RESEARCH REPORT

Towards a new Research and Policy Paradigm: An Analysis of the Sanitation Situation in Large Dense Villages

17 November 2017

Shubhagato Dasgupta

Shamindra Nath Roy

Aditya Bhol

Deepti Raj

SCI-FI SANITATION
SCALING CITY INSTITUTIONS FOR INDIA

CENTRE FOR POLICY RESEARCH

Towards a New Research and Policy Paradigm: An Analysis of the Sanitation Situation in Large Dense Villages

17 November 2017

Abstract

The discourses on rural and urban spaces in India in the context of physical infrastructure have revealed their inherent characteristic differences. However, given the trends of urbanisation in India there has been a paradigm shift in the rural–urban continuum manifested in, amongst other things, planning, production and provision of public and private infrastructure. This research explores the secondary data on sanitation infrastructure in large dense villages in India from three census datasets. The analysis undertaken in the study attempts to comprehend the prevalence of improved on-site sanitation facilities in selected villages found to be proximate to urban areas and national highways. The findings of the research highlight the state-wise variations in large dense villages which account for sizeable percentages of the respective state populations and depict a generally high preference for septic tanks and improved pits. The results of the study substantiate the need for a primary survey to instruct policymaking adequately on the indispensability of decentralised strategies to improve the sanitation value chain.

Suggested Citation

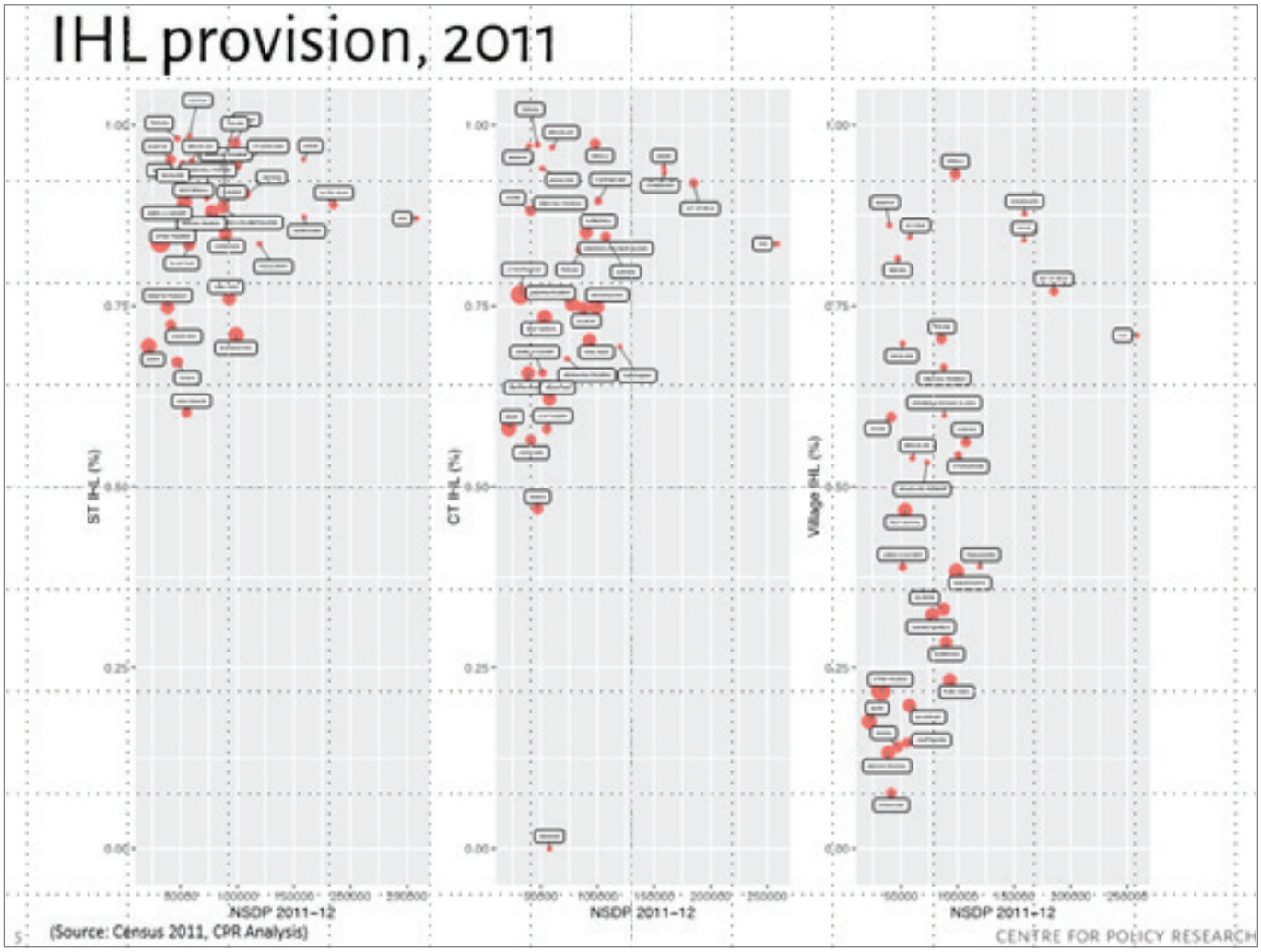
Dasgupta, S., Roy, S., Bhol, A. and Raj, D. 2017. Towards a New Research and Policy Paradigm: An Analysis of the Sanitation Situation in Large Dense Villages. *CPR Research Report.* New Delhi: Centre for Policy Research. DOI: 10.13140/RG.2.2.19252.35207

TABLE OF CONTENTS

Background

The Census 2011 had indicated a significant growth in the numbers of locations defined as Census Towns in 2011. These Census Towns are not recognised as statutory urban areas by the respective State governments and therefore have rural administrations inspite of meeting the technical criteria[1] for urban areas used by the Census. A brief analysis of the census town sanitation characteristics as shown in Figure 1 and Figure 2, shows that generally speaking interms of the access to toilets these villages are much higher than average figures of the cohort of villages in those States. These discussions brought to the fore the fact that the penetration of toilets in CTs resembled more closely the picture in Statutory Towns (STs) at the state level than villages, as shown in Figure 1 and merits a closer look to understand what waste disposal mechanisms are in place in these locations.

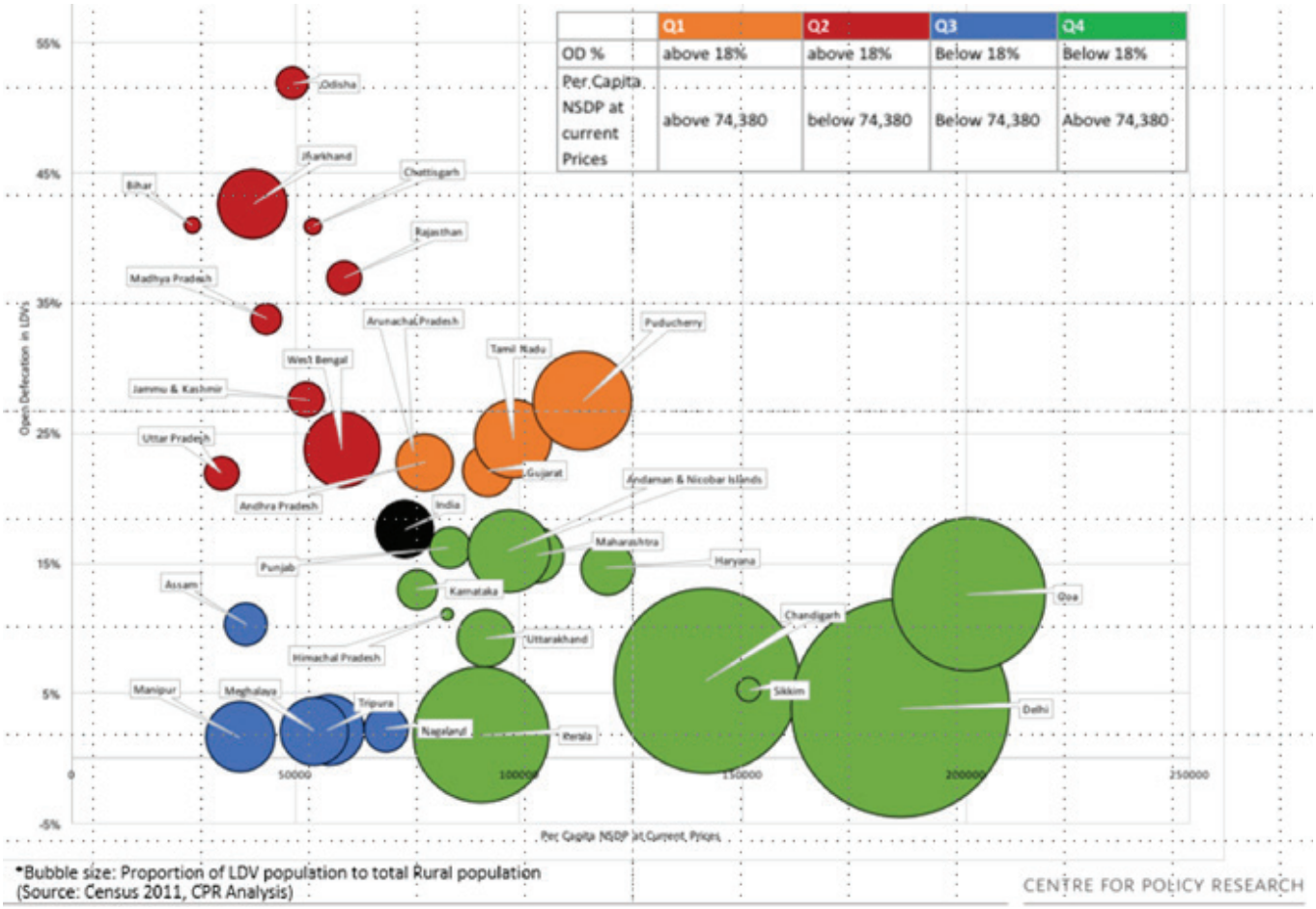
Figure 1: Toilet Penetration in Census Towns



Based on this broad observation the Census Towns were organised by states to get a concise analytical view of the variation among the states as shown in Figure 2 below. This analysis also showed that policy issues around safe containment and disposal of waste will emerge to be more important as the toilet penetration in villages increase. In fact in states especially in the North-east of the country toilet access in these Cenesu Towns was already quite high.

[1] Size: A minimum population of 5,000; Economy: At least 75 per cent of the male main working population engaged in non-agricultural pursuits; and Density: A density of population of at least 400 persons per sq. km.

Figure 2: Open Defecation in Census Towns by Proportion of State Rural Population



At the FSM 4 conference in Chennai in 2017, similar issues were flagged and the need to better understand how safe disposal of faecal waste can be achieved by the use of appropriate technologies including twin pit latrines, FSM systems and other means as applicable from region to region was articulated. This was identified as an area for further study and possible policy action for the Government of India. It was decided to investigate the reasons for penetration of septic tanks as the main on-site system in rural areas in India.

This study aims to follow up on this. This discussion also takes place in a context where the primary flagship funding programme of the Government of India is promoting and funding the use of improved twin pit latrines as a low cost technology of choice in most rural areas. This study, it is hoped, will throw some further light on how widespread this strategy should be and in which locations some thinking and action on collection, treatment and disposal of waste from rural septic tanks may also need to be prioritised. The study also expands the set of villages for the analysis beyond the Census Towns alone to Large Dense Villages (LDVs)[2]. LDV, has been coined as a new concept for this study. This has been done to explore the possibility to identify locations where the issue of toilet penetration and containment systems and the safe disposal of waste may emerge to be an important area of concern in the near future.

The data set used for this study is dated, as it relied on the Census 2011 data which was collected in 2010. This is because the questions related to technologies for toilet, waste containment and treatment, were collected only by the census. This attribute is not captured as yet in the MoDWS database for monitoring the construction of in-house toilet facilities built under Swachh Bharat Mission Gramin (SBM-G). This is an important area that the MoDWS may like to take into consideration going forward. The second issue around the choice of using the Census data was that the classification and units against which data is captured by the Census and the online real-time database of the MoDWS vary. The census data uses a category called villages while, the MoDWS Management Information System (MIS) tracks and monitors the toilet provision data through Gram Panchayats, which rural governance and administrative entities are not the same unit as census villages. Data matching for the Gram Panchayats to the villages is not available as yet. The use of Census

[2] Census Villages with more than 1000 population and with more than 400 people per sq.km.

2011 however has the limitation that it does not capture the current picture but a dated picture especially in a context where the SBM-G of MoDWS has scaled up the provision of in house latrines in the last few years and many districts have been reporting Open Defecation Free status and high levels of toilet provision.

This study is the first in this area of examining the distribution of different on-site systems being used in rural areas in India, while trying to pose questions such as: Are Large Dense Villages (LDVs) facing special sanitation circumstances? Are LDVs sites for special sanitation focus? It aims to lay out the state of this play through an analysis of the Census 2011 data to help sharpen questions around the need for a more discerning view on states and locations where there is an increased use of septic tanks. This requires the government to consider the risks and options for treatment of the faecal sludge generated in these geographies. Can an integrated sanitation strategy for LDVs be drawn up?

This exploratory study takes a look at this issue beyond CTs alone and establishes a category of Large Dense Villages (LDVs) as explained below, before analysing some principal parameters that seem to impact the on-site sanitation arrangement penetration.

Introduction

The lack of basic Sanitation in India has garnered much attention in recent times, and has led to the inception of national level interventions to address the challenges presented by the sector. India is home to 1.21 billion people of which only 31.1 per cent reside in urban areas (Census 2011). The urban and rural areas present varying demographic and socioeconomic conditions. With quite different sanitation infrastructure they present dissimilar, yet commensurately dire, situations that require the attention of policymakers and researchers. Urban areas have only 32.7 per cent of their population covered by a sewered network, 45 per cent of the population with access to improved on-site systems,[3] and 13 per cent of households practising open defecation. Despite the inadequacy of the infrastructure in the dense urban setup and associated negative public health implications, these statistics are still better when compared to the corresponding figures in rural India.

Rural areas in India comprise 68.9 per cent of its total population. As per Census 2011, only 31 per cent of these households have in-house toilets, a meagre 2 per cent are connected to a sewered network, a sizeable yet poor fraction of 23 per cent of total households have improved on-site toilet facilities, and the majority – 67 per cent – of households practise open defecation. The rural sanitation situation is clearly grimmer with dismal public sanitation infrastructure. While the urban areas have had some large public infrastructure projects such as the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), SMART cities mission, Pradhan Mantri Awas Yojana (PMAY – Housing for All) scheme, etc., the rural areas have been deprived of large-scale infrastructure projects with major sanitation components. The already existent rural–urban inequalities on access to sanitation infrastructure are getting amplified by rapid urbanisation which is manifested by expanding urban agglomerations – growth in peri-urban areas and rural areas in the vicinity of Class I cities.

There are LDVs in the country which are attracting increasing attention because of the rapid nature of their economic transformation, as visible from the results of Census 2011. About 35 per cent of the growth in urban population is accounted for by these particular kind of settlements during the last decade (Census, 2011), in the form of Census Towns (CTs).[4] Other than offering the possibilities of linkages between the rural and urban spaces and fulfilling the crucial role of local service centres in rural areas, these rapidly transforming and diversified spaces are also the locus of attention because many of them are proximate to large urban areas (Pradhan, 2013, 2017) and are prospective spaces for the mobilisation of urban planning instruments and governance functions. Also, many of these places have witnessed the growth of urban built-up proportions as they are hotspots of non-farm growth; this is often manifested in a densified and more compact form of settlement morphology, coupled with a tighter use of natural resources like water. A combination of all these factors, accompanied by the population growth in these settlements, has important implications regarding sanitation in rural and urban India.

The broad objective of this study is to identify these LDVs of the country, the identification parameters of which are enunciated in the subsequent sections, and embark on a state-wise analysis to understand these settlements' sanitation situation and preference pattern for specific toilet facilities. The analysis attempts to engender information on trends in the sanitation value chain in these areas which shall be instructive for policymakers and stakeholders, and help them dovetail efforts to improve sanitation infrastructure towards the goals adopted in Swachh Bharat Mission (SBM).

[3] Improved on-site toilets include pour/flush toilets connected to septic tanks and to improved pits (pits with slabs or ventilated improved pits).

[4] India's urban areas are defined in two ways: a) Statutory Towns which are administratively urban and are governed by an urban local body constituted under the 74th Amendment of the Constitution; and b) Census Towns which have rural administration but are functionally urban. As per the Census of India, any settlement which has a population of 5000 and above, a density of 400 persons per sq km, and 75% of the male main workforce engaged in non-agricultural activities can be defined as a CT. They are basically large and dense villages which have been identified as urban areas by the Census.

The present study is divided into three parts. The first part defines the LDVs which are the primary units of analyses in this study. It also focuses on certain characteristics of these areas in terms of their spatial distribution, proximity to large urban areas (Class I cities[5]) or national highways (NHs), in order to highlight the process of rural–urban transformation they are subjected to. The second section deals with the sanitation picture in the LDVs, with a special focus on the improved on-site sanitation systems. The third part deals with the regional picture of the sanitation profile in the LDVs.

Identifying the Large Dense Villages in India

The LDVs are the spaces which are administered as rural areas and have a population of at least 1000 and a density of 400 persons per square kilometre. They include both villages which satisfy these two criteria and all CTs categorised as urban by the Census of India but administered as rural. There are 159,624 such units, with a population of 509 million, derived by applying the LDV criteria to the Primary Census Abstract (PCA) and village directory data; they comprise 3892 CTs and 155,732 villages.[6] It is found that villages with a population of more than 1000 account for 43 per cent of the rural areas of the country and more than 80 per cent of the rural population (Fig. 3 (a)). The density cut-off used here to define the LDVs is derived from one of the census criteria to ascertain a CT. Villages which satisfy the criteria for a LDV consist of 61 per cent of the rural population(PCA) of the country and 57 percent of total rural population (including the population of CTs). Together with the CTs, they have a population of 507 million,[7] which is about 40 per cent of the total population of the country. A list of state-wise distribution of LDVs and their percentage share of respective state population are provided in Table A 2 and Table A 3 in the Annexure.

Figure 3 (a & b)

Fig. 3 (a): Distribution of Village Size-Class

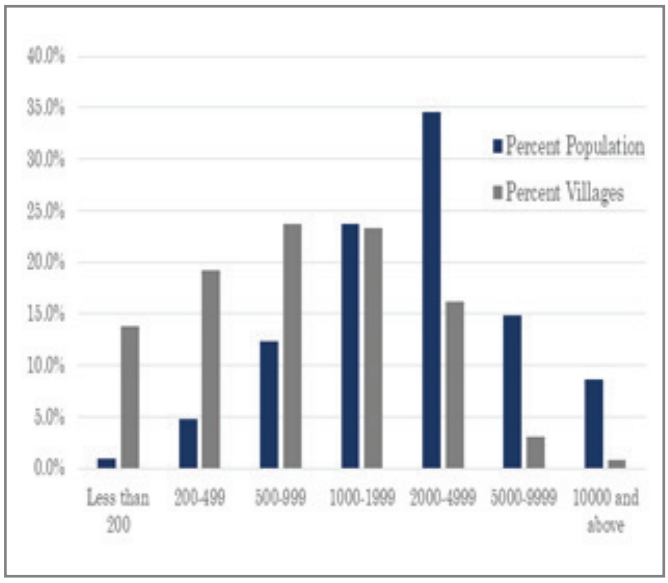
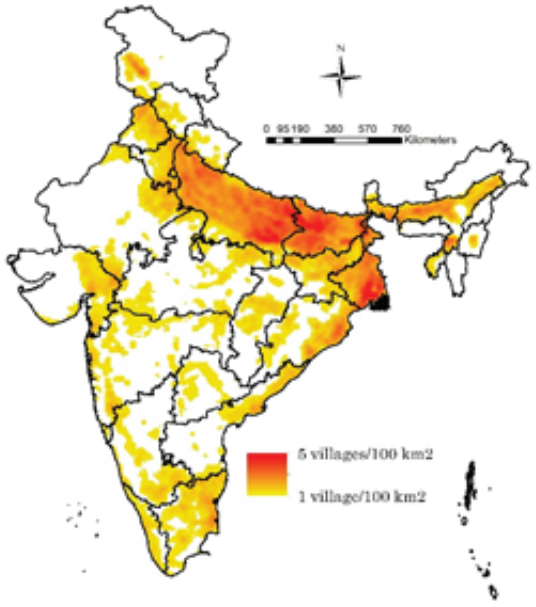


Fig. 3 (b): Spatial Distribution of LDVs



Source: Census of India, A3 Tables, PCA and Village Directory, 2011

The regional distribution of LDVs, as seen from Fig 3 (b) and Annexure Table A 3, is centred on the Indo-Gangetic plain and parts of Assam, Odisha, Tamil Nadu, Kerala, Gujarat and Maharashtra. It can be seen from Table 1 that about 10 per cent of these areas fall within 10 kilometres of Class I cities, while about 63 per cent of them fall within a similar proximity of NHs. While 11 per cent of the total population of the LDVs fall within a vicinity of 10 kilometres of Class I cities, about 42 per cent of their population falls within a 5 kilometre radius of the NHs. The effect of the transport corridors, large urban areas and associated network externalities on these settlements is therefore evident, and is indicative of the importance of these areas with respect to population growth and emerging urban landscapes.

[5] Class I cities are defined by the Census of India as cities with a population of 1 lakh and more.
[6] Refer to Methodological Note presented in Table A 1 of Annexure for details.
[7] Refer to Methodological Note presented in Table A 1 of Annexure for details.

Table 1: LDVs by Distance from Large Urban Areas and National Highways

Distance Bands	Villages		CTs		All LDVs	
	Class I	NH	Class I	NH	Class I	NH
Less than 5 km	2.2% (2.4%)	39.4% (40.4%)	13.3% (13.5%)	65.5% (67.4%)	2.5% (3.6%)	40.1% (43.3%)
5-7 km	2.4% (2.6%)	10.8% (10.7%)	8.4% (9.8%)	8.6% (10.0%)	2.6% (3.4%)	10.8% (10.6%)
7-10 km	4.7% (4.9%)	13.0% (12.8%)	11.3% (12.6%)	8.3% (8.8%)	4.9% (5.7%)	12.8% (12.3%)
10-15 km	10.0% (10.2%)	14.8% (14.4%)	14.0% (17.4%)	7.2% (5.8%)	10.1% (10.9%)	14.7% (13.5%)
More than 15 km	80.9% (80.0%)	22.2% (21.7%)	53.4% (46.8%)	10.7% (8.2%)	80.2% (76.4%)	21.9% (20.3%)
Total	155056 (452.8 mn.)		3892 (54.3 mn.)		158948 (507.1 mn.)	

Source: Census of India, 2011
Figures shown in parentheses are shares of population

Sanitation in LDVs

The LDVs, as evident from Table 2, have nearly 39 per cent coverage of in-house latrine facilities, which varied widely from 78 per cent in the case of CTs to 36 per cent in the case of purely rural areas. Almost half of these households use septic tanks for the disposal of their faecal waste. Within the LDVs, while the CTs have a larger coverage of piped sewer networks, the septic tank figures do not vary much between the CTs and the villages. This indicates that though villages have lower latrine coverage than the CTs, the preferred disposal systems are fairly similar once a latrine has been constructed. LDVs, with or without the CTs, show a fairly high coverage of in-house latrine facilities compared to the non-LDV villages.

Table 2: Broader Picture of Sanitation in LDVs and Other Settlements

Settlement Type	Numbers	Population	IHL %	Piped Sewer %	Septic Tank %	Improved Pits %	Unimproved Toilets%	OD %
CTs	3892	54316370	79%	14%	46%	15%	5%	18%
Villages	155056	452817693	36%	3%	17%	9%	7%	62%
All LDVs	158948	507134063	41%	4%	21%	10%	7%	57%
STs	4041	318549793	82%	36%	37%	5%	4%	12%

It is also notable that a substantial portion of the LDVs (42 per cent) are still using pit latrines and insanitary latrines. Hence, it is evident that if septic tanks are the focus area while designing a new sanitation policy of the LDVs, it is worthwhile to look at issues related to other unimproved means of sanitation and the obstacles in scaling up the basic rural sanitation programme.

The variations in latrine coverage and penetration of septic tanks may be considerable if this aspect can be disaggregated as per population size-classes of the LDVs. It can be seen that larger CTs actually have better IHL coverage and septic tank penetration than the STs (Table 3). Larger villages (population of more than 10,000 or so) have comparatively lower IHL coverage but equally high septic tank coverage for those households which possess a latrine. Also, the variation across size-classes is higher in the case of villages than the CTs. Hence, the size of the settlement does have an effect on the latrine coverage and usage of septic tank across its households, especially in the case of villages compared to CTs.

Table 3: Sanitation Coverage across Size-class and Types of LDVs

Settlement Type	Population Category	No of Units	% Share of Total LDV Population	IHL%	Piped Sewer %	Septic Tank %	Improved Toilets %	Unimproved Toilets %	OD%
CTs	<=4000	77	0%	72%	17%	36%	11%	8%	26%
	4000-10000	1999	3%	68%	8%	37%	16%	6%	29%
	>10000	1816	8%	83%	16%	49%	14%	4%	14%
Villages	<=4000	127595	50%	30%	2%	13%	8%	7%	68%
	4000-10000	23421	27%	37%	3%	18%	9%	7%	61%
	>10000	4040	12%	54%	5%	29%	14%	5%	44%
All LDVs	<=4000	127672	50%	31%	2%	14%	8%	7%	68%
	4000-10000	25420	29%	40%	3%	20%	10%	7%	58%
	>10000	5856	21%	66%	9%	37%	14%	5%	32%

Availability of Water and Septic Tank Penetration

Considering the findings of the above analysis that there is a size-class variation in septic tank coverage and continued high prevalence of unimproved sanitation systems and insanitary latrines in many of the LDVs, it is worthwhile to look at how this links up with access to water. Access to water is inextricably tied with the disposal of wastes, and a larger deficit of water in already backward spaces like smaller villages can have implications for the type of sanitation facilities used by the households. While the expected nature of this relationship is also borne out by the data (Table 4), some variations are observed across the population size categories.

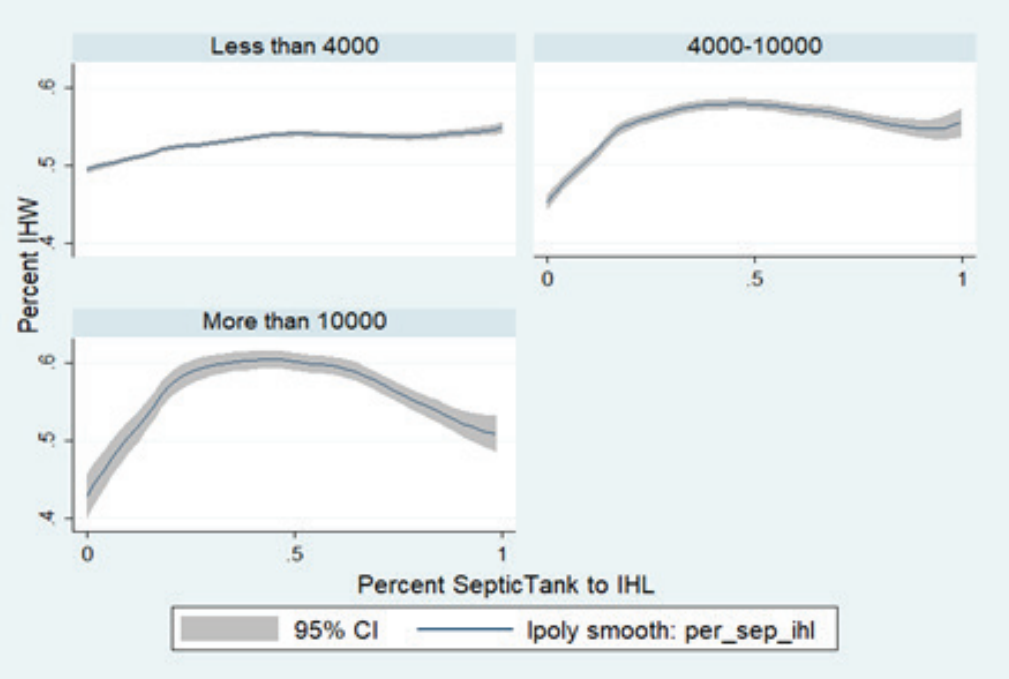
Table 4: Access to In-house Water (IHW) and Share of Septic Tanks to Total IHL Households

In-House Water (IHW - Tapwater Treated and Untreated to premise) and Sanitation Facility respective Population Class LDVs													
Settle-ment Type	Population Category	IHW < 25 %			IHW 25-50 %			IHW 50-75%			IHW > 75%		
		IHL%	Septic Tank %	OD%	IHL%	Septic Tank %	OD%	IHL%	Septic Tank %	OD%	IHL%	Septic Tank %	OD%
CTs	<=4000	65%	27%	33%	66%	40%	33%	74%	49%	21%	79%	38%	19%
	4000-10000	67%	31%	31%	72%	40%	26%	68%	45%	29%	67%	40%	28%
	>10000	86%	48%	13%	86%	53%	12%	81%	48%	16%	79%	46%	16%
Villages	<=4000	27%	11%	72%	34%	16%	65%	37%	19%	61%	41%	22%	56%
	4000-10000	32%	14%	66%	42%	22%	55%	43%	25%	54%	45%	28%	50%
	>10000	49%	24%	50%	71%	37%	27%	58%	35%	38%	57%	38%	37%
All LDVs	<=4000	27%	11%	72%	34%	16%	65%	37%	19%	61%	41%	22%	56%
	4000-10000	35%	15%	64%	46%	24%	52%	46%	28%	51%	48%	30%	47%
	>10000	58%	30%	40%	78%	45%	20%	71%	43%	25%	69%	42%	25%

LDVs in lower size-classes show a steady jump in septic tank coverage once their access to water improves, while in the case of larger villages, the curve dips after certain stages (Fig. 4). This demonstrates that access to water has a slightly higher association with the improvement of septic tank penetration in smaller villages, which can be attributed to the fact that larger LDVs have a higher percentage of piped sewer connection (Table 4). Across types of settlements, the impact on villages is more than on CTs of different size-categories.[8]

[8] The 'less than 4000' population category is not strictly applicable in case of CTs because their population cut-off remains 5000. However, some of these settlements come down the desired cut-off for population after they are identified ex-ante. The number of CTs in this group is low and not statistically comparable with other groups or villages in the same size-group.

Figure 4: Access to In-house Water and Septic Tank Share to All IHL Households



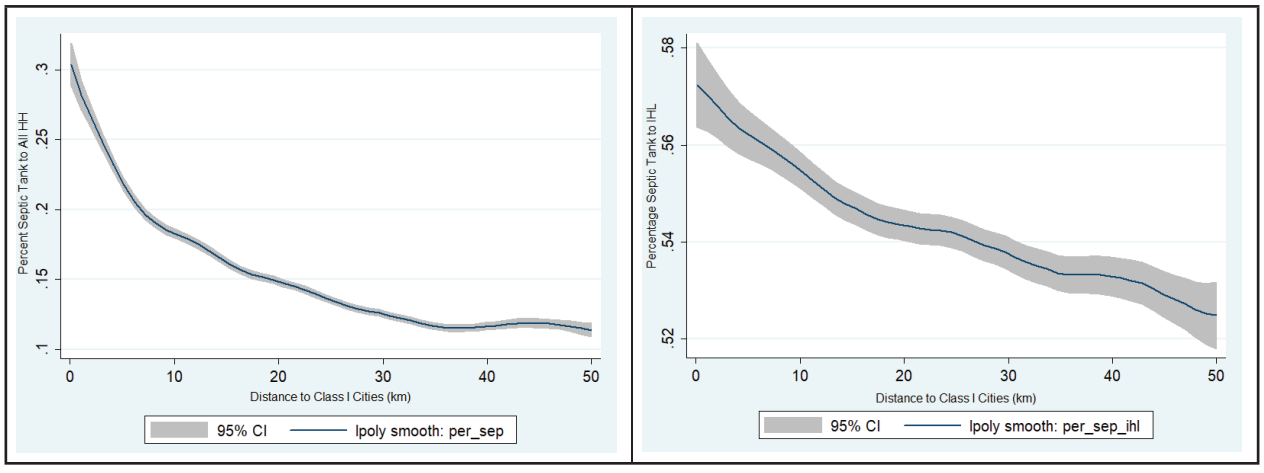
Source: Census of India, 2011, PCA and Houses and Household Amenities and Assets Tables

Spatial Distribution of Sanitation Coverage in LDVs

Other than the size-class distribution, there are variations in the sanitation landscape of the LDVs if they are plotted according to their distance from large urban areas (Class I cities), as shown in Fig. 5 (a & b). The septic tank share shows a steady drop as distance increases, implying a better situation in the LDVs proximate to the urban centres. However, there is a slight difference between how the gradients change in case of the septic tank share of all households in the LDVs and septic tank share of households which already have an in-house latrine. The drop is significant and steady in case of the former (Fig. 5 (a)) while the change is not that pronounced for IHL households (Fig 5 (b)). This indicates that though proximity to large cities does affect septic tank penetration, for households which already have latrines, this aspect is not that significant, i.e. IHL households situated farther from Class I towns also have significant septic tank coverage, in comparison to the proximate ones.[9] Also, at greater distances, the situation flattens out in case of the former, while the drop is continuous for the latter.

Fig. 5 (a): Septic Tank Share to All HH by Distance

Fig. 5 (b): Septic Tank Share to IHL HH by Distance



Source: Census of India, 2011, PCA and Houses and Household Amenities and Assets Tables

[9] Alternatively, the implication here is that households already having IHLs are either serviced by piped sewer or by some sub-structure (sanitary or insanitary), hence the slope is not as acute as that of the adjacent plot.

The spatial distribution of septic tank coverage portrays two different outcomes, if plotted against all households and households with in-house latrines (Fig. 6 (a & b)). Very few places in the country display a septic tank penetration of 50 per cent or more households, if all LDV households are considered. These areas are across the northern, western and some parts of southern India, which are not the spaces where most LDVs are concentrated, as portrayed in Fig. 3(b). However, this picture changes considerably if the share of septic tanks to IHL households is plotted; here, plenty of households in central and eastern India as well show higher coverage. It is notable that parts of central and eastern Uttar Pradesh, Gangetic West Bengal and North-East India show lower coverage in both cases, which can be partly attributed to piped sewer facilities (some parts of North-Eastern India) or a higher share of other unimproved means of sanitation (West Bengal), as shown in Annexure Table A 3.

Fig. 6 (a): Spatial Distribution of Septic Tank Share to All HH

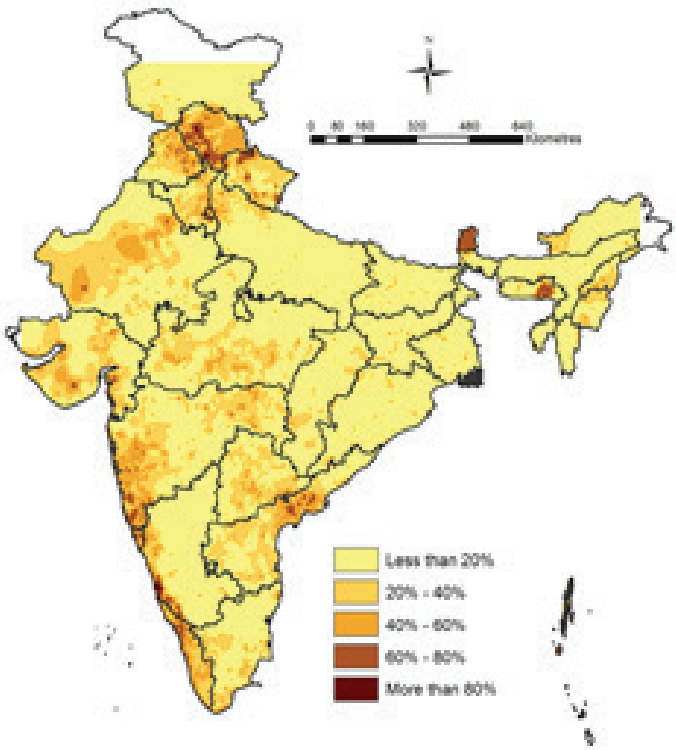
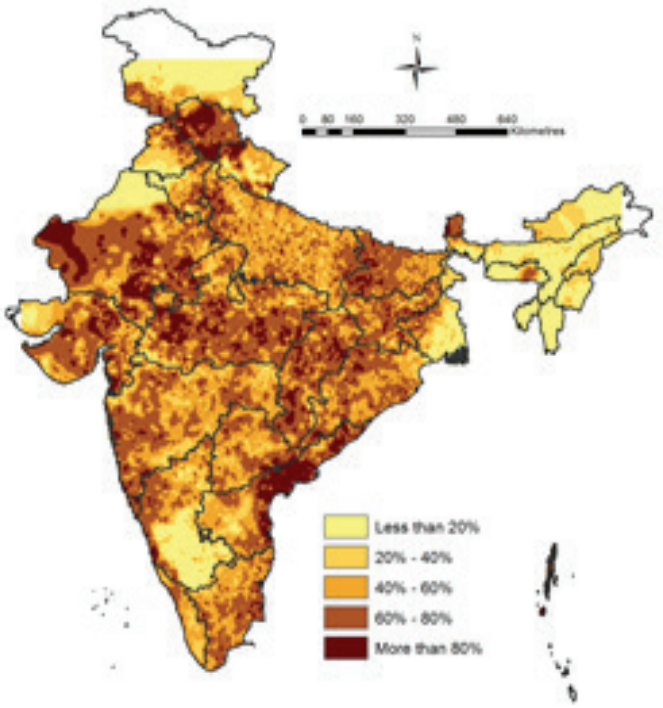


Fig. 6 (b): Spatial Distribution of Septic Tank Share to IHL HH

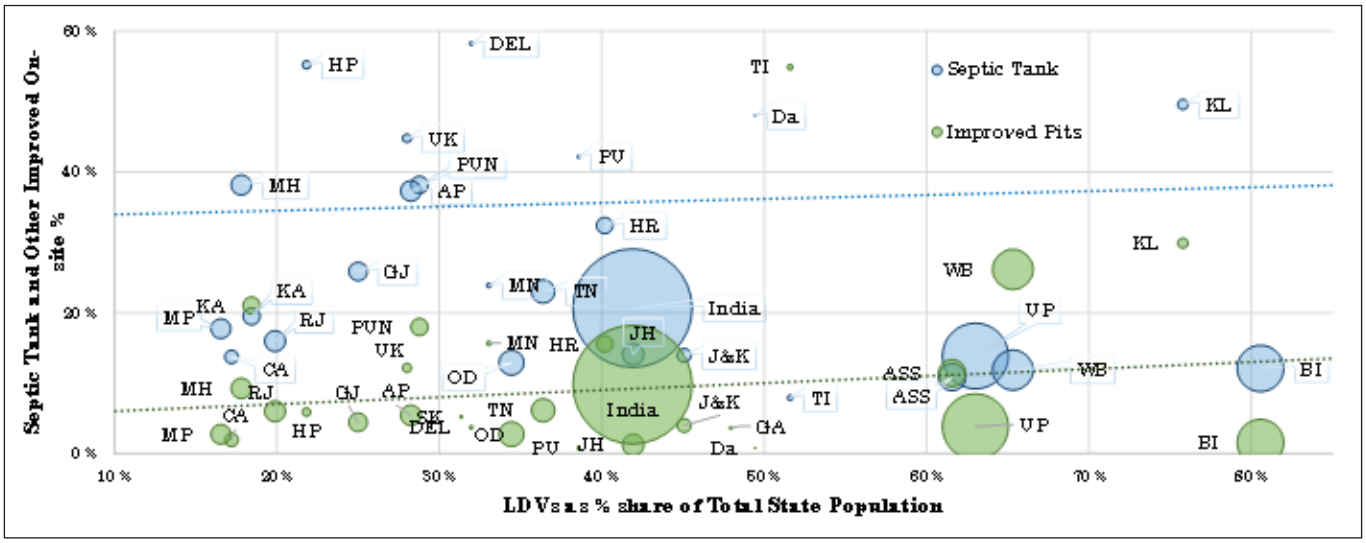


Source: Census of India, 2011, PCA and Houses and Household Amenities and Assets Tables

Scope for Further Study

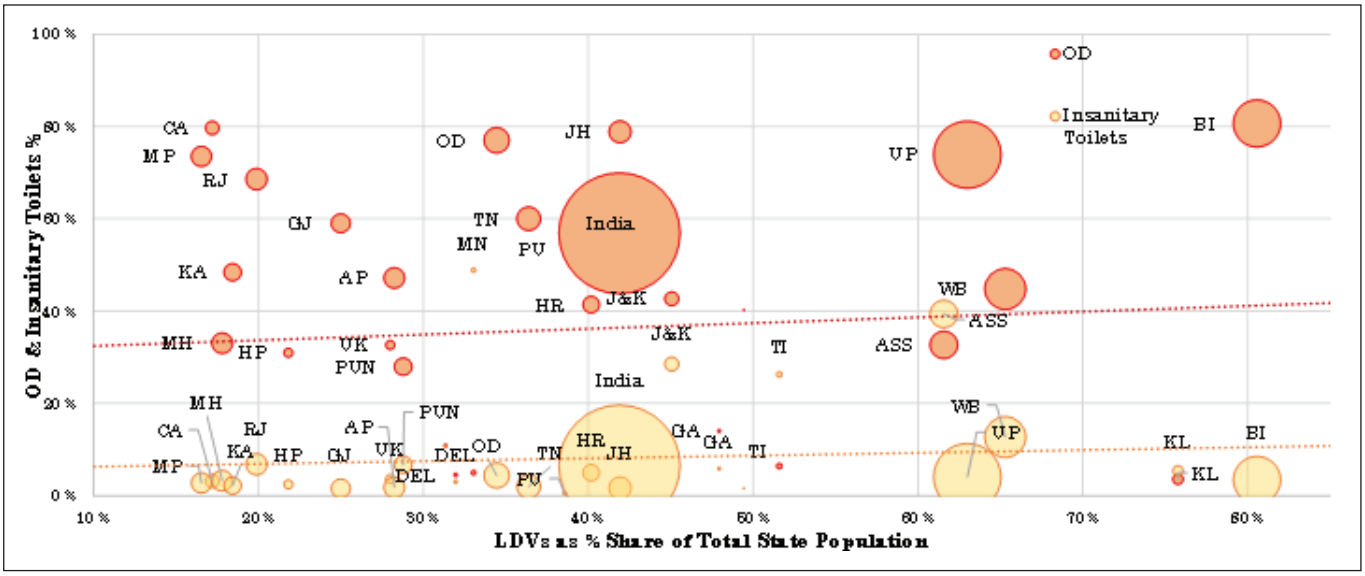
The analysis thus far has been confined to aggregate figures of LDVs in India – classified as CTs or villages; LDVs of different size- classes; and based on their distance from NHs or urban areas. The inferences thus made have been generic. In order to understand state specific issues relating to sanitation in LDVs a disaggregation of the statistics at the state level is imperative. Figures 7 and 8 show the septic tank and improved pits percentages for different states, and open defecation and insanitary toilet percentages, respectively. The horizontal axis on both these charts show that the LDVs' percentage share of total state population and the bubble sizes are based on the actual number of LDVs in the respective states. For example, referring to Kerala (KL) and Uttar Pradesh (UP) in Figure 7 it can be seen that LDVs of both states constitute more than 60 per cent of the total state population. However, Kerala, which has a lower number of LDVs, has high percentages of septic tank and improved pit facilities whereas UP with its large number of LDVs has low percentages of septic tank and improved pit facilities. These figures present a contrasting picture of sanitation in LDVs of different states thereby revealing the complex challenges that confront the relevant stakeholders who are targeting toilet penetration and use goals and trying to improve the sanitation value chain.

Figure 7: Septic Tank and Improved Pits Percentage in LDVs



Source: Census of India, 2011, PCA and Houses and Household Amenities and Assets Tables

Figure 8: Insanitary Toilets and Open Defecation Percentages in LDVs



Source: Census of India, 2011, PCA and Houses and Household Amenities and Assets Tables

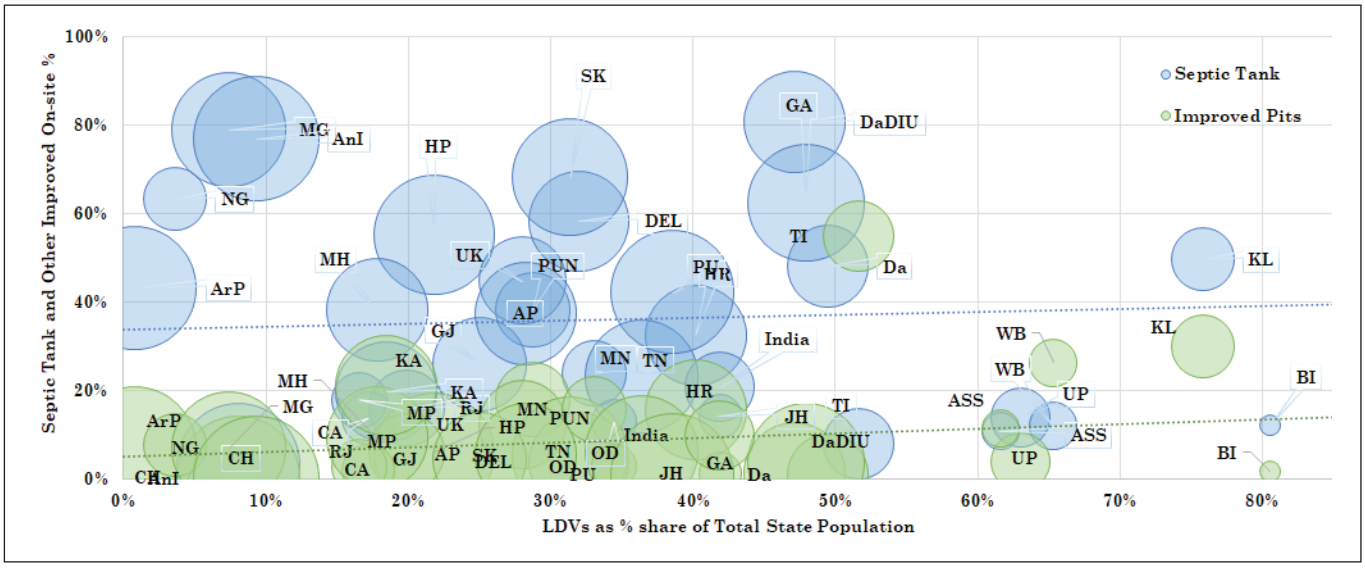
Based on Census data and the charts presented above, a matrix of states with specific characteristics has been prepared, as shown in Table 5 below, to help segregate states into categories based on septic tank percentage and share of LDV population. The purpose of this matrix is to categorise the states into four broad categories: high septic tank and high LDV population share; high septic tank and low LDV population share; low septic tank and high LDV population percentage; and low septic tank and low LDV population share. Kerala is the only state with high septic tank percentage and high share of LDV population. West Bengal, Assam, Bihar, Uttar Pradesh and Jammu & Kashmir have a very high share of LDV population but low percentages of septic tank facilities. This signals the need for stakeholders to adopt different strategies for different states, whether to meet SBM-Gramin goals or to promote adoption of faecal sludge management.

Table 5: State Selection Matrix for Proposed Survey

High Septic Tank and Low Population Share of LDVs Himachal Pradesh, Maharashtra, Uttarakhand, Andhra Pradesh, Punjab, Haryana	High Septic Tank and High Population Share of LDVs Kerala
Low Septic Tanks and Low Population Share of LDVs Madhya Pradesh, Gujarat, Karnataka, Rajasthan, Tamil Nadu, Odisha, Jharkhand, Chattisgarh	Low Septic Tanks and High Population Share of LDVs West Bengal, Assam, Jammu & Kashmir, Uttar Pradesh, Bihar
Note: Low septic tank percentage is pegged at anything less than 30 per cent; anything higher than this is considered high septic tank percentage. Low LDV population share is anything less than 40 per cent of total state population	

The rationale for choosing septic tank percentage is the emphasis on them in the National Policy on Faecal Sludge and Septage Management (NFSSM).[10] However, it must also be noted that as per JMP[11] single pits with a slab and a ventilation outlet are deemed as improved pits and in rural India the share of these facilities is quite high. These improved pits presumably includes twin-pits which are prevalent in LDVs. Hence, these should be catered to by adequately built Faecal Sludge Treatment Plants (FSTPs) following the directives of the NFSSM Policy. It is imperative for policymakers to understand the preference for septic tanks or improved pits in these LDVs and frame state specific strategies to improve the sanitation value chain beginning with toilets and ending with liquid waste management and safe disposal of waste. In this regard, it would be worthwhile to engage in a detailed study to comprehend intersectionality and preference for particular infrastructure in these LDVs. For example, in Figure 9 the state-wise access to septic tanks and improved pits has been analysed against LDV population share keeping in mind the supply of treated and untreated water to household premises (represented by the bubble size). It is interesting to note that there is a positive correlation between in-house access to tap water and preference for septic tanks and improved pits irrespective of the share of LDV population. Also interesting is that states with a very high share of LDV population show relatively lower presence of septic tanks and improved pits and a very low percentage of tap water supply to premises. Such an example exposes a whole range of possibilities for study: the relation between groundwater contamination and sanitation, the relation between socioeconomic parameters or availability of public infrastructure such as water supply, drainage, road networks, etc. and sanitation in India, and so on.

Figure 9: Septic Tanks and Improved Pits Percentage in LDVs Based on In-house Tap Water Supply



Source: Census of India, 2011, PCA and Houses and Household Amenities and Assets Tables

[10] The NFSSM introduced in February 2017 aimed to instruct stakeholders to take necessary steps to cater to liquid waste management generated from the high percentage of improved on-site systems in urban areas. A rural FSSM policy is yet to be formulated.

[11] Joint Monitoring Programme, a joint venture of WHO and UNICEF to track improvements in drinking water and sanitation infrastructure in UN affiliated countries.

Conclusion

This study explores some elemental aspects of LDVs and their correlation to particular types of sanitation facilities based on the availability of public infrastructure and their locations, using secondary data. The study yields instructive information on the variations in the penetration of toilets and on-site arrangements in LDVs across the states of India.

The study also points to the need for a detailed comparative examination of all the states juxtaposing secondary data from the Census and primary data preferably from an independent survey carefully designed to procure information on the state of sanitation of selected LDVs. Such a comparison based on a sampling methodology derived from this study would certainly be highly instructional for policymakers. The primary survey should identify underlying reasons and preferences of households regarding the choice of on-site sanitation systems. As India's habitations, including many villages, get denser and the importance of environmental sanitation is better appreciated in policy circles, could this lead to a post-2019 sanitation agenda?

These LDVs house 40 per cent of the total population of India. Also, 19.6 per cent of these LDVs (comprising 21.5 per cent of the total LDV population) are less than 15 kilometres away from Class I cities. These figures aren't subliminal. They manifestly bring to our attention the scale of rural–urban continuum. Could new institutional arrangements that allow for sharing of environmental sanitation infrastructure across administrative boundaries be the way ahead?

Total sanitation remains a ladder of outcomes; as concentrated efforts are made on one step, other steps of the ladder gain importance. However, there is no doubt that focused research that aims to understand the variations in sanitation provision and behaviours across India is critical to developing future policies and programmes that address India's sanitation crisis systematically and efficiently. It is hoped that this paper will open a new research and policy paradigm for improving sanitation outcomes in India.

References

Mukhopadhyay, P., Zerah, M. H., Samanta, G., & Maria, A. (2016). Understanding India's Urban Frontier: What is behind the Emergence of Census Towns in India?

Mukhopadhyay, P. (2017). Does Administrative Status Matter for Small Towns in India? In Subaltern Urbanisation in India (pp. 443-469). Springer India.

Pradhan, K. C. (2013). Unacknowledged Urbanization. Economic & Political Weekly, 48(36), 43.

Pradhan, K. C. (2017). Unacknowledged Urbanization: The New Census Towns in India. In Subaltern Urbanisation in India (pp. 39-66). Springer India.

Mara Duncan & Barbara Evans (2011). Sanitation & Water Supply in Low-income Countries. Bookboon.com.

Ministry of Urban Development, Government of India (2017). National Policy on Faecal Sludge and Septage Management.

Annexure

Table A 1: Methodological Note

Three databases have been used for the present study. These are the 'Primary Census Abstract' (PCA) for the population of villages and CTs, the village directory for the geographical area of the villages, and the settlement level household amenities and assets information from Census 2011. There are 159,624 such units, with a population of 509 million, derived by applying the LDV criteria to the PCA and village directory data; they comprise 3892 CTs and 155,732 villages. Of these settlements, 158,948 with a population of 507.1 million, can be successfully geocoded for spatial analysis. These datasets have, subsequently, been merged with the amenities and assets data to prepare the final database, which has 158,948 units, out of which 3892 are CTs and the rest 155,056 units are villages, accounting for a population of 507 million.

Table A 2: State-wise Distribution of LDVs

State	Census Towns	Villages	LDVs
Jammu & Kashmir	36	2112	2148
Himachal Pradesh	3	837	840
Punjab	73	3302	3375
Chandigarh	5	5	10
Uttarakhand	41	853	894
Haryana	74	2932	3006
NCT Delhi	110	87	197
Rajasthan	112	4845	4957
Uttar Pradesh	265	48348	48613
Bihar	60	23947	24007
Sikkim	1	85	86
Arunachal Pradesh	1	5	6
Nagaland	7	3	10
Manipur	23	219	242
Mizoram	0	0	0
Tripura	26	327	353
Meghalaya	12	--	12
Assam	126	8259	8385
West Bengal	784	17606	18390
Jharkhand	188	5151	5339
Odisha	114	6917	7031
Chhattisgarh	14	1992	2006
Madhya Pradesh	114	4348	4462
Gujarat	153	3763	3916
Daman & Diu	6	--	6
Dadra & Nagar Havelli	5	25	30
Maharashtra	278	4475	4753
Andhra Pradesh	227	4553	4780
Karnataka	127	3208	3335
Goa	56	73	129
Lakshadeep	6	3	9
Kerala	461	831	1292
Tamil Nadu	376	5859	6235
Puducherry	4	86	90
A&N Islands	4	--	4
All India	3892	155056	158948

Source: Census of India, A3 Tables, PCA and Village Directory, 2011

Table A 3: State-wise Percentage Share of total state population of LDVs

State	Census Towns	Villages	LDVs	Statutory Towns	Other Villages
Jammu & Kashmir	2.2%	42.9%	45.1%	23.4%	31.5%
Himachal Pradesh	0.3%	21.6%	21.8%	9.6%	68.6%
Punjab	2.4%	26.4%	28.8%	34.4%	36.8%
Chandigarh	5.3%	2.7%	8.0%	91.1%	0.9%
Uttarakhand	4.8%	23.2%	28.0%	24.7%	47.3%
Haryana	3.6%	36.6%	40.2%	31.0%	28.8%
NCT Delhi	29.6%	2.4%	32.0%	67.9%	0.1%
Rajasthan	1.8%	18.1%	19.9%	22.9%	57.2%
Uttar Pradesh	1.8%	61.2%	63.0%	20.4%	16.6%
Bihar	0.5%	80.1%	80.6%	10.8%	8.6%
Sikkim	1.0%	30.4%	31.4%	24.2%	44.4%
Arunachal Pradesh	0.3%	0.5%	0.8%	22.7%	76.5%
Nagaland	3.3%	0.3%	3.6%	25.5%	70.9%
Manipur	7.1%	25.9%	33.1%	24.8%	42.1%
Mizoram	0.0%	0.0%	0.0%	52.1%	47.9%
Tripura	7.9%	43.7%	51.6%	18.3%	30.1%
Meghalaya	7.4%	0.0%	7.4%	12.7%	79.9%
Assam	3.1%	58.5%	61.6%	10.6%	27.8%
West Bengal	8.7%	56.6%	65.3%	23.1%	11.6%
Jharkhand	7.8%	34.1%	41.9%	16.1%	42.0%
Odisha	1.9%	32.5%	34.4%	14.2%	51.4%
Chhattisgarh	0.5%	16.7%	17.2%	22.3%	60.5%
Madhya Pradesh	1.6%	14.9%	16.5%	25.9%	57.6%
Gujarat	2.9%	22.1%	25.0%	38.4%	36.6%
Daman & Diu	47.1%	0.0%	47.1%	28.1%	24.8%
Dadra & N avelli	18.1%	31.3%	49.4%	28.6%	22.0%
Maharashtra	3.6%	14.2%	17.8%	41.6%	40.6%
Andhra Pradesh	4.8%	23.4%	28.2%	27.2%	44.6%
Karnataka	2.0%	16.4%	18.4%	36.3%	45.3%
Goa	32.5%	15.5%	47.9%	27.6%	24.5%
Lakshadeep	78.1%	21.4%	99.5%	0.0%	0.5%
Kerala	30.8%	45.0%	75.8%	15.7%	8.5%
Tamil Nadu	6.9%	29.5%	36.4%	41.3%	22.3%
Puducherry	7.3%	31.3%	38.6%	60.0%	1.4%
A&N Islands	9.3%	0.0%	9.3%	28.4%	62.3%
All India	4.5%	37.4%	41.9%	26.3%	31.8%

Source: Census of India, A3 Tables, PCA and Village Directory, 2011

Table A 4: State-wise Sanitation Facilities in LDVs

State Name	Statewise Sanitation in Identified Villages						Sanitation in all the Census Towns (2001 and 2011)						Sanitation in all the LDVs					
	IHL %	Piped Sewer %	Septic Tank %	Im-proved Pits %	Unim-proved Toilets%	OD %	IHL %	Piped Sewer %	Septic Tank %	Improved Pits %	Unim-proved Toilets%	OD %	IHL %	Piped Sewer %	Septic Tank %	Improved Pits %	Unim-proved Toilets%	OD %
Jammu & Kashmir	52%	6%	13%	4%	29%	43%	65%	10%	31%	8%	16%	28%	53%	7%	14%	4%	29%	43%
Himachal Pradesh	68%	4%	55%	6%	2%	31%	88%	19%	67%	2%	1%	11%	68%	5%	55%	6%	2%	31%
Punjab	70%	7%	38%	18%	7%	29%	82%	19%	43%	14%	6%	17%	71%	8%	38%	18%	7%	28%
Chandigarh	88%	83%	5%	0%	0%	6%	93%	89%	2%	0%	2%	6%	91%	87%	3%	0%	1%	6%
Uttarakhand	61%	5%	41%	12%	4%	38%	90%	11%	63%	12%	3%	9%	66%	6%	45%	12%	4%	33%
Haryana	54%	3%	30%	16%	5%	44%	84%	16%	53%	12%	4%	15%	57%	4%	32%	16%	5%	41%
NCT Delhi	77%	11%	59%	5%	2%	13%	92%	27%	58%	4%	3%	4%	91%	26%	58%	4%	3%	5%
Rajasthan	28%	1%	13%	6%	7%	72%	62%	7%	42%	7%	6%	37%	31%	2%	16%	6%	7%	69%
Uttar Pradesh	23%	2%	13%	4%	4%	76%	76%	29%	39%	4%	4%	22%	25%	3%	14%	4%	4%	74%
Bihar	18%	1%	12%	2%	3%	81%	58%	4%	41%	6%	7%	41%	18%	1%	12%	2%	3%	81%
Sikkim	87%	3%	68%	5%	11%	11%	94%	1%	79%	9%	6%	5%	87%	3%	68%	5%	11%	11%
Arunachal Pradesh	80%	25%	39%	9%	7%	18%	68%	3%	50%	2%	12%	24%	76%	18%	43%	7%	8%	20%
Nagaland	87%	8%	30%	7%	41%	11%	94%	4%	66%	8%	17%	2%	93%	4%	63%	8%	19%	3%
Manipur	92%	3%	20%	16%	53%	6%	97%	9%	39%	16%	33%	2%	93%	5%	24%	16%	49%	5%
Mizoram	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tripura	91%	3%	7%	55%	27%	7%	97%	4%	15%	54%	24%	2%	92%	3%	8%	55%	26%	6%
Meghalaya	NA	NA	NA	NA	NA	NA	97%	5%	79%	7%	6%	2%	97%	5%	79%	7%	6%	2%
Assam	64%	4%	9%	11%	40%	34%	88%	11%	37%	14%	26%	10%	66%	4%	11%	11%	39%	33%
West Bengal	50%	2%	10%	25%	14%	48%	73%	5%	26%	36%	7%	24%	53%	2%	12%	26%	13%	45%
Jharkhand	12%	1%	8%	1%	2%	87%	56%	15%	38%	1%	2%	43%	20%	3%	14%	1%	2%	79%
Odisha	20%	1%	12%	3%	4%	79%	47%	9%	30%	3%	5%	52%	22%	2%	13%	3%	4%	77%
Chhattisgarh	19%	1%	13%	2%	3%	81%	58%	6%	48%	1%	2%	41%	20%	1%	14%	2%	3%	80%
Madhya Pradesh	22%	1%	15%	3%	3%	78%	65%	13%	47%	2%	3%	34%	26%	3%	18%	3%	3%	74%
Gujarat	34%	5%	23%	5%	2%	65%	75%	26%	43%	3%	2%	22%	39%	8%	26%	4%	2%	59%
Daman & Diu	NA	NA	NA	NA	NA	NA	87%	4%	81%	1%	0%	4%	87%	4%	81%	1%	0%	4%
Dadra & Nagar Havelli	37%	2%	32%	1%	2%	59%	76%	4%	70%	1%	2%	14%	54%	3%	48%	1%	2%	40%
Maharashtra	52%	4%	34%	10%	4%	38%	75%	14%	53%	5%	2%	16%	57%	6%	38%	9%	3%	33%
Andhra Pradesh	44%	3%	35%	5%	2%	52%	75%	14%	51%	7%	3%	23%	49%	5%	37%	5%	2%	47%
Karnataka	44%	4%	16%	21%	2%	53%	85%	20%	44%	18%	2%	13%	48%	6%	20%	21%	2%	48%
Goa	81%	8%	62%	3%	8%	17%	84%	12%	63%	4%	5%	13%	83%	11%	62%	4%	6%	14%
Lakshadeep	98%	1%	97%	0%	0%	2%	98%	3%	94%	0%	1%	2%	98%	2%	95%	0%	0%	2%
Kerala	94%	10%	45%	34%	5%	5%	97%	11%	56%	24%	5%	2%	95%	11%	50%	30%	5%	4%
Tamil Nadu	28%	3%	18%	5%	2%	69%	70%	14%	45%	9%	3%	25%	36%	5%	23%	6%	2%	60%
Puducherry	39%	1%	36%	1%	1%	59%	69%	2%	67%	0%	0%	28%	45%	1%	42%	1%	1%	53%
A&N Islands	NA	NA	NA	NA	NA	NA	83%	5%	77%	0%	1%	16%	83%	5%	77%	0%	1%	16%
All India	**36%**	**3%**	**17%**	**9%**	**7%**	**62%**	**79%**	**14%**	**46%**	**15%**	**5%**	**18%**	**41%**	**4%**	**21%**	**10%**	**7%**	**57%**

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

The Scaling City Institutions for India: Sanitation (SCI-FI: Sanitation) Project falls under the urbanisation vertical at CPR. The project aims to inform and support the formulation and implementation of the Government of India's urban sanitation programmes and investments. The research programme will study cities and states to understand the reasons for poor sanitation, and inform and support the state and city governments in modifying their urban sanitation programmes so that they are supportive of alternative technologies and service delivery models, with the goal of increasing access to safe and sustainable sanitation in urban areas.

CENTRE FOR POLICY RESEARCH

SCI-FI SANITATION
SCALING CITY INSTITUTIONS FOR INDIA

DHARMA MARG, CHANAKYAPURI, NEW DELHI 110021
WWW.CPRINDIA.ORG