After eliminating open defecation, challenges of treating waste water and sustaining good sanitation practices are fast-emerging

What After ODF?

The Next Generation Issues

Susana India Chapter, Water for People and India Sanitation Coalition

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Contents

Abbreviations

AMRUT	Atal Mission for Renewal and Urban Transformation
CAPEX	Capital Expenditure
CLTS	Community Led Total Sanitation
CRSP	Central Rural Sanitation Programme
CSP	City Sanitation Plan
CSR	Corporate Social Responsibility
FSM	Faecal Sludge Management
FSSM	Faecal Sludge and Septage Management
GDP	Gross Domestic Product
GoI	Government of India
IAS	Indian Administrative Service
IEC	Information, Education and Communication
IHHL	Individual Household Latrine
ILCS	Integrated Low-cost Sanitation Scheme
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
MDWS	Ministry of Drinking Water and Sanitation
MoHUA	Ministry of Housing and Urban Affairs
NBA	Nirmal Bharat Abhiyan
NGO	Non-Governmental Organization
NGP	Nirmal Gram Puruskar
NUSP	National Urban Sanitation Policy
ODF	Open Defecation Free

Executive Summary

India, home to 17.5 per cent of world's population, has successfully constructed toilets for 99 per cent of people identified as 'eligible' in 2012 by the Government of India. Since Swachh Bharat Mission (SBM) was launched on October 2, 2014 as a national development priority and a flagship programme, 92.5 million rural and 5.4 million urban toilets have been made. SBM-Rural, steered by MWDS aimed to make 111 million toilets by 2nd October 2019. SBM-Urban, steered by MoHUA aimed to make 10.4 million toilets[1].

This document attempts to answer a fundamental question: What is a sustainable sanitation system? To qualify as sustainable sanitation, a sanitation system must be economically viable, socially acceptable, technically and institutionally appropriate, and protect the environment and natural resources[2]. Only a sustainable sanitation system will protect and promote human health by providing a clean environment and breaking the cycle of disease.

Having nearly achieved these targets in five years, the two ministries have set their eyes on challenges stemming from their own successes. The two major issues are

1. Ensuring the infrastructure created is used and maintained
2. Ensuring waste water, including faecal sludge and sewage, is treated to acceptable standards

The first issue entails changing social norms for the use of toilets and against open defecation. Approaches in urban and rural area must be tailored to respective social and geographic contexts. MoHUA's guidelines say a city or ward can be declared as ODF+ if at any point of the day, not a single person is found defecating and/or urinating in the open, AND *all community and public toilets are functional and well maintained*. MDWS says ODF+ is a state where there are no faeces in the environment and everybody is using safe technology for disposing faeces, AND solid and liquid resources are managed along with menstrual hygiene.

For the second issue, MoHUA states ODF++ is a condition of safe management of faecal sludge/septage and sewage in addition to ODF+. MDWS progresses to ODF-Sustainability, where the ODF status is maintained by ensuring everybody uses toilets all the time and assets created under SBM remain functional through proper upkeep.

India is a signatory to the Sustainable Development Goals. Under SDG 6.2, it must achieve access to adequate and equitable sanitation and hygiene for all and end open defecation.

This document succeeds an earlier SuSanA-ISC publication of 2016. It draws on SuSanA's resource base of materials and information contributed by over 10,000 members. Its authors have also conducted secondary research. It represents a consultative process with the experts and other prominent authorities in the sector. At the time of publishing, the document represented the best possible advice based on the data and experience of the group.

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[1] Jacob, N, Saxena, S, Shahpuri, A, and Nath, V, 2016. Swachh Bharat: From Mission to Vision. SuSanA India Chapter and India Sanitation Coalition

[2] https://www.susana.org/en/about/vision-mission/sustainable-sanitation accessed on 26-3-2019

Introduction

The rural sanitation programme in India was introduced in the year 1954 as a part of the First Five Year Plan of the Government of India. Government of India introduced the Central Rural Sanitation Programme (CRSP) in 1986 primarily with the objective of improving the quality of life of the rural people and provide privacy and dignity to women.

From 1999, a "demand driven" approach under the "Total Sanitation Campaign" (TSC) emphasized more on Information, Education and Communication (IEC), Human Resource Development (HRD), Capacity Development activities to increase awareness among the rural people and generation of demand for sanitary facilities.

This enhanced people's capacity to choose appropriate options through alternate delivery mechanisms as per their economic condition. Financial incentives were provided to Below Poverty Line (BPL) households for construction and usage of individual household latrines (IHHL) in recognition of their achievements.

To accelerate the efforts to achieve universal sanitation coverage and to put focus on sanitation, the Swachh Bharat Mission (SBM) was launched by the Government of India on 2nd October, 2014 as a national development priority and a flagship programme. It has two sub-missions, the Swachh Bharat Mission – Gramin (SBM-G) for rural areas and the Swachh Bharat Mission – Urban (SBM-U) for urban areas. The Missions aimed to make India open defecation free by 2nd October, 2019.

In rural areas this means improving the levels of cleanliness in rural areas through providing toilets, Solid and Liquid Waste Management activities and making Panchayats ODF. Under SBG-G, 92.5 million toilets have been made against a target of 111 million and 30 states have declared themselves ODF. An incentive of ₹ 12,000 has been given to eligible beneficiaries[3].

SBM-U aims to eliminate urban open defecation by constructing IHHLs and community toilets. The overall target of the mission is to construct 10.4 million units of IHHLs and 0.5 million units of public and community toilets. Against this, 5.4 million IHHLs have been made. An incentive of ₹ 4,000 has been given to eligible beneficiaries.

The guidelines of SBM-R list three phases:

1. Planning Phase
2. Implementation Phase
3. Sustainability Phase

The implementation phase ends when a state declares itself ODF. During this, in rural India over 600,000 swachhagrahis have been trained in community-led approaches to sanitation; in urban India, 23,000 have been. Additionally, several thousand masons, self-help group members, local leaders, frontline workers (ASHAs, ANMs, AWWs, etc) have been oriented to make toilets, trigger change and set up follow-up committees. Development partners and multilateral aid agencies have played a major role in this journey.

[3] SuSanA Discussion on 'On the way to a "clean India": 2 years of Swacch Bharat Mission (Gramin)'. Available at https://forum.susana.org/259-on-the-way-to-a-clean-india-2-years-of-swacch-bharat-mission-gramin-thematic-discussion-susana-indian-chapter

The successes in the first two phases has brought India to the start of the third one. Figure 1 shows what this entails the following for SBM-R. The three broad aspects are hygiene promotion, follow-ups and monitoring and evaluation.

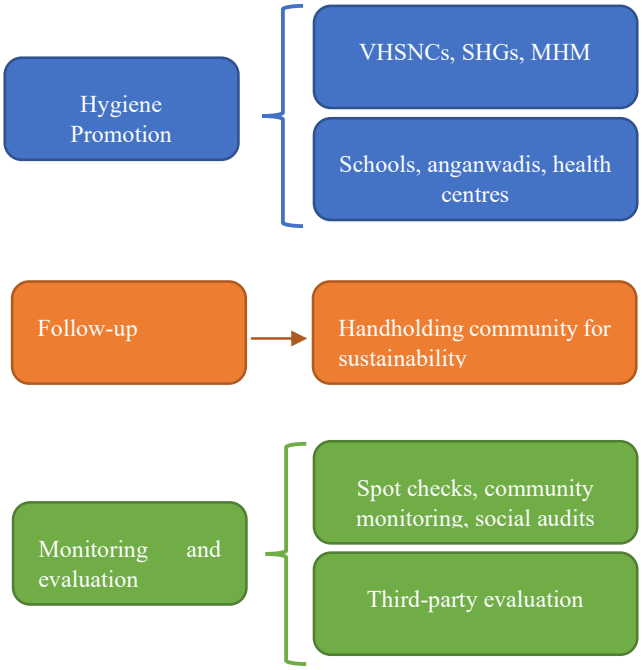

Figure 1: Sustainability phase in SBM-R

Hygiene promotion includes mitigating the risk of exposure to pathogens and hazardous substances that could affect public health at all points of the sanitation system, from the toilet via the collection and treatment system, to the point of reuse or disposal and downstream populations.

Sustainability in SBM-R and SBM-U

The urban and rural approaches to sustainable sanitation differ somewhat. MoHUA guidelines says a city or ward can be declared as ODF+ if at any point of the day, not a single person is found defecating and/or urinating in the open, AND all community and public toilets are functional and well maintained. For ODF++, the condition of safe management of faecal sludge/septage and sewage is added.[4]

The sustainability guidelines by MDWS provide an overview of how this can be achieved.[5] The Ministry of Drinking Water and Sanitation (MDWS) considers ODF+ to be a state where there are no faeces in the environment and everybody is using safe technology option for disposing faeces, AND *solid and liquid resources are managed along with menstrual hygiene*. ODF-Sustainability is a state where the ODF status is maintained by ensuring everybody uses toilets all the time and assets created under SBM remain functional through proper upkeep.

Despite these differences, there is convergence in thinking. MoHUA relies on self-certification and an independent six-monthly verification. Usage and upkeep norms are explicitly mentioned in declaration formats and the guidelines. MDWS's guidelines are also explicit about the process of declaration and verification process for ODF and the need to ensure usage and upkeep. Significantly, they include funding to support ODF-S activities.

The SBM-G guidelines state, "The incentive can be performance based i.e., in terms of motivating number of households and Schools/ Anganwadis to construct latrines and use them and should continue for at least one-year post construction so that sustainability of usage is ensured[6]". The incentive referred to here is paid to sanitation motivators for persuading people

[4] SuSanA Discussion on ODF+, ODF++ and sustainability of sanitation (Thematic Discussion by SuSanA India Chapter), available at https://forum.susana.org/odf-odf-and-sustainability-of-sanitation
[5] ODF Sustainability Guidelines, 2016. Ministry of Drinking Water and Sanitation, Government of India https://mdws.gov.in/sites/default/files/_201612151555.pdf
[6] Guidelines for Swacch Bharat Mission Gramin, 2014. Section 5.2.3. Ministry of Drinking Water and Sanitation.

to demand and make a toilet. Under sanitation programmes, building a cadre of foot soldiers has been the key to achieving ODF. These foot soldiers are called *swachhagrahis*. They have been trained in community approaches to sanitation (CAS) and are knowledgeable about technical and social aspects of sanitation.

It has been found panchayats remain ODF only where they have been effective in building a local constituency of leaders, frontline workers and most importantly, sarpanchs, to take interest in sanitation. Also, self-constructed toilets are more likely to be used than those made by contractors, panchayats or the urban local body and 'given' to the beneficiaries[7].

The existing cadre of *swachhagrahis* must remain engaged for at least a year after ODF declaration but work to make sanitation and hygiene sustainable on an incentive basis. The incentives can be pecuniary, appreciation, competition or opportunities for career advancement. Suitably incentivised sarpanchs can and in most cases, have, made sure their panchayats sustain good sanitation behaviour[8].

The Sustainability Phase of SBM-G suggests the following activities:

- Hygiene promotion focusing on VHSNCs and SHGs, and MHM. For this it recommends working with schools, anganwadis and the health system
- Follow-up, that covers hand-holding the community for sustainability
- Monitoring and evaluation, that includes spot checks, audits, community monitoring and third-party evaluations

Definitions of a sustainable sanitation system

To qualify as sustainable sanitation, a sanitation system must be economically viable, socially acceptable, technically and institutionally appropriate, and protect the environment and natural resources[9]. Only a sustainable sanitation system will protect and promote human health by providing a clean environment and breaking the cycle of disease.

Most sanitation systems have been designed with these aspects in mind, but they fail far too often because some of the criteria are not met. Sustainability is seen more as a direction than a state to reach. Nevertheless, it is crucial that sanitation systems are evaluated carefully about all dimensions of sustainability.

Since appropriateness to the context is such a core criterion for sustainable sanitation, there is no one-size-fits-all sanitation solution. Taking into consideration the entire range of sustainability dimensions, it is important to observe some basic principles when planning and implementing a sanitation system. The Sustainable Sanitation Alliance (SuSanA) believes that

[7] Taru Leading Edge, 2008. Nirmal Gram Puruskar awarded panchayats, A status study. New Delhi

[8] SuSanA Discussion on From missing market incentives to misaligned incentives. What is choking India's rural sanitation progress? (Thematic Discussion by SuSanA India Chapter). Available at https://forum.susana.org/from-missing-market-incentives-to-misaligned-incentives-what-is-choking-india-s-rural-sanitation-progress-thematic-discussion-susana-india-chapter

[9] https://www.susana.org/en/about/vision-mission/sustainable-sanitation accessed on 26-3-2019

the following sustainability dimensions (or "criteria") should all be considered in the design or upgrade of a sanitation system.

SuSanA's principles for planning and implementing sustainable sanitation systems

The following principles for planning and implementing sanitation systems were developed by a group of experts and were endorsed by the Water Supply and Sanitation Collaborative Council as the Bellagio Principles for Sustainable Sanitation[10] during its 5th Global Forum in November 2000:

- Human dignity, quality of life and environmental security at household level should be at the centre of any sanitation approach.
- In line with good governance principles, decision making should involve participation of all stakeholders, especially the consumers and providers of services.
- Waste should be considered a resource, and its management should be holistic and form part of integrated water resources, nutrient flow and waste management processes.
- The domain in which environmental sanitation problems are resolved should be kept to the minimum practicable size (household, neighbourhood, community, town, district, catchments, city).

Sustainable Development Goals and Sanitation

The case for investing in sustainable sanitation is growing stronger. It is already well established that appropriate sanitation and wastewater management can pay for itself many times over due to reduced health care costs and associated increases in productivity (WHO 2012). The new global sustainable development framework adopted in 2015 – the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) – can provide further impetus and arguments for transformative change.

Target 6.2: Achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Target 6.3: Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally

The universal applicability and emphasis on integrated solutions in the SDGs and the broader 2030 Agenda provide strong arguments for investing in sustainable sanitation and wastewater management. The SDGs dedicate an entire goal to water and sanitation: "to ensure availability and sustainable management of water and sanitation for all," bringing greater awareness to sanitation challenges. Under Goal 6 are two targets directly linked to sanitation and wastewater management.

[10] http://www.gdrc.org/uem/usan/bellagio-sanitation.html

Sustainable sanitation can also make cost-effective contributions to achieving a wide variety of SDG goals and targets, across development sectors. Improvements in sanitation and wastewater management could help countries to achieve up to 32 SDG targets. Also important is that the number of targets addressed increases with the level of ambition in sustainable sanitation and wastewater management investments. As examples, at the most basic levels of ambition (ending open defecation and preventing human exposure to pathogens and toxic substances in excreta and wastewater), improving sanitation and wastewater management could relieve a large burden of infectious disease (Goal 3), particularly child mortality. Lower incidence of disease means fewer days of education (Goal 4) and of productive work lost.

If systems also aim to prevent the release of untreated wastewater in natural ecosystems, and reduce the run-off of nutrients from agricultural soil by reusing organic matter, they could improve the status of freshwater and coastal ecosystems and the services they provide (Goal 14).

Recovering and reusing the valuable resources present in excreta and wastewater also contributes to resource efficiency (Goal 12) and can help improve food security (Goal 2). Sustainable sanitation and wastewater management value chains provide new livelihood opportunities (Goals 1 and 8).

Making tomorrow's cities liveable (Goal 11) is unthinkable without adequate sanitation and wastewater management. Furthermore, "equitable access" to adequate sanitation can also help to achieve non-discrimination targets under Goal 5 by increasing participation in school, the workforce, institutions and public life. A lack of suitable facilities effectively excludes women, girls and people with disabilities, especially during menstruation, and increases the risk of gender-based violence.

Framing the issues

Table 1 lays out the demand- and supply-side issues. These apply to both rural and urban sanitation.

Table 1: Demand-side and supply-side issues for sustainable sanitation

Issues	Demand side	Supply side
Technical issues	IEC on the appropriate type of toilets Understanding of need and methods of SLWM and FSM Menu of types of toilets and retrofitting options	Appropriate SLWM and FSM options to be made available Supply chain for materials at the appropriate cost and quality Adequate CT/PTs, institutional toilets
Social and behavioural issues	Options of what happens when the pit is full Effective IEC campaign aimed at SBCC focusing on usage; no OD Work with children as agents of change	Simultaneous use of mass media and IPC Appropriate media tools
Financial issues	Retrofitting of infrastructure Local mechanisms e.g., SHGs are aware of financial avenues	Blended finance for O&M and retrofitting Revolving fund Bank linkages

	Levering community contributions for institutional WASH	
Institutional issues	Strengthen local institutions especially VHSNCs, SHGs Training on sustainability, SLWM, sources of finance, IEC	Support from the administration through *swachhagrahis*

These are discussed below:

Technical issues

One major concern is about quality of construction and types of toilets that impacts their long-term usability. Twin leach pit latrines are useful in most parts of India except in waterlogged areas. Here, beneficiaries must be provided with different types of toilets, so the pits do not fill with water or contaminate groundwater. Raised twin leach pit, ecosan latrines or bio-toilets may be suggested in these cases.[11]

Single leach pit toilets need to be retrofitted. Owing to a lack of affordability a larger percentage of beneficiaries have constructed single leach pit latrines. Septic tanks that do not adhere to norms must also be retrofitted. Other technical issues concern poorly-made pits, slabs and the superstructure, toilets made close to water sources and septic tanks connected to open drains.

Waste water treatment. Conventional, centralised as well as unconventional decentralised treatments are required for treating waste water in rural and urban areas. Solid and liquid waste management, that includes faecal sludge and septage management, methods must be planned, developed and implemented along with O&M protocols.

Conventional systems are centred around sewage treatment plants (STPs) connected to sewers. Unconventional systems use natural treatment processes such as constructed wetlands where sewage or faecal sludge is transported by trucks. Both have their advantages and disadvantages.

Social and Behavioural Issues

These concern changing social norms around sanitation need to be continued for several years after eliminating open defecation to ensure the infrastructure is maintained and used. The existing cadre of community motivators (swachhagrahis) can be re-trained, incentivised and assigned to villages on a contractual basis. A new IEC strategy is needed focusing on the collective or community benefits from an ODF environment. Regular engagement using a wide range of messages and tools is required from this point on.

Institutional issues

The 3-tier panchayati raj system exists in most states, it is not uniformly strong. The village health nutrition and sanitation committees (VHNSCs) exist only on paper in most states. They need to be set up and operationalised. While district and block sanitation committees have been set up across India they need to be re-oriented towards sustainability issues concerning behaviour change, retrofitting and finance and away from construction of infrastructure.

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[11] There have been several discussions on SuSanA about groundwater pollution from leach pit toilets. You can follow one thread here: Ground water pollution from leach pit toilets (question from India)

The sanitation sustainability movement is an opportunity to set up and ensure VHNSCs are operational to improve the overall health status of a community. These institutions must ben incentivised through CSR, a revolving fund, IEC funds, 14th and 15th finance commission funds and other sources.

Financial issues

As the bulk of money from SBM for toilet construction is no longer available, suitable sources of funds need to be found from MNREGA, finance commissions, PMAY, revolving sanitation funds, concessional bank loans, CSR, religious trusts and philanthropic institutions. Household finance must be leveraged through IEC and IPC.

Maintenance of institutional toilets must be facilitated through community contributions in cash and kind. The supply chain for products must be ensured by district sanitation committees so materials and human resources are available in adequate quantities and of the right quality for O&M.

Physical infrastructure

Water supply must be available within proximity to the toilet. Toilets must always be accessible to members of the household or public (in case of CT/PT, schools, anganwadis and health centres).

For maintenance, it is useful to consider a life-cycle costs approach. This covers not just the initial capital costs by day-to-day repairs, major maintenance and replacement costs. While the government assumes toilet owners will be carry out major repairs or expansion (for new family units) themselves, such as digging a second pit, this is unlikely for poor households or where IEC has been ineffective.

Another aspect is the adequacy of hardware as in the seat:user ratio for CT/PTs, school, anganwadi and health centre toilets.

A systems approach to sustainability

Taken together, these aspects aim at resilient and strong WASH systems covering water, sanitation and hygiene. Therefore, sustainable sanitation is built on a robust system. An idea of a systems approach can be found in IRC's working paper, Understanding the WASH system and its building blocks. The WASH system comprises the people, components and functions that are needed to deliver WASH services[12]. The WASH system includes all the actors (people and institutions) and all the factors (infrastructure, finances, policies and environmental conditions) that affect and drive the system.

[12] Huston, A & Moriarty P, 2018. Building strong WASH systems for the SDGs, Understanding the WASH system and its building blocks, IRC, The Netherlands.

A systems approach is not a specific intervention type. It is a philosophy of action, a way of working that recognises the complexity and fundamentally inter-linked nature of the real world. Instead of trying to ignore complexity – for example, by focussing on a specific, time-limited project – a systems approach engages with it in the belief that doing so will lead to solutions that are more meaningful and more sustainable[13]. The diagramme below depicts the service delivery system for sanitation in most states of India.

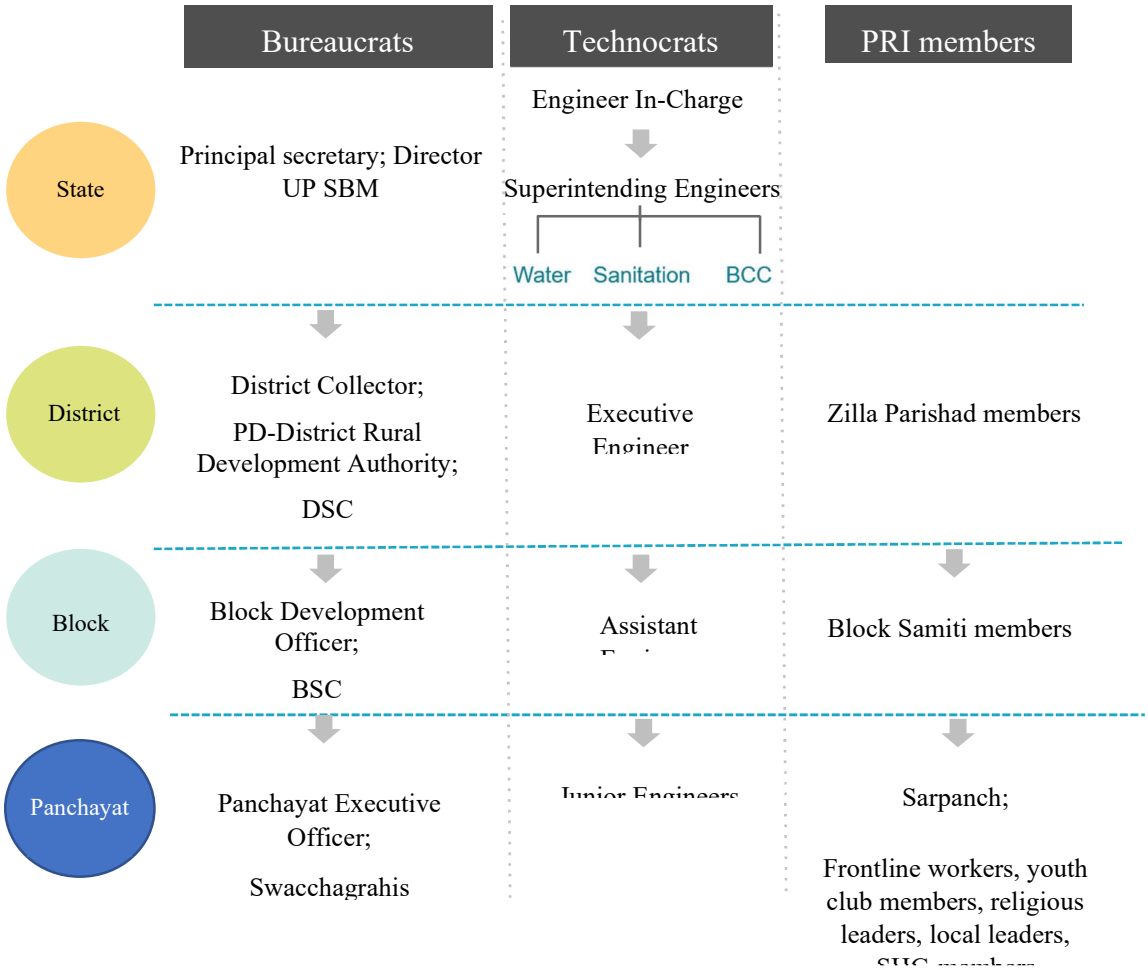

Figure 2: Service Delivery System

People at the Vanguard

Sanitation programmes in India have been driven by personalities. The Prime Minister, chief ministers of states, district magistrates (or collectors) and sarpanchs (pradhans or mukhiyas) have led progress from the national to local levels. Delivery systems for most development programmes in India have three components – the bureaucrats, engineers and elected representatives. In SBM, DSCs and BSCs comprised paid consultants. Swachhagrahis in villages were paid an incentive per day worked. Others engaged with sanitation including

[13] ibid

SHGs, local leaders and religious heads worked voluntarily, i.e., were not paid. Figure 2 depicts this system[14].

There has been a massive training effort to orient the people in the system towards community mobilisation, immediate follow-up and construction. Supply chains have been developed or improved, the payment of the subsidy has been streamlined, an incentives system has been developed for swachhagrahis and others and most human resources are in place. However, the system is not geared towards sustaining sanitation behaviour over the long term.

Recommendations

1. To be considered sustainable, a sanitation system must ensure facilities are kept in good repair and always usable
2. People must be encouraged, not coerced, to use the facilities. Owners must maintain private facilities while local government institutions must maintain public facilities
3. Facilities must have water, good ventilation and light
4. Poorly-made facilities must be repaired or rebuilt on priority
5. Local mandated institutions such as village or urban water, health and sanitation committees must be setup, or be supported, to ensure nobody reverts to open defecation and oversee maintenance
6. Members from community institutions such as self-help groups must form part of these institutions
7. Local trained resources such as swachhagrahis should be part of these institutions
8. The mandated institutions must be allotted a budget and clear guidelines for functioning

[14] Jacob, N, 2019. Capacity of WASH service providers of Odisha state, India. Paper presented at IRC Symposium All Systems Go, The Hague, March 2019

Waste Water, Sewage and Faecal Sludge

The Problem

As much as 80 per cent of surface water and an undetermined percentage of ground water in India is polluted. The single large source of pollution is untreated faecal matter. This flows into surface water bodies from sewage and faecal sludge. Poorly made pit toilets and septic tanks contribute to both surface and ground water pollution.

Out of about 50,000 million litres per day of sewage generated in India, treatment capacity exists for only about 12000 million litres per day (32%) in all metropolitan, class –I cities and class-II towns in India. There are no significant capacities in smaller towns that mostly unsewered. Thus, there is a large gap between generation and treatment of wastewater in India.

Even the existing treatment capacity is not effectively utilized due to poor designs and operation and maintenance. The O&M of existing plants and sewage pumping stations is not satisfactory, as nearly 39 per cent plants do not conform to the general standards prescribed under the Environmental (Protection) Rules for discharge into streams, the Central Pollution Control Board has found. In several cities, the existing treatment capacity remains underutilized while a lot of sewage is discharged without treatment in the same city.

Total & Faecal coliform, which indicate presence of pathogens in water, are the biggest problem with untreated sewage and septage. Between 1994 to 2004, 33 per cent of the total 45,000 Km length of rivers was found to be polluted with more than 500 MPN/100 ML of Faecal Coliform.

While about a third of urban areas are sewered, nearly half use septic tanks; the rest have other onside sanitation such as pit toilets or defecate in the open.

Adequate facilities and services for collection, transportation, treatment and disposal of faecal sludge do not exist in most of towns. The few larger ones have formal and informal collection systems. Disposal is either on open plots, water bodies or, recently, in faecal sludge treatment plants.

Ideally, a septic tank system should be desludged 1.5 to 3 years as per CPHEEO guidelines. In practice, this happens at intervals of 3 or 5 years, resulting in accumulation of dense sludge, reduction in effective volume and hydraulic overloading, which ultimately causes system failure and the release of partially treated or untreated septage from the septic tank.

Definitions

Wastewater is a mixture of pure water with large number of chemicals (including organic and inorganic) and heavy metals which can be produced from domestic, industrial and commercial activities, in addition to storm water, surface water and ground water[15].

Faecal sludge includes contents of onsite sanitation systems like pit latrines, septic tanks, aqua privies and dry toilets. It is raw or partly digested, a slurry or semisolid, and results from collection, storage or treatment of combinations of excreta and blackwater, with or without greywater. Faecal sludge is transported via trucks or rickshaws[16].

Sewage is the untreated liquid waste from domestic sources including toilets, bathrooms and kitchens. These off-site sanitation systems, connected to sewer systems, carry sewage to centralised sewage treatment plants. It is usually raw waste water with little treatment en route. Sewage is transported via pipelines.

Faecal sludge

Policy Landscape

In 2017 MoHUA issued the National Policy on Faecal Sludge And Septage Management (FSSM)[17]. This was to address the sludge from about 46 per cent urban households that use onsite sanitation. The policy states that the problem of faecal sludge and septage must be addressed in a holistic manner in a way that is appropriate and affordable for all areas.

The National Declaration on FSSM, drafted and signed by MoHUA and civil society organizations, influenced the policy. Its scope is to ensure cities and towns have improved OSS together with FSSM to achieve optimal public health status. The policy's objectives are:

1. Move India on the path of mainstreaming FSSM by 2019 and ensure all the benefits of wide access to safe sanitation accrue to all citizens across the sanitation value chain with containment, extraction, transportation, treatment and disposal/reuse of FS, septage and other liquid waste
2. Define the roles and responsibilities of various government entities and agencies and other key stakeholders such as the private sector, CSOs and citizens for effective implementation of FSSM services
3. Enable and support synergies among relevant central government programmes such as SBM, AMRUT and the Smart Cities Mission

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[15] Sharma, Rahul. 2018. Conceptual Clarity on Septage Management in India, GIZ. Paper presented at SuSanA India Chapter Seminar in Panaji, Goa, 21st February 2018. Available at https://www.susana.org/_resources/documents/default/3-2970-7-1519374056.pdf

[16] Hemkendreis Benjamin, Henseler Manuel and Güdel Karin, 2008 (Doulaye Koné and Sylvie Peter, Eds), Sandec Training Tool 1.0 – Module 5 Faecal Sludge Management (FSM); Eawag/Sandec (Department of Water and Sanitation in Developing Countries), P.O. 611, 8600 Dübendorf, Switzerland.

[17] National urban faecal sludge and septage management policy, Ministry of Urban Development, 2017. http://164.100.228.143:8080/sbm/content/writereaddata/FSSM%20Policy%20Report_23%20Feb_Artwork.pdf

4. While not compromising the eventual compliance to the strict environmental discharge standards already set, recognising the constraints in achieving these standards, adopt an appropriate, affordable and incremental approach
5. Mitigate gender-based sanitation insecurity directly related to FSSM reducing the experience of health burdens, structural violence and promote involvement of both men and women in planning and design of sanitation infrastructure

Managing Faecal Sludge

When human excreta collects in a pit latrine, the solids settle at the bottom and form a slurry called faecal sludge. Over time the sludge accumulates and periodically needs to be removed and disposed of. This process presents several challenges because the sludge is offensive, a potential danger to human health and highly polluting if dumped indiscriminately into the environment. Faecal sludge management (FSM) is a set of processes designed to ensure that people and the environment are protected from these hazards. It includes the storage, collection, transport, treatment and safe end use or disposal of faecal sludge. FSM is a significant problem in towns and cities in many developing countries. The FSSM policy recommends agencies and procedures for collecting sludge, transport and treatment[18].

For city-wide programmes, faecal sludge collection may be either on a scheduled or on a call-for-service basis. If sludge is liquid enough, it is usually collected by using vacuum pumps or centrifugal style booster pumps. A variety of manual and motorized devices designed to excavate thick and viscous sludge and accumulated trash are also available in the market.

The collected faecal sludge may be transported to treatment plants via a vacuum truck, a motorcycle tanker, or even a hand cart. Often, mobile or permanent transfer stations are used to improve the efficiency of faecal sludge transportation. This material can be processed at faecal sludge treatment plants, co-treated with in municipal sewage treatment plants, or provided to farmers and treated in specially constructed troughs on fields.

FSTPs use a variety of mechanized and non-mechanized technologies including constructed wetlands, anaerobic digestion, and waste stabilization ponds. Useful products of the treatment process may include treated effluent that can be used for irrigation, biosolids that can be utilized as a soil amendment in agriculture, biogas, biodiesel, and electricity. These have the potential to offset some of the costs of the program, thereby reducing tariffs for the public. However, value addition all the way to biogas, biodiesel and electricity is difficult to achieve in practice due to technological and operational challenges.

[18] National urban faecal sludge and septage management policy, Ministry of Urban Development, 2017. http://164.100.228.143:8080/sbm/content/writereaddata/FSSM%20Policy%20Report_23%20Feb_Artwork.pdf

Collectively, the collection, transport, treatment and reuse of excreta constitute the "value chain" of faecal sludge management[19].

Pit latrines generate faecal sludge when the pits are emptied. However, other types of toilets - those that are designed to be easily emptied, without the addition of water - do not generate faecal sludge but rather dried faeces (in the case of urine-diverting dry toilets) or compost (in the case of composting toilets), for example.

FSM Planning

FSM alone is not the complete solution for treating all the wastewater from households. Septage management and collection, conveyance, treatment and safe disposal) of effluent from septic tanks and greywater from households together make a complete sanitation system. Generally, people tend to compare the construction and operation & maintenance cost of only 'Septage Treatment Plant' with the cost of sewerage network and Sewage Treatment Plant and conclude septage treatment is cheaper.

FSM services can be provided as demand based (call for service), scheduled desludging, or a combination of both. Under either mechanism, OSSFs are desludged on a periodic basis or when an inspection by a competent authority indicates desludging is needed.

In the absence of any orderly municipal sanitation planning, on-site sanitation facilities are most commonly developed by their users themselves. Those are little concerned about the problems with sludge removed from their facilities. Sludge management is usually limited to a de-sludging service that is provided by municipal agencies or the private sector, proper solutions for sludge disposal are generally lacking.

Ideally, FSM must be integral part of every sanitation plan which builds on-site sanitation facilities. Sludge management is an indispensable part of the maintenance of these facilities. Even when a sanitation plan foresees a component for FSM, its implementation is often impaired. It is for example irresponsible to promote septic tanks without providing in the same time solutions for regular de-sludging of the facilities and for safe disposal of the sludge.

The common elements for successful FSM programs include:

- Periodic or as-needed desludging as verified by inspection
- Tariffs that are pro-poor and representative of the costs for providing the service
- Targeted promotions campaigns that educate and raise the willingness to pay for services
- Technology that is appropriate for the level of capacity to operate and maintain the system as well as the realities of the value chain

[19] Sharma, Rahul. 2018. Conceptual Clarity on Septage Management in India, GIZ. Paper presented at SuSanA India Chapter Seminar in Panaji, Goa, 21st February 2018. Available at https://www.susana.org/_resources/documents/default/3-2970-7-1519374056.pdf

- An enabling environment that includes the procedures, rules, policies, laws, tariff schedule and incentives for participation.

Peri urban areas

Peri urban areas are less densely populated than urban centres, and therefore have more land area for the installation of OSSFs to manage the solids and liquids in the wastewater flow. In these areas, it is unlikely that centralized sanitary sewer systems will be installed in the near to intermediate future. Therefore, development in these areas will rely upon decentralized wastewater management systems connected by condominial or simplified sewerage or onsite sewage facilities. In these instances, FSM is a necessary service in order to keep these systems functioning properly.

Rural areas

Rural areas with low population density may be the most difficult in which to organize FSM programs. Such locations may be difficult for large trucks to access. Other options such as on-site or decentralized FSM services, or direct disposal on farmland can be organized.

Parts of an FSM system

Toilets

About a third of rural and nearly half of urban toilets are connected to septic tanks. In rural areas, the rest are single or twin leach pit toilets. Most public and community toilets in towns and cities are linked to septic tanks. Nearly all small and medium towns lack a sewer system while the metros are only partially covered. Pits, septic tanks and containment structures that are just sealed tanks comprise the first stage of an FSM system[20].

Emptying

The emptying of pits can be done on demand by householders or on a schedule decided by the local government institution (LGI). The householders must pay for emptying. Fees for emptying individual household septic tanks or pit latrines will be decided by the gram sabha but must cover the expenses of the operator. For PT/CTs, the LGI will be responsible for regular emptying.

The following methods are recommended to empty pits and transport faecal sludge to a treatment site. These do not involve direct contact with faecal sludge and therefore do not violate the Prohibition of Employment as Manual Scavengers and Their Rehabilitation Act

[20] Hemkendreis Benjamin, Henseler Manuel and Güdel Karin, 2008 (Doulaye Koné and Sylvie Peter, Eds), Sandec Training Tool 1.0 – Module 5 Faecal Sludge Management (FSM); Eawag/Sandec (Department of Water and Sanitation in Developing Countries), P.O. 611, 8600 Dübendorf, Switzerland

2013. The decision to use one or more methods can be taken at the district or block levels keeping mind the local socio-economic and geographic conditions.

1. Use of simple tools such as buckets, shovels and rickshaws for transport. The personnel engaged must be provided protective equipment of gloves, shoes, masks and goggles. They must not be made to enter the pit, septic tank or drain but use implements to extract the sullage, transport it without human contact to a disposal site
2. A simple device called the Gulper can be employed to pump sullage from pits, septic tanks and drains. The collected sullage is transported to a treatment site on a rickshaw or similar device. A Gulper can be made locally at less than ₹ 1 lakh for one device.
3. Vacuum-tugs that can be mounted on a cart, tractor trolley or towed by a jeep. They cost about₹ 3,00,000 and have a capacity of 500 litres. An 8 HP motor powers the tug. Operators should aim for 8+ trips a day.
4. Suction machines. These are the most expensive option costing between ₹ 13 and 20 lakhs each. Therefore, they are not recommended for use in rural settings.

Transport

Suction machines transport faecal sludge to treatment plants. However, it may be necessary to have transfer stations that are intermediary drop off locations used where treatment facilities are located far from collection centres. Traffic concerns or local truck bans during daylight hours may necessitate them. In addition, municipalities where a significant percentage of homes cannot be accessed by tanker truck should utilize transfer stations. These can be mobile or fixed.

Treatment Options

There are a few treatment options being used in India. Each has its own merits and demerits[21].

Disposal on fields in agreement with farmers. Farmers construct troughs and faecal sludge transporters empty their vehicles into these troughs. Over a few months, the sludge dries into manure and is used by the farmer. Alternatively, the sludge is applied directly to crops without any treatment. Sewage and faecal sludge are rich in Nitrogen, Phosphorous and Potassium.

Co-treatment with sewage in sewage treatment plants. In this method, transporters empty trucks into sewage treatment plants where faecal sludge is treated with sewage. This is an option where there are under-utilised STPs.

[21] Hemkendreis Benjamin, Henseler Manuel and Güdel Karin, 2008 (Doulaye Koné and Sylvie Peter, Eds), Sandec Training Tool 1.0 – Module 5 Faecal Sludge Management (FSM); Eawag/Sandec (Department of Water and Sanitation in Developing Countries), P.O. 611, 8600 Dübendorf, Switzerland.

Co-treatment with animal dung in bio-gas plants. Individual or community bio-gas plants that are fed with animal and human excreta are another option. The gas produced is used in individual or common kitchens. The slurry can be further processed into manure.

Sludge drying beds. These porous structures are designed to let the faecal sludge dry over a period weeks. The dried sludge can be used as manure after allowing it to mature over several months during which pathogens such as bacteria and helminth eggs die off.

Planted reed beds. In these, specially constructed reed beds are used to process sludge. They are planted with local species of grass and weeds that accelerate decomposition of faecal sludge and through transpiration, reduce the volume of water.

Faecal sludge treatment plants used a series of processes to treat FS. These are

- Faecal sludge reception, where the truck interfaces with the treatment plant and sludge is unloaded
- Preliminary treatment - to remove garbage, sand, grit, and FOG (fats, oil and grease)
- Primary treatment - simple separation by physical means, or separation with microbial digestion
- Liquids treatment - for example by using constructed wetlands, waste stabilization ponds, anaerobic digesters and polishing filters
- Solids processing - using the solids resulting from faecal sludge treatment for beneficial use where possible

Constructed wetlands are gaining attention as a low-cost treatment technology that can be constructed in many instances using local materials and labour. For sites with enough land and a ready supply of gravel and sand, this technology offers low cost, scalability, and simple operation.

In a SuSanA discussion on wastewater treatment[22], there were discussions on how to set standards for waste water use in agriculture. Determination of a global standard for treatment should be reconsidered depending on its reuse post the treatment to appropriately deal with health and environmental issues. Standards for reusing waste water needed to be set in consultation with end-users such as farmers or industry. Currently, CPCB set standards on its own, not through a consultative process.

Depending on its quality, waste water could be used in farming or by industry and for power generation. The biggest advantage in the first use case was the assured availability of water and nutrients. Waste water from villages that was relatively free from chemicals was better suited

[22] Setting Standards and Financing Wastewater Treatment in India, 2019. Jacob N, Palrecha A and Prasad, S. SuSanA India Chapter. https://forum.susana.org/setting-standards-and-financing-waste-water-management-in-india-thematic-discussion-india-chapter-february-2019/23074-introducing-the-discussion-on-setting-standards-and-financing-waste-water-management-in-india

for this than waste water from cities. If industry were to use urban waste water, it would reduce the demand for fresh water by that amount and thereby, the stress on water resources.

It is not clear who owns the water, however. Even though source is predominantly rural, and some cities paid irrigation departments for water with return clauses, the issue was who would the city pay to use water and return it, after treatment. It they were to pay farmers from whose lands the water has come, there were no institutions that a city corporation could pay other than the state irrigation department. A study by the International Water Management Institute showed most farmers using waste water lived in or around a city.

Scope for recycling and reuse

Treatment products and reuse options

Composting digests organic matter is digested in the presence of oxygen with the by-product of heat. For faecal sludge, the heat deactivates the pathogens while the digestion process breaks down the organic matter into a humus-like material that acts as a soils amendment, and nutrients that are broken down into a form that is more easily taken up by plants. Properly treated faecal sludge can be reused in agriculture[23].

Biosolids from septage are rich in nitrogen. When they are mixed with materials that are rich in carbon, such as shredded crop wastes, the composting process can be maximized. Proper mixture to achieve a ratio of 20 to 1 to 30 to 1 of carbon to nitrogen is best.

While treated or untreated FS can be used in agriculture, there are risks for consumers and farmers from nematode infections, bacteria, viruses and protozoa. These need to be recognised and mitigated. The World Health Organization notes[24]

(i) Irrigating crops eaten raw with wastewater containing more than 100,000 coliforms per 100 ML in uncovered plots results in high levels of bacterial contamination of crops unless irrigation stops before harvesting
(ii) Improving the water quality so it has 100 – 1000 coliforms per 100 ML reduces the contamination of crops significantly
(iii) Crop recontamination occurs in markets where they are washed with untreated water

Recommendations

1. Waste water treatment and reuse standards are necessary and must be determine in consultation with end-users

[23] Palrecha Alka, Kapoor Dheeraj and Malladi, Teja, 2012. An exploratory study of wastewater irrigation in Gujarat. IWMI-Tata Water Programme, India.

[24] WHO guidelines for the safe use of wastewater, excreta and greywater / World Health Organization. 2006

2. Waste water, faecal sludge and sewage are resources. After treatment they must be made available for further use and not thrown away
3. Integrated planning is required for ensuring all faecal sludge and sewage is collected, transported, treated and made available for reuse
4. Health precautions are necessary while reusing treated or raw sewage and faecal sludge
5. Market linkages must be established where they do not exist especially in rural areas

Disclaimer

This publication is based on discussions on the India Chapter of the Sustainable Sanitation Alliance. It does not purport to reflect the official positions of Water for People and India Sanitation Coalition.