# SYNTHESIS DOCUMENT: BUILDING DECISION TREE FOR RURAL FSM

ABSTRACT

Faecal sludge management in rural areas is a fast emerging as a challenge as most toilets are single pits or containment tanks. The FSM chain, from containment and collection through transportation and treatment followed by safe reuse is very new and tenuous. While SBM II guidelines provide limited approaches, it was felt that a decision-support mechanism was needed. This thematic discussion elicited help on such a mechanism.

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## Introduction

One of the main second-generation sanitation issues India needs to solve is the management of the faecal waste and sludge accumulating in single and twin pit toilets, holding tanks and septic tanks in rural areas. These systems of containing faeces account for most toilet containment systems. They present a very different challenge than the proper designing and construction of toilets – the constant need to empty them so toilets remain usable, and the possibility that people may revert to open defecation in absence of proper FSM arrangements.

According to a survey by the Quality Council of India[1], in rural areas, 23.89 per cent of toilets were twin leach pits, 40.87 per cent were single leach pits, and 31.93 per cent had septic tanks but were not connected to any treatment system. Narrow lanes, scattered habitations, lower payment abilities, the lack of treatment facilities and small villages are some challenges in rural areas. Additionally, there are few scientific, quick and safe emptying systems. As a result, most emptying operations are done manually or in an improper manner.

An estimated, 61 MLD faecal sludge will be produced by 2024 in rural India, requiring about 2,000 STPs/FSTPs. The private sector has a potential role here and with a suitable enabling environment, can provide financial, technical and managerial expertise.

Currently, there appear to be two emptying paradigms. One is the 'formal' or official paradigm in place for the last couple of years. This takes the view that emptying pit toilets and septic tanks should be done either on demand or on a schedule. The sludge is best handled by a treatment plant or 'proper disposal'. Toilet owners pay for the service of emptying, transport and treatment. The value chain is a viable business proposition, which hypothesis has to be proven at scale and over time.

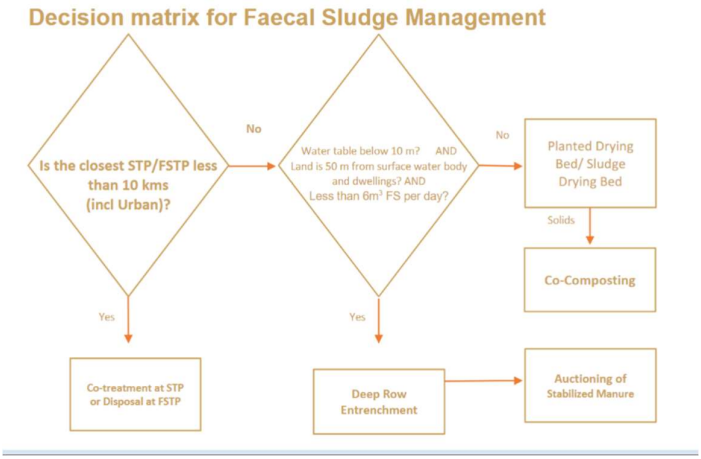
The other is the 'informal' paradigm that has grown organically in response to the demand for emptying septic tanks. This holds that emptying happens when a toilet owner demands it, especially when the tank is filled or overflown and systems are choked, sometimes at intervals of over 10 years. The nutrient-rich sludge, removed by private emptier, could be disposed on a field and the field-owner pays for it. After a few months when natural processes kill off most pathogens, the dried sludge is used as a soil conditioner, reducing the need for fertilisers. This value chain is also a viable business proposition; if it were not, it would not have existed. It comes with its set of environmental concerns and impacts such as water pollution, health and safety issues with improper treatment and handling of human waste etc.

In both paradigms, despite the usage of mechanized equipment for desludging (in many cases), human intervention is involved and continues to be performed by persons engaged in manual

[1] Report of "Household survey for assessment of toilet coverage under SBM gramin", QCI, 2018

scavenging even though the existing laws and the SBM II guidelines forbid it. Direct contact with faeces (in the pits/ septic tanks) is necessary if the sludge is dense and cannot be sucked out, as happens if desludging is at long intervals.

This is also the case when tanks are not constructed well as per norms, which is the case most often, wherein they need to be broken and opened for pumping or emptying to take place. While we have no reliable data on sanitation workers engaged in desludging activity, according to the data by Rehabilitation Research Initiative 2019, more than 15 lakh people are still engaged in manual scavenging, of whom more than 70 per cent are women.




The government's guidelines for SBM II (Rural), sketch the FSM process as illustrated in the decision matrix. There are different approaches because of population densities, access, demand for desludging services and the ability to pay. The co-treatment of faecal sludge with sewage is an option where sewage treatment plants (STPs) exist at a distance of max 15-20 kms from the villages. Where they do not, FS can be poured into trenches, or onto drying beds in fields, or into planted drying beds. In all three methods, the dried sludge can be used in agriculture after curing for several months. The problem is this matrix assumes implementers have a degree of knowledge about the technical and financial aspects of FSM, which is usually not the case.

In practice, in rural areas, FS collected by desludging operators is emptied unsafely into water bodies, farm lands or any empty plots. This pollutes both surface and groundwater that may be used by animals and humans. In open areas, FS dries and can be blown into houses, contaminating food and water, a form of deferred open defecation. Digging trenches and

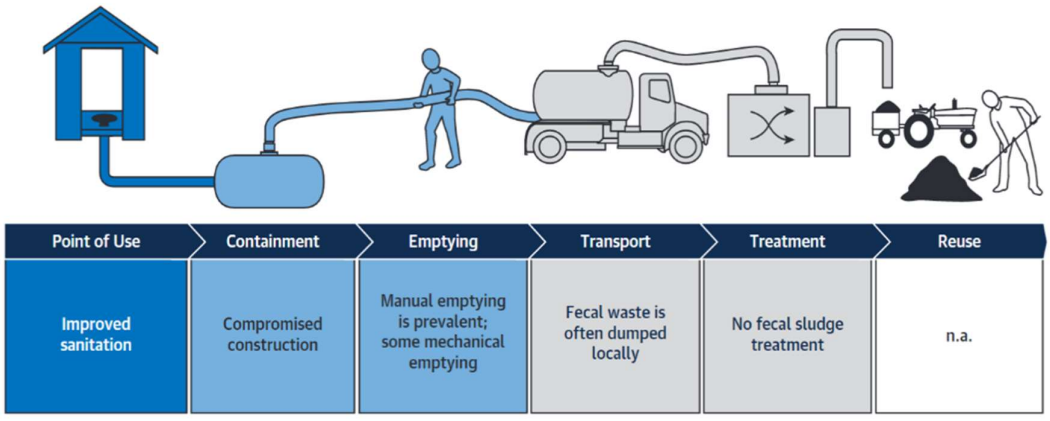



*Figure 1: Risks with FS in India. Source: Global Water Practice, The World Bank*

making drying beds can be easily promoted provided farmers overcome the revulsion of handling human faeces reinforced by the caste system. Figure 1 summarises the risks[2].

To bring the two paradigms together so that FSM in rural areas grows organically and is safely managed, several things need to happen.

Legal control and regulations for Safe and Sustainable FSM

Households and owners of premises including rural institutions such as schools, anganwadis and health care facilities have the responsibility to manage on-site containment, make timely arrangements for de-sludging, and to ensure there is no manual scavenging. Desludging and transport operators need oversight to ensure integration with treatment facilities, coverage of all settlements, enforcing standards of service provision (adequate equipment, enforcing the prohibition of manual scavenging and unsafe work on desludging operations, and service providers decant septage only in treatment facilities).

Some form of price regulation is also needed to ensure fair and affordable prices. For all these, we need to define the roles and responsibilities as well as powers of the Panchayati Raj Institutions clearly. The current extension of the Municipal SLWM act to rural areas may not address lack of clarity about many of these issues. There are no norms for re-use of treated septage in India though the Central Public Health Engineering and Environment Organisation's Advisory Note on Septage Management in Urban India[3] suggests the following norms for reuse of dewatered/treated septage in agriculture till CPCB notifies such norms.

- A faecal coliform density of less than 1000 MPN/g and Salmonella species density of less than 3 MPN per 4g total dry solids
- Helminth egg concentration of less than 1/g and E coli or less than 1000/g total solids in treated septage
- MSW Rules (2000) to check the concentration of arsenic, heavy metals and pH in the reusable water.

**Access to treatment facilities**

Transporting faecal sludge over 15-20 KM to a treatment plant may be the longest viable distance from collection points to keep logistic costs reasonable. This is based on surveys and experiences from the field. But this may also only work if volumes are high, tipping charges are reasonable, and enforcement is strict.

While they charge from the users the charges for the entire distance up to the STP/FSTP, the so-called informal operators may simply drop their loads at the nearest convenient location to maximise profits. Can they be incentivised to do so in nearby designated areas which have been prepared, such as trenches or drying beds, is this better than penalising?

The performance of STPs has been dismal, as data from the Central Pollution Control Board show. The current installed treatment capacity for Class I and II towns is 6,190 million litres per day (MLD) against a generation of 29,129 MLD. There are no figures from smaller towns, census towns and villages. It is safe to assume existing STPs are not up to the job and smaller

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[2] Verhagen, Joep, and Pippa Scott. 2019. "Safely Managed Sanitation in High-Density Rural Areas: Turning Faecal Sludge into a Resource through Innovative Waste Management." World Bank, Washington, DC

[3] Advisory Note on Septage Management in Urban India, MoUD, GoI, 24 http://cpheeo.gov.in/upload/uploadfiles/files/Advisory%20Note%20on%20Septage%20Management%20in%20Urban%20India.pdf

towns do not have STPs. Constructing more such infrastructure is a slow and costly process. The Government of India has come up with Urban-Rural Convergence norms for meeting the FSM needs of rural areas in urban peripheries, which should be seen in this light.

Studies and the guidelines propose that FSM could generate enough revenues to cover operating costs. Constructing a treatment facility is a capital-intensive and technical matter, though biological treatment through wetlands of the percolate from FS is not. Most FSTPs have been constructed using grant money from various sources; their operating costs are still being worked out.

Will funds from the 15th Finance Commission, SBM II and other sources be enough to make and maintain treatment facilities, given their restrictions? Funds from SBM II can be used only for making trenches, drying beds and FSMPs, or any other technology where retrofitting and co-treatment are not possible, according to the guidelines.

Collecting and transporting FS has become a business, but how can this be extended to the entire FS cycle? Is there a market for sludge from FSTPs and STPs? There are some examples where treated sewage from cities is being bought and used by industry and farmers though this is not applicable to rural areas.

A more comprehensive decision tree is required. If there are treatment facilities close enough to make tipping commercially viable, private transporters could be persuaded through financial and legal means to use them. In their absence, the guidelines suggest that farmers could be educated to make trenches, drying beds or reed beds to accept and treat the FS. They would pay the transporter and in turn, save on fertilisers. The decision tree needs to factor caste barriers to handling FS, educating households on desludging timings and getting them to pay.

FS safety standards are needed. Untreated FS is a pollutant and health hazard. Existing rules and laws cover the pollution aspect for water pollution and disposal of solid waste, but inadequately for FS. They do not deal with the second at all. CPHEEO's norms are not binding. For instance, how many helminth cysts per unit weight are permissible? How can they be neutralised or is there even a cost-effective way to do so? How can eutrophication of water bodies from the high nutrient loads in FS be prevented?

And the final and important question remains: How to prevent the practice of manual scavenging and direct human contact with faecal matter while engaging sanitation workers, and ensure their health, safety, dignity and livelihood?

Therefore, while the guidelines have been laid down and roles and responsibilities decided, there are many challenges to managing FS in rural areas. A suitable decision tree, similar to the shit-flow diagram, can be a valuable tool to bring the two paradigms together.

## Discussion summary

Sandhya Haribal, Project Manager in the Consortium for DEWATS Dissemination (CDD) Society opened the discussion by talking about India's efforts in the sanitation space in recent decades with great success. The desludging of toilet containments in rural areas is currently being carried out in an erratic manner. As the availability of desludging vehicles is scarce and houses are usually constructed on vast plots, the containments are found to be oversized (in order to delay emptying). In terms of treatment facilities also, there are not many existing examples, and this issue needs immediate redressal.

Key challenges in rural FSM

Sandhya identified the following key challenges in terms of rural FSM:

- What is the ideal treatment capacity one should design for a given cluster of villages? With varying scenarios across a single district, assessing ideal capacities which would cater to not just the present but future population is a challenging task
- Even if infrastructure for treatment is built/provided, ensuring proper and timely desludging and discharge of the collected sludge at the designated point is another challenge and would require a much stronger institutional mechanism
- With a different economic and administrative structure as compared to urban counterparts, neither the community nor PRIs may have sufficient resources or capacities to manage an FSM system which will require contextual and easy to manage low-cost systems
- Faulty construction of toilets and containments in many places could pose a demand risk for any newly set up FSM system
- With limited financial resources and various behavioural challenges, it might be difficult to attract private service providers into rural hinterlands.

Sandhya posed several questions to build the decision tree for FSM in rural areas:

- What is the ideal approach to planning the ideal capacity and location of an FSM system for a group of villages?
- How can one ensure smooth functioning of an FSM system in a rural area in the current scenario? Please provide inputs on the administrative, legal, management, financial and social aspects
- What could be your suggestions for making FSM systems a thriving services market in the rural scenario?
- How can one overcome the acceptability challenge to this concept of treating human waste and using the treatment by-products in rural areas?

The contributors to the thematic discussion expanded on the challenges. These can be summarised as

1. The perceived and actual high cost of FSM, starting with pit emptying to transport and treatment. FSTPs are too expensive for rural local government institutions to build. Panchayats may be hard-pressed to cover their running costs including transport of FS, low as they may seem. Hence, PRIs are not involved
2. Collecting FS from scattered households in rural areas, and carrying it to a FSTP in a urban/peri-urban area where it can be treated is not economically viable
3. To meet the demand of rural FSM, an estimated 2,000 plants will be needed, along with ancillary services to transport raw FS to the plants and treated FS to markets. These nowhere in sight yet
4. Existing FSTPs are in the process of developing plans to become economically viable, but in their absence, it is difficult to envisage their long-term sustainability
5. The majority of households in rural areas have either single leach pit toilets or massive containment tanks. The FS in these will be too hard to suck out with regular machines, necessitating manual intervention
6. The SBM II guidelines suggest trenching as a means to dispose FS but this should be avoided as it needs large amounts of land, and it does not cover health and environmental safety. There are no details of how this is to be done. Further, planted or

unplanted beds are recommended for treatment, both of which also need large tracts of land

7. While co-treatment at STPs, and disposal of sludge in landfills, is suggested, in large villages and peri-urban areas there is no integrated planning process for these
8. Additional research showed the lack of standards for reusing treated FS in agriculture. CPHEEO recommends levels of faecal coliforms and helminth, but these are not binding. Pollution control boards do not have the rules and human resources to police FSTPs
9. In Kerala, one of the first states where most households had toilets linked to containment tanks as early as 2013, untreated FS was a major source of contamination of groundwater. Pit emptiers, mostly private, operated without regulation and dumped raw FS in any open area or water body, exacerbating the problem

## Solutions For Effective Rural FSM

The discussions provided several valuable ideas for FSM given these challenges. Treatment, transport, financial viability and business cases, capacities of PRIs, community awareness and human and environmental safety were covered in these suggestions.

### RECOMMENDATIONS

- Any solution for rural FSM must be simple and context specific.
- The sparsely developed and remote rural areas would be best served with on-site or decentralized solutions.
- Converting single pit toilets to double pits, and containment tanks to septic tanks, is the most desirable solution.
- Co-treatment at existing FSTPs and STPs is the next option where feasible but will take a while to materialise. The district administration could formalist these arrangements via MoUs.
- Emptying charges and frequency need to be fixed with financial and technical considerations in mind; they cannot be political decisions.
- Integrated management of FSM and SWM can be planned and executed in most rural areas.
- FSTPs need to be monitored by state pollution control boards and local authorities.

On-Site Sanitation (OSS). Several participants advocated for OSS, primarily twin leach pit toilets and well-designed septic tanks of a suitable size, with baffles and soaking areas. These are permanent solutions, but expensive and difficult to implement. Families that opted for single leach pits did so because they could not afford twin pits, or lacked the space; neither situation is likely to change and therefore, there is little chance of getting them to dig another pit. Those that made large containment tanks did so as they did not want the hassle of emptying a pit, ever. It may not be technical feasible to convert these expensive tanks into proper septic tanks. This leaves the small number of families with twin leach pits and suitable septic tanks as the only ones with proper OSS.

Co-treatment at FSTPs/STPs. The SBM II guidelines recommend this approach, where possible. If there are treatment facilities within a distance of up to 20 KM, the district administration that coordinates SBM II can consider using them if capacity and cost considerations permit. Panchayats can be placed in zones, depending on their distance and access, from the plant, and transport and tipping charges fixed to balance the cost to households with transport costs. To make this work, several aspects need to be worked out.

1) Emptying charges and frequency need to be fixed. These can be calculated and finalised at meetings between the treatment plant operator, the district administration, and panchayats.

First, the plant's capacity needs to be determined to work out the FS quantity that can be treated. Second, the emptying schedule of the panchayats needs to be prepared to provide this quantity of FS, with a margin of error to accommodate vehicle and plant break-downs, and delays in emptying pits. The houses, transport routes, dates and quantities can be mapped to form a cluster for the FS treatment chain

2) These arrangements need to be formalised into a FS treatment plan for the cluster backed by rules. The district administration can sign an MoU with the plant operator that also specifies tipping charges. Tipping charges can be graded depending on the distance of the source from the plant with panchayats further away being cross-subsidised
3) Monitoring systems to ensure the collection and transport happen as stipulated, and safely, need to be instituted. Block and district sanitation coordinators can perform this task
4) A call centre for emptying services can be set up so families can reach out for their services when needed
5) The financial viability of the treatment plant needs to be ensured. If it was made with grant funds from the government or other donors, that agency can support the plant's operations for a period of 1-2 years to develop a business plan. Income and expenditure sources can be identified and matched to ensure its viability. The typical income sources that participants suggested were tipping charges and sales of treated FS. Expenditure heads include salaries for plant operators, electricity and repairs
6) A Public-private-social partnership is a way forward to resolve the transportation of FS using the hybrid annuity model (HAM) which was successfully demonstrated in Andhra Pradesh. This would further enable to improve the services by linking payments to the performance. In the HAM, 50% of the capital investment comes from the private player, the remaining 50% is paid by the government to the player in form of annuity payments along with fixed O&M cost
7) Integrated planning of FSM and SWM is necessary especially in dense villages which would enable in synergies between the two closely related services. Self-help groups should be actively involved in operation and maintenance. They may need handholding support.
8) Monitoring and regulation of FSTPs should be executed at regular intervals with the help of state pollution control boards. This would enable in maintaining proper standards for managing the FS. Attempts should be made to make such plants cost effective and recover the resource to be used in the form of solid/liquid manure. This would enable the farmers of nearby villages to use such manure along with existing ones.

Deep-row Trenching. The SBM II guidelines suggest these, but are vague about how to execute it. It was suggested that this method can be used only if there is land available, the water table is low and the landowner is willing to give the FS time to cure before using it for manure. Educating the farmers is necessary so they understand how to dig the trenches, turn the FS and time its extraction so that the helminth eggs and coliform bacteria have become unviable.

Members shared the experience of two FSTPs. The first in Wayanad district, Kerala, was constructed by PriMove infrastructure and supported by UNICEF and the municipal corporation. PriMove managed the O&M for a year and then handed it over to the municipality. The municipality could not meet the running costs in the first year, but it plans to address this by increasing the tipping fees and selling manure. The plant uses the tiger bio-filter technology, where earthworms for composting the sludge. It has a capacity of 10 kilolitres per day (KLD).

The second FSTP is in Dhenkanal town, Odisha which has a 27 KLD capacity. Here, treatment follows the process of solid-liquid separation, stabilization, dewatering of sludge and pathogen

removal. Its income is from demand-based collection. It serves the town and 49 panchayats. It demonstrated a scalable and sustainable model for septage management in India.

As part of the process of developing the decision tree, the SuSanA India Chapter organised a webinar on 9 March with ISC, CSE, CDD society, IRC, UNICEF and WaterAid India. The purpose of this webinar was to help taking decisions regarding the management of faecal sludge (FS) in rural areas by developing decision tree which can be further used by the implementable agencies such as gram panchayats (GPs).

The speakers were:

1) Sandhya Haribal, Senior Project Manager at CDD Society, Bangalore
2) Ajit Saxena, Executive Director EEDS Bhopal
3) Abdullah Al-Muyeed, Chief Operating Officer, CWIS-FSM support cell, Department of Public and Health Engineering, Bangladesh
4) Hrudananda Mohanty, Associate fellow and State Coordinator (Odisha Projects), Centre for Policy Research, New Delhi
5) Avinash Y. Kumar, Senior Fellow at SACIWaters, Hyderabad
6) Sushmita Sengupta, Senior Programme Manager at Centre for Science and Environment, New Delhi

The panelists covered six aspects of FSM: **Planning, Institutional, Technical, Financial, Monitoring & Regulation and Social**. This helped in enabling visualise solutions which could be implemented across the rural areas. The webinar was attended by nearly 200 participants.

Speakers outlined the strategies that had been adopted to address challenges related to FSM in rural areas

1. Planning

FSM in Bangladesh formally started in 2017 when it got its institutional and regulatory framework for both rural and urban areas. For efficient management of FS, four categories were created: Rural, Urban, Mega city corporations and Dhaka city-specific. According to the recent report regarding SDGs, 40% of rural areas had a safely managed sanitation solution due to the wide prevalence of twin pit toilets. In 2018, the government policy called Amar Gaon Amar Shohor was implemented which involved setting up improved facilities in urban areas which was extended to peri-urban and rural areas. Bangladesh is adapting to the changing situation. Technology selection follows mixed mode approach, and suitable institutional arrangement are being made across the country, including collaborations between the ministries of local government and rural cooperatives. Bangladesh has developed a National Action Plan in 2021 for rural areas.

In India, various factors need to be considered such as local climatic conditions, the status of drainage and water systems, income levels, topography, etc. FSM is technology-centric but people engagement is not given due importance. Neither is the issue of containment tanks, single pit toilets, etc., that are badly made and leak into stormwater drains. This necessitates joint management of greywater and FSM. A baseline assessment of toilets should include determining the type of toilets followed by an assessment of the suitable technology that should factor in social, geographical and economic aspects. The shit flow diagramme can be used for the purpose.

Urban-rural convergence is one way to manage FS that can formalise these services. It is a collaborative process between PRIs and the municipality while district administrations take

overall decisions. For undertaking the urban-rural convergence, clustering of villages is essential for increasing the efficiency of the management system. One such example is Devagiri, where 30-40% of the sludge is from the nearby villages. Several FSTPs in towns get FS from villages within a 10-20 Km radius. In Karnataka, panchayats have demarcated 7-8 acres of land (though only 2-2.5 acres is needed) for solid and liquid waste management facilities (SLWM). Some panchayats have compost beds and an incentive to co-compost FS to use manure. Over time, farmers prefer the manure generated from FS.

There are two scenarios where clustering can be carried out: In a decentralised manner with compost sheds in each village or in a centralised manner where sludge is taken from 15-20 villages to a nearby municipality. In the centralised model, one needs to decide on the ownership of the conveyance measures, if it will be government owned or privately owned as well as its maintenance.

2. Institutional

The urban-rural convergence model from Odisha is replicable in other parts of India as well as across Bangladesh. The capacity of plant, location (distance) of villages to the plant for clustering, types of pits available to rural setting as well as operational cost needs to be considered while extending the services to rural areas. In certain rural areas, rural-rural convergence can also be considered where facilities can be set up in uncultivable land and nearby GPs can them. In Bangladesh urban-rural convergence has taken place, leading to an integrated approach for management of FS and SWM in a single plant.

3. Technical

Technical knowhow for FSM is crucial for successful implementation. In rural areas, where most toilet pits are single, effective FSM is difficult. In certain villages across Jharkhand, Rajasthan and Odisha, some single pits were so deep that they were even touching the GW table. Moreover sometimes, the sludge becomes so hard that the entire system might collapse while emptying. In such scenarios, off site treatment is the best option. Another option is retrofitting these single ones with twin pits. Retrofitting is a critical item for FSM planning. Families need to be made aware of FSM as many are not sure why it is necessary for the longer run. A local level analysis and study needs to be carried out to map out the technologies which can be locally implemented for FSM. A matrix of technology needs to be developed which would include why this is technology required, its limitations and strengths.

In Bangladesh too, the issue main regarding technology selection and retrofitting the single pits is the lack of awareness and education at the grassroot level. Hence, spreading awareness and educating the public regarding the usage of pits or storage tanks, O&M of such facilities, providing training to local mansions regarding construction of proper toilet tanks at grassroot level will be of immense help. Educating the skilled labourers and the households is very critical.

4. Financial

For proper implementation of FSM be it in rural or urban areas, financial assessments are needed during the planning phase regarding its collection fee, transportation, fuel price, etc. In Odisha, the base price is fixed for a urban body to carry out FS collection and transportation. This is again based on the distance travelled. As it is not always feasible for the government authorities to carry out such activities, the private sector can play a crucial role. Moreover in certain places, for making it cost-effective, by using the available truck used for SWM, to attach

a tanker with a pump for FS collection. There are three bands of distance for prices:0-10Km, 10-15Km and 15-20Km. When 1KL vehicle travels for 10Km from municipal boundary it is estimated that they consume 2L fuel (Rs 90/L fuel cost is provided). Similarly for 10-15 Km, cost of 5L is provided additionally. For 15-20 Km, cost of 7L fuel is provided. Rather than expecting a cost-effective and profitable solution, a sustainable financial system needs to be developed for the longer run. In Bangladesh, the authorities are still trying to understand the affordability of schedule based and demand based emptying system for its citizens. At present, there are varied soft issues (e.g. knowledge regarding collection fee, harmful impacts of manual scavenging, need for timely desludging of pits/septic tanks etc.) that needs to be tackled in a delicate manner for effective implementation of FSM across the rural areas which needs to be coupled with its financial aspects.

5. Monitoring and regulation

In the FSM services, informal sector plays a crucial role and hence needs to thriving market for them needs to be ensured. The informal sector might include truck drivers, safai karmacharis and the manual scavengers. Capacity building needs to be provided to them regarding the operation and maintenance of the FSTPs. An environment of ownership needs to be created for them which will enable smooth and responsible implementation of FSM. Monitoring of such informal and private players are also important so that services are provided at a regular interval, in a regulated price and make sure that no monopoly exists in the market for making it more competitive and effective.

6. Social

Awareness and capacity building of people who manually clean and empty septic tanks is very critical. Along with such activities, new technologies which would eliminate human workload for emptying tanks needs to be introduced. Alternate possibility of engagement of such workers in the same sector but by using motorised or mechanised technology is the way forward. Moreover, prevalence of strict law, which is currently available, needs to be implemented in a stricter way.

The recording of the website can discussion can be accessed here.

**Responses from SuSanA members on the FSM thematic discussion**

1. **Ajit Seshadri, Vijay Vigyan Foundation, New Delhi**

   He insisted on changing the mindset of kids regarding the perception of FS as well as increase the use of faecal sludge as manure and soil conditioner. Mr. Ajit stressed that manual scavenging must be avoided at all cost and if needed PPE kits or other safety measures should be in place. Moreover, use of FS as a manure will be a beneficial to sustain and generate revenue regularly for FSTPs. He also appreciated rural citizens for dealing with voluminous excreta from livestock-cattle, goats and others. If this excreta matter is duly handled and evolved as produce i.e. compost or cow dung fuel-cakes or others, then human excreta, could be also be easily dealt with by using methods such as incineration, which might be done at local village level itself. Doing it right, will locally address all the pollution issues and help in achieving the SDG targets. Even the scrupulous habit of open- burning of agri- waste and waste from other paths may be curtailed totally.

2. **Ajit Phadnis, PriMove**

He stressed on the importance of public-private-social partnership as a way forward for FSM. According to him, sustainability of FSM services is linked to appropriate technology options for the entire cycle (collection, transportation, treatment and disposal/reuse) and also to regulation, local governance, responsiveness and responsibility of citizens. Some key discussion points for evolving a decision tree

- What would be criteria for selection of technologies in the rural area? Examples of innovative technologies?
- Considering FSTP would probably cater to more than one gram panchyat, what could be the ideas for processes for planning and DPR preparation especially involving PRIs and communities?
- Ideas for regulated and efficient desludging and transportation system to ensure safe disposal
- Ideas for business models to ensure sustainable safe FSM

**3. Aditya Bhuyan, Indian Sanitation Coalition**

Major challenges as to why private players are reluctant to be involved in FSM are *inadequate priority assessment of costs and risks, lack of clearly defined and practical monitoring process and lack of performance linked payment* . Private-public partnership can be one option using the hybrid annuity model (HAM) which was successfully demonstrated in Andhra Pradesh.

**4. Pawan Jha, Foundation for Environment and Sanitation**

Mr. Jha pointed out that unaffordable cost related to the FSM process is a key issue in both rural and urban areas. There is an urgent need to make CAPEX and OPEX cost effective so that local bodies can be involved in the process. He stressed that NFSSM needs to realise the issue and lower the cost of FSSM. Moreover, socio-economic and cultural conditions of rural areas also needs to be considered while addressing the issue of FSM.

He is also suggested that to carry FS/ septage from rural households to STP at a distance of 20-25 km is not a practical option. Additional cost to carry such wastes will have to be borne by the households. Village panchayats generally doesn't have enough fund to bear the cost. Moreover, there are rarely functional STPs in districts. Such STPs. even if available, can't take additional load of septage. About 40% households have single pit toilets. Through sludge pump, contents of such toilets can't be emptied as it is thicker due to leaching of water in soil. It is a serious issue for septage management from single pit toilets. Trenching of FS/ Septage should be avoided. It is not a technology for safe management of FS. There is no consideration of health and environmental aspects or safe reuse of septage during trenching. The method was applied long ago in some developing countries that has now been banned. It should not be encouraged.

**5. Nirma Bora, UNICEF Climate Change and Environment Sustainability**

She has provided a detailed revenue model of FSTP in Wayanad District, Kerela. The facility uses innovative nature-friendly and organic 'tiger bio-filter' technology, which uses earthworms for composting faecal waste. The FSM plant is of capacity 10 KLD(Kilo Litres/ Day) that can treat 10,000 litres septage per day. Operational and Management support provided by UNICEF prior to handover to the respective municipality

in 2020. PriMove Infrastructure Development Consultants was involved in the development while UNICEF provided financial and technical support. Local municipal corporations provided local resources such as land, water and electricity supply.

She also talks about the revenue model of FSTP in Dhenkanal town, Odisha. Faecal Sludge Treatment Plant was of 27 KLD (Kilo Litres per Day) capacity that can treat 27,000 litres per day. The main treatment steps followed in the FSTP are solid-liquid separation, stabilization, dewatering of sludge and pathogen removal. The separated liquid component is also treated to meet discharge standards. The faecal sludge is conveyed to the FSTP through desludging trucks

**6. James Harper, Freelance Researcher**

Unaffordable cost is the primary driver of poor rural FSM. Moreover, transportation of huge FS away from households in rural areas is not a viable solution. High costs of transport make traditional technologies (vacuum trucks, STPs, FSTPs, etc.) unworkable in rural areas. He believes that focus of this decision tree should be on on-site treatment and disposal of FS. If the rural area is near to an existing FSTP/STP or near to where vacuum trucks already operate successfully and have adequate road access throughout the year then the traditional-technology decision tree applies. If no, then we enter this new decision tree that is being discussed here and focus on on-site technologies. He also suggested on starting a Wikipedia page pertaining to the discussion on FSM.

**7. Mitali Agarwal Mehta, India Sanitation Coalition**

FSM is essential because almost 80% of the water supplied, flows back into the ecosystem as wastewater. This can be a critical environmental and health hazard as untreated water has been recognized as one of the major sources of pollutants for rivers and other water bodies. Accordingly, the India Sanitation Coalition had compiled great examples of FSM from across ten states of India in its best practices compendium of the series, “Business of Change” titled "Models of Success in Faecal Sludge and Septage Management (FSSM)”. This compendium carries ten State level cases in a framework that inter alia captures inception & planning, institutional setup, operations & technology used, financial & business models, and successes & lessons learnt.

**8. Depinder Kapur, Shiv Nadar University**

Mr. Depinder pointed out two important aspects for building a decision tree regarding FSM in rural areas:

1. FSM management framework that we were looking at urban areas so far, may also need a re look.
2. FSM framework for rural areas should be based on rural typologies - population, aquifer typologies, water scarcity.

A framework should be developed which needs to be revenue and financing neutral.

**9. Tejas Gathani, Team1Biotech**

Since Rural India has their own challenges, treatment should start at the source i.e, inside the septic tank with the addition of robust microbial consortia. They eventually liquefy both the faecal matter and biodegrade wastes. The end results may not be as good as an STP but even with reduction of pollution at source by 20 to 40% means a huge amount of savings at the end of pipe treatment. The key to getting the results would be the quality of the microbial consortia and the mode of application. Having facultative bacteria helps due to unavailability of the needed dissolved oxygen (DO) inside the septic tank.

**10. Paresh Chhajed Picha, IIT- Bombay**

Few suggestions for the discussion

- Nearby towns already provide emptying services in villages. The arrangements could be institutionalised instead of reinventing the wheel. When such towns build FSTPs, additional capacity to extend treatment service to these villages would save a lot of resources and efforts. Forming such partnerships should be at the top of the agenda.
- Integrated planning of FSM and SWM is necessary, especially in large and dense villages. This also enables harnessing the synergies between the two closely related services.
- Support of the state (capacity development, financial resources, guidelines, developing robust monitoring and information systems) is key.
- SHGs could play an important role in operations, in both emptying and treatment plant. They may need handholding support initially, but will create livelihoods for local people and ensure long term sustainability.
- Monitoring and regulation of performance of FSTPs has not received adequate attention. The pollution control boards probably are short of capacity to deal with the number of FSTPs being established.
- Involving local colleges/university students in planning, operations and overseeing service provision could be a game changer. This will not only support the local government but also raise awareness among the youth and such trained students will also demand accountability. This will improve the overall governance at the local level.

**11. Tejas Deshmukh, UNICEF Gujarat**

The possibility of treatment of faecal sludge at an existing STP/FSTP needs to be explored, before deciding if there is a need for a new FSTP. There are two options for using existing treatment infrastructure: 1) Co-treatment at existing STP and 2) Disposal at existing FSTP. Such existing STPs/FSTPs in urban centres within a radius of 10 km or 30 minutes driving time (preferably) or up to 15-20 km or 45 minutes driving time (in extreme cases as an interim solution) can be identified. The district, in coordination with the competent authority responsible for the O&M of the STP/ FSTP can consider the technical aspects of the existing facility in detail. This is a critical step to ensure its smooth functioning after accepting additional faecal sludge. Finally, an estimate of the quantity of faecal sludge that can be treated at the facility should be arrived at. This estimate needs to be used to form a cluster and map them to a specific STP/FSTP facility for disposal. The district can enter into a formal MoU to this effect with the respective ULB.

As a way forward there is a need for MoU between the nearest Municipalities and Gram Panchayat for convergence on the FSM initiative for villages lying in the proximity of 50km radius from the nearest STP. Villages lying in the vicinity of 50 km can be mapped and categorized into five categories of areas falling under 10/20/30/40/50 km for the purpose of fixing tariff slabs. Interested rural HHs (HH having toilets with single/septic tank) may send their septage/FS to the STPs/FSTPs of the nearest ULB on payment of

notified service. These Gram Panchayats can be encouraged to utilize the entire value chain of FSM, starting from availing the cesspool vehicles to STP/FSTP of respective ULBs. The cost of the services can be fixed through a joint dialogue between ULB and District Panchayats.

## Participants

| | | | |
|---|---|---|---|
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| **11** | Tejas Gathani | Team1Biotech | India |
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## Way forward

The discussion has helped in shaping varied ideas regarding FSM in rural areas. These solutions need to be simplified so that local communities can further take over in long run and contextualise them based on local conditions. As already discussed, urban-rural convergence might not be solution for all rural areas across the country due to its remote location. Hence, on-site or decentralised plants would be the best option for FSM. With rural sanitation space getting prominence with the recent Government Developments, it is a good time to innovate, demonstrate and scale up through a collaborative process.

## Resources

1. Report of "Household survey for assessment of toilet coverage under SBM gramin", QCI, 2018
2. Verhagen, Joep, and Pippa Scott. 2019. "Safely Managed Sanitation in High- Density Rural Areas: Turning Faecal Sludge into a Resource through Innovative Waste Management." World Bank, Washington, DC

## The Thematic Discussion Series Host

This document was prepared by Nitya Jacob and Aditya Bhuyan.

The Thematic Discussion Series on Innovations in WASH was organised and hosted by the Sustainable Sanitation Alliance (SuSanA) on the SuSanA Discussion Forum Platform. The discussion is part of a series of online discussion taking place under the umbrella of the SuSanA India Chapter. It was facilitated by WaterAid India, the India Sanitation Coalition and IRC.

To view the whole discussion, please go to the SuSanA Forum:

https://forum.susana.org/53-faecal-sludge-management/25209-faecal-sludge-management-in-rural-areas-building-a-decision-tree