FAECAL WASTE MANAGEMENT IN SMALLER CITIES ACROSS SOUTH ASIA: GETTING RIGHT THE POLICY AND PRACTICE

RESEARCH REPORT

Shubhagato Dasgupta
Centre for Policy Research

Ramisetty Murali
Freshwater Action Network South Asia

Nikhil George
Centre for Policy Research

Depinder Kapur
India WASH Forum

Freshwater Action Network South Asia

CENTRE FOR POLICY RESEARCH

Suggested Citation

Dasgupta, S., Murali, R., George, N., & Kapur, D. (2016). *Faecal Waste Management in Smaller Cities Across South Asia: Getting Right the Policy and Practice.* New Delhi: Centre for Policy Research.

Corresponding author: shubhagato@cprindia.org

Contributors

Afghanistan: Abdul Samay Saquib
Bangladesh: Waled Mahmud, Avinash Y. Kumar
Bhutan: TsheringTashi
Maldives: Mohamed Rasheed Bari
Nepal: Rabin Bastola, Karmarth Subedi
Pakistan: Rashid Mahmood
Sri Lanka: Ananda Jayaweera

FAECAL WASTE MANAGEMENT IN SMALLER CITIES ACROSS SOUTH ASIA: GETTING RIGHT THE POLICY AND PRACTICE

ABOUT FRESH WATER ACTION NETWORK SOUTH ASIA

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The Freshwater Action Network South Asia (FANSA) aims to improve governance in WASH sector by strengthening the role of civil society in decision-making. It considers both environmental and developmental aspects as crucial for the realization of the right to water and sanitation for present and future generations. FANSA was established in 2008 based on the felt need of the civil societies to ensure that their local experiences and voices are represented at the policy-making discussion and fora. The South Asian network is a member of Freshwater Action Network (FAN), a global consortium of civil society networks engaged in implementing and influencing water and sanitation policy and practice.

Vision: A world where water is respected and protected by all as an essential resource for all forms of life and where universal access to water and sanitation is achieved responsibly, equitably and inclusively. Mission To empower civil society organizations to engage effectively and influence water governance towards the realization of the right to water and sanitation for present and future generations.

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FRESH WATER ACTION NETWORK SOUTH ASIA
Regional Convenor - FANSA
H.No.2-17-127/4, East Kalyanpuri, Uppal,
Hyderabad-500039 | Telangana | INDIA
Tel: +91-40-64543830, 27200068

CENTRE FOR POLICY RESEARCH
Dharam Marg, Chanakyapuri
New Delhi – 110021. India
TEL: +91 (11) 26115273-76 (4 LINES)
FAX: +91 (11) 26872746

PREFACE AND ACKNOWLEDGEMENTS

The idea of collaboration between FANSA and CPR was first initiated in a discussion with Dr Roshan Shreshta and ourselves at a Bill and Melinda Gates Foundation (BMGF) workshop in March 2015 in New Delhi. Networking and advocacy strengths of FANSA and CPR's expertise in research and policy analysis were mutually recognized and proactive efforts were made by both the organizations to pool the same for addressing larger common interest issues. We are delighted that this collaboration has already lead to this research report. Through regular exchange of information and interaction we realized that advocating for sustainable faecal sludge management is one of our common priorities. Building on the outcome of the CPR's National workshop 'Towards Universal Urban Sanitation: Smaller Cities a Priority Area for Policy Focus' we have decided to make a strong case for prioritizing the smaller cities'/ towns' FSM in SACOSAN VI. Mr Nikhil George and Ms Kimberly Noronha at CPR and Dr Saroj Tucker at FANSA contributed significantly in shaping this idea with clear objectives and scope of work that related well with the SACOSAN's objective of improving sanitation in South Asia. Ms Tripti Singh at CPR provided exceptional research assistance during the production of this report. We would like to gratefully acknowledge valuable support from Depinder Singh Kapur of India WASH Forum who joined this initiative and contributed to developing a consolidated regional picture on the urbanization in South Asia with focus on status of FSM in small towns. His thoughts were also very helpful in designing the overall structure and content of this report.

Profiling of the urban sanitation with particular reference to faecal sludge management was lead by FANSA National Convenors in the five countries of FANSA's presence; Mr Yakub Hossain (Bangladesh), Dr Seetharam M.R, (India), Ms Lajana Manandhar (Nepal), Mr Rasheed Mahmood (Pakistan) and Mr Hemantha Withanage (Sri Lanka). The study coordinators who supported in data collection and analysis were Mr Abdul Samay Saquib (Afghanistan), Mr Waled Mahmud and Mr Avinash Y. Kumar (Bangladesh), Mr Tshering Tashi (Bhutan), Mr Mohamed Rasheed Bari (Maldives), Mr Rabin Bastola and Mr Karmarth Subedi (Nepal) and Mr Ananda Jayaweera (Sri Lanka). We would like to thank all of them for their extensive support in terms of data gathering and ground reality interpretations from their respective countries. This report has benefited significantly from their insightful contribution. Mr Bipin Bihari Nayak and Ms Madhura Dasgupta at CPR worked diligently on the layout and presentation of this report.

This collaborative effort enabled deeper understanding and appreciation of mutual strengths and we do hope that this partnership among our institutions would grow further towards stronger engagement in addressing the challenges of urban sanitation. We gratefully acknowledge the funding support from the Bill and Melinda Gates Foundation which has made this report possible.

Being aware of inherent challenges of such inter-country collaborative work, we were delighted to see the harmony and smooth coordination with which the team has accomplished this study. We hope that this report would draw the attention of the key decision makers to the urgent need as well as opportunities for sustainable faecal sludge management in smaller cities and towns of the South Asia region. We hope that this report will serve as an important baseline as countries in the region start gearing up on improved sludge management.

Ramisetty Murali
Regional Convenor - FANSA

Shubhagato Dasgupta
Senior Fellow,
Centre for Policy Research

TABLE OF CONTENTS

LIST OF FIGURES

PICTURES

LIST OF TABLES

SECTION 1:
URBANISATION AND SANITATION IN SOUTH ASIA

SOUTH ASIA IN THE URBAN WORLD

South Asia is one of the least urbanized regions in the world (see Table 1). In terms of urban population growth rate Sub Saharan Africa and other Asian regions have higher growth rates, South Asia too clocked an urban growth rate over the last decade which was higher than many other regions in the world (see Figure 1). It seems quite predictable that in the 21st century South Asia will be transforming into a predominantly urban society. This transformation will be unprecedented, just because of its scale! Over the next twenty years, 320 million people are expected to be added to the urban system in South Asia (United Nations, Department of Economic and Social Affairs, Population Division , 2014), (see Table 2). This will bring about significant structural changes to the global economic system that will affect the world in many ways. This added urban population will on one hand lead to the increase in area and population of the mega cities, and on the other hand there will be a significant rise in the number and population of smaller cities and towns in the region. It must also be kept in mind that recently a number of scholars (Denis & Marius-Gnanou, 2011) (Uchida & Nelson, 2008) have been proposing that the strict definitions of urban populations in India and South Asia, may not be capturing a number of characteristics of the urbanisation process unfolding in South Asia. While this is an ongoing debate and new instruments for measuring built mass and urban characteristics have been developed such as the Agglomeration Index, it does reveal the fact that given the variation of technical definitions of urban areas, the global comparison has its limitations.

Table 1: Urbanisation levels in different regions of the world

Region	***Urban Population (%)***
Caucasus and Central Asia	43.6
Developed countries	78.3
Eastern Asia	56.9
Latin America and the Caribbean	79.8
Northern Africa	55.6
Oceania	23.3
Southern Asia	33.2
South-eastern Asia	47.6
Sub-Saharan Africa	37.7
Western Asia	71.3

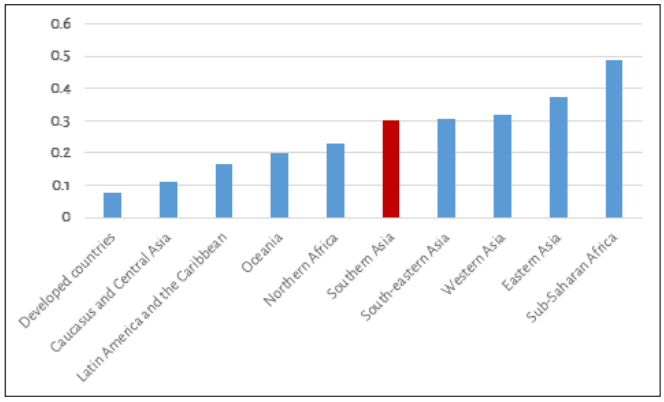
Source: United Nations, Population Division (2015)

Table 2: Projected urbanisation levels for different regions in the world

MDG Regions	***Urban Population 2035 (000's)***	***Urban population (%) 2035***
Caucasus and Central Asia	47752	49%
Developed Countries	1081984	83%
Eastern Asia	1104296	72%
Latin America and the Caribbean	636095	84%
Northern Africa	136463	62%
Oceania	3757	26%
South-eastern Asia	433092	58%
Southern Asia	886896	43%
Sub-Saharan Africa	756934	48%
Western Asia	303972	77%

Source: United Nations, Population Division (2015)

Figure 1: Decadal urban growth rate by region (2004-2014)



Source: United Nations, Population Division (2015)

SACOSAN COUNTRY URBANISATION LEVELS AND URBAN DEFINITIONS

Within South Asia too almost all countries, with the exception of Nepal, show a relatively high and steadily increasing urban population. Maldives has the highest urban population of 44% followed by Pakistan (38%), Bhutan (37%), Bangladesh (34%), India (32%), Afghanistan (26%) and Nepal and Sri Lanka both (18%) (United Nations, Department of Economic and Social Affairs, Population Division, 2015).

The urbanisation profile of the South Asian countries varies between each other. South Asia is also home to nine of the world's largest 40 cities which are Dhaka, Delhi, Mumbai, Karachi, Kolkata, Bangalore, Chennai, Hyderabad and Lahore (United Nations, Department of Economic and Social Affairs, Population Division , 2014). The geographically larger countries like India and Pakistan have large urban systems and populations. Among the different countries in the region, India has the highest total and urban. In terms of population density, Bangladesh has the highest population density in the world (1,125 per sq km) Maldives (1,191/Sq Km) too has a high density of population (The World Bank, 2014). Sri Lanka also has a high population density and is 44th in the world in terms of country density ranking.

While South Asia is increasingly becoming urbanized and is perhaps one of the few regions of the world where villages are getting denser and new towns and cities are coming up at a rapid scale, it is important to note that each country has a unique way to classify urban areas. Countries have been using both "Technical" classifications and "Administrative" classifications. Technical classifications are those which use those used by national statistical and census organisations and scholars, which aim to understand the demographics and development of assets and services in countries, while Administrative classifications are those as per prevailing Acts and policies which affect the governance arrangements of particular sites/ geographies and communities. As an example, in the Technical classification used by the Registrar General of India in the census is as below which is similar across most countries of South Asia:

- Minimum population Size is common for almost all countries
- Population engaged in non-agriculture activities
- Density of population per square Km

However for administrative purposes India uses different criteria to declare statutory towns. Statutory towns and cities are accredited under existing laws that lead to the establishment of municipalities and urban governments. Often as in India today all the technically eligible jurisdictions recorded by the Census fulfilling the criteria of urban category are not confirmed statutory status by the province/ nation as the case may be. This leads to the condition as in India, where technically in 2011 the census identified 7985 cities and towns, while administratively only 4041 of them have been acknowledged statutorily as cities and towns and confirmed municipal/urban government structures. Given that the urban development and local government subject is the jurisdiction of State governments in India. Urban local bodies have a constitutional mandate for separate electoral and administrative units that are distinct from the administrative and political set up of the larger state or district political and administrative dispensation. To explain this further, the Agra Municipal Corporation in India is the urban local government with elected Municipal Councillors headed by a Mayor and supported by an administrative arm of officers and staff, headed by a Municipal Commissioner performing the tasks of city administration. The Agra District, is an administrative unit of the state (provincial) government of Uttar Pradesh and includes the Agra Municipal Corporation, adjoining rural areas and towns.

Bangladesh has a population of over 154 million and has a current annual growth rate of 3 percent. As per the UNDP its urban population was project to be 53 million and is expected to rise to 116 million in 2014, which will reflect 50 percent of its total population. It currently houses two cities with more than a million population, 39 cities/towns having 100,000 to 1 million population and 216 towns having 10,000 to 100,000 population (Brinkhoff, Bangladesh, 2011). Administratively it has eleven city corporations and 315 municipalities or Paurashavas. According to the Bangladesh Paurashava Act 2009, 'city areas' mean, acquired land by municipality or cantonment board and announced as 'city area' placed along with the criteria that 75% of the population should be engaged in non-agricultural profession, and that atleast 33% land is non-agriculture type. Density of population also should not be less than 1500 in average in each sq. km and the population should not be less than 50 thousand.

The Democratic Socialist Republic of Sri Lanka had a total population of 20,359,439 in 2012. In the same year Sri Lanka had an urban population of 3.7 million, (18.3%) of its total population. The main cities are the provincial capitals and 24 district capitals. The only metropolitan area is the Greater Colombo Area with a population of nearly 2 million. The 24 districts are divided into 331 divisions. Major cities are categorized as cities with population up to 100,000, there are 10 major cities.

Nepal is the least urbanized country in the region. According to the 2011 Census, 4.52 million people (17% of the population) live in 58 Municipalities in Nepal. The population growth rate of 1.35 percent (Government of Nepal, 2013). According to the Nepal Self Governance Act (1999), any area having minimum population of twenty thousand (ten thousand for hilly and mountainous area) with, electricity, transportation, drinking water and communication facilities can be specified as municipal area. Similarly, according to Town Development Fund, the specific characteristics that defines city area includes the current population of at least 3,000 (hills) and 5,000 (Terai or Inner Terai), with a density of 40 persons/hectare, have an all-weather road, have grid electricity and basic infrastructure (markets, banking, school and health facilities).

Pakistan had a total population of 188.02 million in in 2014, out of which 72.5 million people lived in urban areas according to the Statistical Survey of Pakistan. Pakistan categorises urban areas

as follows; Metropolitan Corporation consisting of more than 10 million populations, Municipal Corporations consisting of more than 0.5 million and less than 10 million population, Municipal Committee more than 0.1 million and less than 0.5 million population and Town Committee consisting of 0.1 million or less population. There is no uniform formal definition of small towns in Pakistan as in other countries of the region. Even the Town Committee population varies from province to province. Punjab being thickly populated province has more population in town committees as compared to other province.

For India, Pakistan, Bangladesh and Nepal; one could conclude that classification of cities and towns is strongly linked to either administrative and/or political formulation of the towns and cities as per either administrative declarations and/or as per national constitutions.

Afghanistan does not have a criteria for defining cities and towns, already urbanized areas are merely classified and defined as towns by the government. As per the National Risk and Vulnerability Analysis (NRVA) in 2012 the total population was 26,954,000 out of which 6,130,000, i.e. 22.75 % lived in urban areas. The urban population for 2015 is estimated to be at 26 percent. Cities based on the population for 2013 are divided into major cities wherein 9 cities including the capital Kabul are categorized as major cities. The rest of urban areas are called cities or towns and most often have a population of less than 100,000.

The urban population in Bhutan was 31 percent in 2005 as per the Population and Housing Census of Bhutan, 2005 and as per projections undertaken in the National Urbanisation Strategy, 2008 it is expected to go up to 60 percent by 2020. Bhutan is guided by their Thromde Act 2007 that provides definition of urban areas. The Government has to declare an urban area as "Gyelyong Thromde", provided the urban area has: (a) A resident population of 10,000 or more persons irrespective of their census; (b) A population density of 1,000 persons or more per square kilometer; (c) An area of more than 5 square kilometers; (d) More than fifty percent of the population is dependent on non-primary activities; (e) A revenue base sufficient to finance its services; (f) National administrative significance such as the capital city or servicing more than on Dzongkhag. Other than this an urban system based on the same critrea with lower benchmarks help declare "Dzongkhag Thromde"; "Yenlag Throm", and "Geog Throm".

A summary of the definitions the research team could put together from secondary sources and speaking with experts in each of these countries is placed in the table below.

Table 3: Definitions of urban in SACOSAN Countries

Sl No	Country	Urban Definition
1	Afghanistan	No formal technical definition, traditional urban administrative areas are enumerated as urban.
2	Bangladesh	Administratively areas notified under the Pourashava Act 2009 with the following characteristics (a) Three-fourth of the people is involved with non-agricultural profession. (b) 33 percent land is non-agriculture type. (c) Density of population is not less than 1500 in average in each sq. km. (d) Population will not be less than 50 thousand
3	Bhutan	Each district has a district town and a satellite town by law
4	India	Technically Statutorily declared Towns (places with municipal corporation, municipal area committee, town committee, notified area committee or cantonment board); also, all places having 5000 or more inhabitants, a density of not less than 1 000 persons per square mile or 400 per square kilometre, pronounced urban characteristics and at least three fourths of the adult male population employed in pursuits other than agriculture.
5	Nepal	Administratively any area having minimum population of twenty thousand in Terai and ten thousand for hilly and mountainous area (modified periodically) with, electricity, transportation, drinking water and communication facilities can be specified as municipal area.
6	Maldives	Minimum population of 25000, necessary capacity to deliver appropriate services, minimum level of gross productivity as specified by central government from time to time
7	Sri Lanka	Administratively, Urban sector comprises all municipal and urban council areas.
8	Pakistan	Places with municipal corporation, town committee or cantonment.

Source: Table 6 – Demographic Yearbook 2005 (2015); Maldives Constitution Article 8, Decentralisation Act, Appendix 2; 1st Chapter, Clause 3(2), Paurashava (Municipality) Act 2009, Bangladesh; Local Self Governance Act – 1999, Nepal

In Conclusion, the official recognition of towns and cities remains a challenge in South Asia. A reason often proposed as an explanation on why statutorily recognised towns are most often lesser in number than technically eligible entities is the fact that for the State or Nation to recognize a new town or a city implies that it would need to allocate additional fiscal, administrative and political set up and a local taxation base. This additional bureaucracy, fiscal outlay as well as additional tax collection is often opposed by many stakeholders. Hence declaration of new towns and cities whenever it has an administrative and political dimension remains a contested turf in most countries of South Asia.

This section therefore shows how large scale urbanisation is a future reality for South Asia and that the future of society in the region is urban. It also shows how some of the national records, census and global databases may be underestimating the levels of the urban progression of communities in South Asia.

CITY SIZE AND THE DEFINITION OF "LARGER" AND "SMALLER" TOWNS USED IN THIS REPORT

This section lays out the context under which each of the SACOSAN countries consider cities and towns as "larger" or "smaller". As discussed in the section above each country has a different approach to classifying urban areas and it is therefore easy to expect that the smaller and larger cities/ towns definition is also likely to vary after incorporating the two broad approaches, technical and administrative.
In Pakistan administratively under the 18th Amendment in the constitution of Pakistan, the Local Government subject has been devolved to the provinces. Subsequently each province has promulgated Local Government Acts for their respective provinces.

Administratively, Nepal had 58 Municipalities (1 Metropolitan City and 4 Sub Metropolitan Cities) as per the 2011 Census, however the total number of Municipalities (including Metropolitan and Sub Metropolitan Cities) has increased to 217 as per the latest government declaration. With a population of 2.5 million people, the Kathmandu Valley is the location where rapid urbanisation is taking place. Other than the Kathmandu valley, Pokhara, the largest medium-size city is also witnessing rapid urbanisation. The largest 10 cities of Nepal are Kathmandu, Pokhara, Patan (Lalitpur), Biratnagar, Birgunj, Dharan, Bharatpur, Janakpur, Dhangadi and Butwal. Smaller urban clusters based on non-farm economic activities, comprising an urban core surrounded by a hinterland of smaller towns and rural areas, have emerged close to the border with India and along the main highways, with population increasing by 5-7 percent every year in some of these fast growing areas (Muzzini & Aparicio, 2013).

In Sri Lanka, where the technical criteria are not used and urban classification emanates from administrative criteria, there 24 district capitals, which are generally the more important cities. The 24 districts are divided into 331 divisions and the sub divisions. There are 14074 "Grama Niladhari" Divisions which is the lowest administrative unit for population. In Sri Lanka, major cities are generally categorized as cities with population not less than 100,000. There are 10 major cities, 7 of them are in the Colombo District.

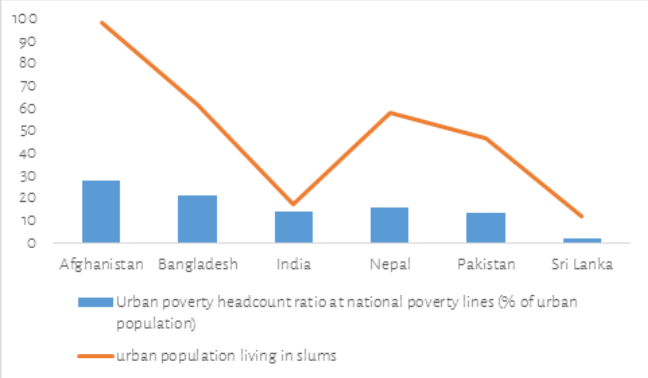
In Afghanistan, urban areas are experiencing rapid population growth since the Karzai administration began in late 2001, which is mainly due to the return of over 5 million expats. The only city in Afghanistan with over a million residents is its capital, Kabul. The other larger cities in the country are Kandhar, Herat, Mazar-i-sharif, Kunduz, Taloqan, Jalalabad, Puli Khumri, Meymaneh and Sheberghan.

In Bangladesh, which has a high urban primacy, smaller cities and Paurashavas (which are more than 300 in number) are spread out across the country, however about 9% of the total population resides the Dhaka metropolitan area alone and it is estimated it contributes close to 36% of the country's GDP. Chittagong is the second-largest city (Brinkhoff, Bangladesh, 2011) and the city's metro region houses 3% of the country's population (Hussain, 2013).

In India, cities and towns are classified by population size by the Census using technical criteria which were discussed before. City size classification are, Class 1 cities are those cities with more than 100,000 population. Smaller cities range from Class 2 cities to Class 6 cities. As presented above since urban development is a state subject states are expected to notify urban areas as per their own norms, which have consistently varied from state to state. As per the (2011) Census, India had only 4041 urban settlements out of which there were 46, million plus cities, 5 cities with more than 5 million population and 2 out of these 5 cities have more than 10 million population. As of 2011 India had 107 City Municipal Corporations, 1443 Town Municipalities, 2091 Nagar Panchayats (Areas in Transition).

The percentage of the urban population living below their respective national poverty lines varies from 2.6 % in Sri Lanka to 27.6 % in Afghanistan (see Figure 2 below). The chart also indicates that a large proportion of the population who are above the poverty line live in slum conditions. Which means, although they can satisfy their basic food needs, they do not have access to housing and public services of a desired quality – with comparatively less access to transport infrastructure, public places like parks. People living in slums also are more vulnerable to risks from environmental pollution and natural disasters and floods.

Figure 2: Slum share exceeds poverty rates in South Asia, 2005-2011



Source: Ellis & Roberts (2016)

In conclusion given the different technical and administrative differences in declaring urban settlements as larger and smaller cities in the region, for the purpose of this report which examines the sanitation status in smaller towns, the authors have concluded to adopt a general acceptable technical definition across all the SACOSAN countries to develop a comparative framework for sanitation adoption in the region. The chosen size criteria is set such that this report will refer to smaller towns as those which have a population of less than a 100,000 in 2011. This definition overlaps fully with Sri Lankan and Indian criteria and has a close overlap within Pakistan, Nepal, Bangladesh and Maldives. In the case of Bhutan since Thimpu is the largest city and has less than a 100,000 residents, the report will refer to Thimpu as the only larger town in Bhutan and the other towns including Phun Shiling will figure as smaller cities. The authors did consider raising the larger town criteria for India (which has the largest urban system) to 1 million, as most towns below the 53 million plus cities have low access to sewerage system, however decided against it in the interest of consistency and comparability. Annexure 1 carries a list of larger cities by country and the other urban areas are being bracketed as smaller cities for the purpose of this report.

Based on the above classification of larger and smaller cities the table 4 below presents the share of urban population in smaller cities in each country.

Table 4: Total number of statutorily recognised urban areas and the share of urban population living in smaller cities by country[1]

Country	***Year and Source of Data***	***Total Number of Cities Considered***	***Total Urban Population Considered***	***% Urban Population in Small Cities***
Afghanistan	2013 (Central Statistical Organization)[2]	48	6197000	17%
Bhutan	Census 2005	27	174903	55%
Bangladesh	Census 2011	257	45934155	19%
India	Census 2011	4041	318549793	30.75%
Maldives	Census 2014	10	172731	37%
Nepal	Census 2011	58	4523820	46%
Pakistan	Census 1998	268	40062355	23%
Sri Lanka	Census 2012	64	3710536	29%

Source: (Brinkhoff, Afghanistan, 2013) (Brinkhoff, Bangladesh, 2011) (Brinkhoff, Bhutan, 2015) (Brinkhoff, Maldives, 2014) (Brinkhoff, Pakistan, 1998) (Brinkhoff, Sri Lanka, 2012) (Central Bureau of Statistics, Nepal Planning Commission Secretariat, 2011) (Office of the Registrar General and Census Commissioner of India, 2011)

SECTION 2:

URBAN SANITATION IN SOUTH ASIA

SOUTH ASIA COMPARED TO OTHER WORLD REGIONS

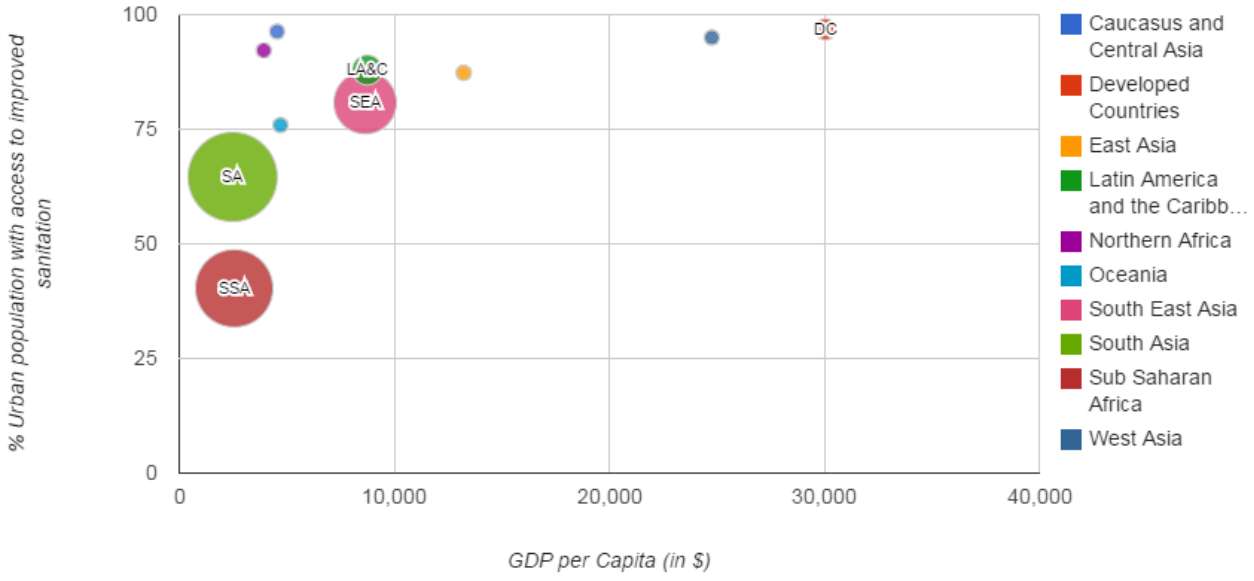
South Asia is amongst the weakest regions in the world with respect to drinking water and sanitation indicators (see Table 5). While there has been significant progress on improved drinking water increasing access to sanitation has lagged. Although majority of the population engaged in open defecation lives in rural areas in South Asia, when urban open defecation and access to improved sanitation is considered South Asia emerges as high contributor (see the largest circle in Figure 3). A number of countries notably, Bangladesh, Nepal, Sri Lanka and Maldives have done well over the last decade to improve benchmarks on open defecation and access to toilets in their countries, South Asia as a whole has not met the Millennium Development Goals (MDG) target on Sanitation. It must however be placed here that India with its large population, which defecates in the open has been the main country responsible, and rural communities in specific have been slow to adopt toilets many Civil Society Organisations (CSOs) from other countries including Bangladesh and Nepal often contest the MDG and JMP data which relies on governmental sources only.

Table 5: Access to improved water and sanitation by region (Urban)

Global Regions	***% Urban population with access to improved water***	***% Urban population with access to improved sanitation***
Caucasus and Central Asia	97.48	96.3
Developed Countries	99.58	96.8
Eastern Asia	90.90	87.3
Latin America and the Caribbean	96.46	87.3
Northern Africa	95.76	92.2
Oceania	96.74	75.9
South-eastern Asia	95.82	80.8
Southern Asia	93.07	64.6
Sub-Saharan Africa	89.47	40.3
Western Asia	94.03	95.0

Source: Joint Monitoring Programme for Water Supply and Sanitation (2015)

Figure 3: Access to improved sanitation and gdp per capita by region[3]



Source: Compiled by the authors from The World Bank (2013) and Joint Monitoring Programme for Water Supply and Sanitation (2015)

Table 6: Access to improved water and sanitation by country (urban)

Country	Urban population (%)	Access to Improved Water-Urban (%)	Access to Improved Sanitation-Urban (%)
Afghanistan	26.7	78.2	45.1
Bangladesh	34.3	86.5	57.7
Bhutan	38.6	100	77.9
India	32.7	97.1	62.6
Maldives	45.5	99.5	97.5
Nepal	18.6	90.9	56
Pakistan	38.8	93.9	83.1
Sri Lanka	18.4	98.5	88.1

Source: Joint Monitoring Programme for Water Supply and Sanitation (2015)

While the MDGs, and rightfully for that time, focused on measuring sanitation progress on improvements in the access to improved toilets at a point in time when penetration of toilets, especially in rural areas was very weak in South Asian countries, there is now increased recognition of the fact that sanitation systems without safe treatment and disposal are inadequate. Alongside this ,the strong progress made by some countries (Bangladesh, Nepal, Sri Lanka and Maldives) has also demonstrated that this region needs to now gear up for the providing a safe and secure sanitation value chain for its citizens which doesn't harm health and the environment. Interestingly, this new focus on the complete urban sanitaion chain, also significantly affects urban areas in the region, which while having better access to toilets than rural areas, lack adequate arrangements for safe treatment and disposal.

Sanitation experts believe that progressing from the MDGs the new Global Goal (Sustainable Development Goal) number 6 will focus not only on measuring access to toilets but also the safe treatment and disposal of waste water and faecal waste. If safe waste water and faecal waste treatment and disposal is taken into account, South Asia will remain as a region where majority of the citizens do not have access to a safe sanitation services.

City population access to drinking water, sanitation and safe faecal disposal is not evenly available for many cities in South Asia. Urban water and sanitation data is hidden within the district level data for water and sanitation coverage in Pakistan. National level statistics for access to toilets in Pakistan cities is not easily available. Reports in the media (The dirty truth: 41 million Pakistanis without toilets, 2015) paint an alarming picture of the overall sanitation status of Pakistan, which is the third largest country with poor sanitation, behind India and Indonesia. The report also pointed out that only around 57% of the population were using sanitary means of excreta disposal.

The decennial census in India provides numbers for household access to sanitation. Other central statistical agencies collect data on housing conditions including access to water and sanitation periodically. Nearly 7.9 million people i.e, 11.7 percent of total urban population still practice open defecation in India's cities and towns. While approximately 33 percent urban India's households are connected to sewerage systems larger number of households i.e 38 percent rely on septic tanks. Manual scavenging of toilets still persists in urban India, despite legislation against the same. The Swachh Bharat Mission Urban targets incentives for closure of manual scavenging and universal access to safe toilets.
Nepal is a country which has over the last decade had significant success in reducing open defecation. The Nepal census of 2011 indicated that 91 % urban households had access to toilets. A number of municipalities were declared Open Defecation Free (ODF) and others are in the process. However an emerging key concern is on safe wastewater management and treatment, where the country witnesses low capacity. According to the census, 30 % of the urban households have toilets connected to sewer systems while 47.5 % have toilets connected to septic tanks (Government of Nepal, 2013) .

Bangladesh is the other country that has lead the charge on reducing open defecation rapidly. The Bangladesh JMP Report 2015 of UNICEF claims that an open defecation is now down to 3 percent of the population, a claim that is not fully supported by many CSOs. However waste water conveyance,

treatment and disposal remains a key concern. Conventional sewerage system is absent in all urban areas except Dhaka where only 25% of the population is served by a sewer network (Government of Bangladesh, 2013). All other urban areas use onsite options: septic tanks, pit latrines, unhygienic latrines or none at all. Manual emptying is often done at night in a clandestine way. Residents have to rely on such a service, either because services for mechanical emptying are either non-exist or not reliable, too costly. Solidified deposits are not removable by suction, often the pit is not accessible by emptying vehicles. The Water and Sewerage Authority (WASA) is responsible for water, sewerage and storm-water drainage in the City Corporations where such institute is existed. Presently, there are four such institutions in Bangladesh i.e. Dhaka, Chittagong, Rajshahi and Khulna. In the cities where WASA has yet been established, the respective Water Supply and Sewerage Sections of the City Corporations or Municipalities are accountable for water and sanitation services. According to the Local Government Act (2009), municipalities must manage all types of waste, solid waste, liquid and industrial wastes. In Sri Lanka, according to their latest Census (2012), access to improved sanitation stands at 93.6 %. However conventional piped sewerage systems are connected to less than 5% of this toilet coverage.

Almost 96% of the urban population and 70% of the rural population of Sri Lanka has access to toilets. Sri Lanka has achieved the MDG target for access to improved sanitation and people practicing open defecation in Sri Lanka is less than 1.7 percent (not more than 150,000 persons). Sri Lanka has also successfully phased out "Bucket Latrines" in the 1980s. Usage of manual labour for servicing dry lartines does not exist among any community at present. Emptying of septic tanks in areas where gully emptier trucks are not available, is however still done using manual labour.

In Afghanistan access to improved sanitation remain a challenge. As per data provided by the Water and Sanitation Group (WSG), traditional latrines are still the most commonly used toilet (see Table 8) No urban area has a centralized sewage collection and treatment system (Case study on Urban waste water governance – GIZ and the Ministry of Urban Development). Sewage is often mixed with domestic waste water. Sewage is only produced in a small number of localities and is often limited to blocks with high rise buildings or newer constructions. Household sanitation systems comprise dry toilets, water-based flushing systems attached to an on-site collection or disposal unit, and localized management systems. Dry toilets have been the age-old practice in the country and still is dominant in both rural and urban areas. Only one in ten residents in the capital Kabul and one in five in the provincial capitals are connected to the drinking water supply network, which is in a poor state of repair. In addition to the unsanitary condition of traditional latrines, poor excreta management particularly in urban areas is another challenge. These latrines are often emptied prematurely with fresh or semi fresh excreta and under unprotected circumstances without being fully detoxified composted being used as fertilizers which is harmful for health and environment. In urban areas in addition to improved or unimproved latrines, on site sanitation with pour flush or flush latrines, septic tank and seepage pits are common type of improved sanitation.

Table 7: Sri Lanka sanitation situation, 2012

Total household	***Water sealed and Connected to pipe sewerage***	***Water sealed & Connected to a septic tank***	***Pour flushed Toilet***	***Direct pit***	***Shared***	***Not using a Toilet***
5,264,282	240,322	4,683,248	111,732	136,544	4,154	88,282
	4.6%	89%	2.1%	2.5%	0.07%	1.7%

Source: Department of Census and Statistics, Sri Lanka (2012)

Table 8: Types of toilet facilities and use (%) across afghanistan

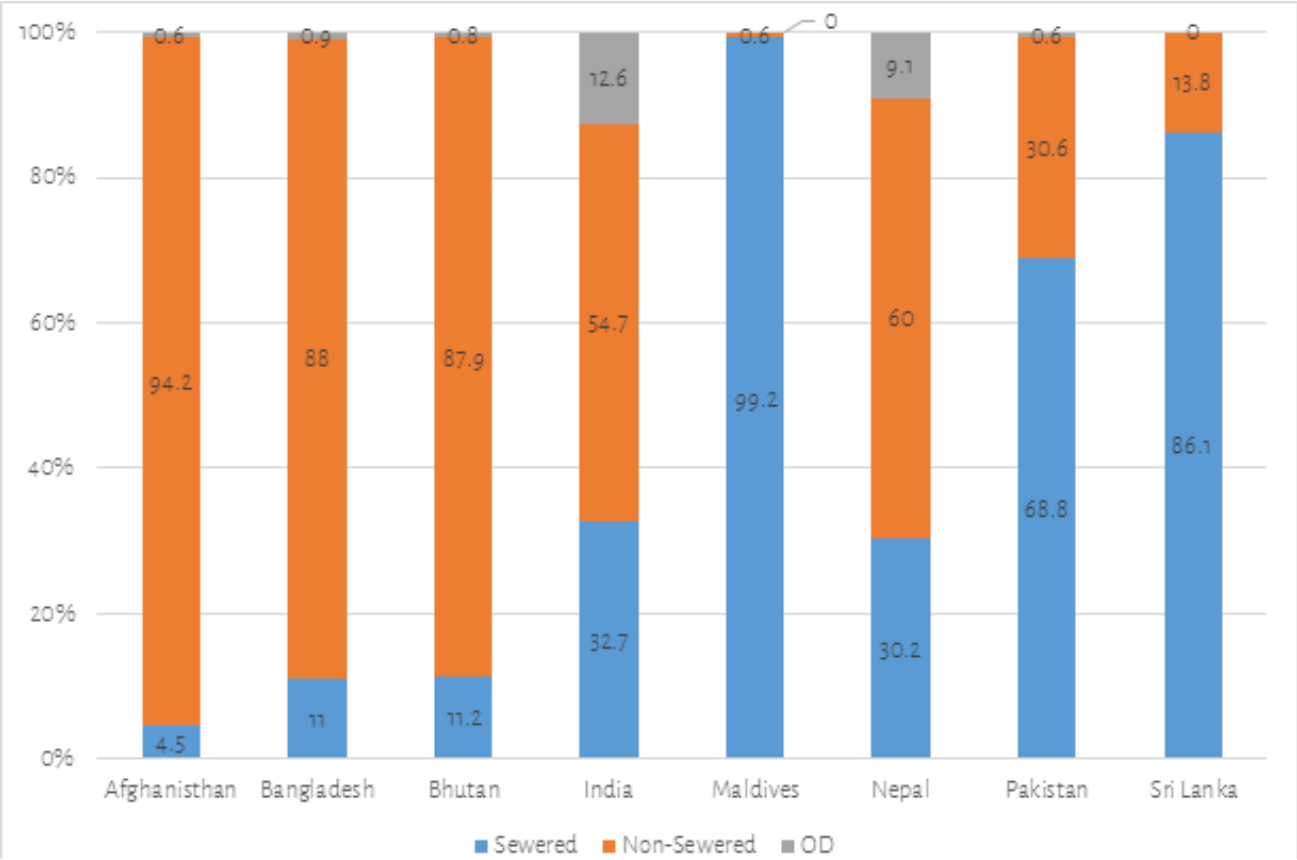
Toilet type	North	West	Central	East
Open pit	9	15	21	34
Traditional covered	78	43	54	42
Improved latrine	1	2	2	4
Flush latrine	2	3	2	3
None (open field, bus	10	34	21	13
Dearan (not pit)	0	2	0	4
Other	0	1	0	0
Total	100	100	100	100

Source: House (2013)

It is clear from both the global comparative data and the inputs from experts in each country, that the sanitation treatment and disposal systems are much weaker than the access to safe toilets and open defecation circumstances in each and every South Asian country. The figure below shows how access to underground sewerage varies across SACOSAN countries and how onsite sanitation has remained the primary approach to treatment of faecal waste and waste water in South Asia.

While Figure 4 below shows how the sewerage coverage ranges from less than 10 percent of urban population to more than 60 percent in Pakistan, the treatment capacity at the end of the sewerage pipeline is much lower, but this information is not collected systematically in any of SACOSAN countries. The figure 5 shows the waste water from toilets flow and treatment capacity in urban India, based on Census 2011 and a Central Pollution Control Board study in 2012, which while documenting the capacity of sewerage treatment plants, fails to record their utilisation rate.

Figure 4: Open defecation, non-sewered sanitation and underground sewerage in some SACOSAN Countries

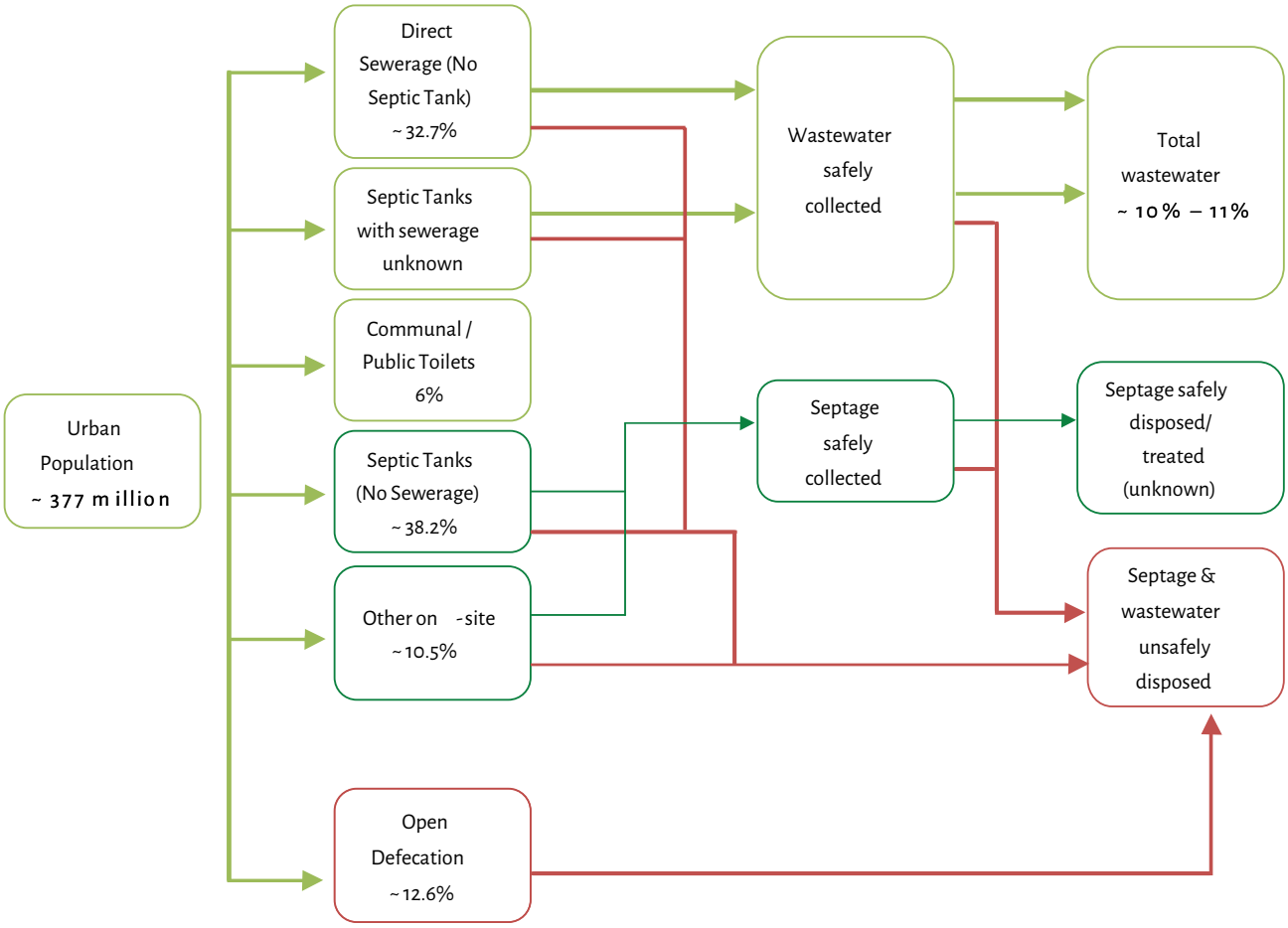


Source: Joint Monitoring Programmeme for Water Supply and Sanitation (2015)

The outline waste water flow diagrams presented below in Figures 5 and 6, based on more than one database, are a close approximation and a broad graphic description of the conditions in the two countries. It is clear from the diagrams that improvements in conveyance, treatment and disposal have not kept pace with improvements in access. Table 9 below presents the waste water treatment capacity in Bhutan, Nepal, Sri Lanka, and India, showing that from wherever some data is available it points to the same lacunae across South Asia.

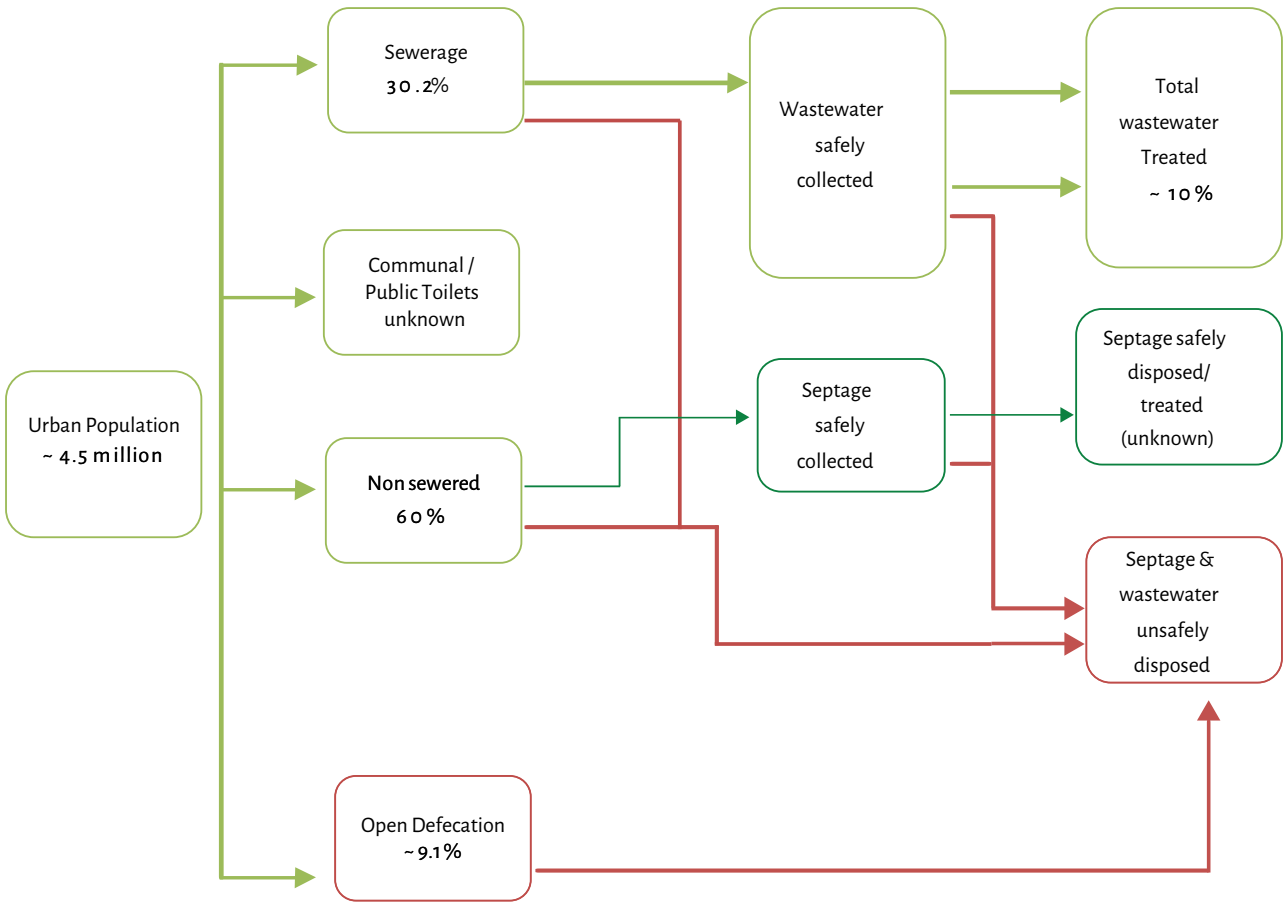
Although there are a number of reasons that can be put forth to explain the low level of waste water treatment and safe faecal sludge disposal in the region, including that the policy focus was elsewhere toilet access and rural sanitation) one important fact

Figure 5: Outline wastewater flow diagram for all census urban areas in India



Source: Office of the Registrar General and Census Commissioner of India (2011) and Central Pollution Control Board, India (2009)

Figure 6: Outline wastewater flow diagram for cities in Nepal[4]



Source: Joint Monitoring Programme for Water Supply and Sanitation (2015) and primary data collected by the authors .

is that in the past all country governments have focused on provision of underground sewerage systems and centralised sewage treatment plants in the past as a modern solution. However, other than Maldives other countries in the region have made very little progress in improving the sanitation chain by investing in the underground sewerage and waste water treatment systems.

Table 9: Estimated Wastewater treatment capacities in Bhutan, India, Nepal and Sri Lanka

Country	***Treatment Capacity in MLD***
Bhutan (8 cities)	8.47
India	11787
Nepal (6 cities)	36.30
Sri Lanka (11 cities)	69.8

Source: Status of Water Supply, Wastewater generation in Class I cities and Class II towns in India (2009) and primary data collected by the authors in the other countries.

Policies, Institutional framework, programmes and projects with special reference to "smaller" towns

Government intervention in sanitation through policies, changes in institutional frameworks, programmes and projects have varied in each South Asian country. This section discusses some of the different government interventions especially in the smaller town context in each country. The water and sanitation policies and institutions began getting a lot of attention during the UN International Drinking Water and Sanitation Decade (1981-90). A number of countries in the region increased funding support with a focus on improving drinking water supply, however only a few new programmes to support rural sanitation (like the Central Rural Sanitation Programme, India) and urban basic services (like the Integrated Low Cost Sanitation scheme) were initiated in the region. Here too the primary focus was on improving latrine coverage and elimination of the practice of dry latrines that needed to be serviced (daily removal of night soil) directly by people and not on the safe treatment.

A number of innovative projects including the Orangi Pilot Project, Pakistan also were implemented and scaled up during this time.

The water and sanitation sector governance and the institutional arrangements that support them in Pakistan differs from one province to the other. Smaller towns are either governed by municipal committees or town committees under the respective (provincial) Local Government Act. The primary responsibility for water and sanitation service delivery lies with these bodies. The sector is guided through the National Sanitation Policy 2006 and the National Environment Policy 2005. The private sector has contributed to the water and sanitation agenda through the various private housing schemes in which sanitation is taken care by hosing scheme administration, there are very limited interventions in terms of large corporate PPP arrangements for water and sanitation.

In Afghanistan, several laws, regulations, standards and policies relating to and impacting on waste water management exist. Some of the prominent ones are: Urban Water Supply and Sewerage Sector Policy (2005, MUDH)/ Urban Water Supply and Waste Water Sector Policy (draft, 2014, MUDA), Rural WASH policy, Water Law (2009), The Environment Law NEPA[5] , a draft Waste Management (Municipal Wastes) Regulation (draft, 2008), Law of Municipalities (existing)/ Municipal Law (draft, 2012). A new, more comprehensive Municipal Law has been drafted but not yet enacted. The new draft policy specifically identifies the various forms of waste water in order to avoid overlapping of institutional responsibilities as well as to avoid omissions in managing any streams of waste water typically found in the urban areas.

Similarly there are several Acts and Regulations in Nepal governing water and sanitation. The National Sanitation and Hygiene Master Plan 2011 is one of them. It has provisions for continuous monitoring of Open Defecation Free status. The Urban Water Supply and Sanitation Policy 2009 addresses critical issues of cost sharing and co-financing. The Local Self Governance Act and Regulation 1999 sets out the powers, functions and duties of Village Development Committees, Municipality and District Development Commission in relation to water and sanitation. It also sets out which natural resources are assets of local bodies and empowers local bodies to levy a natural resource tax.

The sanitation policy and programmes in Bangladesh could be a narrated as two phases. The first phase from 2003 to 2011 wherein the government's policy was aligned towards generating awareness to increase sanitation coverage to all sections of the population. This effectively bought down the percentage of persons involved in open defecation. From 2011 onwards, there has been a paradigm shift and the focus has been on the containment, collection and conveyance of faecal sludge and its effective treatment, which culminated into the National Sanitation Strategy of 2014, which states that the strategic direction for sanitation policy would be to prioritize faecal sludge management in the country. Recent programmes include the Department of Public Health Engineering (DPHE) and Asian Development Bank (ADB), project called Secondary Towns Water Supply and Sanitation Sector (GOB-ADB) Project (STWSSP), providing Faecal Sludge Treatment Plants (FSTPs) in 11 towns. As part of this, the Pourashavas are provided with tractor towed tanks with suction pumps for emptying and transporting faecal sludge from septic tanks and pit latrines. In addition, Faecal Sludge Treatment Plants are constructed at the outskirts of the towns were the withdrawn sludge is disposed.

In Sri Lanka the Water Supply & Sanitation Sector (WS&SS) has transformed through important institutional developments during the past. In the early 1950s, government established a separate Water Supply & Drainage (WS&D) department under the then Ministry of Local Government which would carried out development planning through 5 year plans. The National Water Supply & Drainage Board (NWSDB) was established in 1975 under an Act of Parliament. The last decade from 2005 - 2015 saw many changes in the sector on the coordination, institutional structure and technology. Two relevant policies pertaining to Sanitation are the Rural Sanitation policy and National Sanitation Policy. The rural sanitation policy was approved in the mid1990s to promote sustainability of the outcomes of the Community Water & Sanitation. The National Drinking Water Policy was incorporated in 2010. Long standing unwritten policy of the government was to provide subsidies to construct toilets to those people who had unimproved sanitation facilities. The present impressive coverage is mainly due to the various projects and programmes implemented by Ministry of Local Government, National Water supply & Drainage Board, Ministry of Health, Education and provincial councils.

While India doesn't have an all-inclusive water and sanitation policy it have a National Water Policy which focuses on the best use of its water resources and has a sanitation policy for urban areas (National Urban Sanitation Policy 2008). India has also had a variety of national programmes which have aided state and local governments and households with financial support to implement water and sanitation programmes. While improving toilet access in rural areas has got most of the attention in the past, the federal government funded Jawaharlal Nehru National Urban Renewal Mission (JNNURM) significantly raised the resources for urban areas between 2005 and 2012. More recently, there is a big-push from the federal government in India and access to sanitation is a top policy priority. The policy ambition is supported through a universal access programme called the Swachch

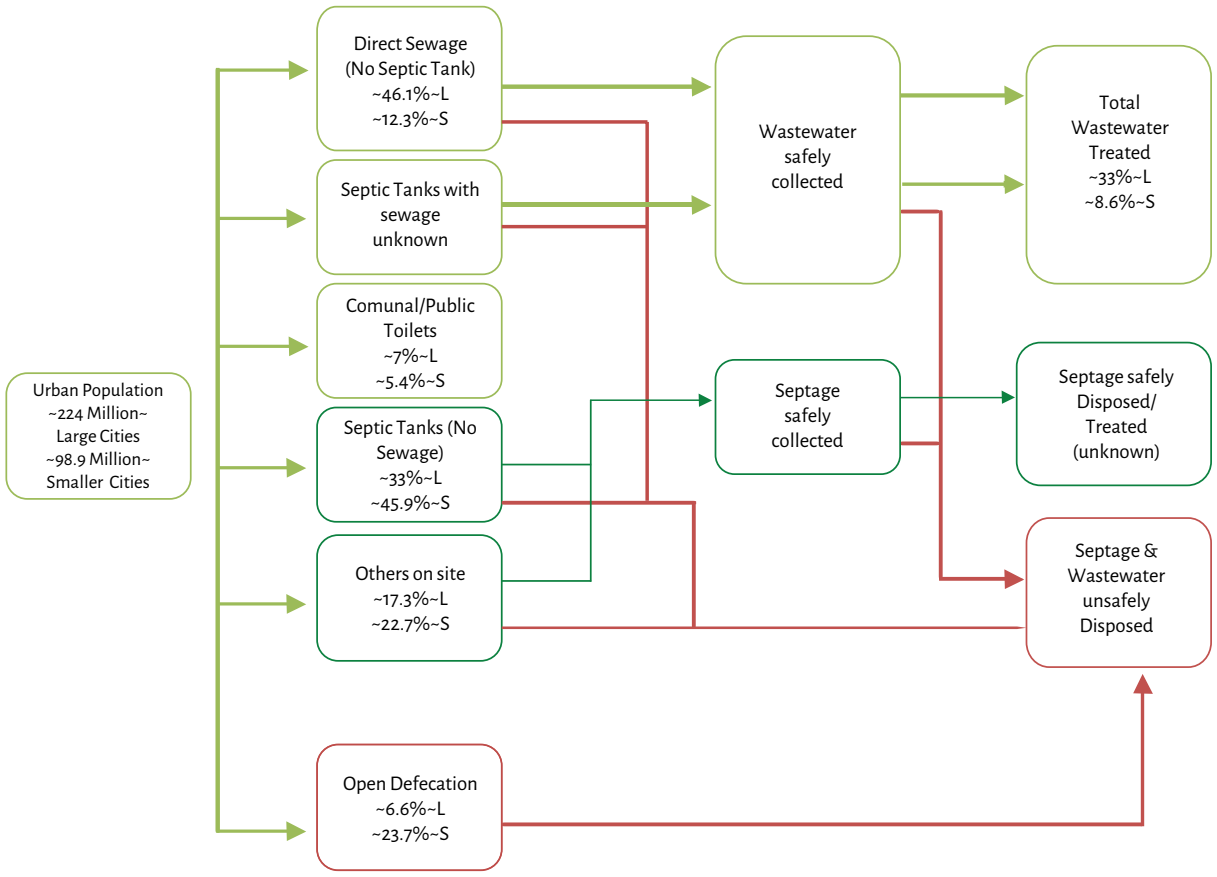
Bharat Mission (SBM)[6] . There is now a SBM for both rural and urban areas, where individual toilets are subsidized by the Government. In terms of institutional arrangements in India, the primary responsibility of drinking water and sanitation lies with the state governments. Each state has a different set of institutional mechanisms and implementation ranges from state line departments to para statal boards/companies. Some states have also decentralized this responsibilities to local government especially in urban areas especially larger cities.

In conclusion, it is clear that each country has developed their own policies and institutional structures to deliver water and sanitation. Most countries have programmes and policies driven by national and provincial governments. Local governments are generally conceived at best as implementing agencies and rarely seem to have a significant stake in determining the overall policy or institutional framework at this stage. By intervening in toilet provision too, the issue of individual and community responsibility seems to be diluted in most circumstances and remains an area of debate and a challenge to sustainability in the sector.

SMALLER TOWN SANITATION AS A BLIND SPOT

As discussed in the preceeding section, the sanitation condition in rural areas in South Asia has dominated the discussion, state led initiatives and international interventions since the 1980s, during the UN International Decade on Water and Sanitation and through till the closure of the MDGs. As is revealed by disaggregating the macro data on sanitation available in India by statutory city size smaller cities (see Figure 7) on all parameters of safe toilet access, safe conveyance and safe treatment and disposal, smaller cities lag behind the average urban benchmark levels significantly. Smaller cities do not have any particular institutional and policy focus and the attempts at improving sanitation have mainly focused on either rural areas or on larger cities. While on the one hand rural areas have received sanitation investments from national government at a prominent scale, on the other hand larger cities and city governments invested and improved sanitation infrastructure and services, based on the more robust finances available to them including nationally and externally aided projects. This circumstance has led to a situation where smaller cities have become the "blind spot", in the discussions and interventions to improve sanitation in South Asia. This is also reflected in the lack of systematic data availability and reports on sanitation conditions in smaller towns and the limited understanding of the issues and possible options.

Figure 7: Wastewater flow diagram for larger and smaller statutory cities in India



Source: Office of the Registrar General and Census Commissioner of India (2011) and Central Pollution Control Board, India (2009)

SECTION 3:

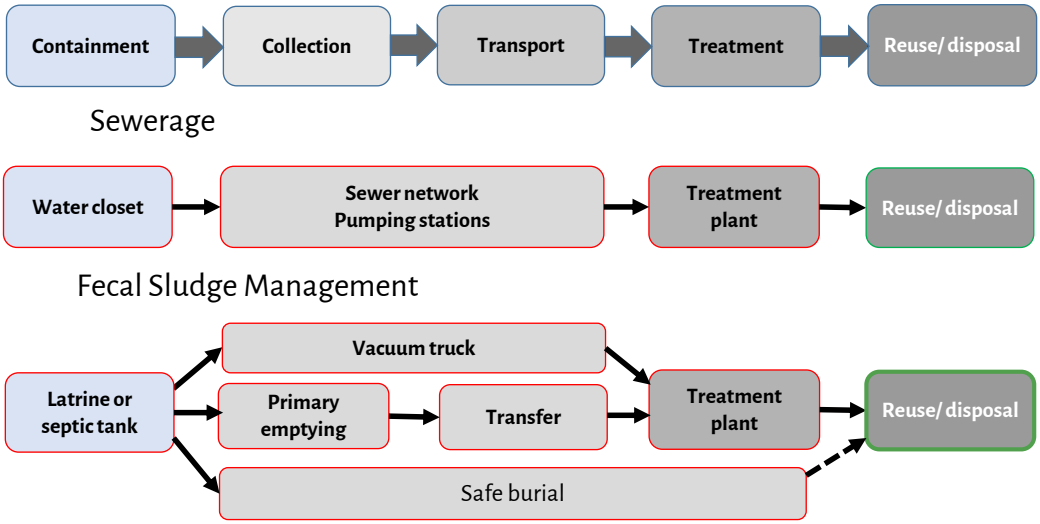
FAECAL SLUDGE MANAGEMENT FOR SMALLER TOWNS IN SOUTH ASIA

OPTIONS IN THE SANITATION CHAIN

As discussed in the preceeding section, the safe treatment, disposal and reuse of domestic waste water and human faecal waste remains a significant problem in South Asia. There are two broad approaches for safe disposal and reuse, which are the underground sewerage and centralised/decentralised sewerage treatment and Faecal Sludge Management as shown in Figure 8 below[7] . The two options are explained (graphically) in Figures 9 and 10 respectively.

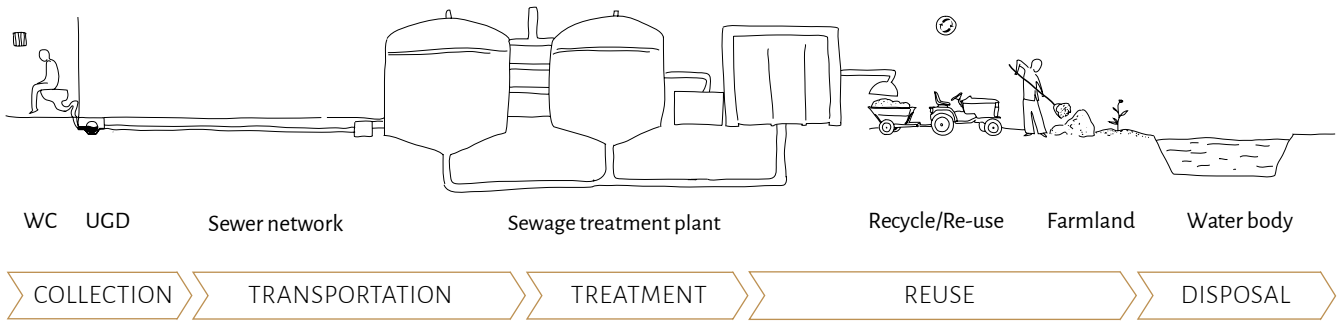
The earliest references for sewerage as a solution for wastewater management are from the Indus Valley civilisation. Underground piped sewerage was initially designed and built in cities in the United Kingdom and Europe in the 19th century. Getting a fillip due to the "great stink" in London and the associated public health crisis, many western cities adopted underground sewerage systems by the end of the 19th century. Cistern flush toilets also gradually replaced other forms of toilets including bucket toilets. Primary and secondary waste water treatment got more

Figure 8: Schematic Representation of Wastewater Management



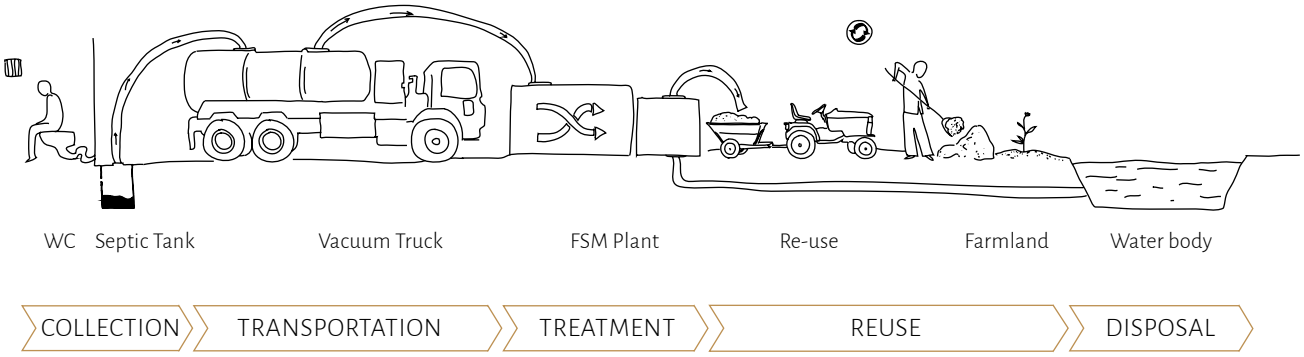
Source: Blackett, Hawkins, & Peal (2014)

Figure 9: Underground Sewerage based urban sanitation system



Source: Dasgupta, et al. (2015)

Figure 10: Faecal sludge management based urban sanitation system



Source: Dasgupta, et al. (2015)

prominence over the following fifty years. At this time, during the end of the 19th century some largest South Asian cities which were under colonial rule also saw the implementation of its earliest piped underground sewerage systems. In some dense part of these cities this period also saw the development of various bucket toilets, which were either cleared into local drains or moved away by manual scavengers. This activity was stigmatised and most manual scavengers belonged to the most marginalised sections of society and therefore it is not surprising that many social reformers of that time did discuss the issue of sanitation. Social, political and policy interventions lead to urban residents who had adopted toilets to move to pits and septic tanks. i.e onsite sanitation systems and increasingly the bucket toilet in houses has been brought down to a large extent.

Faecal sludge is the term for the sludge[8] produced in onsite sanitation systems (and excludes domestic sewage or black water that is transported to a treatment facility via a sewerage network) (Strande, 2015). "It can be raw or partially digested, a slurry or semi-solid, and results from the Collection and Storage/Treatment of Excreta or Blackwater, with or without grey water" (Strande, 2015). As Faecal sludge is produced in a wide range of onsite sanitation systems , both wet and dry – septic tanks, pit latrines (dry and wet), bio digesters, holding tanks etc., there is a wide range in the physical characteristics depending on storage duration of the on-site system, temperature of the place, design of the system and whether there is common treatment of black and grey water etc.

Faecal Sludge Management (FSM) involves safely collecting, transporting, treating and disposing the faecal sludge from the on-site sanitation systems. A more commonly used term has been septage management, which is "a historical term to define sludge removed from septic tanks" (Tilley, Ulrich, Lüthi, Reymond, & Zurbrügg, 2014). On-site sanitation systems collect, contain and partially treat the faecal waste and wastewater. The sludge accumulated in these systems need to be periodically removed and treated before being disposed into the environment.

Picture 1: Implements used to manually empty faecal sludge

Image credit: Urban Management Centre, Ahmedabad, India

CURRENT SANITATION SYSTEMS IN SMALLER TOWNS ACROSS SOUTH ASIA

Onsite systems (illustrated in Figure 10) owned by households are the dominant sanitation technology used currently in urban South Asia as a whole and in smaller towns in particular. These onsite systems consist of a toilet, a treatment and storage infrastructure and need a transport/conveyance infrastructure and a treatment, reuse and disposal facility for it to be safe for the human health and the environment. Also these systems require that the system of primary treatment, storage, collection, treatment and disposal or reuse minimises human touch and contact for it to be safe. However even though onsite systems as they are in South Asia today, have been used for many decades, most of the sanitation chain especially in smaller towns continues to be unsafe and unhygienic due to infrastructure available and practices followed.

A number of onsite storage and treatment options are used in the region. While some parts of Afghanistan and Pakistan have dry systems most other parts have either lined or unlined pits (Picture 2) and a variety of septic tank arrangements. ***De-sludging*** services are provided in cities across the region by private, largely informal service providers. Manually handled tools and buckets as in Picture 1 are used in many circumstances especially in smaller cities where mechanised de-sludging equipment is not available. Manual de-sludging is a hazardous practise as the contact with the faecal waste cannot be minimised as shown in some situations in Picture 3. Workers seldom have sufficient safety equipment which reduces their direct exposure to faecal sludge and therefore are at very high risk of being affected by the pathogens in faecal sludge. There are often occasional reports of death and injury from accidents which occur due to cave-ins, fires (from methane gas) and asphyxiation. Manual cleaning is prohibited by law in India now, also because of the strong linkages that only particular marginalised social classes are forced by convention to undertake this activity. In some cities the city administration also provides these services alongside the private and informal sectors. While some service providers have vacuum system to suck out the sludge, it is common practice still across most of the region that sludge is manually removed when equipment is unavailable or in areas inaccessible to the equipment.

Picture 2: Lined pit in Sri Lanka

Image Credit: Ananda Jayaweera

Picture 3: Pit latrine and septic tank emptying in India, Pakistan and Bangladesh

Image Credit: Injeti Srinivas, CPR, Waled Mahmud, Rashid Mahmood

Transport: The sludge is transported in a variety of ways ranging from manually operated wheel barrows of various shapes as in Figure 1 or Figure 4 among others or in tankers carted by rural motorised vehicles including tractors, trucks, open trucks etc. In many cases the vehicles for transporting the sludge do not have easy access to the on-site system, given the narrow streets in many parts of the city. Also as these services are seldom formal arrangements there is no coordination with the traffic arrangements and sometimes traffic congestion prevents efficient emptying and haulage.

Picture 4: Manual cleaning of drains with faecal matter and transport with street sweepings in a wheel barrow in Pakistan

Image Credit: Rashid Mahmood

Picture 5: Vacuum tag Emptying Process in Bangladesh

Image Credit: Waled Mahmud

Picture 6: Municipal vacuum tanker in India

Image credit: Urban Management Centre, Ahmedabad, India

Treatment: Most cities in the region do not have facilities to treat the faecal sludge. Some cities are partly covered by a sewerage network, in such cases the faecal sludge could be introduced into the network carrying waste water or at the treatment plant. See picture 7a.

Disposal:Since treatment facilities are absent in most cities, faecal sludge is disposed directly into the environment. Depending on the transport system being used and the available places for disposal, different arrangements are made.

Picture 7a: Septage being added to sewarage network Udaipur, India

Image Credit: Injeti Srinivas, CPR, Waled Mahmud, Rashid Mahmood

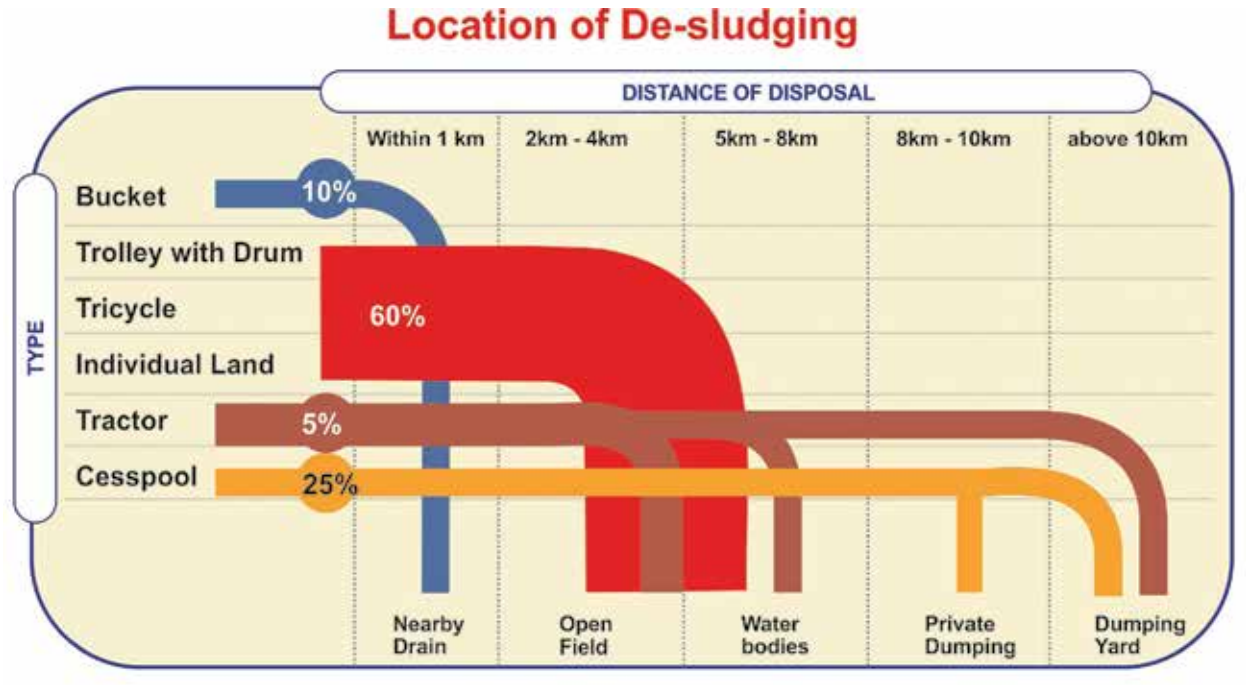
Picture 7b: Raw septage being Prepared for fertilizer use, India

Image Credit: Vishwanath

A select few cities have also experimented with treatment and recovery, but an overwhelmingly large number of cities do not have any treatment facility and often the untreated faecal waste is unscientifically used as manure in farms, Picture 7b.

As per a recent study in Angul, a small city in India, faecal sludge is collected and transported in buckets, drums and trolleys, on tricycles and in some cases in troliies attached to tractors. The mode of collection and transport greatly influences the disposal practice, ranging from the nearby drains and open fields to private agricultural lands, to the municipal dump-yard (see Figure 11 below).

Figure 11: Outline wastewater flow diagram; Angul, India



Source: Draft Baseline Survey Report: Project Nirmal (2015)

As shown in the Figure 11, faecal waste is discharged at shortest possible distance from the points of collection to save time and cost, thereby increasing risk of exposure. It is also the case that in many cities, dumping sites for Faecal Sludge are close to squatter or formally inhabited low-income areas where they threaten the health of ever-growing segment of population.

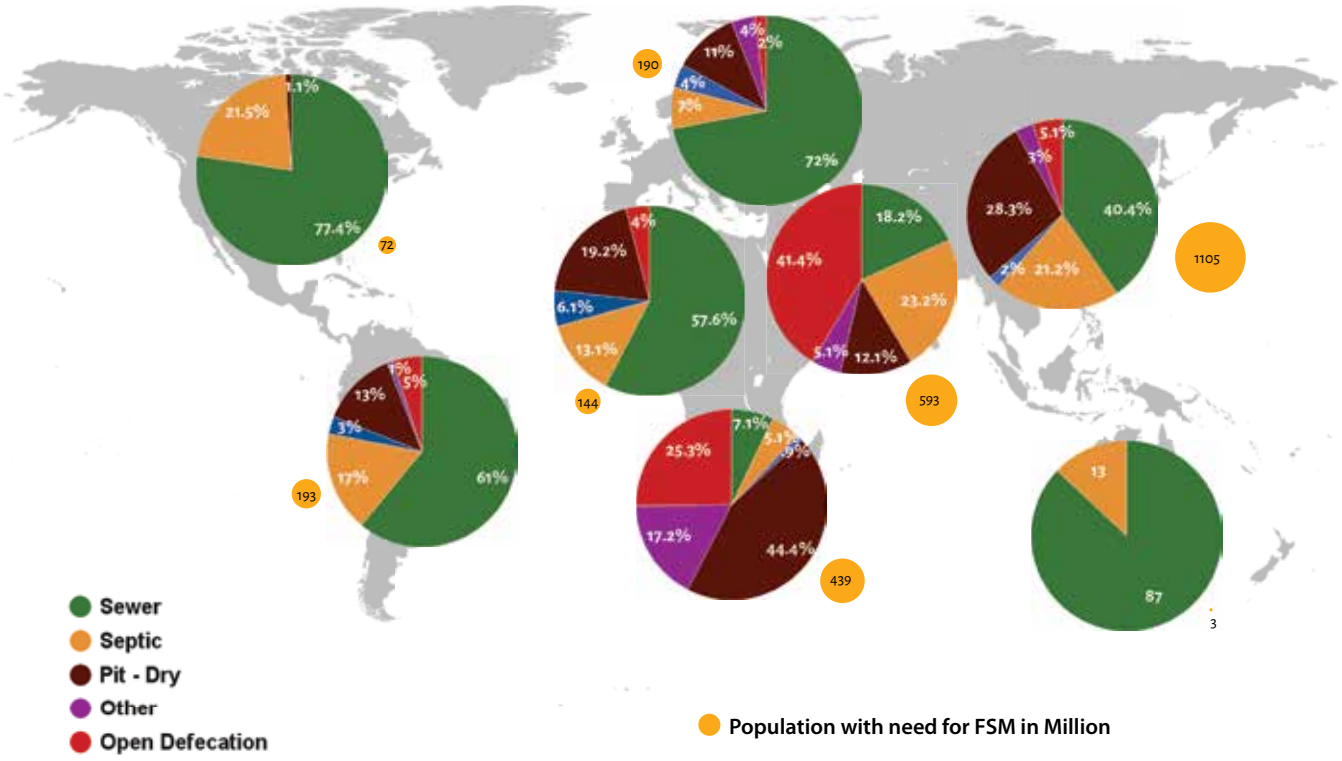
Picture 8: Open dumping of septage in Sri Lanka, India

THE NEED TO PRIORITISE FAECAL SLUDGE MANAGEMENT

As per a study undertaken by the Boston Consulting Group (Cairns-Smith, Hill, & Nazarenko, 2014) (see Figure 12), world over it is estimated that close to 2.7 billion people depend on onsite sanitation systems. For the South Asian region it is estimated that less than 20% of households have access to offsite underground sewerage and sanitation systems.

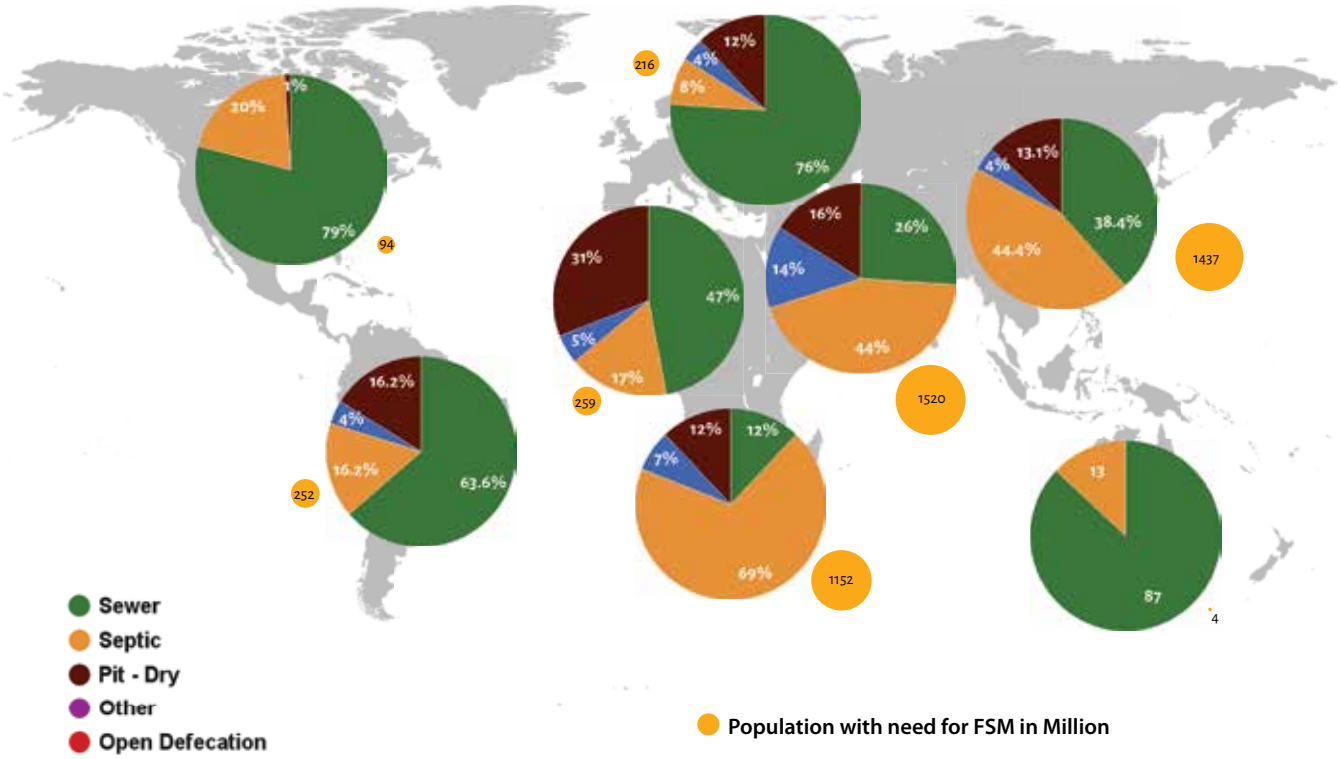
The study also projects that if current trends of in South Asia and Africa continue, onsite treatment and faecal sludge management may need to serve the majority of the population by 2030.

Figure 12: *Close to 2.7 billion people need FSM today*



Source: Cairns-Smith, Hill, & Nazarenko (2014)

Figure 13: *At current trends FSM could serve the majority of sanitation needs*



Source: Kone (2013)

The important takeaway from the above analysis is that adopting FSM is a necessity in the short to medium term, not an option to be considered along other options. Given the current hazardous de-sludging, transportation and disposal arrangements major improvements need to be made to the current systems so that exposure of the community to the viruses, bacteria & parasites could be contained. Faecal Sludge disposed into the environment directly poses a public health hazard as people especially children could come into direct contact with it. Disposal of faecal sludge without treatment also result in environmental pollution and the various ill effects associated with it.

As discussed in a section above sanitation situation and reliance on these older and unhygienic, practises are prevalent across all smaller cities as defined in this report. Some larger cities of the region have some dispersal on underground sewerage but still have a significant population that does not have access to safe FSM services.

In a city, FSM should ideally be a carefully planned and coordinated activity between the different actors involved – households, de-sludging service providers, the city administration and possibly other institutions. The table below indicates their possible involvement in faecal sludge management. The number of institutions and stakeholders actually involved and the responsibilities taken up by them would vary from city to city.

Table 10: Different stakeholders in the faecal sludge sector and their possible involvement

Stakeholder	Laws, Standards	Coordination	Tariff Setting	Collection & Transport	Treatment	Resource Recovery	Enforcement	Training and Information	Monitoring
Ministry	•							•	•
City Administration/ Municipal utility		•	•	•	•	•	•	•	•
Police							•		
Private companies				•	•	•			
Households				•					
RWAs		•					•	•	
NGOs								•	•

Source: Adapted from (Bassan, 2015)

THE NEED TO PRIORITISE FAECAL SLUDGE MANAGEMENT FOR SMALLER TOWNS

Why should there be focused policy attention on faecal sludge management in the small towns across the region?

While it is difficult to classify FSM as an "alternative system" given the large number of people who use it in spite of its being at a low level of development in South Asia, in terms of government sanction and policy it could be called as an alternative as it is minimally present in government policies, programme and projects. Governments in South Asia have so far only seen underground sewerage and sewage treatment as an acceptable form of public intervention in waste water and faecal waste treatment.

The existing situation on the ground– high dependency on on-site sanitation systems, high vulnerability from inadequate operation & de-sludging practices of these on-site systems and slow rate of adoption of desired faecal sludge management practices while taking on the opportunity to leverage on peoples own investments and the differences in the features between underground sewerage and FSM make FSM the preferred option for smaller towns in South Asia. The four conditions necessitate immediate policy attention on FSM adoption across small towns in South Asia. This section will examine in detail the factors that contribute to the three conditions.

1) Existing situation on the ground– high dependency on on-site sanitation systems

Present dependency: It is clear from the data that households across small towns in the region are almost entirely dependent on on-site sanitation systems. When a town is entirely dependent on on-site systems, it cannot explore the possibility of co-treating the faecal sludge at the sewage treatment plant, an option available to larger towns where both on-site systems co-exist with sewerage systems.

Future dependency: An important aspect that needs to be considered while assessing the dependency of small towns is the fact that projections based on the increases in sewerage coverage in the region indicates that, it is highly likely that these small towns would continue to be dependent on on-site sanitation systems.

Recent sewerage treatment and septage treatment capacity addition in Sri Lanka and India

In Sri Lanka, among the seven ongoing sewerage projects, five of them are located in large cities, while the other two are located in comparatively smaller towns (outside the 19 large cities), Katargama and Kurunegala. While these s are small by population size, they are of religious and administrative importance in Sri Lanka.

In India, the recently concluded JNNURM (a large public investment programme in urban infrastructure) undertook over 250 projects to improve sewerage systems across the country (Ministry of Urban Development, Government of India, 2014). Over half of these projects are ongoing (Ministry of Urban Development, Government of India, 2014) and would be the major contributors to capacity addition in sewerage in the short to medium term. While 150 of these projects were taken up in the larger cities (total 485 large cities) with a total project cost of 202.5 billion Indian rupees, only 100 were in the smaller cities (total 3556 smaller cities) with a total project cost of 35.4 billion Indian rupees. As per Ministry of Urban Development, Government of India's (Ministry of Urban Development, Government of India, 2014) data the progress of these projects have been slow. While 42 projects in the larger cities have been completed only 7 among those taken up in the smaller cities have been completed so far.

2) Existing Situation on the Ground -- High Vulnerability

Direct Exposure vulnerability: The preceding section presented in detail the de-sludging practices from on-site sanitation systems that are mostly unsafe due to direct exposure to faecal sludge and how faecal sludge is indiscriminately disposed into the environment without adequate treatment. As one of the poorest regions in the world, with manual scavenging still prevalent in some parts of the region, workers involved in de-sludging on-site sanitation systems across small towns in the region are at many times directly exposed to pathogens in faecal sludge and highly vulnerable to adverse health effects from this.

Vulnerability from Dependence on local water sources: Compared to large cities, in small towns across South Asia, households are more likely to depend on local water sources mainly wells for potable water. Indiscriminate dumping of faecal sludge in water sources and practises like burying the sludge in the ground are common in the region. The twin practises of burying faecal sludge and higher dependency on groundwater sources makes small town households in the region more vulnerable to risks from inadequate faecal sludge management practises.

Demographic vulnerability: Children are more vulnerable to environmental health risks, like risks from inadequate sanitation (Bearer, 1995), (WHO, n.d.). This is because they consume more air, water and food in proportion to their bodyweight, behave differently from adults (potentially increasing their exposure) and face the risk of irreversible damages as their body systems are still developing. Children's health problems resulting from exposure to different unfavourable environmental agents, all rank among the highest environmental burden of disease worldwide (WHO, n.d.). South Asian region is home to the largest number of children anywhere in the World and is likely to remain so in the near future (United Nations, Department of Economic and Social Affairs, Population Division, 2015). The large population of children in the region makes it even more vulnerable to the adverse effects of improper practices of managing faecal waste.

3) Slow rate of Adoption and challenges

Small towns in the region are dependent on on-site sanitation systems and are particularly vulnerable to inadequate practices in managing the sludge from these systems. Therefore the towns in the region should improve faecal sludge management; but there are challenges in enabling wide and sustainable adoption of improved FSM in these towns. What are some of these challenges that merits special policy attention?

Poor functioning of on-site systems: On-site systems should safely contain and partially treat the human waste it receives. For an FSM approach to give the desired level of benefits of improved sanitation, it is essential that the on-site systems are built and operated to the desired standards. Field experiences from the towns show that this is not the case in several places. A town while taking up FSM would also likely have to put in place an initiative to encourage households to improve the build and functioning of their on-site sanitation systems, not just work on improving collection and treatment of faecal sludge.

Difficulties in accessing On-site Systems: As seen in the preceding section describing practises from small towns in the region, on-site systems serving some households are not easily accessible to mechanised de-sludging equipment mounted on trucks. Solutions to challenges like these would have to be

worked out locally. To promote the adoption of FSM, it would be important to demonstrate that such challenges can be overcome.

Not viewed as a Public Responsibility: Emptying of faecal sludge from on-site systems and disposal of it has so far functioned informally or at best through semi-formal arrangements in several of these towns. The local governments of these towns have not seen it as an area that requires them to take responsibility and readership. Implementing FSM requires the local governments to play an important and active role. The policy effort to bring FSM to the small towns in the region would involve building the capacity and willingness to take leadership in faecal sludge management.

4) The differences and advantages in the operating features between underground sewerage and FSM

Costs of conveyance to treatment facility: Underground sewerage relies on pipes being placed below the ground to convey the faecal waste and waste water, while FSM doesn't require an underground pipes. The capital costs that need to be incurred if a underground sewerage network is put in place is in all circumstances many times more than mechanical de-sludging required in FSM. Also in terms of operating costs too, operating underground sewerage systems often involve much higher flushing water requirements in the system as well as electric pumping stations to assist the movement of the wastewater within the pipes which makes underground piped sewerage often many times more expensive that FSM conveyance systems.

Costs of construction of a treatment facility: Typically regular sewerage treatment plants (STP) are required for waste water treatment. As land gets scarce often more mechanised and energy intensive designs of STPs have to be used. This when compared to Septage treatment plants (SpTP) is much higher as the quantum of waste water that needs is part of septage in any FSM system is much lower.

Time required to build a conveyance system: Special construction related issues related to the construction of the underground sewerage system in terms of technical complications, such as the type of the housing area, width of streets and soil conditions could complicate and make its construction a difficult and expensive option. A review of the projects across India's flagship urban investment programme of the recent past called the JNNURM, show that underground sewerage projects are taking the longest to complete when compared to other urban infrastructure sectors including water supply, roads, bridges, bus terminals etc. There is also anecdotal evidence from cities like Puri, where it took close to 15 years to build, while the estimated construction time at the design stage was 5 years.

Sharing responsibility and funding: Underground sewerage is mainly a full public funded option due to the bulkiness of the financing required. Sometimes connection charges are recovered from the households after the construction has taken place and may or may not be agreed to by the household. On the other hand FSM conveyance systems are cheaper and clearer in the funding structure. The costs are mainly borne by the households directly and therefore there is stronger financial accountability.

Regulation and monitoring: Given that all underground sewerage systems are and (need to be) managed by public sector institutions the regulatory and monitoring structures can only be strengthened to the extent that governments agree to hold their own departments and companies accountable. On the other hand FSM systems are generally run by the private sector who directly raise their revenues from user fees and the service quality is directly monitored by the users. In terms of environmental discharge given the lack of facilities in the region and there being very few private waste disposal facilities too, new regulations and monitoring arrangements for FSM will have to be though through.

Institutional capacity requirements: Another distinguishing factor between underground sewerage systems and FSM systems. Underground sewerage systems across the world rely on strong and technically robust public sector institutions to build and operate these systems. On the other hand FSM systems are less complex, have less constructed infrastructure and operational complexities and therefore require less technical operational oversight while providing similar outcomes. Given the lower levels of capacity in smaller cities and the dispersion across larger geographies this provides a good fit for smaller towns.

Private Sector Participation: Private participation is rarely found in underground sewerage operations given a range of factors from, lumpy investment requirements, limitations of the revenue model and the nature of risks. However given the direct household based revenue models applicable to the FSM service delivery model, private sector participation is much easier to structure and implement in FSM, making the scaling up of FSM possible across the large number of smaller towns in the region.

Climate benefits: Another under documented but potentially key aspect is the differences in terms of climate benefits and disaster risk related issues applicable to underground sewerage projects verses FSM approaches. UGDs are prone to suffer significant losses when disasters such as floods, and earthquakes strike. Also given the higher capital costs, the materials involved in construction and the energy and water requirements for operating UGD systems there is a high climate impact of the system. Given the low fixed infrastructure requirements in FSM, it allows for quicker rehabilitation of systems.

RECENT DEVELOPMENTS IN FSM IN SOUTH ASIA

FSM is used as formal accepted model for waste management in many countries in South East Asia. Recently a number of countries and provinces in South Asia too have started investing and intervening in the informally operating FSM chains in smaller cities through investments in mechanised collection vehicles operated by the formal public sector for empting and transporting faecal waste. This is also recently being taken further forward by investments and developing treatment and disposal facilities in smaller towns. Bangladesh and Sri Lanka are in the lead in this exercise as evident from the map of new projects see Figure 14 and Table 12.

Other than these, pilot projects are also being experimented in smaller towns in India. Sanitation policies in the region in the past have not focused on FSM. It is only recently in that policy drafts in Nepal and a guidance note in India, have focused on FSM/Septage management. It is also fascinating to note that a number of states in India with Tamil Nadu and Tripura in the lead and Odisha, Andhra Pradesh and Maharashtra too possibly developing state wide FSM support policies as in table 11.

Table 11: Policy support to FSM in SACOSAN countries

Country	***Urban Sanitation Policy (year)***	***Year Enacted***	***Does the Policy cover FSM***	***Availability of Public funding for FSM***
Afghanistan	Urban Water Supply and Sewerage Sector Policy[9]	2005	No. The new draft (Urban Water Supply and Waste Water Sector Policy) supports FSM	No
Bangladesh	National Water Supply and Sanitation Strategy	2014	Yes. The adoption ofFSM is identified as an integral par of the strategy.	via multilateral assistance
Bhutan	No National Policy	NA	NA	
India	National Urban Sanitation Policy	2008	Yes. The pilicy is supplemented by septage guidance note[10] and specific septage management policies adopetd by state governments in Tripura, TN, and Odisha	500 select cities may choose to avail funds to implement FSM under Atal Mission for Rejuvenation and Urban (AMRUT)
Maldives	Article 23 (f) of the New Constitution of Maldives	2008	No. The establishment of a sewage system of a reasonably adequate standard on every inhabited island;	information unavailable
Nepal	Urban water supply and sanitation policy; National Sanitation and Hygiene Master Plan 2011	2009; 2011	Not explicitly covered	information unavailable
Pakistan	National Sanitation Policy	2006	Not explicitly covered	information unavailable
Sri Lanka	No National Policy	NA	NA	via multilateral assistance

Source: Compiled by the authors

Figure 14: Operational and upcoming FSM plants in SACOSAN Countries

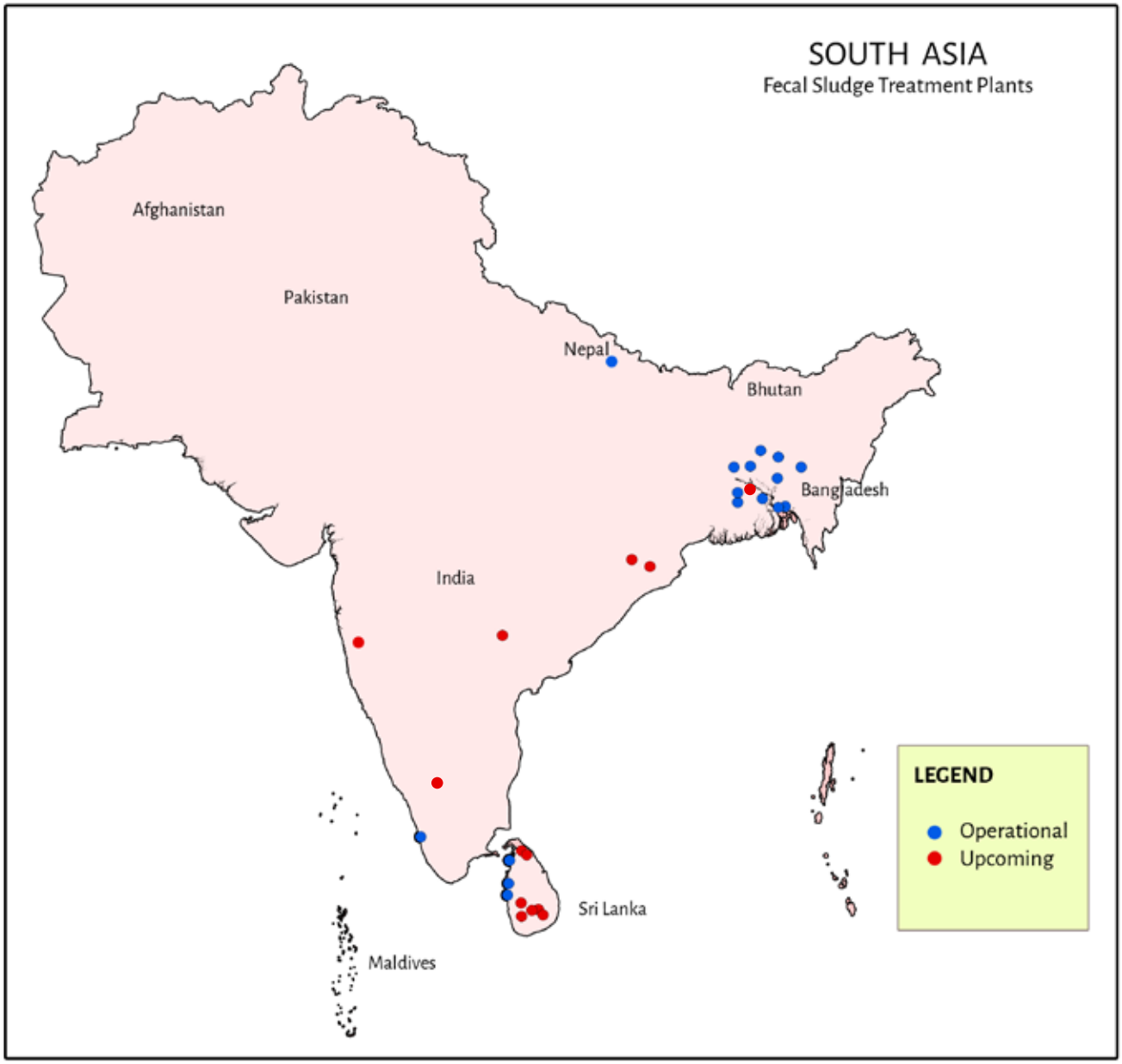


Table 12: Faecal sludge treatment plants in SACOSAN Countries

Country	Operational	Upcoming
Bangladesh	Jessore, Sirajganj, Natore, Jhenaidah, Netrokona, Choumuhani, Sherpur, Lakshmipur, Moulvubazar, Madaripur, Narsingdi	Faridpur
India	Kochi, Bengaluru	Warangal, Angul, Denkenal, Wai,
Sri Lanka	Mannr Chilaw, Puttalem	Kilinochchi, Mulative, Badulla, Monaragala, Kegalle, Ratnapura, Nuwara Eliya
Nepal	Kathmandu	

Source: Primary data collected by the authors

CASE STUDY 1: FAECAL SLUDGE MANAGEMENT IN LAKSHMIPUR, BANGLADESH

Background:

The Asian Development Bank (ADB) assisted Secondary Towns Water Supply and Sanitation Sector Programme (STWSSP) took up projects in 16 secondary towns in Bangladesh. In 11 towns among the 16, Faecal Sludge Treatment Plants have been constructed, in an effort to improve sanitation. The case study profiles the FSTP built at Lakshmipur.

Picture 10: Faecal sludge treatment plant (reed beds) Lakshmipur, Bangladesh

Image Courtesy: Avinash Y. Kumar

Planning and Implementation

The initiative included i) the construction of the sludge treatment system (at the outskirts of the town) and ii) the procurement of tractor towed tanks with suction pumps (vaccutugs) of capacity 2m^3 and 0.7m^3. The plant has been operational since May 2013.

> *"The implemented Faecal sludge treatment plants are the conventional sludge drying beds with simple impermeable beds filled with different layers of gravel and sand including planted vegetation for evapotranspiration which enhance the drying phenomenon. Planted drying beds do not need desludging before each new application / loading of sludge as root system of the plants maintains the permeability of the beds. The constructed treatment plant at required around 780 m2 land area which consists of two beds for alternative use. Each bed consists of 144 m2 area and has been designed to run around 5-7 years i.e. waste water and septage sludge can be disposed in a bed continuously 5-7 years with septic tank emptying interval 2-3 days per week."*

(Local Government Engineering Department, Government of Bangladesh, 2014)

Improvements at the Household level: Key to the Efficacy of a FSM System

Although Lakshmipur now has the critical public infrastructure in place for an effective faecal sludge management system, it is important that the city now focuses on ensuring improved performance along the sanitation chain -- where the onsite systems work well, faecal sludge is mechanically collected and treated at the treatment site. Here, it is important to stress that the on-site systems should function effectively for the effectiveness of the entire system. A field survey of 100 randomly selected households in Lakshmipur found out some areas and practices at the household (on-site system) level that needs attention.

- Improving access to septic tanks and pit latrines for easy mechanical desludging. Presently, it is difficult for the vaccutug to access septic tanks that are in dense settlements or located in relatively inaccessible spaces like beneath stairways.
- Ensuring that the on-site systems like the septic tanks and pit latrines are not directly connected to storm water drains. This practice not only results in environmental pollution, but also poses challenges in estimating the demand and load of the emptying and treatment service respectively.

Going forward the Pourashava leadership will have to take efforts to address the above mentioned areas and also make improvements in the emptying and collection of faecal sludge. The present service offered by the Pourashava charges BDT 1000 per trip. It involves submitting an application and paying the fee, after which the service would be offered in 1-3 days that the majority of households had not yet used the Paurashava service and instead depend on the services provided locally by people referred to as Methors to clean their pits/ septic tanks. This is despite the fact that these services are often more expensive than what is offered by the Paurashava. The faecal sludge removed from the pits/septic tanks are either buried or disposed to open drains or water bodies causing direct pollution.

A Good Beginning that needs to be built on

Among the 11 towns in Bangladesh, where faecal sludge treatment plants have been constructed in 2014, Lakshmipur has been among the earliest to start operation. The successful operation of the plant can bring valuable sanitation gains to the town of Lakshmipur and also help in the adoption of faecal sludge management systems across Bangladesh. While the previous section highlighted the challenges in improving faecal sludge collection and the maintenance of on- site systems, it is also important that the Pourashava attains the technical capacity to operate and maintain the sludge treatment plant. Although, a faecal sludge treatment plant is way smaller in scale and has few electro mechanical parts (when compared to sewage treatment systems) the successful operation of the system requires engineering capacity for its operation and maintenance. It is important that the programmes and initiatives to improve sanitation in Bangladesh, realize the importance of the successful operation of the facility at Lakshmipur and make available adequate support to the city in this initiative.

CASE STUDY 2: CHILAW TOWN SEPTAGE MANAGEMENT FACILITY, SRI LANKA

Chilaw is a smaller city in Sri Lanka (population 25000, area 6.4 sq. km.) administered by an Urban Council (UC). The town is in the North Western Province bordering the west coast. The urban council's sanitation functions include maintenance of public toilets, drainage, water quality surveillance food quality and septage disposal. Up to May 2015 the septage from overflowing septic tanks were applied to coconut lands away from the UC area. The sanitation activities are managed under the Public Health Inspector's department where the records are maintained on water quality, water borne diseases, public toilets and records of the operation of gully trucks. The UC provides the service of emptying the septic tanks on request at a fee of SLR 2850 for the people living within the UC limits and charge SLR 6840 for the people outside the UC limits to empty the septic tanks using trucks. The UC maintains two trucks of capacity 3000 liters and 5000 liters for the septage disposal. People who live on the coasts and are affected by tides empty their systems every three months.

Under the Asian Development Bank (ADB) assisted Dy Zone Urban Water & Sanitation Project, Chilaw town has built a faecal sludge treatment facility. The treatment system consists of a flow through pond system with an anaerobic, facultative and maturation ponds. The capacity of the facility is 39 m3 per day. The facility is situated 10 km away from the UC limits and is designed to receive a minimum input load of 6 trucks per day. As the facility serves a low lying coastal area, there is a high demand for the service. The facility also services the rural areas around the town.

The plant was built at a total cost of SLR 203 million and was commissioned in May 2015 and is playing an important part in safely managing faecal sludge in Chillaw, Sri Lanka.

Picture 11: Public toilet block at the town centre, Chilaw

Picture 12: Faecal sludge treatment facility, Chilaw

Picture 10: The pond system, fsm treatment facility, Chilaw

Picture 13: Inlet for connecting to faecal sludge carrying trucks

SECTION 4:

ESSENTIAL ELEMENTS TO SCALING UP ADOPTION OF FAECAL SLUDGE MANAGEMENT

The way a city/town decides to plan and implement an initiative would be based on the institutional strengths and resources available to it. Therefore, while there would be differences in institutional arrangements from city to city and across countries, the set of actions that need to be taken is broadly common to all the towns and cities as the objectives to be met are broadly similar. This section presents a broad list of actions at the national and sub national levels and briefly discusses their importance towards promoting the adoption and sustainability of FSM across cities in the region. The list of actions presented here has government agencies taking the leadership and other actors like the private sector, civil society organizations and research institutions lending support in their respective areas of strength.

NATIONAL (FEDERAL) INITIATIVES:

In the comparatively larger countries in the region, especially India, Pakistan and Bangladesh the federal government agencies are less likely to be involved in direct planning and implementation of FSM in towns and cities. However, in all the countries the federal governments and their agencies have an important role in enabling and facilitating the adoption of FSM. An important role of the federal governments as they focus on improving urban sanitation through FSM, especially in smaller towns is to show political and policy commitment towards promoting the adoption of FSM. As discussed in earlier parts of the report, safe and scientific FSM is not just absent across cities and towns in the South Asian region, it is also largely absent from the national and sub-national policies, regional planning processes and the curriculums of public health engineering education and training. For FSM to be adopted at the desired rate, a more enabling policy and practice environment needs to be built up. The following paragraphs lists, and briefly discusses initiatives that would help build the supporting environment.

1) Political awareness and will to focus on smaller towns and on FSM

As discussed in the first section of this report, smaller cities are like a policy "blind spot", stuck in between rural areas and larger urban areas. Urban policies are made to address larger city problems. As examples national urban infrastructure programmes like the JNNURM or the AMRUT targeted and spent more resources in larger cities than in smaller cities. Also projects in road developement and solid waste management received priority over sanitation. This divide in the sanitation sector, where larger cities typically have absorbed most of the "modernisation" efforts has led to some coverage of underground sewerage in larger cities but minimal attention to smaller city sanitation requirements.

Political will and policy attention at the national level to attend to issues especially related to sanitation and faecal sludge management is essential. Even in India currently, where there is high level of political awareness and will on sanitation, the Swachh Bharat Mission (Urban) does not focus on treatment and disposal and the AMRUT programme only focuses on larger town treatment and disposal, demonstrating that greater awareness and will from the political leadership is required if sanitation problems of smaller cities and solutions such as FSM are to be addressed.

2) Integration into Policy and Planning

For wide and sustainable adoption of FSM, it is important that FSM gets integrated into the policy and planning process of the country. While focused and time bound initiatives are key to the adoption of FSM across the cities and towns, it is important that the process gets integrated into the regular planning and policy framework. Some steps to facilitate this integration are listed below.

a) Countries should fix / clarify responsibilities for FSM: In most South Asian countries, the governance responsibility for sewerage management in urban areas is well defined, much like how it is for solid waste management. However, there is usually no city/town level agency that has the responsibility of on-site sanitation systems and faecal sludge management. This is still seen as an individual household responsibility in most cases, inspite of its significant public health externalities. Countries should take the necessary steps (bringing amendments to legislations or bye laws) to ensure that each city/town has a nodal agency which would be primarily responsible for FSM.

b) Country Development Plans and Policies should include: Immediate priority actions is needed to monitor and address septage overflow from existing household and institutional faecal management systems is of desired permissible limits. While longer term solutions can wait, there is an urgency to monitor and take remediation steps to ensure that there is time bound measurable improvement in the current status of faecal sludge management in all towns and cities. If this requires creating additional systems and manpower, this should be invested in on priority.

c) Citizen awareness and creative solutions need support from governments: Governments implicitly shoulder the responsibility for ensuring safe faecal disposal and treatment. Governments are duty bound to ensure safe water and sanitation are delivered to the people as basic human rights. If local community groups or NGOs take up the responsibility of managing community and public toilets, managing decentralised septage solutions, etc. then this should not be only undertaken as an informal sector operation and governments need to develop support mechanisms and regulations to support this work. This requires greater community awareness of the ill effects of open discharge of waste and the need for formalising the system and can only be improved with strong community support based on greater citizens awareness.

d) FSM Financing Policy: Across the region, major sanitation infrastructure like sewer networks and sewage treatment plants are publicly funded. The capital costs of the infrastructure is seldom recovered in full from the users of the system. In many cases the operational costs are not fully recovered too. Each country would have to carefully consider how they plan to extend financial support to implementing Faecal Sludge Management. While tariff would be determined at the city level, it would be influenced by the financial support a city receives to build a system. Should the improved infrastructure be public funded, like the conventional sewerage system? Should de-sludging services be financed from taxes or user fees? Each country would have to design a policy that needs to carefully consider the question of financing FSM infrastructure and the principles and objective to be considered in determining tariffs for FSM services.

3) Capacity Building

As safe and scientific faecal sludge management systems are generally absent across the region, so is the capacity to build and operate these systems, more so at a rapid scale and especially across small towns. Across small towns it is important to build the capacity among its political leadership and other staff members, so that they can plan for an initiative like Faecal sludge management, which involves infrastructure creation, enhancing service delivery, ensuring the participation of all households and institutions who have on-site sanitation systems etc. What initiatives can be undertaken at a federal government which would build these capacities across the region, especially in the smaller cities? Discussed below are some initiatives that can build contribute towards building this capacity, some in the short term, and others in the medium to long term.

a) Orientation and training of Municipal Engineers (including Public Health Engineers), elected local government representatives and other non-government specialists in FSM systems: This has two aspects: First, at the level of engineering education, curricula covering sanitation systems should, in addition to sewerage, also cover non-sewered FSM systems. This will help create a new cadre of professionals within and outside government who will be geared to selecting the best available sanitation system for small towns suited to the context, rather than relying only on sewerage systems. The second aspect includes capacity building for mid-level professionals and decision makers that covers FSM, and includes peer learning site visits to places where FSM has been implemented, to learn from both, the successes, as well as the adjustments made to local contexts. Finally it is elected peoples representatives, media and civil society at large that needs to understand the technical, social and health aspects of FSM. For them to exert political pressure on the bureaucracy to deliver results instead of merely infrastructure and technical solutions.

b) Commit to piloting and demonstration of FSM in small towns: Depending on the geographical area and spread of the country, all SACOSAN countries should invest in an adequate number of pilot projects covering 100% population in a small town. More than one town in each country, representative of its different regions, where a variety of FSM solutions can be deployed to learn the best option for a given context in each country. Towns may also explore the possibility of sharing the treatment facility with adjoining rural areas.

c) Commit to Invest in improving and adapting on-site sanitation systems and faecal sludge treatment systems: Across cities in the region although on site sanitation systems are widely used, there are conditions that reduces the efficacy of these systems --- high altitude (cold and dry conditions inhibit decomposition of faecal waste) areas affected by water logging and tidal inundation (backflows into the on site system can make it unusable) etc. Also, across the cities in the region several household sanitation systems would be situated in areas that cannot be accessed by a de-sludging truck or in some cases households would not have adequate space to build an on-site system. It is important that countries commit to mobilizing science and engineering to inform planning (and policy) and bring improvements to these faecal sludge treatment systems.

d) Implementation and financing: Sanitation budgets at the local small-city level should also be allowed to cover non-sewered FSM systems. This should cover the entire chain from creation of on-site sanitation infrastructure (with appropriate household contributions), to transportation and treatment systems, their monitoring, operations and maintenance. Oftentimes, sanitation budgets are limited either to infrastructure creation, or to salaries for sanitation workers with local bodies. The non-staff O&M cost is often not covered.

4) Developing Regulations

Smaller cities and towns across South Asia in their effort to adopt FSM would have to create new infrastructure for treating the faecal sludge collected. When city level agencies decide to take up implementation, it would help the process if there is a supporting regulatory framework. Some of the components of the supporting framework is listed and discussed below.

a) Faecal Sludge Treatment Standards: The standards to which the sludge should be treated and the institutional responsibility of who would monitor and enforce the same. This would bring much needed confidence to the city agency and the private contractor (if any) in the design and construction of the faecal sludge treatment plant. Since the laws and regulations on environmental protection are usually federal, the standards for faecal sludge treatment before disposal into the environment or agricultural use should be developed by the federal governments of these countries.

b) Model bye-laws and resolutions for construction and use of on-site systems: . For well-functioning faecal sludge management, steady improvements have to be made to the on-site systems. Municipal bye-laws should lay down that on-site systems should be built to standards, are easily accessible and regularly de-sludged. Federal government (or in larger countries like India and Pakistan, state or provincial governments) are well suited to develop model bye-laws and resolutions that can be adopted by the municipal governments. Passing these resolutions would be one of the earliest steps for the city administrations while implementing FSM. As smaller cities have a small staff and limited capacity, model resolutions and bye laws could make the process easier.

c) Manual of Practice for de-sludging operations: Well regulated de-sludging services are a key component of FSM. When the cities in the region, transition into a more organised and regulated system, a manual of practice helps the city to bring in operational standards for its de-sludging services. The document is also a valuable resource for de-sludging service providers as a resource for staff training. Robbins (2007) identifies the following broad areas to be covered in a manual of practice: safety guidelines, operational checks for the equipment including the trucks for transporting the sludge, spill control & clean-up and record keeping. The preparation of a practice manual, which would involve participation from city agencies is best organised and coordinated at the federal level.

d) Support to Private sector operators: As several smaller cities depend on private operators for de-sludging services; it is likely that private sector partners would be involved in providing the improved services and in some cases as operators of treatment facilities. Steps should be initiated to improve the business environment for these firms. These actions could involve recognising this branch of the sanitation industry at different levels and arms of the government, to ensure that these operations receive construction permits, credit availability and favourable tax rates. Model private sector and PPP contracts can also help in increased private sector participation.

5) Investments in Research and Development

Two aspects of FSM systems need improved understanding in the South Asian context. The first relates to technical issues, such as the effect of watertables, hilly regions and cold conditions on the rate and efficacy of FS treatment. The second is related to socio-cultural issues. They include community perception of faecal sludge and relative neglect of worker safety during faecal sludge handling.

A significant step in implementing FSM is the successful treatment of faecal sludge management. To ensure that there is wide adoption of these treatment systems, especially across several smaller cities, it is important that these systems be able to provide effective treatment, while being able to be operated at a comparatively low cost and level of technical expertise. The faecal sludge treatment systems that are widely used today have been developed in and for operations in other regions of the World, most notably South East Asia. South Asia, is a large geographic region and the cities here vary considerably between each other (and from the cities in South East Asia) in their geophysical characteristics like average temperature, atmospheric pressure, precipitation levels, ground water table and vulnerability to flooding. These factors have a role in the rate and level of treatment that take place both at the on-site systems and the sludge treatment plants. Also, across the cities in the region several household sanitation systems would be situated in areas that cannot be accessed by a de-sludging truck. While the city level agencies and their private sector partners would work towards adapting the system to local conditions, it is important to supplement their effort through a commitment to mobilize science and engineering research capacities. Research institutions working in collaboration with private operators have an important role in improving the system for local needs and thereby encouraging the cities to adopt the FSM.

SUB NATIONAL INITIATIVES

The city/town government and other public utilities involved in providing services at the town level would be involved in planning, implementing and operating the infrastructure and associated services for faecal sludge management; which puts these agencies at the centre of all initiatives around FSM. The success of all the initiatives listed above for enabling and supporting FSM require commitment and eagerness from the city agencies. The following few paragraphs explores initiatives at the city/town level to bring in the desired level of faecal sludge management. While taking on the task of planning, implementation and operation, the cities would face varying challenges; most of which would be specific to the city. Consequently most steps that the cities take would be to address these city/town specific challenges and are difficult to list here. Therefore the following paragraphs are organized to indicate a desired level of improvement that a city/town should target. Against each of these desired levels are listed, a few starting steps that a city/town could follow to get started.

1. Safe and effective functioning of all on-site sanitation systems: For the safe and effective functioning of on-site systems it should be ensured that these systems are built and operated to standards. This would include ensuring that the systems do not directly connect to storm water drains and avoiding scenarios like -- treating both greywater and blackwater in a system designed for treating only the latter.

Actionable Steps:

- Improve building approval processes to ensure that new buildings install on-site systems that comply with the standards and can be accessed by de sludging operators easily.
- Initiate proceedings to build a database of all buildings that are dependent on on-site sanitation system and the type of system each house uses.
- In the data collected identify how many on-site systems directly connect outflows to storm water drains or other water bodies.
- Initiate a training programme for masons and plumbers who install on-site sanitation systems on the standards and good practices in the installation of these systems.

2. Regular and safe de-sludging from all on-site sanitation systems and safe transport of the sludge to sites of treatment

For the effective functioning of on-site systems regular de-sludging is important. A city with good FSM practice would ensure that all on-site systems are periodically de-sludged. Equally important is that the de-sludging is done mechanically, that adequate safety of the workers is ensured from occupational hazards and from exposure to faecal sludge.

Actionable Steps:

- Identify the de-sludging service providers, who provide both formal and informal de-sludging services.
- Collect data on recent cases of work hazards (if any) from exposure to methane and cave-ins during de-sludging of septic tanks, storm water drains and during the cleaning of wells.
- Collect data on the modes and routes of transporting faecal sludge.
- Organize stakeholder meetings with the service providers on how to improve de-sludging services and ensuring worker safety.

3. Ensuring that the sludge is disposed/reused after adequate treatment

Faecal sludge is often disposed into the environment without adequate treatment, causing exposure to pathogens and pollution of the environment, especially water resources. The single most important step in FSM is to ensure that the sludge is not indiscriminately disposed. Even when it is used for farm uses, appropriate treatment should be ensured.

Actionable Steps:

- Identify hotspots where faecal sludge is emptied directly into the environment and take measures to identify relatively safe spots and options for its disposal like, use in plantations.
- In cases where faecal sludge is being used in farms, initiate studies to ensure that the practice is safe.
- Explore options of treating FS at treatment plants of neighbouring towns and cities as regional FSTP.
- When no treatment facility is available within the town or nearby, initiate the process of building a low cost facility. This would involve: identifying a suitable site for the plant, constituting a project team to conduct the preliminary study etc.

NOTES

1. The total number of cities listed in the table includes all cities for which the data was available at the cited sources. The actual number of cities/towns are likely to be slightly higher.
2. Data presented for Afghanistan is from the population data collected by the Central Statistical Office, from the different city and town administrations and not through a nation-wide census operation.
3. The area of the circles indicate estimated number of urban residents practicing open defecation in the different regions.
4. Total Wastewater generated is estimated at 80 LPCD.
5. The National Environment Protection Agency (NEPA) was formed in 2005. The Environment Law defines the agency's function as well as its powers. NEPA serves as Afghanistan's environmental policy-making and regulatory institution.
6. Swacch Bharat Mission broadly translates as 'Clean India Mission'.
7. Other sub categories could include decentralized waste water treatment and advanced onsite treatment and disposal.
8. The sludge produced when domestic wastewater (sewage) is treated, is commonly referred to as sewage sludge (Strande, 2015). The solid or semi-solid residue that is generated during the treatment of domestic wastewater or industrial effluents are referred to as sludge. In most cases sludge generated would require further treatment before it can be safely introduced into the environment.
9. Presently under revision.
10. Advisory Note: Septage Management in Urban India (CPHEEO, Ministry of Urban Development, 2013).

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ANNEXURE :

List of Cities identified as Large Cities in the Study

AFGHANISTAN

Kābol [Kabul]
Herāt
Kandahār
Mazār-e Sharīf
Jalālābād
Konduz [Kunduz]
Pol-e Khomrī [Puli Khumri]

BANGLADESH

Dhaka [Dacca]
Chittagong
Khulna
Nārāyanganj
Sylhet
Tongi (Tungi)
Rājshāhi
Bogra
Barisāl
Comilla
Rangpur
Sābhār (Savar)
Mymensingh (Nasirabad)
Gāzipur
Jessore
Rupganj
Dināpur
Nawābganj
Brāhmanbāria
Cox's Bāzār
Tangail
Kadamrasul (Bandar)
Chāndpur
Sirājganj
Kāliākair
Feni
Naogaon
Narsingdi
Pābna
Jamālpur
Sripur
Saidpur
Farīdpur
Bhairab Bāzār
Sātkhira
Jhenida
Noākhāli
Kishorganj
Kushtia

BHUTAN

Thimpu

INDIA

Greater Mumbai
DMC (U)
BBMP
GHMC
Ahmadabad
Chennai
Surat
Kolkata
Pune
Jaipur
Lucknow
Kanpur
Nagpur
Indore
Thane
Bhopal
Vadodara
GVMC
Pimpri Chinchwad
Patna
Ghaziabad
Ludhiana
Agra
Nashik
Faridabad
Rajkot
Meerut
Kalyan-Dombivli
Vasai-Virar City
Srinagar
Varanasi
Aurangabad
Allahabad
Dhanbad
Amritsar
Vijayawada
Navi Mumbai
Jabalpur
Haora
Ranchi
Gwalior
Jodhpur
Coimbatore
Raipur
Madurai
Kota
Chandigarh
Guwahati
Solapur
Hubli-Dharwad
Mysore
Bareilly
Moradabad
Gurgaon
Bhubaneswar
Aligarh
Jalandhar
Tiruchirappalli
Salem
Mira-Bhayandar
Thiruvananthapuram
Bhiwandi Nizampur
Saharanpur
Warangal
Jamshedpur
Gorakhpur
Guntur
Amravati
Bikaner
Kochi
Bhilai Nagar
Cuttack
Bhavnagar
Firozabad
Jamnagar
Jammu
Dehradun
Durgapur
Asansol
Kozhikode
Nanded Waghala
Kolhapur
Nellore
Gulbarga
Ajmer
Loni
Ujjain
Siliguri
Ulhasnagar
Jhansi
Sangli Miraj Kupwad
Mangalore
Belgaum
Malegaon
Gaya
Tirunelveli
Ambattur
Jalgaon
Kurnool
Udaipur
Maheshtala
Patiala
Tiruppur
Davanagere
Akola
Rajpur Sonarpur
Bellary
South DumDum
Rajarhat Gopalpur
Bhagalpur
Agartala
Muzaffarnagar
Bhatpara
Kakinada
Latur
Panihati
Rajahmundry
Dhule
Rohtak
Kollam
Bilaspur
Korba
Bhilwara
Brahmapur
Muzaffarpur
Ahmadnagar
Mathura
Avadi
Kadapa
Kamarhati
Shahjahanpur
Bijapur
Rampur
Shimoga
Alwar
Chandrapur
Raurkela
Junagadh
Thrissur
Barddhaman
Kulti
Nizamabad
Parbhani
Hisar
Tumkur
Karnal

Panipat
Tirupati
Aizawl
Bally
Gandhinagar
Karimnagar
Dewas
Sonipat
Ichalkaranji
Bathinda
Jalna
Satna
Purnia
Maunath Bhanjan
Barasat
Imphal
Farrukhabad-cum-Fatehgarh
Sagar
Durg
Anantapur
Ratlam
Hapur
Arrah
NDMC
Etawah
Ambarnath
Bharatpur
Begusarai
Tiruvottiyur
North DumDum
Gandhidham
Baranagar
Sikar
Puducherry
Ramagundam
Alappuzha
Katihar
Thoothukkudi
Ganganagar
Rewa
Uluberia
Mirzapur-cum-Vindhyachal
Raichur
Pallavaram
Hardwar
Pali
Bulandshahr
Vizianagaram
Nadiad
Nagercoil
Mango
Thanjavur
Murwara (Katni)
Sambhal
Singrauli
Eluru
Secunderabad (CB)
Naihati
Yamunanagar
Raurkela
Bidar
Bidhannagar
Munger
Nandyal
Panchkula
Burhanpur
Morvi
Anand
Ongole
Kharagpur
Dindigul
Hospet
English Bazar
Deoghar
Chapra
Haldwani-cum-Kathgodam
Haldia
Khandwa
Puri
Morena
Amroha
Bhind
Hardoi
Khammam
Madhyamgram
Bhiwani
Berhampore
Ambala
Fatehpur
Rae Bareli
Mahesana
Orai
Mahbubnagar
Sambalpur
Bhusawal
Bahraich
Vellore
Adoni
Raiganj
Sirsa
Dinapur Nizamat
Serampore
Guna
Jaunpur
Madanapalle
Panvel
Shivpuri
Hugli-Chinsurah
Silchar
Surendranagar Dudhrej
Unnao
Sitapur
Chhindwara
Tambaram
Adityapur
Badlapur
Cuddalore
Gadag-Betigeri
Veraval
Navsari
Bahadurgarh
Machilipatnam
Shimla
Medinipur
Bharuch
Hoshiarpur
Jind
Chandannagar
S.A.S. Nagar (Mohali)
Tonk
Faizabad
Tenali
Alandur
Kancheepuram
Proddatur
Vapi
Moga
Rajnandgaon
Robertson Pet
Chittoor
Banda
Budaun
Uttarpara Kotrung
Batala
Erode
Saharsa
Pathankot
Vidisha
Thanesar
Hassan

Kishangarh
Rudrapur
Nalgonda
Balurghat
Krishnanagar
Barrackpore
Porbandar
Lakhimpur
Santipur
Hindupur
Beawar
Bhadravati
Hanumangarh
Anantnag
Raigarh
Jamuria
Bhuj
Hajipur
Sasaram
Habra
Bhimavaram
Bid
Chitradurga
Dibrugarh
Abohar
Tiruvannamalai
Udupi
Kaithal
Baleshwar
Godhra
Shillong
Rewari
Hathras
Hazaribag
Chhatarpur
Mandsaur
Chas
Palanpur
Kumbakonam
Valsad
Damoh
Kolar
Srikakulam
Bankura
Mandya
Dehri
Mainpuri
Malerkotla
Siwan
Kalol

Patan
Lalitpur
Dhaulpur
Gondiya
North Barrackpore
Bettiah
Palwal
Palakkad
Rajapalayam
Botad
Modinagar
Kanchrapara
Deoria
Raniganj
Neemuch
Khanna
Pilibhit
Jorhat
Guntakal
Pithampur
Motihari
Kanhangad
Nabadwip
Jagdalpur
Basirhat
Halisahar
Jagadhri
Rishra
Kurichi
Dimapur
Dharmavaram
Nagaon
Kashipur
Ashokenagar Kalyangarh
Bhadrak
Khurja
Baidyabati
Sawai Madhopur
Ambikapur
Puruliya
Ghazipur
Satara
Churu
Madavaram
Gangapur City
Dohad
Darjiling
Barshi
Etah
Jhunjhunun

Chikmagalur
Jetpur Navagadh
Roorkee
Gudivada
Baran
Hoshangabad
Amreli
Pudukkottai
Narasaraopet
Adilabad
Baripada
Hosur
Muktsar
Yavatmal
Titagarh
Barnala
Chittaurgarh
Tinsukia
Khargone
Dum Dum
Basti
Gangawati
Ambur
Giridih
Chandausi
Gonda
Bagaha
Achalpur
Gondal
Bagalkot
Osmanabad
Akbarpur
Champdani
Deesa
Nandurbar
Azamgarh
Delhi Cantonment (CB)
Firozpur
Mughalsarai
Sehore
Bongaon
Kanpur (CB)
Khardah
Tadpatri
Port Blair
Sultanpur
Shikohabad
Jalpaiguri
Shamli
Mangalagiri

Suryapet
Karaikkudi
Wardha
Ranibennur
Kishanganj
Hindaun
Jamalpur
Nagaur
Ambala Sadar
Bhiwadi
Bundi
Miryalaguda
Ballia
Tadepalligudem
Jagtial
Bansberia
Baraut
Udgir
Betul
Jehanabad
Nagapattinam
Buxar
Seoni
Ozhukarai
Biharsharif
Darbhanga
Aurangabad
Hinganghat
Dhamtari
Sujangarh
Bhadreswar
Chilakaluripet
Malappuram
Kasganj
Banswara
Kalyani
Gangtok
Datia
Nagda

MALDIVES

Male

NEPAL

Kathmandu
Pokhara
Lalitpur
Biratnagar
Bharatpur
Birgunj
Butwal
Dharan
Bhimdatta
Dhangadhi
Janakpur

PAKISTAN

Karāchi
Lahore
Faisalabad (Lyallpur)
Rāwalpindi
Multān
Hyderābād
Gujrānwāla
Peshāwar
Islāmābād
Sargodha
Bahāwalpur
Sukkur
Jhang
Sheikhūpura
Lārkāna
Gujrāt
Mardān
Kasūr
Rahīmyār Khān
Sāhīwal
Okāra
Wāh Cantonment
Dera Ghāzi Khān
Mīrpur Khās
Nawābshāh
Mingāora
Chiniot
Kāmoke
Būrewāla
Jhelum
Sādiqābād
Jacobābād
Shikārpur
Khānewāl
Hāfizābād
Kohāt
Muzaffargarh
Khānpur
Gojra
Bahāwalnagar
Muridke
Pākpattan
Abbottābad
Tando Ādam
Jarānwāla
Khairpur
Chishtiān
Daska

SRI LANKA

Colombo
Kaduwela (Battaramulla)
Maharagama
Dehiwala-Mount Lavinia
Moratuwa
Kesbewa
Negombo
Sri Jayawardenepura (Kotte)

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DHARMA MARG, CHANAKYAPURI, NEW DELHI 110021
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