-writing skills**.
iv. Have a strong Data collection & analysis team.
v. Ability to **integrate technical, financial, and social dimensions** into practical recommendations.
vi. Sound knowledge & good Understanding about **Faecal Sludge Management (FSM) & Solid Waste Management (SWM)**.
vii. Regulatory & Policy Knowledge.
viii. AutoCAD & GIS Mapping Skill.

9.5 Other Attributes:

i. Experience working in **South Asia, particularly Bangladesh**, or in dense urban/community-based settings is an asset.
ii. Culturally sensitive and able to work effectively with both formal and informal sector actors.
iii. Fluency in Bangla and English (required).

10 Appendix A – Reference Design for Proposed FSTP

Process Flow of a Planted Drying Bed with Anaerobic Stabilization Reactor



The Solids from the Planted drying beds (PBDs) are emptied once in 1-2 years depending on the frequency of loading. The emptied bio solids then need to be sun-dried or dried under green house roofs made out of polycarbonate sheets. Alternatively, they can be co-composted to generate nutrient balanced end product. Either way, after drying they can be potentially used for agriculture or at the very least urban space making.


Planted drying beds (PDBs) are sludge drying beds having filter media (e.g. sand and gravel) And have plants with emergent macrophytes in it. Typically, FS can be applied to PDBs after screening. PDBs are loaded with layers of sludge that are subsequently dewatered and stabilised through multiple physical and biological mechanisms. The solid loading rate for planted drying beds in tropical climates should be in the range of 180–250 Kg TS/m2/ year. FS is repeatedly loaded onto PDBs (loading phase), with up to 15-20 cm of FS per loading. The minimum time between two successive loadings in the PDB should be 6-8 days (varies based on the local evapotranspiration rates). Here, it accumulates for several years depending on the loading rate (loading period 12-24 months, resting period 2-3 months).

The dimensions of the system are to be designed accordingly and the percolate from the PDB is treated separately in any wastewater treatment system. The volume of sludge on the PDB reduces continuously through moisture loss and degradation. At the same time, the plants maintain the porosity in the sludge layer, thereby significantly reducing the need for sludge removal compared to unplanted drying beds.

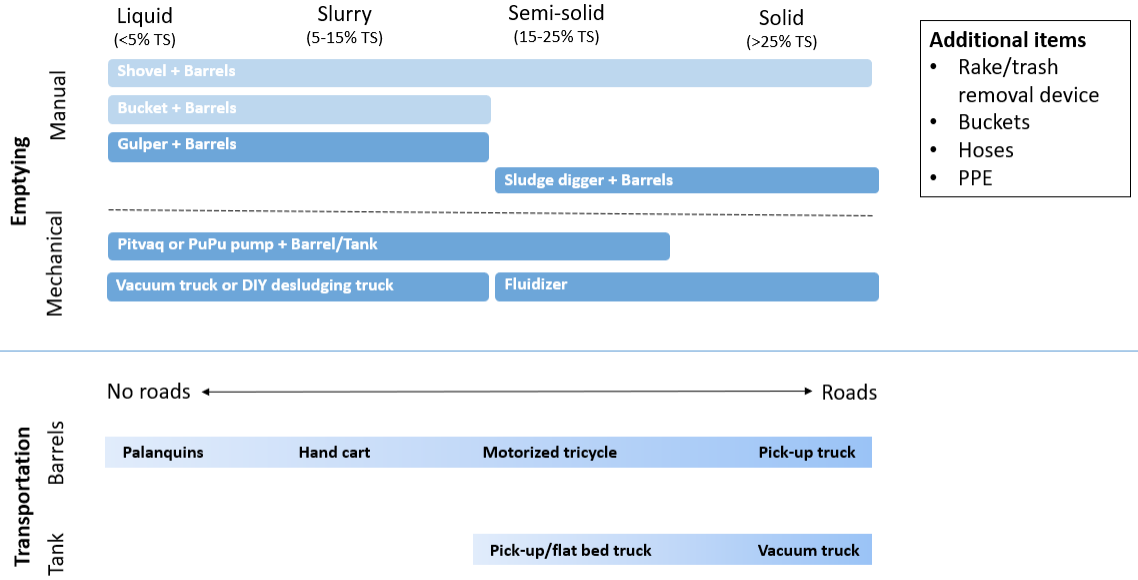
After the completion of loading phase, the accumulated sludge from the PDB needs to be removed and sun dried so that it is free of moisture and stored in safe place. It can then be directly applied to soil as a conditioner. Unlike UPDBs, the removed sludge does not need to be treated further for pathogen inactivation – as the long retention period of at least 12 months followed by sun drying ensures that pathogens are inactivated. The plants that are uprooted from the PDB can also be converted into manure.

The area requirements of a 2-3 m3/d system are

Module	Area in Sq m
Anaerobic Stabilization Reactor	12-18
Planted Drying Bed	~100-120 (4 Beds)
ISAF	6
PGF	5-7.5
Operator Room + Sludge Storage House	15-20 (Can be optimized based on space constraints)

Planted Drying Bed FSTP @ Kali Bilod – near Indore, Madhya Pradesh. Courtesy – CDD India

11 Appendix B – Reference from EAWAG on the feasible options for emptying and transporting FS



12 Evaluation Criteria for Consulting Firm/Individual Consultant

Technical Evaluation (60 Marks)

Sl. no	Weighted	Selection criteria
1	60 %	• Sound knowledge & good Understanding about **Faecal Sludge Management (FSM) & Solid Waste Management (SWM)**. • Strong understanding of the **Sanitation Value Chain,** FSM service models (containment, emptying, transport, treatment, reuse/disposal) and Solid Waste Management service models. • Experience with **innovative desludging and transport technologies** (e.g., Vacutug, Pupu Pump, motorized tricycles), including those currently available in the country or region.

		• Experience with **innovative waste collection and transport technologies** (e.g., waste truck, motorized tricycles), including those currently available in the country or region. • Knowledge of **economic/financial modelling for sustainability**, including user fees, O&M cost recovery, and ownership models. • Demonstrated experience in collaborating with Government, Semi-government, NGO's, INGO's and Private sectors.

Interview & Presentation (20 Marks)

Sl. No	Weighted	Criteria
1	20%	Presentation & Interview

Financial Evaluation (20 Marks)

Sl. No	Weighted	Criteria
1	20%	Competitive cost (Service brief of the consultancy/Jobs)

13 Required Documents:

TIN, BIN (Consulting firm), Trade License (Consulting firm) and updated Tax return certificate

14 Payment Modalities

i. Payment will be made within **30 working days** upon approval of the final deliverables.
ii. VAT and TAX shall be deducted per Bangladesh Government rules during payment settlement. The payment shall be made in the bank account.

15 Submission of Proposals

Proposal will be evaluated Technically & Financially, and proposal must be submitted with technical offer and financial offer in 2 separate sealed envelopes marking on envelope with title (Technical or Financial) respectively. Both envelopes will be put in a bigger envelope with the name of addressee/PRAPAK and title: "Feasibility Study for Combined Faecal Sludge Treatment Plant (FSTP) and Material Recovery Facility (MRF) in Narayanganj"

Please Submit Hard Copy Documents Below Address

Director, Logistics
BDRCS Logistic Department, National Headquarters
684-686, Red Crescent Sarak, Bara Maghbazar, Dhaka 1217

Submission Deadline:
25 January 2026 before 3:00 PM

For any query, please E-mail/Call: abrar.hossain@bdrcs.org or +880 1675-385414.