Rural Sanitation Practices

A Rapid Assessment Study for Odisha

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Glossary

Blackwater is the wastewater originating from the toilet that is comprised of excreta, flush water, and anal cleansing materials

Desludging is the act of emptying an on-site sanitation system, either manually or mechanically, by pumping out its contents

Faecal sludge refers to the slurry of solids formed as a result of the processes (such as settling) that wastewater undergoes in an on-site sanitation system

Greywater, or sullage, refers to wastewater originating from non-toilet related uses of water such as washing, bathing, etc.

Inorganic solid waste, also referred to as dry waste, is waste that is not easily degradable over time and comprises plastics, metal, glass, etc.

Organic solid waste, also referred to as wet waste, is waste that is biodegradable and can be transformed beneficially as animal feed, energy source or compost. It includes food waste, agricultural and crop processing residues, among others.

List of Acronyms

AWC	Anganwadi Centre
BCC	Behaviour Change Communication
CT	Census Town
DEWATS	Decentralized Wastewater Treatment System
FMCG	Fast Moving Consumer Goods
FSM	Faecal Sludge Management
GP	Gram Panchayat
GOBAR-DHAN	Galvanizing Organic Bio-Agro Resources-Dhan
IEC	Information Education and Communication
JJM	Jal Jeevan Mission
MRF	Material Recovery Facility
ODF	Open Defecation Free
O&M	Operation and Maintenance
RWSS	Rural Water Supply and Sanitation
SBM-G	Swachh Bharat Mission-Gramin
ULB	Urban Local Body

Executive Summary

Sustainable liquid and solid waste management systems safeguard the health of the community against diseases and infections, improving its physical and mental well-being.[1] Since their introduction in 1954, rural sanitation programmes have evolved over the years and the latest iteration, Swachh Bharat Mission-Gramin (SBM-G), has been unprecedented in its focus, mandate and resource allocation towards meeting the goals of sustainable sanitation. Over its five-year run, its objective has expanded from the mere provision of a toilet facility to also include the institution of systems for Solid and Liquid Waste Management (SLWM) and prioritization of Open Defecation Free (ODF) villages for piped water supply schemes. For the former, the Mission has earmarked funds based on the size of the Gram Panchayat (GP), for example, INR 20 lakhs for GPs with 500 households and so forth. The latest Rural Sanitation Strategy, 2019-2029, further emphasizes these goals, along with those of ODF Sustainability.

In its response to the national thrust on access to a toilet facility under SBM-G, the state of Odisha made significant strides in augmenting coverage of individual toilets from 14% in 2011[2] to a purported universal coverage in 2019.[3] The state now intends to establish SLWM systems for downstream management of liquid and solid waste – starting with issuing a state-level policy governing the subject – to leverage its current progress in the elimination of open defecation for sustainable sanitation outcomes. To inform such a policy of the on-ground situational needs, the Centre for Policy Research undertook a rapid assessment of the prevailing waste management landscape in three districts of the state. This report discusses the resulting findings relating to aspects ranging from community practices to the SLWM infrastructure capabilities existing in these regions.

KEY FINDINGS

Toilets increase, but quality flags

SBM-G rapidly enhanced the number of individual toilet facilities. Still, they lack in quality in many cases, especially among the constructions which involved external actors, such as NGOs, in the construction process.

Single pit, the singular winner

Single pits are the most commonly found on-site sanitation system, followed by twin pits and septic tanks. Functioning on the same principle as a twin pit, these, however, require mechanized emptying to be considered a safe technological option.

Twin pits, but only in name

Missing or inaccessible junction boxes, pits connected in series, and lack of user awareness regarding their maintenance, are holding back the potential of twin pits as the sustainable and affordable option in sanitation technology they have been envisioned as.

Infrastructure first, usage later

The predominance of single pits over twin pits, inadequate dissemination of user information dissemination concerning operation and maintenance (O&M), lack of associated services, viz. in-house water and desludging, and inadequate focus on behaviour change have led to low toilet usage.

Toilet usage, contamination or sanitation?

In a significant number of cases, households concomitantly rely on in-house borewells or handpumps located in the vicinity of toilet facilities. In these cases, factors such as the inherent vulnerability of the aquifer, a high water table, the proliferation of leaching pits, and unregulated setback between pits and wells have the potential to result in contamination of water supplies.

1. WHO Guidelines on Sanitation and Health, 2018.
2. Census of India, 2011.
3. SBM-G dashboard https://sbm.gov.in/sbmReport/home.aspx (last accessed on 26 November 2019).

Greywater, but not in the backyard

In the absence of in-house water supply, communities usually perform chores such as bathing and washing at the water source, fetching and storing water at the premises only for drinking and cooking. The production and disposal of untreated greywater, therefore, needs addressing at both the household and settlement level.

Handpumps and borewells, unsanitary sites

In the absence of soak pits alongside handpumps and borewells, both public and private, the water stagnates at the site, creating an unhygienic environment susceptible to vector breeding.

Solid waste, the missing agenda point

Solid waste management is yet to be seen as a significant concern at the GP level. Organic waste is safely and productively managed at the household, while inorganics are dumped and/or burned. Centralized management systems are absent, with even dustbins at marketplaces a rarity.

Less agrarian, more plastic

The nature of the habitation dictates the type and quantity of waste generation, and the avenues available for recycling. The more urban habitations have greater penetration of FMCG products and in turn, generate more plastic waste – which the region is ill-prepared to handle.

Going forward, the state of Odisha should align its efforts for sustaining its ODF status with the key ascertained dimensions of toilet usage, viz. usable toilets accompanied by functional on-site sanitation (OSS) systems, reliable and convenient sources of water for toilet use, easy and affordable access to toilet maintenance services, and behaviour change. The universal access to and usage of a toilet facility is a necessary but not sufficient condition for the creation of clean and sanitized villages, protection of the health of communities, and the abatement and prevention of environmental pollution.

The state should account for variations in village characteristics, e.g. proximity to urban centres, nature of villages – whether more or less agrarian, socioeconomic variations at the settlement (hamlet) level, and also the household-level and community-level behaviours, in determining optimal solutions and strategies since they directly impact SLWM needs.

Introduction

The World Health Organization defines health as not a mere absence of disease or infirmity, but as encompassing a state of mental and social well-being.[4] Solid and liquid waste management systems are, therefore, a vital precondition for an enhanced quality of life – as a safeguard for both human and environmental health. While solid waste management comprises segregation of waste into processable streams, their collection and appropriate processing, liquid waste management entails the creation of a well-functioning sanitation service chain for faecal wastes, as well as the suitable treatment and disposal/recycling of greywater. Of these, the sanitation service chain addresses the collection of faecal waste through adequate provision of a toilet facility, the containment and conveyance of blackwater, its subsequent treatment and recycling of end products.

In India, the primary responsibility for providing drinking water and sanitation facilities lies with the state government. In response to the deficient state of sanitation in rural areas and a slow rate of positive change, the incumbent government launched the Swachh Bharat Mission-Gramin in October 2014. Among the objectives of the programme are: 'Bringing about an improvement in the general quality of life in the rural areas, by promoting cleanliness, hygiene and eliminating open defecation', and 'developing community managed sanitation systems for solid and liquid waste management'.

The state of Odisha, predominantly rural with more than 80% of its residents living in villages and Census Towns (CTs)[5], has consistently reported individual toilet coverage as low as 92% in 2001 to 86% in 2011.[6] However, the state has made rapid strides in sanitation under the aegis of SBM-G and the level of access to an individual toilet facility has risen to 100%.[7] As for downstream blackwater management, rural Odisha is heavily dependent on OSS systems. All of the new toilets constructed under the programme are connected to a single pit or twin pits or a septic tank. To sustain and leverage the gains under SBM-G for the achievement of sanitation outcomes, the Hon'ble Chief Minister of Odisha announced a campaign in 2018, called Swachh Odisha Sustha Odisha (SOSO), for ensuring availability and sustainable management of water and sanitation for all. The state further intends to issue the 'Orissa Rural Sanitation Policy' with the goal of realizing the vision in a time-bound and targeted manner. This report presents the findings from a rapid assessment of existing infrastructural capabilities and household practices concerning SLWM in rural Odisha.

METHODOLOGY

The assessment was conducted in 27 villages across nine Gram Panchayats in three districts of Odisha. The three districts – Angul, Debagarh, and Dhenkanal – were selected for the assessment based on stakeholder consultation consisting of representatives from the government and developmental organizations.

All the GPs in a particular district were categorized into three categories, namely 'GP with Census Town[8]', 'GP with all ODF villages', and 'GP with all non-ODF villages[9]'. Within each category, the largest GP was selected, and in cases where the GP was farther than 35 kilometres from the district headquarter, the next largest GP was selected. The selection of predominantly tribal GPs was prioritized, wherever possible. Within each GP, villages were chosen based on a preliminary discussion with the Sarpanch/Assistant Sarpanch, accounting for the size of the village and other unique physio-social characteristics.

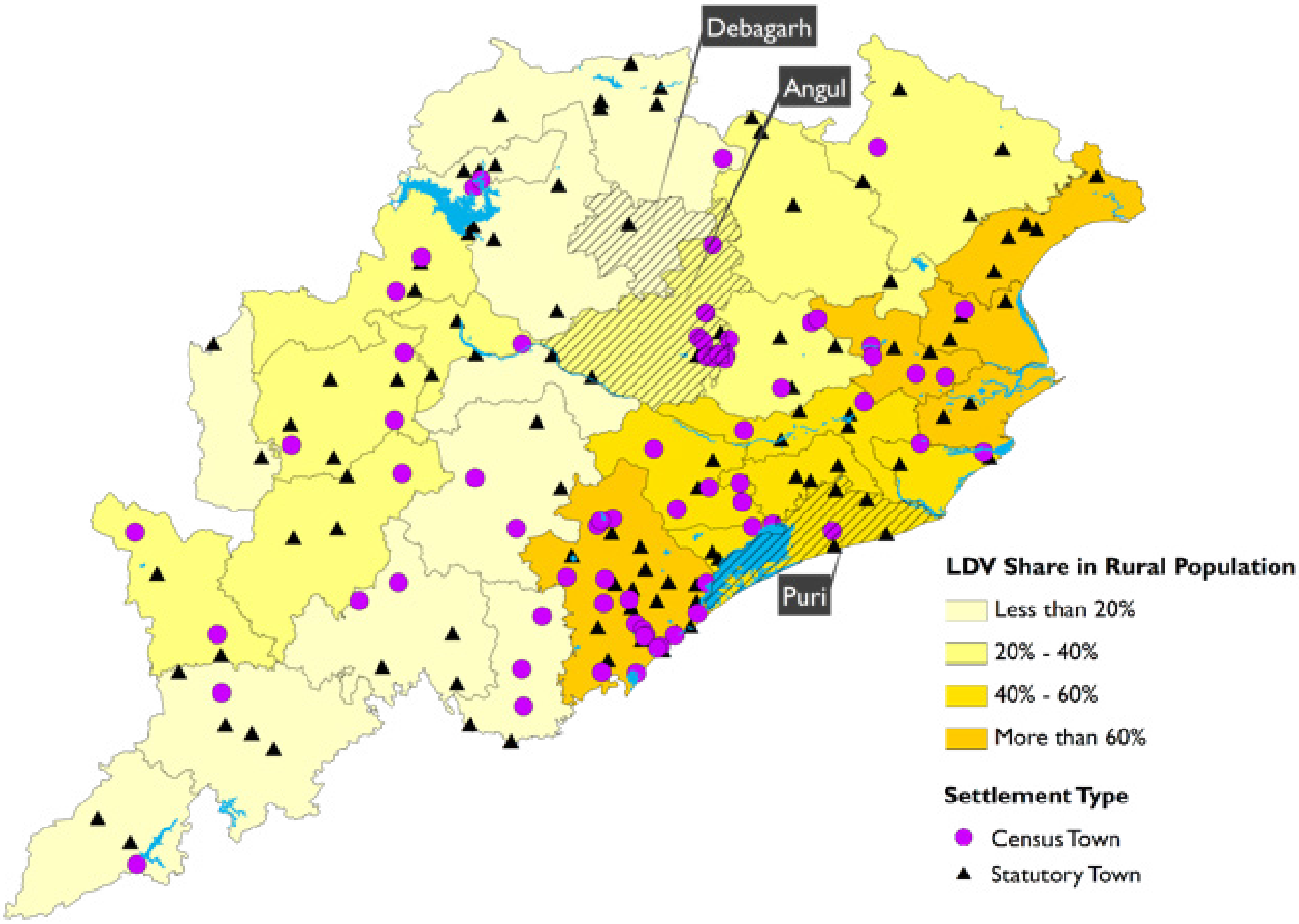
The data collection comprised group discussions, key informant interviews (with stakeholders like the GP Sarpanch, Self-Help Groups, Swachhagrahis[10], and transect walks.

4. WHO Guidelines on Sanitation and Health, 2018.
5. Census of India notifies Census Towns based on the parameters of population, population density and major occupation of a habitation. These are regions which exhibit the characteristics (and preferences in infrastructure) similar to those of urban settlements but are rural in administration.
6. Census of India, 2001 and 2011.
7. SBM-G dashboard https://sbm.gov.in/sbmReport/home.aspx (last accessed on 26 November 2019).
8. Census of India notifies Census Towns based on the parameters of population, population density, and major occupation of a habitation. These are regions which exhibit the characteristics (and preferences in infrastructure) similar to those of urban settlements, but are rural in administration. Large Dense Villages – a classification coined by an earlier CPR study - refers to census villages with more than 1000 population and with more than 400 people per sq.km.
9. Debagarh being an ODF district – i.e. all the GPs of the district are ODF – and lacking a Census Town, all the selected GPs conformed to only one of the three categories.
10. As per SBM-G guidelines, Swachhagrahis are designated motivators for bringing about behaviour change with respect to key sanitation practices in rural areas and in sustaining ODF status in the villages.

Table 1 District-wise list of surveyed Gram Panchayats and Villages

District	GPs Covered	GP Characteristic	Villages Covered
Angul	Nuahata	CT	Birabahanpur, Nuahata, Talabhal
	Saida	ODF, Tribal	Kantala, Saida, Sarebeda
	Tubey	Non-ODF	Kulai, Jakuba, Tubey
Debagarh	Dandasingha	ODF	Dandasingha, Balirai, Rengalbahal
	Dholpada	ODF	Kumurapali, Hetkhamar, Menjaribahal
	Gundiapali	ODF	Chacchupali, Bardatalia, Ratanpur
Puri	Birapratappur	CT	Birapratappur, Dolagobindpur, Samajajpur
	Gualipada	ODF	Bolakana, Gulipada, Humar
	Nagaur	Non-ODF	Bankipur, Golapur, Nagapur

Figure 1 Demographic pattern among districts in Odisha and selected districts for rapid assessment (LDV: Large Dense Villages)



Water Supply

Standpipe in Angul Angul district

Households, given adequate levels of affluence and acceptable ground water quality, install private handpumps and borewells. Groundwater is the predominant water source in all districts, although the quality of water varies regionally. Consequently, access to an in-house water supply through private handpumps and borewells is contingent on both the affluence of the household and the expected water quality. The most affluent households not only had a borewell within the premises, but were pumping water into an overhead tank for storage. However, in regions of poor water quality, households across the socioeconomic spectrum were less likely to rely on a private water source. Overall, settlements in the district of Puri exhibited a greater preponderance for in-house water supply compared to both Angul and Debagarh – with Debagarh reporting the highest perceived occurrence of poor water quality. Again, in Debagarh, where piped water supply was reliably available, the public dug-wells were observed to be unkempt and ill-maintained.

The Department of Rural Water Supply and Sanitation (RWSS)-installed piped water network supplies water for a few hours each day where available and functional, even as defunct pipelines remain common. Piped supply of water, facilitated by RWSS, is limited to community-level standposts. Access often differs for hamlets of the same village, and these along with public handpumps and borewells can be a source of conflict. Water is supplied through the piped network for a few hours, usually in the morning; however, there are stretches which have been dry and out of operation for several years, especially in Puri GPs. In certain villages of Angul district, households also reported resorting to illegally siphoning out water from the piped network. The private sector

'There is a real scarcity of water in the village and during the summer season, the situation worsens. The quality of water is also very poor. Every year two to three nephron-related deaths occur in the village.'

– **Sarpanch**, Debagarh district

Figure 2 Clockwise list of figures (from top left): TATA steel plant in Angul; standpipe with a small tank in Debagarh; a pokhari (pond) as a site of non-potable water use in Puri; abandoned standpipe in Angul; solar-powered pump in Debagarh

> 'During road widening, some of the standpipes got damaged. They are still defunct due to a lack of funds for their rehabilitation.'
>
> **– Sarpanch,** Puri district

can also participate in the provision of water supply, as was observed in the village of Talabhal in Angul district, where standposts established by the RWSS and operated by the TATA Steel plant (at their own cost) serve the local community. In another novel model, a solar-powered pump serves the village of Bardatalia in the district of Debagarh.

Community water sources serve as sites of non-potable water usage such as washing utensils and clothes, and bathing. Household chores requiring water, such as bathing and washing (excluding cooking), are traditionally performed at the source of water itself – minimizing the need for fetching the water and storing it at the premises. This phenomenon is also explained by the fact that, as per National Sample Survey, 2018, nearly 80% of rural households in Odisha do not have access to a bathroom.[11] Therefore, pokharis (ponds) and rivers emerge as important sources of non-potable water. Even in regions with standpipes across the three districts, a second source of water (and usually one which supplies water reliably through the day – handpumps, borewells, pokharis, etc.) is used for non-potable purposes.

11. NSS Report No. 584: Drinking Water, Sanitation, Hygiene and Housing Condition in India.

Table 2 Access to drinking water (* denotes Census Towns)

District	GP	Village	Standpipe	Public Handpump/ Tubewell	Private Handpump/ Tubewell	Public Well	Private Well	Solar Pump
Puri	Birapratappur	Birapratappur*	Defunct					
		Samajajpur	Defunct					
		Dolagobindpur						
	Nagapur	Nagapur						
		Golapur						
		Bankipur		Bad taste & colour				
	Gualipada	Bolakana						
		Gulipada	Defunct	Bad taste				
		Humar						
Angul	Nuahata	Birabahanpur				Bad taste		
		Nuahata*						
		Talabhal				Bad taste		
	Saida	Kantala						
		Saida						
		Sarebeda		Bad odour				
	Tubey	Kulai						
		Jakuba	Defunct					
		Tubey				Bad taste & colour		
Debagarh	Dandasingha	Dandasingha						
		Balirai		Bad taste				
		Rengalbahal		Bad taste				
	Dholpada	Kumurapali						
		Hetkhamar						
		Menjaribahal						
	Gundiapali	Chacchupali		Bad taste	Bad taste			
		Bardatalia		Bad taste & colour				
		Ratanpur		Bad taste				

Sanitation Service Chain

Unused toilet facility being used for storage in Puri

TOILET ACCESS AND USAGE

Toilet access has increased across the board – covering households, schools and Anganwadi centres (AWCs) – but the quality of the infrastructure is sub-par in a significant number of cases. The construction of new facilities has proceeded through three primary routes – household-led, NGO-led and contractor-led. Of these, many toilets built under the last two modes were ill-constructed, and consequently, dysfunctional. The phenomenon was more commonly observable in the districts of Puri and Angul compared to Debagarh district.

The deficiencies ranged from missing doors and roofs to missing on-site containment systems. One of the reason for these issues seemed to be possibly the misalignment of the NGO's and contactor's incentives. The former, upon accepting a work order, would have the household's claim to a subsidy waived off, receiving the subsidy itself instead. This was the primary model for external actor-led toilet construction in the district of Puri. On the other hand, in Angul, the contractor would obtain a signed cheque from the beneficiary in advance, and upon receipt of the subsidy in the beneficiary's bank account, encash it. In the district of Debagarh, toilets were constructed through both the NGO- and contractor-led models, except that the household made the payment to the contractor in cash, as well as other means, once it received the subsidy.

Despite active SBM implementation and the majority of toilets being functional, the utilization of facilities has been low and subject to various factors. Reasons for open defecation ranged from those rooted in technology and services to behavioural – such as preference for open environment, socialization

> 'SBM toilets constructed by contractors mostly become damaged after some time and are rendered out of use.'
>
> – **Resident of a Harijan settlement**, Debagarh district

Figure 3 Clockwise list of figures (from top left): Individual toilet missing an on-site sanitation system in Puri; dysfunctional toilet at an AWC in Angul; unused individual toilet facility being used for storage in Debagarh

Nonetheless, functional toilets too have witnessed limited usage.

> 'Those without means tend to be left out of the scheme benefits since subsidy is only dispensed after construction. On the other hand, delayed subsidy payments erode public confidence in the scheme and cause households to opt out.'
>
> – **Sarpanch,** Puri district

opportunities, etc. – underscoring the nexus between the two. The most commonly cited of these is the lack of in-house water supply, especially in the district of Puri, but also significantly in Angul and Debagarh. Since households only fetch water for potable uses to the premises, carrying water from a distance for toilet use is viewed as an additional and avoidable burden. Therefore, it is not surprising that households with a reliable in-house water source also professed to relatively regular usage of the toilet. In fact, as per the NSS 2018, about 32% of households not using toilets reported unclean or insufficient water as a major deterrent.[12]

In addition to lack of in-house water and behavioural reasons, the perception of the accompanying OSS system can deter usage. Owing to financial and administrative challenges, single pits have proliferated unfettered despite their disadvantageous desludging requirements. Being about 3 feet in diameter and depth, these pits were considered too small by households in the Nagapur GP of Puri district which expressed the fear that within just a few weeks or months of use, they would fill up and require emptying. Given the unavailability of affordable desludging services (the perception of costs ranges between INR 2000 and INR 5000), households use the toilet only during emergencies, if at all. On the whole, toilet usage is more common among the younger members and females in the household.

Interestingly, in the village of Humar in Puri district – which had been strongly exposed to IEC (Information Education and Communication) activities prior to construction – households seemed knowledgeable about the functioning of the twin pit system and its maintenance. The village also reported sustained toilet usage and exhibited pride at the achievement.

12. NSS Report No. 584: Drinking Water, Sanitation, Hygiene and Housing Condition in India.

Table 3 Usage of toilet facilities (* denotes Census Towns)

District	GP	Village	Reported Usage among Toilet Owners	Reasons for Not Using Toilet		
				Lack of In-house Water	Small Pit/ Emptying	Out of Habit
Puri	Birapratappur	Birapratappur*	Low			
		Samajajpur	Low			
		Dolagobindpur	Medium			
	Nagapur	Nagapur	Low			
		Golapur	Medium			
		Bankipur	Low			
	Gualipada	Bolakana	Low			
		Gulipada	Medium			
		Humar	High			
Angul	Nuahata	Birabahanpur	High			
		Nuahata*	High			
		Talabhal	Medium			
	Saida	Kantala	Low			
		Saida	Medium			
		Sarebeda	Low			
	Tubey	Kulai	Medium			
		Jakuba	Medium			
		Tubey	Medium			
Debagarh	Dandasingha	Dandasingha	High			
		Balirai				
		Rengalbahal	High			
	Dholpada	Kumurapali				
		Hetkhamar				
		Menjaribahal				
	Gundiapali	Chacchupali	High			
		Bardatalia				
		Ratanpur*				

CONTAINMENT SYSTEM

Cylindrical single pits, 3 feet by 3 feet (ft), are the most common OSS system, with direct repercussions on the usage of the toilet facility and ensuing maintenance. OSS systems found in the three districts, in decreasing order of prevalence, are: cylindrical single pit, rectangular single pit and twin pit, and septic tank system. Barring the Nuahata GP and Tubey GP in the district of Angul where twin pits are more common than the other types, the trend is observable across the board.

The rise of single pits creates a two-fold dilemma: first, they discourage households from using toilets, and second, they require mechanized intervention to be safe if they are used consistently. Concrete rings are the preferred material of construction for cylindrical leaching pits, and bricks and cement for rectangular. In some cases, the concrete rings meant for constructing two separate pits had been utilized to construct one deeper pit instead, to avoid early desludging. In general, the resource-linked order of preference appears to be shallow cylindrical single pit (3 ft x 3 ft), deep cylindrical single (3 ft x 6–9 ft) pit, rectangular pit (4 ft x 4 ft x 4 ft – 10 ft x 10 ft x 10 ft) and septic tank (a rarity), when construction is led by the household.

Twin pits, where present, are not always built to the mark and defeat their primary design objective of functioning sustainably without external intervention. Twin pits, present in a smaller proportion overall, are largely non-compliant with the governing standards even in regions where they are the dominant sanitation technology (the aforementioned settlements in Angul district). Deviations primarily include inadequate distance between the pits, inaccessible or missing junction chamber, and interconnection between the two pits such that they act as two single pits in series.

> ‘Can’t say what will happen when the tanki (tank) fills up – they told us that it will take five years to fill up. Maybe the government will give more money, after it fills up, to construct a new one.’
>
> – Swacchagrahi (on the maintenance requirements of pits constructed under SBM), Puri district

Figure 4 Clockwise list of figures (from top): Deep cylindrical single pit in Puri; interconnected twin pits chamber in Angul; twin pits with a concretized junction chamber in Angul

Leaching systems – twin pits and single pit – are close to in-house tubewells, borewells, etc., raising concerns of an emerging faecal-oral pathway. Regardless of whether they are single or twin-, a sizeable proportion of households simultaneously rely on leaching pits and in-house groundwater sources. In most of these cases, the two are housed within the same plot. The distance between the two ranged from 2 to 20 metres or more, compared to the minimum setback of 3 metres and 10 metres (with the requisite caveats), in low water table and high water table regions respectively.

Despite only a recent surge in access to a toilet facility, there are major concerns about desludging of OSS systems (vis-à-vis maintenance). Desludging of OSS systems is an emerging concern among new toilet owners. As opposed to accounts of actual desludging, the discussion centres on the perception of desludging services available. The perceptions themselves are a result of hearsay in some cases, and exposure to the service providers in others. The informal service providers from cities near the surveyed areas in the district of Puri had been promoting their businesses in the region, recognizing its newly unleashed market potential. Still, the households deem (or perceive) the cost of the service high to the point that it inhibits toilet usage, as noted earlier.

Most of the new toilet owners treated the idea of manual emptying as an absurd notion, underscoring the broad absence of caste-based entrenchment of the work. An older toilet in one of the villages in Puri, however, had been serviced manually at least once by Urban Local Body (ULB)-based sweepers. Largely, desludging services are not yet incorporated in the vision of the local authority.

Table 4 Types of on-site sanitation systems (* denotes Census Towns; X denotes presence of defunct toilets; color grading denotes prevalence)

District	GP	Village	Septic Tank with Soak pit	Septic Tank without Soak pit	Single Pit – Cylindrical	Single Pit – Rectangular	Twin Pits	Defunct/Ill-constructed Toilets
Puri	Birapratappur	Birapratappur*						
		Samajajpur						
		Dolagobindpur						
	Nagapur	Nagapur						
		Golapur						
		Bankipur						
	Gualipada	Bolakana						
		Gulipada						
		Humar						
Angul	Nuahata	Birabahanpur						
		Nuahata*						
		Talabhal						
	Saida	Kantala						
		Saida						
		Sarebeda						
	Tubey	Kulai						
		Jakuba						
		Tubey						
Debagarh	Dandasingha	Dandasingha						
		Balirai						
		Rengalbahal						
	Dholpada	Kumurapali						
		Hetkhamar						
		Menjaribahal						
	Gundiapali	Chacchupali						
		Bardatalia						
		Ratanpur						

Greywater Management

Figure 5 Clockwise list of figures (from top left): Stagnation of sullage within household premises in Puri; Public handpump connected to a soak pit chamber in Angul; sullage discharge to a stormwater drain in Angul; a system of two individual single pits for blackwater and sullage management respectively in Puri; choked drain in Debagarh

A significant proportion of greywater is produced at the community-level water source instead of at the household level, and is ill-managed in both the scenarios. Communities perform water-related tasks, such as washing and bathing, at the source and thereby reduce the requirement of fetching and storing water within the premises. As a result, the production and disposal of greywater – without any treatment in most cases – occurs at both the household and the settlement level.

If the water source is private, instead of public, or if the tasks are performed at the dwelling unit, greywater is conveyed through channels into the backyard (which sometimes contains a kitchen garden). The channels can be crudely dug or pucca, with the former occurring more commonly than the latter. Leaching pits for sullage management are rare in comparison and are usually part of a combined toilet and bathing facility. Public handpumps and tubewells are unconnected to a soak pit in most cases (with the village of Tubey in Angul district being the only exception), and the wastewater from the site pools in the vicinity. Creating an unhygienic environment, the stagnated water also lends itself to vector breeding.

Access to stormwater drains varied across districts but, where available, households tend to utilize the drains for disposal of wastewater. While the GPs in Puri were largely devoid of stormwater drains, Debagarh and Angul fare better in comparison. In the district of Angul, Tubey GP reported the highest coverage of drainage infrastructure, followed by Saida and Nuahata. In these cases, however, the households situated along the drain were discharging greywater into the drain. In the village of Rengalbahal, Dandasingha GP, Debagarh, the stormwater drainage network – choked with mud and husk – had been rendered defunct.

Table 5 Access to water for non-potable purposes (* denotes Census Towns)

District	GP	Village	Standpipe	Public Handpump/ Tubewell	Private Handpump/ Tubewell	Public Well	Private Well	Pokhari	River
Puri	Birapratappur	Birapratappur*							
		Samajajpur							
		Dolagobindpur							
	Nagapur	Nagapur							
		Golapur							
		Bankipur							
	Gualipada	Bolakana							
		Gulipada							
		Humar							
Angul	Nuahata	Birabahanpur							
		Nuahata*							
		Talabhal							
	Saida	Kantala							
		Saida							
		Sarebeda							
	Tubey	Kulai							
		Jakuba							
		Tubey							
Debagarh	Dandasingha	Dandasingha							
		Balirai							
		Rengalbahal							
	Dholpada	Kumurapali							
		Hetkhamar							
		Menjaribahal							
	Gundiapali	Chacchupali							
		Bardatalia							
		Ratanpur							

Solid Waste Management

coconut husk as a significant component of organic waste in Puri

ORGANIC WASTE

Traditional practices of productive recycling of organic waste have persisted over time in agrarian villages. Kitchen waste, crop residue, coconut husk and cattle waste are the major organic waste streams that households generate. All of these are especially efficiently managed in the smaller and predominantly agrarian villages due to the wide availability of avenues for recycling. In larger or more urban villages, however, these avenues are on the decline. As a result, households dispose organic and non-organic waste together. But the recycling of organics is also observable in distinctly agrarian pockets of even some larger villages such as Birapratappur (CT) in Puri district. Kitchen waste is used as a cattle feed, and cattle waste in turn is combined with other organic streams to produce compost or used as a soil conditioner directly after drying. Cattle waste also serves as a kitchen fuel in the form of dung cakes. The practice of using dung cakes as fuel is more prevalent in the district of Angul compared to the other two.

Although formal, community-level management systems are absent, stakeholders engage in meaningful partnerships as a best practice. Farming households usually use the compost thus produced at their own holdings, but a couple of cases in the village of Nagapur in Puri district demonstrate the ingenuity of households in monetizing these avenues. In both the cases, non-farming households engaged in cattle rearing – with one comprising only female members – had been commercially selling their compost at INR 1000–1500 per tractor. In a novel synergy, the Department of Agriculture had been sporadically collecting vast amounts of coconut husks for generation of coco-peat and other derived products in the village of Humar in Puri district.

> 'We compost our waste and use it on our own agricultural lands. Why would we give away our waste to a common facility?'
>
> – Resident of an agrarian village, Puri district

Furthermore, technological interventions can be a missed opportunity if not aligned with the community needs, as in the case of the Golapur village in the district of Puri. Nearly a dozen bio-digestors were installed by an NGO in the village ten years ago, but these had reportedly become non-operational after only a few months of installation. The households stopped operating the bio-digestors soon after switching to LPG.

Figure 6 Clockwise list of figures (from top left): Compost heap; dysfunctional bio-digestors; dried dung cakes for use as kitchen fuel (all in Puri)

Table 6 Types of organic waste management practices (* denotes Census Towns)

District	GP	Village	Use as Kitchen Fuel	Composting	Use as Cattle Feed	Buried without Recycling
Puri	Birapratappur	Birapratappur*				
		Samajajpur				
		Dolagobindpur				
	Nagapur	Nagapur				
		Golapur				
		Bankipur				
	Gualipada	Bolakana				
		Gulipada				
		Humar				
Angul	Nuahata	Birabahanpur				
		Nuahata*				
		Talabhal				
	Saida	Kantala				
		Saida				
		Sarebeda				
	Tubey	Kulai				
		Jakuba				
		Tubey				
Debagarh	Dandasingha	Dandasingha				
		Balirai				
		Rengalbahal				
	Dholpada	Kumurapali				
		Hetkhamar				
		Menjaribahal				
	Gundiapali	Chacchupali				
		Bardatalia				
		Ratanpur				

INORGANIC WASTE

Generation of inorganic waste is linked to the nature of habitation – with the more 'urban' settlements generating significant amounts of plastic waste with no avenues for its management. The degree of inorganic waste generation varies widely depending on proximity to market places to the nature of the settlement, with the more 'urban' villages (or CTs) being hotspots of plastic waste, and tribal villages, like Saida in Angul district, barely generating any. Non-recyclable plastic waste has already worryingly pervaded the former, along with littering in public spaces and near shops, stalls or marketplaces. Recyclables such as plastics and cartons, among others, are reused within the premises before disposal. In the district of Puri, households also have the option of selling these to informal waste collectors, or kabbadiwalas, who intermittently service most regions.

In the absence of formal systems, households resort to dumping and burning waste indiscriminately. Non-recyclables are usually dumped in vacant land, pits, unused pokharis and backyards, being usually burned after sufficient accumulation. The practice is highly common in all three districts. Canals and drains in the districts of Puri and Angul respectively, being uncovered, become disposal sites. Some households also choose to bury their waste in backyard pits. Formally designated waste disposal points are rare – being present in only one-fourth of the surveyed villages – and exist only in the form of a collection bin in the marketplace. Since systems for downstream processing are non-existent, the waste thus gathered is periodically disposed through burning even at these common collection points.

Figure 7 Clockwise list of figures (from top left): Waste collection bin at a stall in Angul; waste-burning site in Puri; fixed solid waste collection bin in Debagarh – unused except for used syringes; polluted pokhari lined with solid waste in Puri

Table 7 Types of inorganic waste management practices ('x' indicates shops and stalls present; * denotes Census Towns)

District	GP	Village	Plastic Generation at the household-level	Littering in Public Spaces	Littering near Shops/ Stalls, etc.	Provision of Public Collection Point	Burning of Accumulated Inorganics	Presence of Informal Waste Collectors
Puri	Birapratappur	Birapratappur*						
		Samajajpur			X			
		Dolagobindpur						
	Nagapur	Nagapur			X			
		Golapur						
		Bankipur						
	Gualipada	Bolakana			X			
		Gulipada						
		Humar						
Angul	Nuahata	Birabahanpur						
		Nuahata*			X			
		Talabhal			X			
	Saida	Kantala						
		Saida						
		Sarebeda			X			
	Tubey	Kulai						
		Jakuba			X			
		Tubey			X			
Debagarh	Dandasingha	Dandasingha			X			
		Balirai						
		Rengalbahal						
	Dholpada	Kumurapali						
		Hetkhamar			X			
		Menjaribahal						
	Gundiapali	Chacchupali						
		Bardatalia			X			
		Ratanpur						

Conclusions

The state of Odisha has leveraged SBM-G support from the last five years to significantly increase access to individual toilets, but in the absence of an enabling ecosystem, the usage of these facilities remains low. Such an ecosystem comprises not only infrastructural components, viz. in-house water, well-constructed OSS systems, and desludging services (wherever required), but also a strong behavioural change component. The latest rural ODF protocol in taking cognizance of the first of these has already considered in-house water supply under its ambit. The Rural Sanitation Strategy, 2019-2029, further underscores the importance of looking at ODF sustainability and SLWM holistically. Of the former, more than IEC for the benefits of toilet use, educating households on the nature of their OSS system, its maintenance requirements, and mechanisms for fulfilling these present a more compelling need within the current context.

As for the OSS systems themselves, the high prevalence of low-volume single pits poses a challenge for the sustainability of the ODF status of the communities. These single pits, which are most commonly 3 feet by 3 feet in diameter, are perceived (in alignment with the on-ground reality) by households as requiring frequent and costly maintenance. Unless these pits are upgraded to a low-maintenance system or subsidized services for desludging provided, it is likely that they will fall out of use, if used continually at all.

Even twin pits – a low-maintenance mainstay of sanitation programmes since the 1980s – are ill-constructed in many cases such that the very objective of precluding external intervention for their O&M is defeated. An overhaul of OSS systems, therefore, is crucial for the continued and affordable use of these toilet facilities. Additionally, formalization of desludging services by empanelling operators with the GPs (ULB-based or private), setting up requisite communication channels, and collaboratively devising suitable pricing options would contribute to the sustainability of sanitation outcomes. With time, GPs would also have to deliberate upon the treatment and disposal/safe use of faecal sludge and septage from any septic tanks or single pits in use, while also developing standard operating procedures for the manual evacuation of sludge from twin pits. Given the high water table underlying Odisha and the subsequent wide-ranging reliance on groundwater, the quality of the pits – single, twin or soak pits – requires close monitoring.

Another challenge is the handling of greywater which has until now received little institutional attention. The recently announced scheme for rural water supply, Jal Jeevan Mission (JJM), features greywater management as a component for water security and source sustainability. As of now, however, formal greywater management systems remain rare, with more affluent households choosing to construct a second leaching pit for greywater, or in some cases disposing it into stormwater drains, where available. In the view of the latter, it will be crucial to sensitize households against mis-utilizing stormwater drains alongside provisioning adequate systems for the purpose.

While some degree of uniformity can be expected with respect to the issues in liquid waste management across different settlements, the types of solid waste being generated and the ensuing management challenges vary noticeably within settlements based on specific characteristics. Agrarian villages generate significant amounts of organic solid waste streams, such as cow dung, crop and plantation waste, among others, but usually recycle it as an agricultural input. Plastic waste generation is low in these settlements, and negligible in those that are predominantly tribal. In direct contrast, more 'urban' villages, including CTs, are hotspots of plastic and inorganic waste – wherein plastic waste is observed to be polluting vacant land, public spaces and pokharis that have fallen out of use. Due to shifts in occupation in these settlements, both organic solid waste generation and avenues for its recycle are limited compared to those that are more agrarian.

Regardless of its type, formal management systems for solid waste are absent across the value chain. Waste collection bins at marketplaces or designated disposal points are rare, and even where they exist, institutional collection and downstream processing of waste is not undertaken by the local authorities. Solid waste management, on the whole, does not feature strongly on the agenda of GPs. Therefore, going forward, it will be important to mainstream and build capacities for solid waste management as a first step.

The following table (Table 7) presents some emerging recommendations for all relevant components.

Table 8 Recommended interventions

Intervention Type	Toilet Access and Usage	Faecal Waste Management	Solid Waste Management	Greywater Management
Technical	Providing toilet access to those left behind during the last five SBM years Repairing of dysfunctional toilet facilities, including those at AWCs, schools, etc. Identifying and responding to the need for public or community toilets, especially in market areas Reducing time and labour burden of water collection by augmenting settlement-level water sources and household-level supply (possibly in convergence with new ODF protocol and JJM)	Converting single pits to technically sound and hydro-geologically suitable twin pits where feasible; constructing technically sound soak pits to accompany any septic tanks Where aforementioned is unfeasible due to high settlement density or other factors, (1) converting leaching structures to watertight units and (2) creating a settlement-wide conveyance system for effluent and greywater – leading up to a treatment facility such as a waste stabilization pond, DEWATS, or others For villages contiguous with or near Statutory Towns, coordinating with ULBs for desludging service provision for any single pits or septic tanks, as well as treatment of evacuated contents at existing faecal sludge treatment plants Where urban-rural synergies are infeasible (such as villages not located in proximity of Statutory Towns), procuring cluster-level equipment for desludging service provision for any single pits or septic tanks, as well as treatment of evacuated contents	Setting up adequate number of collection points for unrecycled domestic solid waste, waste from market spaces, religious or tourism sites, etc. – with a focus on segregated collection Instituting door-to-door collection of segregated solid waste for villages with high waste generation and low household-level management and recycling, where techno-economically feasible Conveying collected and segregated wastes periodically to processing facilities, such as a Material Recovery Facility (MRF), through optimally sized vehicles Setting up composting facilities locally (given that end products can also be consumed locally) for managing organic waste, where ill-managed; may also consider options such as a biogas plant under the GOBAR-DHAN scheme Coordinating with ULBs for processing of inorganic waste or setting up requisite rural processing units, if required, at most feasible clustering level (settlement-, GP-, etc.) Reducing crop and plantation residue burning by scaling up instances of best practices (e.g. coco-peat manufacture from coconut husk) Rehabilitating existing dump sites suitably	Creating greywater management infrastructure at household level, where spatially feasible (possibly in convergence with JJM) Creating greywater management infrastructure at community level where former is infeasible (possibly in convergence with JJM)

Intervention Type	Toilet Access and Usage	Faecal Waste Management	Solid Waste Management	Greywater Management
Social	IEC and BCC focused on the merits of toilet usage IEC and BCC focused on the maintenance of on-site sanitation infrastructure, i.e. desludging needs and available service providers, as well as emptying and operation cycle of twin pits	IEC focused on the necessity of household-level water treatment (and mechanisms) for potable purposes prior to consumption	IEC focused on solid waste management and source segregation	IEC focused on the harms of utilizing stormwater drainage infrastructure for sullage disposal, where applicable
Institutional	Establishing operating procedures for safe emptying of twin pit contents at the end of an operation cycle, especially given the hydrogeological context – high water table and clayey soils which impact percolation rates – of Odisha	Developing novel models for cost recovery of conveyance and treatment services – with a focus on balancing service sustainability with affordability Assessing demand for treatment of end products (including twin pit humus) and building synergies for its recycle Testing water quality for faecal contamination at specified intervals Defining roles, responsibility and accountability towards faecal sludge management (FSM) for all stakeholders at various levels of intervention	Creating incentive mechanisms at community level for source segregation and appropriate disposal Establishing linkages between markets for unrecycled organic waste (agrarian villages) and their source (non-agrarian villages) Defining roles and accountability for solid waste management at various levels of intervention	Defining roles and accountability for greywater management at various levels of intervention

SCALING CITY INSTITUTIONS FOR INDIA: SANITATION (SCI-FI)

Sanitation programme at the Centre for Policy Research (CPR) is a multi-disciplinary research, outreach and policy support initiative. The programme seeks to improve the understanding of the reasons for poor sanitation, and to examine how these might be related to technology and service delivery models, institutions, governance and financial issues, and socio-economic dimensions. Based on research findings, it seeks to support national, state and city authorities develop policies and programmes for intervention with the goal of increasing access to inclusive, safe and sustainable sanitation. Initiated in 2013, the programme is funded by the Bill and Melinda Gates Foundation (BMGF) and UNICEF India.

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