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स्वच्छ भारत
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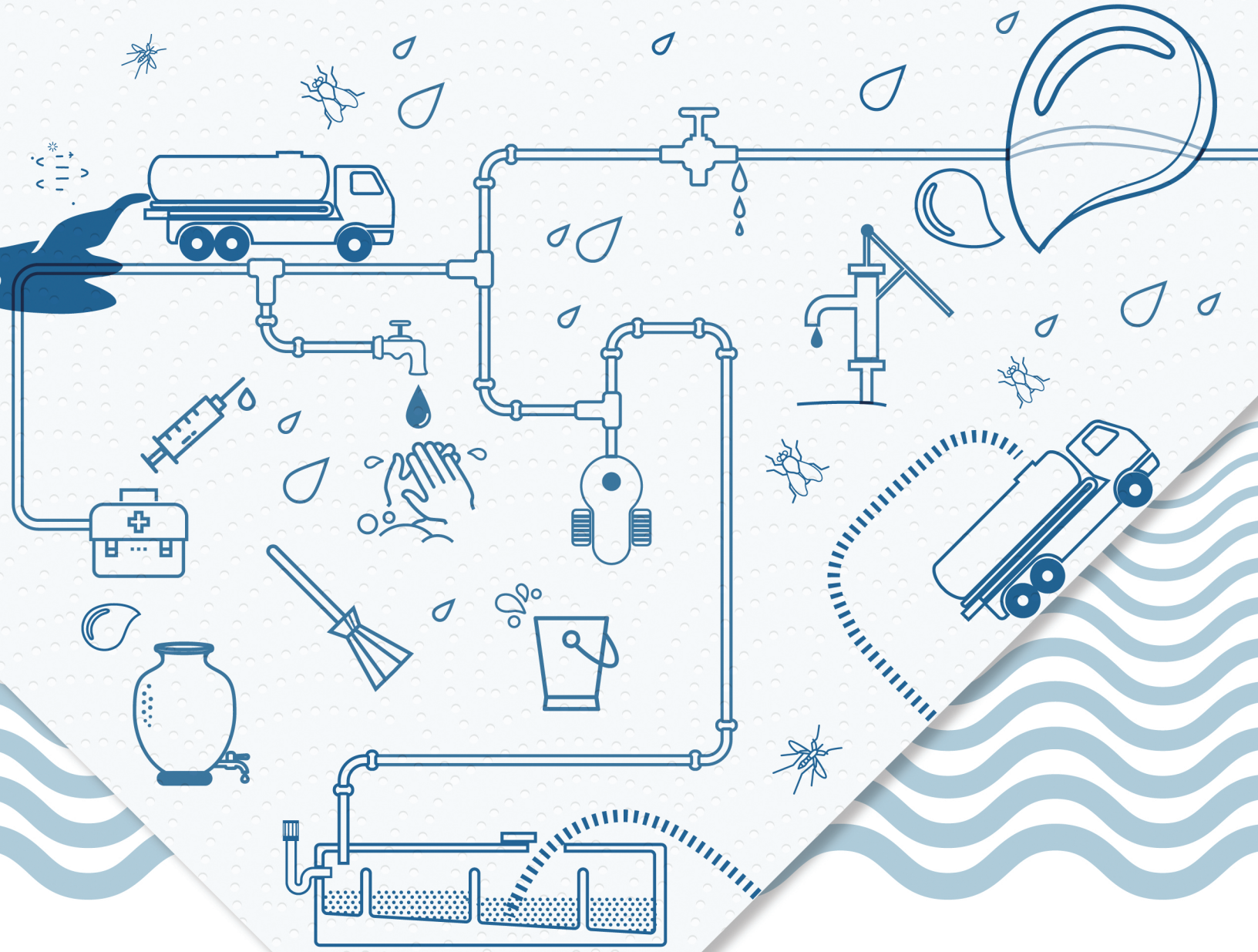
RAPID ASSESSMENT OF

THE FAECAL SLUDGE AND SEPTAGE SITUATION IN 100 TOWNS OF RAJASTHAN



SCBP

National Institute of Urban Affairs

Consortium for DEWATS Dissemination Society

Supported by National Institute of Urban Affairs, Department of Local Self Government

Text Isha Dash, Prerna Prasad, Ravi K Kalal
Graphics, Drawings and Design concept: Twist Open Innovations
Images CDD Society

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Government of Rajasthan

MESSAGE

Sanitation is a priority for Rajasthan. We are committed to contributing to achieving the targets set forth by Hon'ble Prime Minister under the Swachh Bharat Mission (Urban), for an open Defecation Free India by 2019. Our State Government and Urban Local Bodies are providing a matching agent to the central SBM grant for toilet construction, including additional Rs. 4000 from SFC grants available to the state.

Despite the challenges faced by our State in terms of water availability and a predominantly rural demography, our government is promoting the construction and use of toilets in both rural and urban areas of the state. Water is life, and safe sanitation ensures a healthy life for all. I feel pleasure in stating that our efforts towards laying the foundation for growth and development of Rajasthan have been extremely fulfilling so far and our focus on sanitation is part of this vision. We appreciate the importance of not just providing access to toilets for all but also the need for treatment and disposal of faecal waste and the waste water generated.

I am happy to know that Local Self Government Department, Government of Rajasthan has joined hands with NIUA and CDD Society for carrying out the Rapid Assessment Study on Sanitation and Septage Situation in 100 towns of Rajasthan, where no underground sewerage is available. I congratulate them on the release of this Study Report. This document should be of immense value to planners and help design workable solutions.

Vasundhara Raje
Chief Minister,Rajasthan

सत्यमेव जयते

Government of Rajasthan

MESSAGE

I am pleased to note that priority is being accorded to addressing the problem of wastewater, septage and solid waste management in our state.

The capacity building initiative on urban sanitation and septage management by National Institute of Urban Affairs (NIUA) with the support of Gates Foundation will be for all cadres of staff of Urban Local Bodies, elected representatives and the private sector service providers. In collaboration with City Managers Association of Rajasthan (CMAR).

All towns and urban centres are encouraged to initiate improvements to achieve Open Defecation Free (ODF) status and move forward to address the challenges of construction of appropriate septic tanks, their desludging and cleaning and safe disposal/treatment of human waste and waste water.

I am happy to release this Rapid Assessment Study Report by NIUA and CDD Society on the Sanitation and Septage Situation in 100 towns of Rajasthan. It will go a long way in addressing the challenge of urban sanitation and wastewater management.

Shrichand Kriplani
Minister
Local Self Government,
Urban Development and Housing Department,
Government. of Rajasthan

सत्यमेव जयते

Government of Rajasthan

FOREWORD

Rajasthan is the second largest state of india in terms of geographical area. We have a rich culture and heritage and a vibrant social order. The state has made significant progress in agriculture, industrial, service sector and tourism over the last few decades.

Urbanisation is both a challenge and also an opportunity, for providing modern infrastructure and employment opportunities for the youth of the state. Urban sanitation is a challenge in terms of providing sufficient water for a traditional sewerage based conveyance network and its treatment.

As per Census 2011, there are 216 urban settlements in Rajasthan, alongwith 188 Urban Local Bodies (ULBs). More than half the urban population (53.48%) of Rajasthan relied on on-site sanitation systems such as Septic Tanks (45.62%), Pit latrines (5.44%) and other systems (2.42%) for collection of faecal sludge and wastewater. Finding solutions for addressing the safe treatment of faecal sludge and septage wastewater is important.

The Department of Local Self Governance is providing strategic oversight and support for urban sanitation in the state. The Public Health Engineering Department (PHED), Rajasthan Urban Infrastructure Development Programme and the Rajasthan Urban Drinking Water Sewerage and Infrastructure Development Corporation (RUDSICO) are the nodal state agencies for addressing the sanitation challenge in the state.

The Rapid Assessment study of sanitation and septage situation in 100 small towns of the state is very timely. We are keen to learn the typology of towns and their treatment and disposal of septage and wastewater.

I hope the recommendations of the report will be incorporated into the plans and strategy of Local Self Government Department for undertaking implementation of FSSM in these 100 cities in coming years.

Ashok Jain
Chief Secretary
Government of Rajasthan

सत्यमेव जयते
Government of Rajasthan

FOREWORD

Sanitation is key to achieving improved public health and enhancing socio-economic outcomes. To achieve this objective, the Department of Local Self Governance has embarked on this initiative to understand the sanitation situation in 100 towns of Rajasthan. This runs coherent with the aim of providing toilets under the Swachh Bharat Mission to end open defecation by universalizing construction and use of toilets. This preliminary assessment is aimed at strengthening the sanitation value chain across these towns.

Currently the penetration of sewerage systems in Rajasthan is low and approximately 67% of urban Rajasthan (Census, 2011) households are dependent on on-site sanitation systems. To bring about quick improvements in sanitation levels across urban areas in Rajasthan and stop dangerous practices such as dumping of faecal waste in open grounds and water bodies, this study is of utmost importance.

Adopting faecal sludge and wastewater management practices would require our towns to be innovative and take a lead in identifying appropriate technology options and institutional arrangements. This report is a first step in understanding the qualitative and quantitative attributes of the problem at hand.

The "Rapid Assessment of Sanitation Situation in 100 towns of Rajasthan" report will facilitate state-wide implementation of Faecal Sludge and Wastewater management.

The report shows the sanitation problems in small towns, identifies gaps and recommends solutions. Our state commits to addressing the challenge of safe disposal and treatment of faecal waste and wastewater. We commit to resources available from AMRUT and from the state government own funds, to prioritise this work in a few towns of the state to begin with and then to upscale it to all towns and urban centres in the coming years.

Dr. Manjit Singh
Principal Secretary to Government
Department of Local Self Government, Rajasthan
State Mission Director, AMRUT and Smart Cities

सत्यमेव जयते

Government of Rajasthan

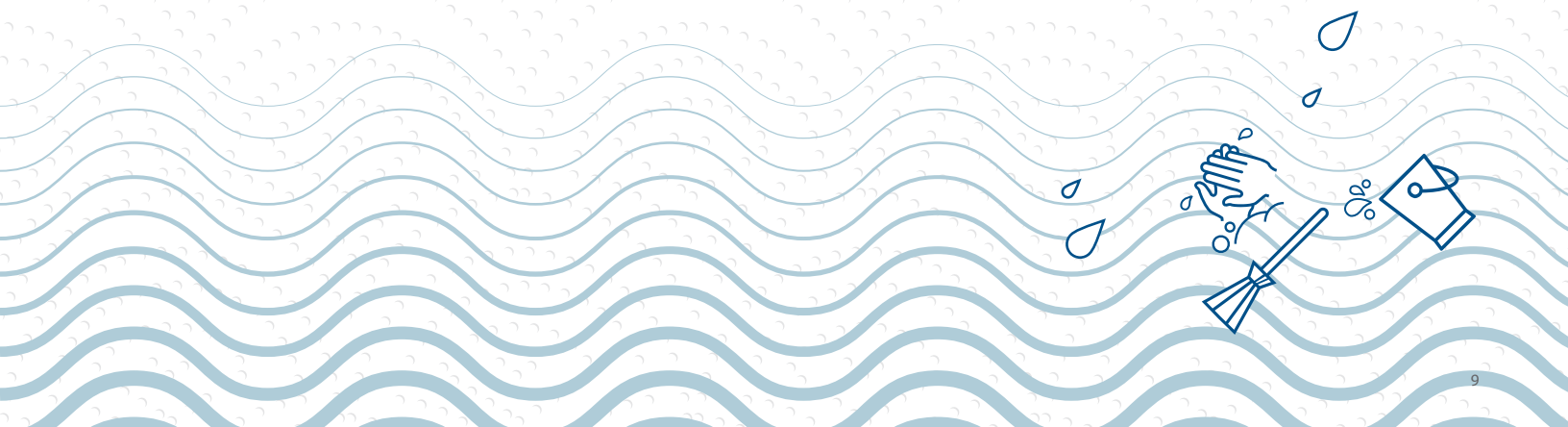
FOREWORD

While every effort is being made to provide sewerage connectivity to urban residents of the state, we realize that sewerage systems based sanitation solutions alone may not address the challenge of urban sanitation for Rajasthan. Challenges of water scarcity, high capital and operating costs of centralized sewerage systems, makes decentralized septage management solutions attractive for most towns of the state. There is also an urgency to address the safe treatment and disposal of faecal waste and waste water, that is a major environment pollution threat affecting groundwater, lakes and water bodies.

Rajasthan was one of the first states to come out with the State Sewerage and Waste Water Policy in 2016. Safe treatment of septage is now being prioritized by Rajasthan. A new state Faecal Sludge and Septage Management (FSSM) Policy Guidelines are ready. These guidelines are inspired by the National FSSM Policy release earlier this year.

With the launch of this assessment report of 100 Towns Sanitation and Septage Assessment by NIUA and CDD Society, we are committed to prioritize septage management in Rajasthan.

Mr. Pawan Arora (IAS)
Director cum Joint Secretary
Local Self Government Department
Government of Rajasthan



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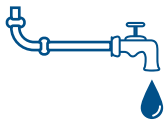


ACKNOWLEDGEMENT

The major part of this project involved survey, research and dedication. IThis project would not be possible without vital contributions from the 100 Urban Local Bodies surveyed for this project and relevant stakeholders in sanitation sector. CDD Society would like to extend its sincere gratitude to all of them.

CDD Society is thankful to the Government of Rajasthan for extending their support to conduct this survey programme. We are grateful to all the state nodal agencies - Rajasthan Urban Infrastructure Development Project (RUIDP), Directorate of Local Bodies, Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited (RUDSICO).

We sincerely thank Dr. Manjit Singh, Principal Secretary, Department of Local Self Government and Mr. Pawan Arora, Director and Joint Secretary from Department of Local Self Government for providing necessary mandate to conduct this project.

We are grateful to National Institute of Urban Affairs (NIUA), Delhi for their support and for providing necessary guidance concerning on-ground project implementation. We sincerely thank you for your feedback and contribution to improving the quality of this report.

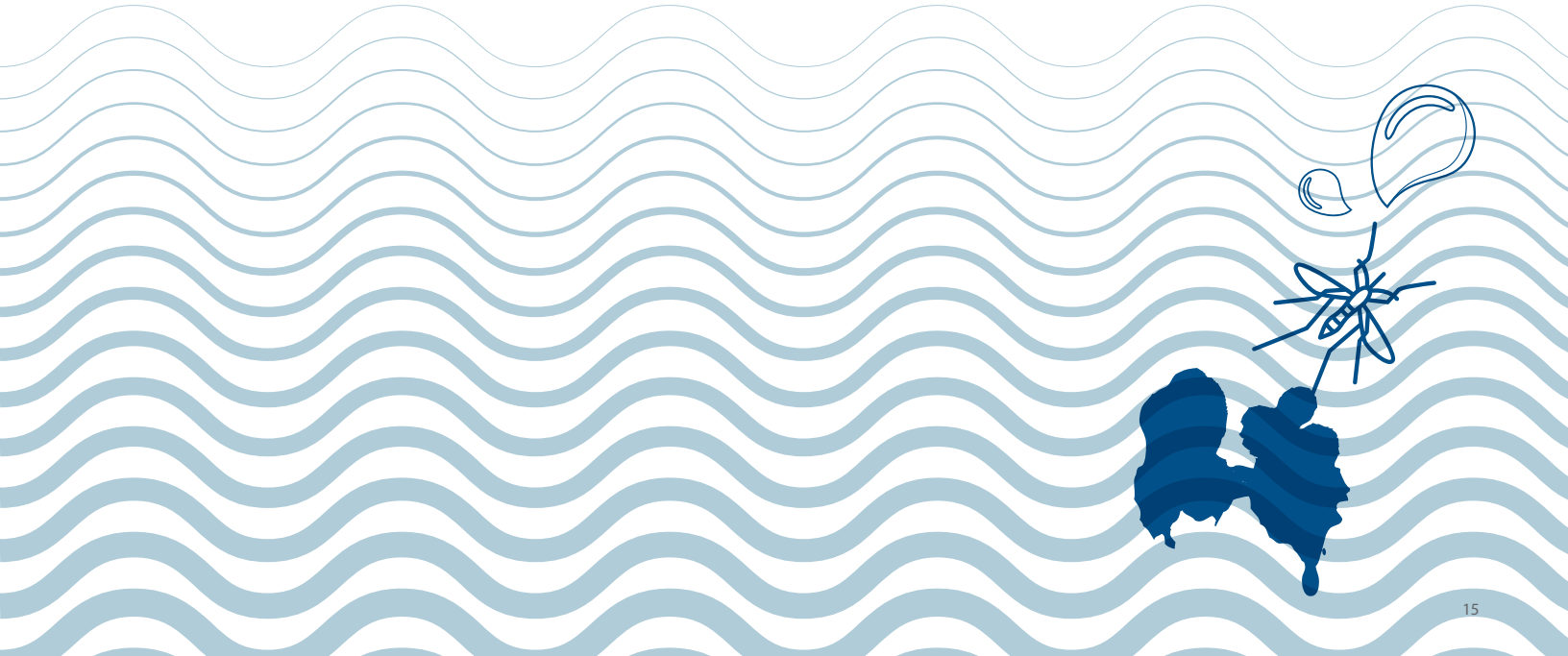
LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AIT	Asian Institute Of Technology
AMRUT	Atal Mission For Rejuvenation And Urban Transformation
ASP	Activated Sludge Process
CAPEX	Capital Expenditure
CB	Capacity Building
CPHEEO	Central Public Health And Environmental Engineering Organization
Cr	Crore
CT	Community Toilet
DPR	Detailed Project Report
FAB	Fluidized Aerated Bed
FAT	Financial Analysis Tool
FSM	Faecal Sludge Management
HH	Household
HRIDAY	Heritage City Development and Augmentation Yojana
IEC	Information Education And Communication
IHHL	Individual Household Latrine
JDA	Jaipur Development Authority
JMC	Jaipur Municipal Corporation
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
JoDA	Jodhpur Development Authority
JoMC	Jodhpur Municipal Corporation
LPCD	Liters Per Capita Per Day
m	Meter
MBBR	Moving Bed Biofilm Reactor
MLD	Million Liters Per Day
mm	Millimeter
NASA	National Aeronautics And Space Administration
NCRPB	National Capital Region Planning Board
O&M	Operation And Maintenance
OD	Open Defecation
ODF	Open Defecation Free
OPEX	Operational Expenditure
OSS	On-Site Sanitation System
PESTEL Framework	Political Environmental Social Technical Economical Legal Framework
PHED	Public Health And Engineering Department
PT	Public Toilet
RIICO	Rajasthan State Industrial Development and Investment Corporation
RUIDP	Rajasthan Urban Infrastructure Development Project
RUDSICO	Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited
SAT	Situation Assessment Tool

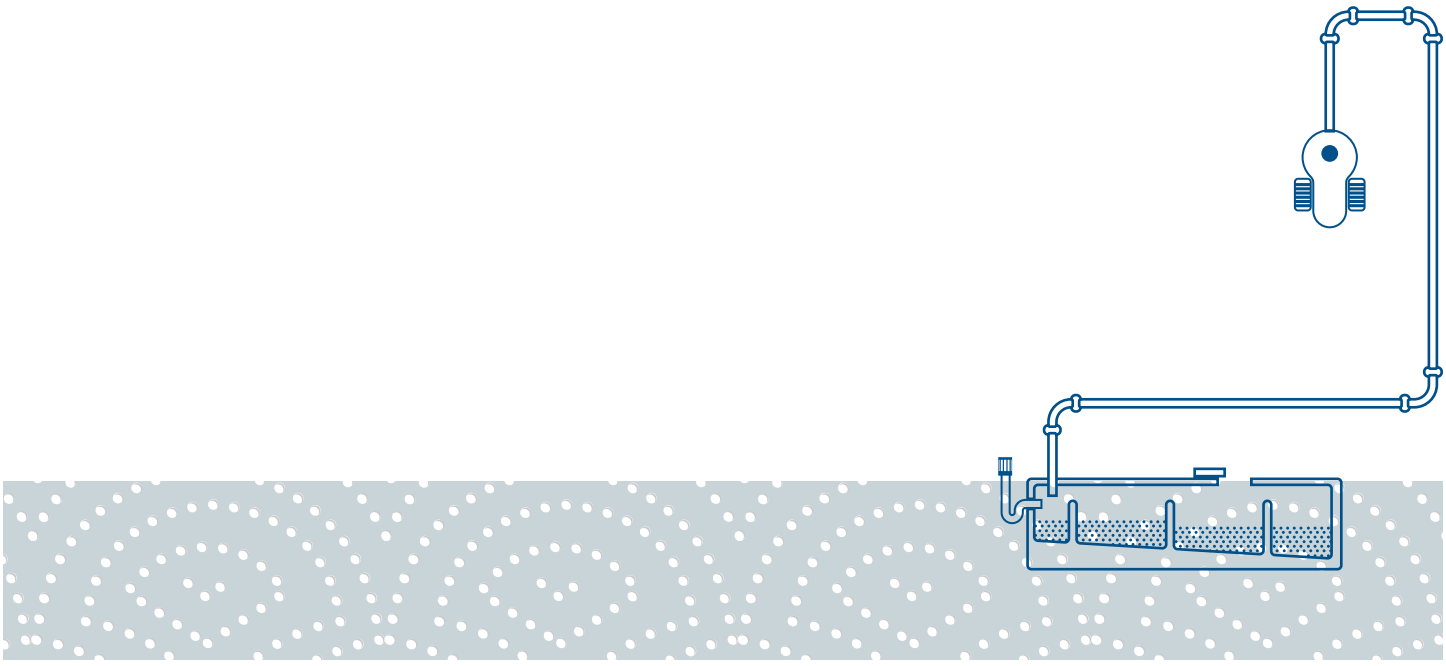
SBM	Swachh Bharat Mission
SBR	Sequential Batch Reactor
SFD	Shit Flow Diagram
SLB	Service Level Benchmark
sq.km	Square Kilometer
SSWWP	State Sewerage and Wastewater Policy
STP	Sewage Treatment Plant
UASB	Up-Flow Anaerobic Sludge Blanket
UGD	Underground Drainage
UIDSSMT	Urban Infrastructure Development Scheme for Small And Medium Towns
UIT	Urban Improvement Trust
ULB	Urban Local Body
WSP	Waste Stabilization Pond
WW	Wastewater



GLOSSARY

S.No.	Term	Definition
1	Faecal Sludge (FS)	Faecal Sludge comes from on-site sanitation technologies[1], and has not been transported through a sewer. It is raw or partially digested, a slurry or semi-solid, and results from the collection, storage or treatment of combinations of excreta and black water, with or without greywater. FS is highly variable in consistency, quantity and concentration[2].
2	Septage	Septage is the partially treated settled faecal matter in a semi solid condition found at the bottom of septic tanks. It also includes liquids, solids, as well as fat, oil and grease (scum) that accumulate in a septic tank over time.
3	Scum	Greasy substance floating on the surface of sewage or sludge.
4	Sewage	Sewage is the general term given to the mixture of water and excreta (urine and faeces).
5	Sewer	An open channel or closed pipe to convey sewage.
6	Faeces	Refers to (semi-solid) excrements devoid of urine or water.
7	Cesspit	An enclosed container used for storing sewage.
8	Sludge	The thick, viscous layer of materials that settles at the bottom of septic tanks and pits. Sludge comprises mainly organics but also sand, grit, metals, and various chemical compounds.
9	Sullage	Old term for greywater, it includes wastewater from cooking, washing and bathing but not excreta.
10	Single Pit Latrine	A sanitation solution including a superstructure and a pit in which faeces, urine and anal cleansing material (water and/or solids) are disposed. The pit is lined to prevent it from collapsing and provide support to the superstructure, but the bottom of the pit is permeable to release leachate.
11	Twin Pit	The Single Pit Latrine with an additional pit for use, when the first pit is full. It should be possible to dig out a filled pit, after it has stood for a year, without any objectionable smell, whilst the other pit is in use.
12	On-site Sanitation System	A system of sanitation whose storage facilities are contained within the plot occupied by a dwelling and its immediate surroundings. For some systems (e.g. twin-pit), faecal matter treatment is conducted on site. With other systems (e.g. septic tanks, single-pit), the sludge has to be collected and treated off-site.
13	Water Closet	A room with only a toilet/pan/commode, usually a pour flush toilet is generally known as a Water Closet.
14	Decentralised Sanitation Solutions	Decentralised Sanitation solutions are on-site sanitation systems which are used to collect and partially treat septage/faecal sludge from individual dwellings, businesses or small communities that are managed individually.
15	Faecal Sludge Management	Faecal Sludge Management includes the entire process of design, collection, conveyance, safe treatment and re-use/disposal of faecal sludge.

S.No.	Term	Definition
16	Desludging Operator	A person involved in the collection and cleaning of domestic or commercial septic tanks and pits using a vacuum suction vehicle.
17	Urban Local Body	Urban Local Body means any Municipal Corporation, City Corporation, City Municipal Council, Town Municipal Council, Town Panchayat, Notified Area Committee and Cantonment Board within the limits of Rajasthan.
18	Urban area	Urban Area includes all cities and towns falling under the purview of the Urban Development Department, Government of Rajasthan.
19	Desludging	Desludging refers to the process of removing the accumulated faecal sludge or septage from the on-site sanitation systems.
20	Effluent	Effluent means the wastewater that flows out of a septic tank or supernatant liquid discharged from the septic tank.
21	Septic Tank	A Septic Tank is a combined sedimentation and digestion tank where the sewage is held for one to two days. During this period, the suspended solids settle down to the bottom. This is accompanied by anaerobic digestion of settled solids and liquid, resulting in reasonable reduction in the volume of sludge, reduction in biodegradable organic matter and release of gases like carbon dioxide, methane and hydrogen sulphide. The effluent although clarified to a large extent, will still contain appreciable amount of dissolved and suspended putrescible organic solids and pathogens.
22	Resource Recovery	Extraction of the useful portion of the faecal sludge for reuse.



[1] Excluding twin-pit latrines as they are improved pit latrines which allow on-site treatment and transformation of faecal sludge into a hygienized soil amendment. (http://www. sswm.info/content/twin-pits-pour-flush)

[2] L. Strande, M.Ronteltap, D.Brdjanovic; Faecal Sludge Management: Systems Approach for Implementation and Operation; IWA Publishing; 2014; 1.

EXECUTIVE SUMMARY

The purpose of this report is to distil the lessons learnt from the survey of 100 small towns in Rajasthan primarily aimed at improving sanitation services. The report culls out the core elements of wastewater and faecal sludge management and proposes technological solutions along with a broad investment plan for implementation.

Rajasthan being the 7th most populous state in India has a major contribution to make for India to become an open defecation free nation by 2019. The Swachh Bharat Mission promises 66,42,221 toilets based on on-ground survey in urban India, out of which 3,93,767 are to be constructed in Rajasthan (6%). 81,466 units of individual household toilets and 3,540 community and public toilets have been completed.

Following are some important facts in the wake of which the current project was initiated:

- 31 towns and cities have 63 Sewage treatment plants with a capacity of 866 MLD of sewage. The STPs treat 395 MLD of sewage which is 23% of the total sewage generated in 189 cities and towns. Despite the above, 99% of the towns and cities in Rajasthan have less than 50% underground drainage system coverage.

- 71% of these towns have a population of less than 50,000 and do not have any dedicated funding apart from the SBM for sanitation improvement that would deal with post toilet infrastructure. It is the small towns of class III stature and below which have not had adequate scope for development. The economies of such towns are generally underdeveloped with only a fraction of the population involved in gainful economic pursuits.

This project was embarked upon with three main objectives in mind:

1. Conduct a Rapid Sanitation Assessment including wastewater and faecal sludge management as focus of 100 small towns in Rajasthan.

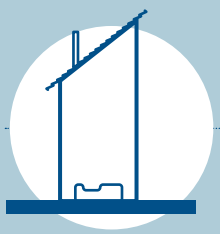
2. Identify technical, financial and capacity gaps.

3. Recommend technical solutions along with a broad investment plan.

The 100 cities that were chosen to be a part of the study are those that are not funded for sanitation by any centre or state run programme. Rajasthan has 189 towns out of which 88 towns are funded by one or more national or state level programs/grants. The remaining towns responsible for self-provisioning their sanitation infrastructure were targeted for this study.

The study took place in four phases. The rapid sanitation situation assessment for the selected towns was carried out using Situation Assessment Tool and Financial Assessment Tool from AIT's Toolkit.

KEY FINDINGS



43% of the towns have greater than 90% toilet coverage; another 43% lie between 70-90% while 14% have less than 70% coverage.

55% of the containment systems are unlined while the remaining 45% are lined in nature where the supernatant is directly let out into to the open drains.

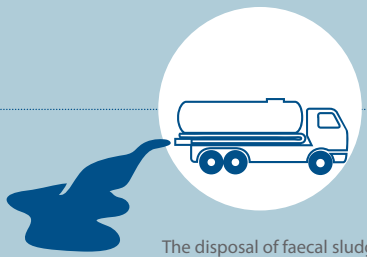
32% of the ULB's have their own desludging vehicles while in 58% of the towns, private desludging service providers ran the business. Cost per desludging (per 1 trip) varied from Rs 500/- to Rs 4000/-. Depending on demand, desludging service providers may travel 20-50 Km to provide these services.

Along with these mechanical services, non-mechanical desludging is also practiced to complement these services in areas the vehicles do not reach.

The 100 towns surveyed were analyzed based on two parameters: environmental vulnerability and the preparedness of the town.

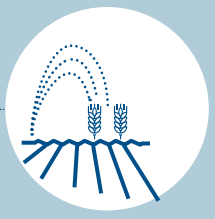
Following are the typologies into which the towns have been segregated:

S. NO.	TYPOLOGIES	RISK
1	Towns that have more than 20 desludging events in a month	Direct Exposure to soil and groundwater/surface water contamination
2	Towns having more than 80% unlined pits and high water table	Potential pollution of groundwater which is found at 50 feet or above.
3	Towns that have more than 80% lined tanks but due to the absence of a soak pit, all the supernatant flows into the open drain.	Contamination of greywater flowing in storm drains. The tanks when not emptied every three years as CPHEEO guidelines, reduces the effectiveness of tanks and increases the microbial load on the wastewater in the drains.



The disposal of faecal sludge was at the solid waste dumping site or barren lands outside the town and sometimes drains outside the town.

Only 2 towns out of the 100 towns surveyed had some wastewater treatment infrastructure. I.E. Nokha and Vidyavihar.



The perception towards reuse of wastewater in agriculture was better than that towards faecal sludge reuse. In 37% of the towns surveyed wastewater reuse was prevalent.

Apart from the identification of the technical gaps, a PESTEL analysis has been done to understand the deficiencies in the enabling environment. Key takeaways from the same are given below:

Political	Conflicting interests + Frequent transfers + Low awareness
Environmental	Water scarcity + Drought and heat spells, Soil and water contamination at disposal locations + Presence of communicable diseases
Social	Low socioeconomic status + Stigma attached to reuse + Lack of understanding of the FS, WW and health impacts
Technical	Unscientific containment units + Indiscriminate disposal of FS+ Containment supernatant contaminating the water bodies
Economical	Limited funding and manpower + Low tax collection efficiency
Legal	Poor enforcement of environmental policies

An effective sanitation management system for the 100 towns of Rajasthan would require integrating inputs from technology and enabling systems to ensure that pollution and adverse impacts on public health can be prevented. The implementation models for solution should therefore synchronise technical intervention with facilitating factors like promotion and awareness building and with support systems like appropriate policy, legal frameworks, financial access and developing knowledge and skills for operating and managing the system.

The way forward suggests the steps to be taken to create an environment which enables the state to show exemplary solutions/model towns; build capacity among stakeholders to customise given solutions for each town, own it and implement it; and finally to replicate the impact (not the solution) in each town.

Phase I: Identify pilot towns and conduct in-depth ideation and implementation plan for wastewater and faecal sludge management

Phase II: Build capacities of stakeholders through training workshops and IEC activities along with advocacy for change in institutional frameworks.

Phase III: In-depth analysis of sanitation situation in the remaining towns in Rajasthan along with planning and DPR submission with customised solutions. This phase will be complemented with capacity building activities.

30 cities were selected from the three typologies mentioned in the treatment section to serve as a tentative list of pilot cities to begin the exercise of improving the sanitation situation in small towns in Rajasthan.

Investment Plan:

I. The faecal sludge accumulated in containment systems, with the assumption that Swachh Bharat Mission reaches its target by 2019 and all toilets are built adhering to design standards, is estimated to be approximately 897 cubic metres[3]. This is the tentative amount of faecal sludge that will need to be treated, as per the findings of the rapid assessment carried out in the 100 select towns in Rajasthan.
II. Thus, a rough figure of INR 350 Crore may be considered as the capital expenditure for implementation of the technical recommendations alone[4].
III. Apart from the capital expenditure, roughly INR 75 Crore (estimated on the higher side) is needed annually for operation and maintenance of the implemented technology
IV. Moreover, funds need to be allocated for skill building, training, IEC activities and advocacy for policy change to ensure an enabling environment is created for successful implementation of the solutions.

[3] Quantification of Faecal Sludge accumulated in lined and unlined pits have been done for 100 towns using data received from the ULB during the study. FS accumulated per day in a town in cubic metre= Population*% of HH dependent on lined pits*0.00021 + Population*% of HH dependent on unlined pits*(0.067/365). FS accumulated in a lined pit per day = 0.00021 and FS accumulated in an unlined pit per year = 0.067 as per CPHEEO manual on septage and sewerage management.

[4] If we assume the technology implemented is DEWATS and FSTP built is as described before, purely due to its low cost of operation and maintenance. The capital and operational costs will change with change in technology.

1
INTRODUCTION

1.1 Assessment Background

Septic tank based sanitation systems predominate the towns and cities of Rajasthan, as well as several other states of India. Swachh Bharat Mission (SBM) is now also looking at Faecal Sludge Management as a strategy which needs to be embraced by urban local bodies as an imperative step to tackle the increasing amount of faecal sludge that will be accumulated in containment systems owing to the increase in number of toilets. According to the State's Sewerage and Waste Water Policy 2016, underground drainage networks is estimated to reach around 75% of the towns in a couple of years, however, a large number of households and buildings with toilets will also depend on on-site containment units in the near future. 101 towns in Rajasthan have no external source of funding apart from SBM to improve the overall sanitation conditions pointed above. These towns require technical and financial assistance to address the challenge of septage maanagement.

1.2 Assessment Objectives

In order to move up the environmental sanitation ladder resulting in improved environmental conditions (clean ground and surface water bodies and soil and public health), FSM is the next incremental step. In order to define an FSM strategy for towns, one must assess the sanitation situation based on risks to public health and environment, identify gaps and suggest recommendations for providing FSM solutions. The investment needed can also be estimated based on the recommendations.

Therefore, the rapid assessment was embarked upon with three main objectives:

1. Study the sanitation situation in 100 small towns of Rajasthan with Faecal Sludge Management as the focus.
2. Explore concept solutions for the infrastructure gaps found in the post toilet sanitation value chain.
3. Estimate investment required to fill the gaps found in the sanitation value chain for the 100 towns at the state-level.

RAJASTHAN

A SUMMARY OF THE ROUTE TRAVELLED FOR THE STUDY BY RESEARCH TEAMS

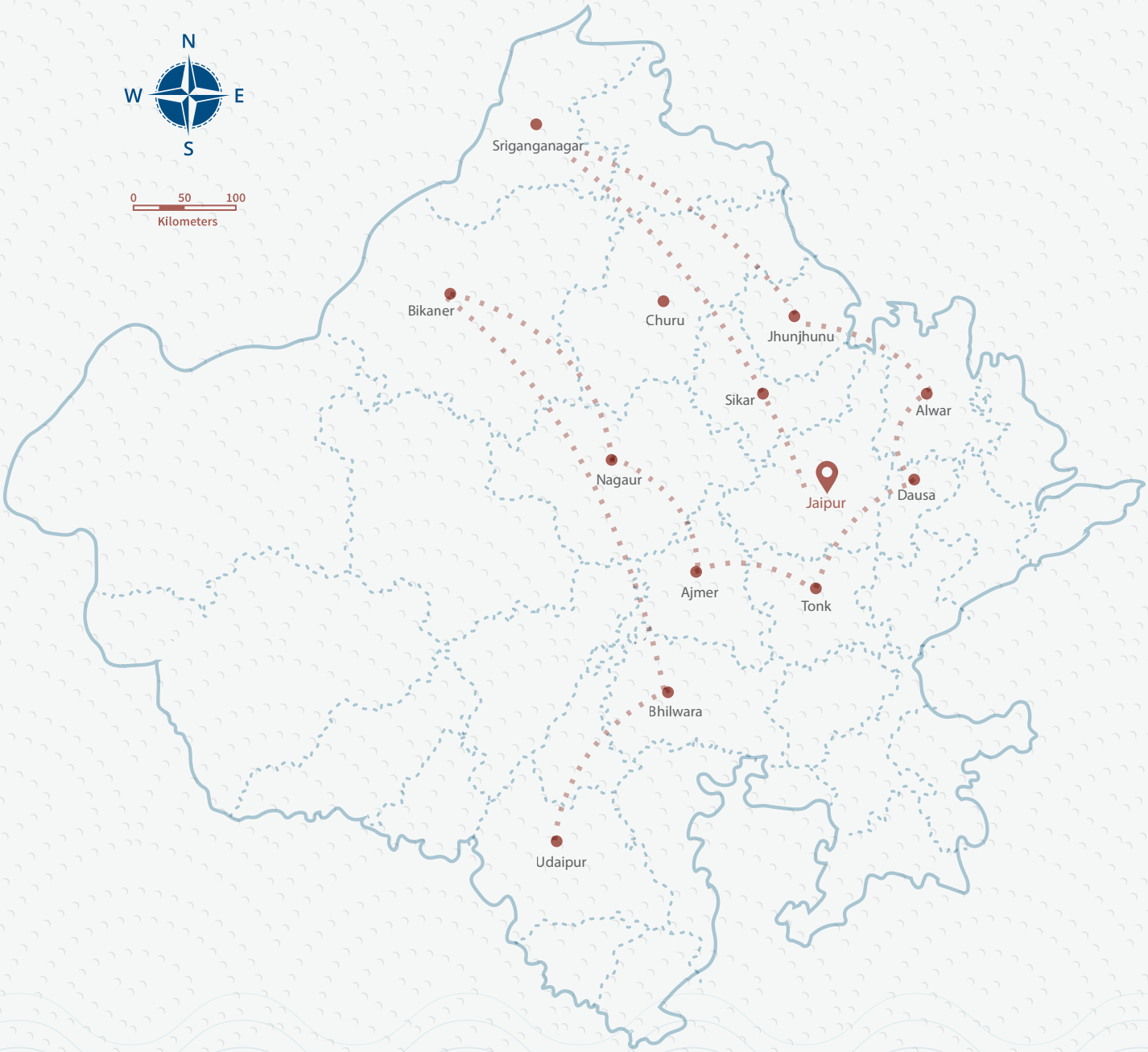


Figure 1: A Summary of the Route Travelled for the Study Research Teams

2
ASSESSMENT METHODOLOGY

2.1 State Level Sanitation Situation Analysis

For understanding the current sanitation situation in Rajasthan, a secondary data assessment was carried out. This provided insights into how the State has addressed the sanitation related issues from the technical, financial, institutional and legal/governance framework perspective.

2.2 Selection of Cities for FSM Intervention

The 100 towns included in the study are those that are not funded under AMRUT, SBM, or any state government scheme. Rajasthan has 189 towns out of which 88 towns are funded by one or more national or state level programs/grants. Annexure 1 has the list of the cities selected for the study.

2.3 Assessment Planning and Route Mapping

The study took place in four phases, initial pilot surveys were conducted in three towns (Chaksu, Chomu and Viratnagar) using the SAT and FAT tools developed by AIT, Bangkok to fine tune the tools to our purpose and situation. Following the pilot, in the first phase 6 teams comprising of 2 members each covered a total of 36 towns in 7 days. In subsequent phases 2 teams went on field for longer durations and covered the remaining 67 towns. In the second phase, 2 teams covered 31 towns over a period of 2 weeks. In the third phase, 35 towns were completed by two teams in 20 days. (Details in Annexure 2)

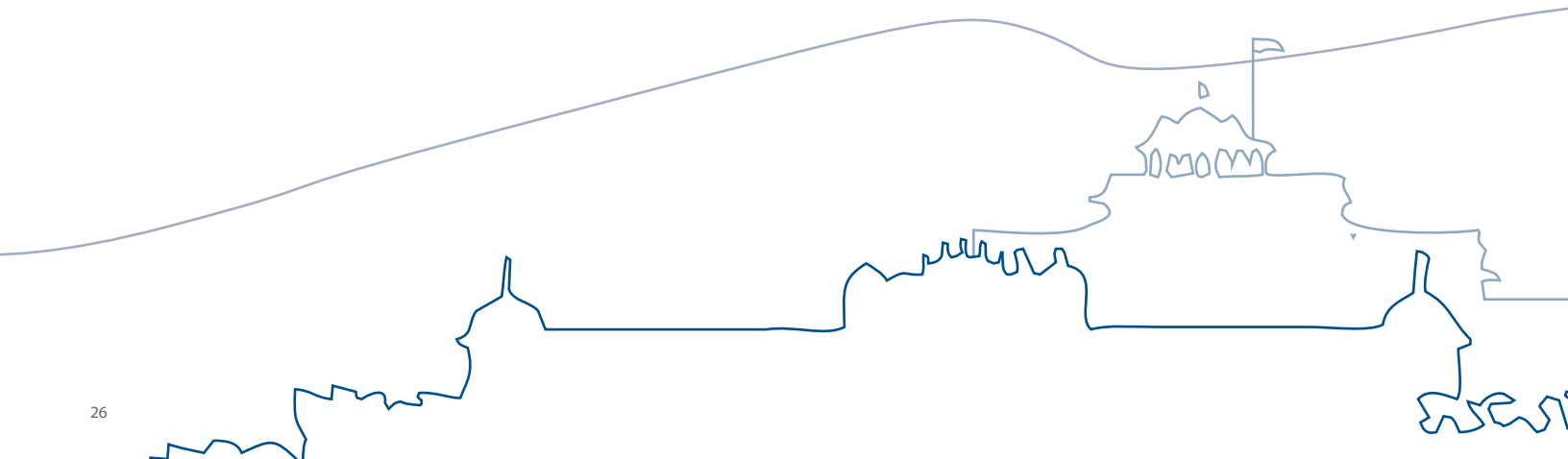
Before deciding the route to be given to the teams the spread of the cities were studied and the optimum route was decided based on the distance between the cities. The teams faced challenges due to the remoteness of the towns to be surveyed, and unpredicatable absence of officials in Urban Local Bodies due to events, festivities and other reasons. Anticipating such issues was also a part of planning route maps and scheduling.

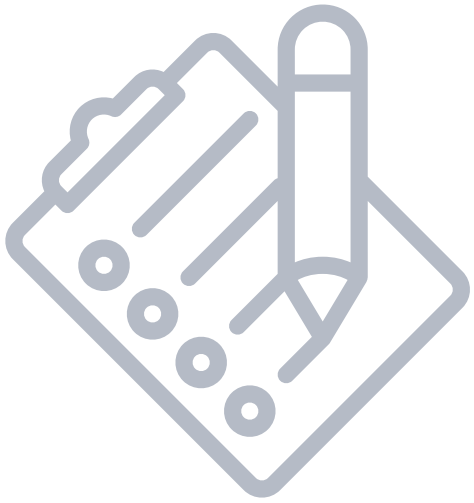
The rapid sanitation situation assessment for the selected towns was carried out using Situation Assessment Tool and Financial Assessment Tool from AIT's Toolkit. The tools have been described in detail and critiqued in Annexure 3. Apart from the tools, secondary data and primary data from the Urban Local Bodies and multiple other stakeholders was gathered to shed light on the towns' growth, demography, layout, services provided, economy, financial health and climatic conditions.

Data collected through the tools enabled us to assess the town's demography, overall sanitation situation along the various stages of the sanitation value chain, assess awareness of the staff in each ULB as well as the residents, financial health of the ULB, and any further issues typical to the towns.

Table 1: Data Collection Methodology

DATA COLLECTED	RESPONDENT
I. Secondary Data	
a. Service Level Benchmark Data	Urban Local Body, PHED Data
b. Master Plan of the Town	
c. Budget Summary	
d. Urban Development Tax Demand and Collection	
e. Ward Map of the town as prepared under Election Commission	
f. Swachh Bharat Mission Progress Report	
g. Water Supply Data and Water Connections	
II. Primary Data	
a. Situation Assessment Tool	ULB, PHED
b. Financial Assessment Tool	Desludging Service Provider
c. Typology of Containment Systems	Mason
d. Desludging Services	Desludging Service Provider
e. Household Survey	Residents of the Town
f. Observations on Field	Surveyor






2017

3

RAJASTHAN: A BROAD OVERVIEW

3.1 Demography

Rajasthan is a state in the north-western part of India. The state covers an area of 3,42,239 Sq. Km. or 10.41% of the total geographical area of India. It is the largest Indian state by area. Population of Rajasthan as per the Census 0f 2011 is 6,85,48,437 of which 24.9% reside in the urban areas. Rajasthan is the 7th largest state by population, comprising 190[6] municipal bodies spread across 33 districts.

3.2 Climate

Rajasthan is predominantly arid and semi arid, however we see wide variation in the climate in some parts of the state. The northern tip has fertile lands and ample water for agriculture and south western part of the state is hilly , wetter and more fertile too. On average winter temperatures range from 8° to 28° C and summer temperatures range from 25° C to 46° C. Average rainfall also varies; the western deserts accumulate about 100 mm annually while the south eastern part of the state receives 650 mm most of which falls from July through September during the monsoon season.

3.3 Administrative Divisions and Coverage under Swachh Bharat Misssion

Rajasthan is divided into 33 districts spread across 7 administrative divisions.
Out of the 190 Urban Local Bodies in Rajasthan, only 28 cities are eligible for funding under AMRUT[7], 4 of which are also covered under the SMART City[8] Mission, while one of the four is being covered under HRIDAY[9] scheme also.

Table 2: Districts of Rajasthan

S. NO.	DIVISION	DISTRICT
1.	Jodhpur	Barmer, Jaisalmer, Jalore, Jodhpur, Pali, Sirohi
2.	Bikaner	Bikaner, Churu, Sri Ganganagar, Hanumangarh
3.	Jaipur	Alwar, Dausa, Jaipur, Jhunjhunun, Sikar
4.	Ajmer	Ajmer, Bhilwara, Nagaur, Tonk
5.	Bharatpur	Bharatpur, Dholpur, Karauli, Sawai Madhopur
6.	Kota	Baran, Bundi, Jhalawar, Kota
7.	Udaipur	Banswara, Chittorgarh, Dungarpur, Rajasmand, Udaipur, Pratapgarh

[6] Number of towns declared by Government of Rajasthan as accessed at http://lsg.urban.rajasthan.gov.in/content/raj/udh/lsg-jaipur/en/home.html on 05.05.2017
[7] AMRUT- Jaipur,Jodhpur, Kota, Bikaner, Ajmer, Udaipur, Bhilwara, Alwar, Bharatpur, Sikar, Pali, Ganganagar, Tonk, Kishangarh, Hanumangarh, Beawar, Dhaulpur, Sawai Madhopur, Churu, Gangapur City, Jhunjhunun, Baran, Chittaurgarh, Hindaun, Bhiwadi, Bundi, Nagaur, Sujangarh.
[8] Smart City- Jaipur, Udaipur, Kota, Ajmer
[9] HRIDAY- Ajmer

Rajasthan is categorised into 10 agro-climatic zones as shown below:

Table 3: Agro-Climatic Zones of Rajasthan (Hussain, 2015)

S. NO.	ZONE	RAINFALL (mm)	SOIL TYPE	DISTRICTS
1.	IA- Arid Western	200 – 370	Desert soil and sand	Barmer, Jodhpur
2.	IB-Irrigated North Western Plain	100 – 350	Alluvial Deposits	Sri Ganganagar, Hanumangarh
3.	IC-Hyper Arid Partial Irrigated Western Plain	100 – 350	Desert soils and sand	Bikaner, Jaisalmer, Churu
4.	IIA- Transitional plain of inland drainage	300 – 500	Sandy loam	Nagaur, Sikar, Jhunjhunun
5.	IIB-Transitional Plain of Luni Basin	300 – 500	Red desert soil	Jalore, Pali, Sirohi
6.	IIIA-Semi Arid Eastern Plain	500 – 700	Alluvial and brown soil	Jaipur, Ajmer, Dausa, Tonk
7.	IIIB- Flood Prone Eastern Plain	500 – 700	Alluvial prone to water logging	Alwar, Dholpur, Bharatpur, Sawai Madhopur, Karauli
8.	IVA-Sub humid southern eastern plain and Aravalli hills	500 – 900	Alluvial	Bhilwara, Rajsmand, Chittorgarh
9.	IVB-Humid southern plain	500 – 1100	Reddish medium textured well drained	Dungarpur, Udaipur, Banswara, Pratapgarh
10.	V-Humid South Eastern Plain	650 – 1000	Black of alluvial origin	Kota, Jhalawar, Bundi, Baran

RAJASTHAN

AGRO-CLIMATIC ZONES

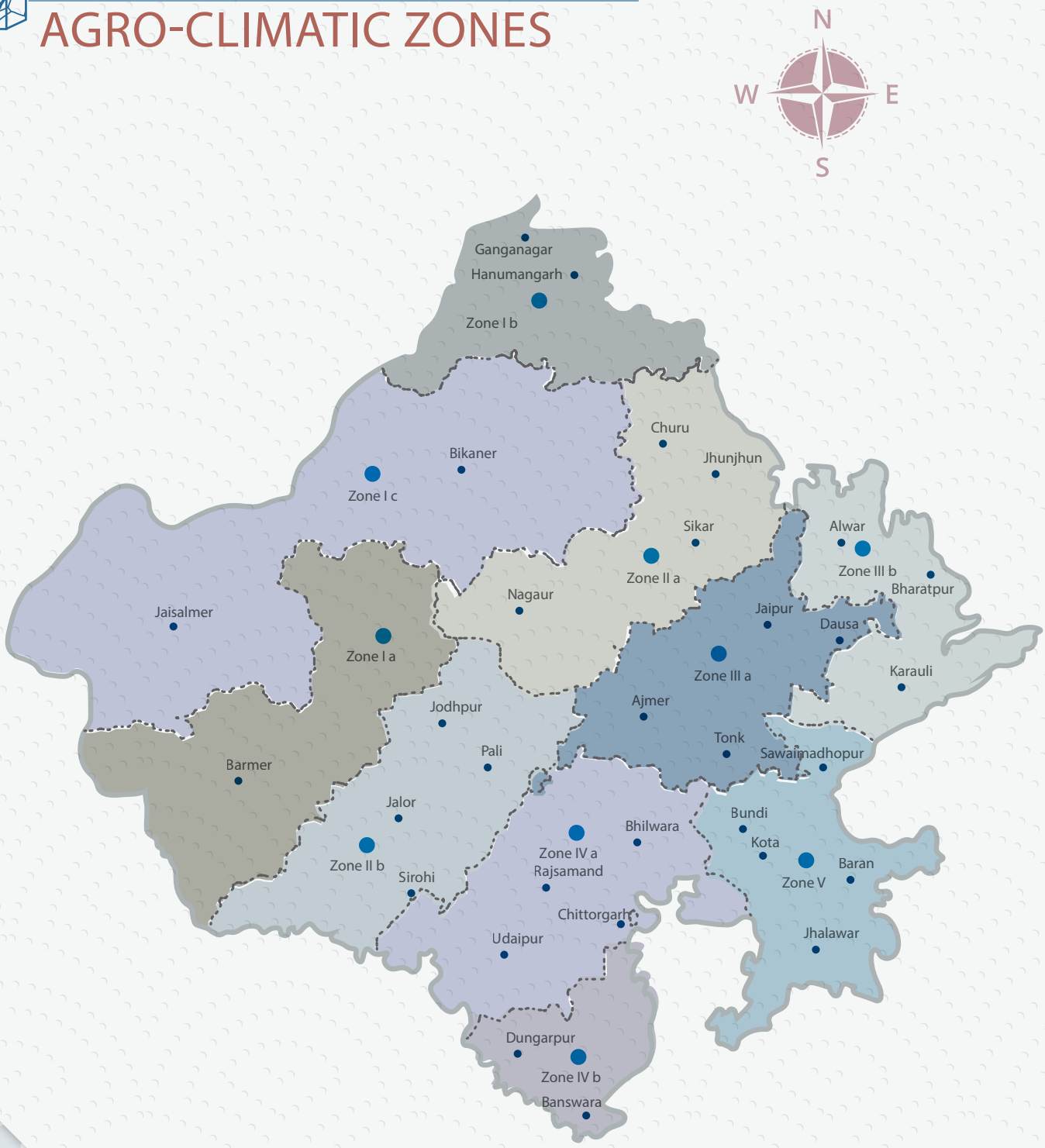


Figure 2: The Ten Agro-Climatic Zones in Rajasthan

HYDROGEOLOGY MAP

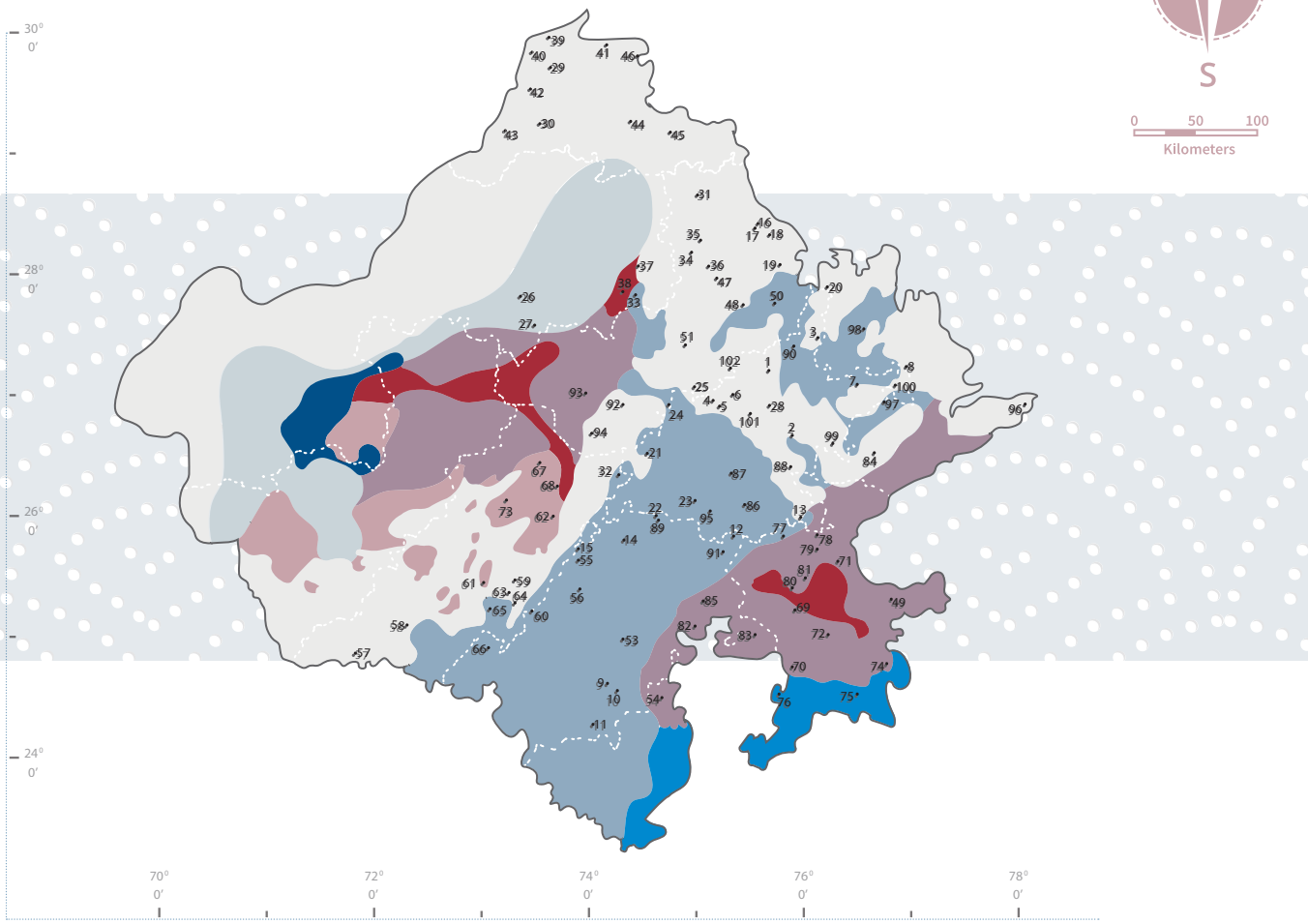


Figure 3: Hydrogeology Map

SOIL TYPE	MBGL	RESTRICTED TO
Unconfined to confined aquifers	Down to	
Alluvium, sand, silt clay	330	
Sandstone, shale & siltstone	390	
Laathi sandstone	440	
Basalt (with or without intrertrappen)	150	Vesicular zones, fractures and weathered mantle
Sandstone & shale	375	

SOIL TYPE	MBGL	RESTRICTED TO
Unconfined to semiconfined aquifers	Down to	
Limestone and dolomite	284	Caverns, fractures and weathered mantle
Quartzite, slate, phyllite, schist and gneiss	150	Fractures and weathered mantle
Unconfined aquifers		
Granite and rhyolite	80	Fractures and weathered mantle

3.5 Status of Groundwater

Nearly 40% of the state is composed of hard rocks. According to the latest assessment of the Dynamic Ground Water Resources which was jointly carried out by the Central Ground Water Board and the State Government in 2011, 88.9% of the assessed units in Rajasthan were either in the over-exploited, critical or semi-critical state (Dubbudu, 2016). According to NASA satellite imagery data, the groundwater levels in northern parts of Rajasthan have been declining at the rate of 33 cm per year over the past decade (Times of India, 2013). The status of groundwater development in Rajasthan stands at 125% (Central Ground Water Board, 2015) compared to 58% (Central Ground Water Board, 2016) at the national level which implies that the annual groundwater consumption is more than the annual groundwater recharge. Preventing pollution of scarce groundwater by Faecal waste through the deep unlined toilet pits and septic tanks, is therefore a major challenge for the state.

DEPTH TO WATER LEVEL MAP OF RAJASTHAN

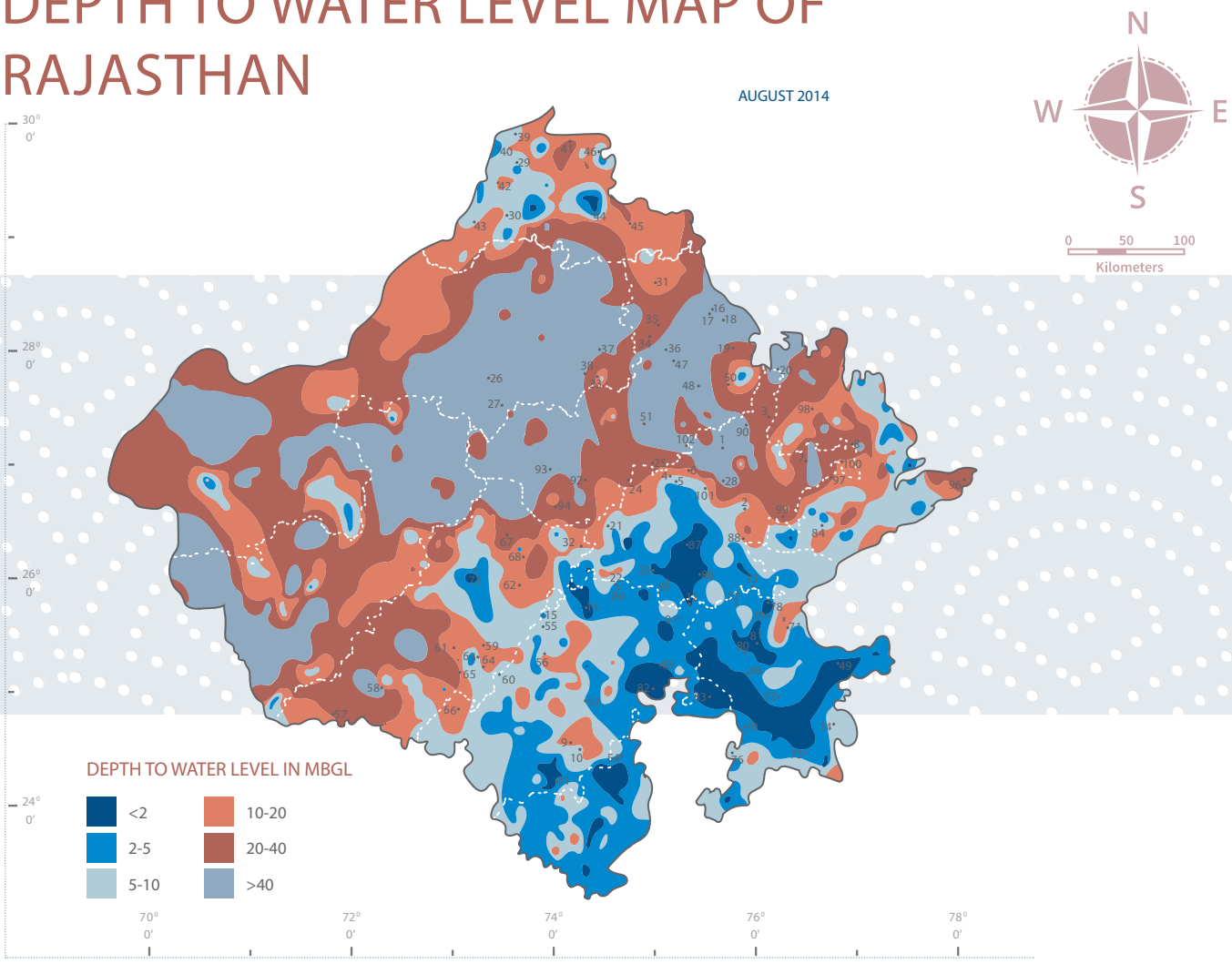


Figure 4: Depth to Ground Water Level Map of Rajasthan - August, 2014

3.6 Water Supply

Rajasthan, spread over 3.42 lakh sq. km (about 10% of the total land area in India) has less than 1% of the total quantity of fresh water available in India. The 14 major river basins divided into 59 sub basins in the state are rain fed. According to the Water Policy (2016) of Rajasthan the order of water allocation priority is drinking water, irrigation, power generation and industries and other uses in that order (Government of Rajasthan).

The primary source of water supply are the 231 big and small reservoirs (India WRIS, 2016) on various river stretches. This is augmented by the numerous tube wells owned by the individual Public Health and Engineering Departments in each town. Rajasthan Government has made collection and conservation of rainwater compulsory for all public buildings and establishment and all properties in plots occupying area more than 500 m^2 in urban areas. The respective town PHEDs have installed RO stations for drinking water provisioning.

With increasing population and water demand for various purposes, the State is heading towards absolute water scarcity. According to a World Bank report on Urban Water Supply and Sanitation services, Rajasthan has the least availability of water and the least reliable supply. As per PHED data, 76% of the urban population among Indian states is covered through individual connections. Per capita availability is estimated at less than 80 LPCD. The benchmark set for water supply nationally is 135 LPCD. Only 23 towns have a service level above 100 LPCD. (The World Bank, Ministry of Urban Development, India, 2012). A study conducted in district headquarters of Rajasthan revealed poor water quality with low levels of essential minerals such as Iron, Calcium and Magnesium and high level of harmful elements such as chromium, and fluoride in water provided at public sources such as the railway station and bus stands indicating the need of intervention in this aspect also (Saurabh, et al., 2014).

4

RAJASTHAN: URBAN SANITATION SITUATION

4.1 Status of Toilet Coverage

The Swachh Bharat Mission promises 66,42,221 HH toilets based on the actual on ground survey in urban India, and around 3,93,767 have to be constructed in Rajasthan (6%)[10] until the year 2019. 81,466 units of Individual Household Latrines and 3,540 Community and Public Toilets have already been completed. Rajasthan is among the five states that require acceleration for reaching Open Defecation Free Status. The total funding assistance from the Central Government for Rajasthan is Rs.341.99 Cr for construction of Individual Household Latrines, Community Toilets, Public Toilets and other soft components like IEC for behaviour change (Swachh Bharat Urban).

4.1.1 Wastewater Generation and Treatment

A total of 189 towns and cities of Rajasthan generate approximately 1707 MLD wastewater. Only 31 towns and cities have 63 Sewage treatment plants with a treatment capacity of 866 MLD sewage. However, according to CPCB, the STPs treat around 95 MLD of sewage which is 23% of the total sewage generated in 189 cities and towns.[11] The favoured technologies in the STPs are MBBR, ASP, WSP, SBR, Anaerobic & Facultative ponds, UASBR, UASB, WSP and FAB (CPCB, 2015). There is zero treatment and safe disposal of faecal waste in the non AMRUT towns of the state, although new investments are being made under RUIDP and RUDSICO for sewerage systems for towns above 50,000 population.

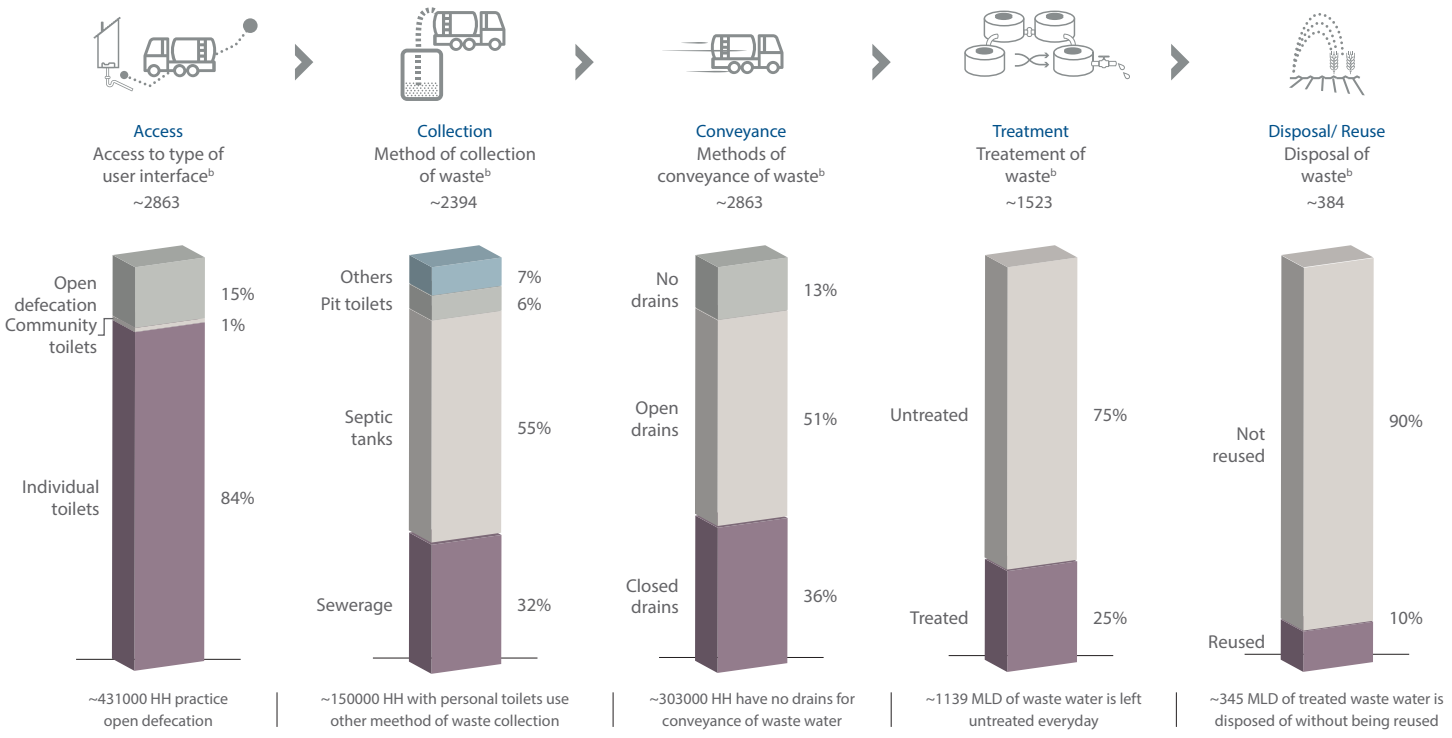


Figure 5: Significant Gaps exist across the Sanitation Value Chain in Urban Rajasthan (Source: CEPT)

Number of ULBs[a] : 185

[10] The Swachh Bharat Mission promises 1.04 crore IHHL's which is the central mission targets as per the Census 2011 data out of which 5,62,524 are to be made in Rajasthan alone (5.4%). (Accessed at http://www.swachhbharaturban.in/sbm/home/#/SBM on 29.4.2017)

[11] Total Population- 1,58,07,765, Water Supply Rate: 135 LPCD, Total Water supplied= 1,58,07,765*135 = 2,13,40,48,275 liters/day WW generated= 0.80* 2,13,40,48,275 liters/day = 1,70,72,38,620 liters of WW WW= 1707.2 MLD, Actual Treated- 394.5 MLD (23%)

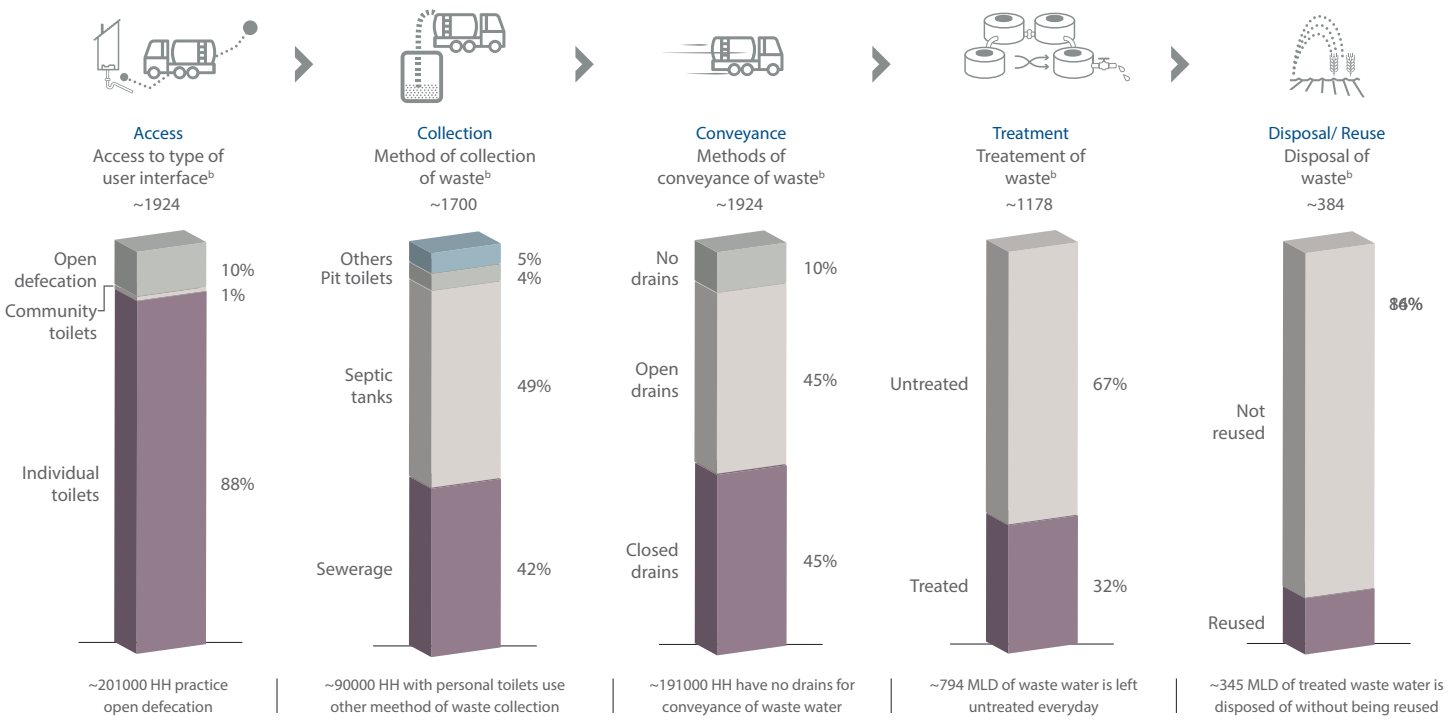


Figure 6: Significant Gaps exist across the Sanitation Value Chain: AMRUT cities of Rajasthan (Source: CEPT)

Number of ULBs[a] : 29

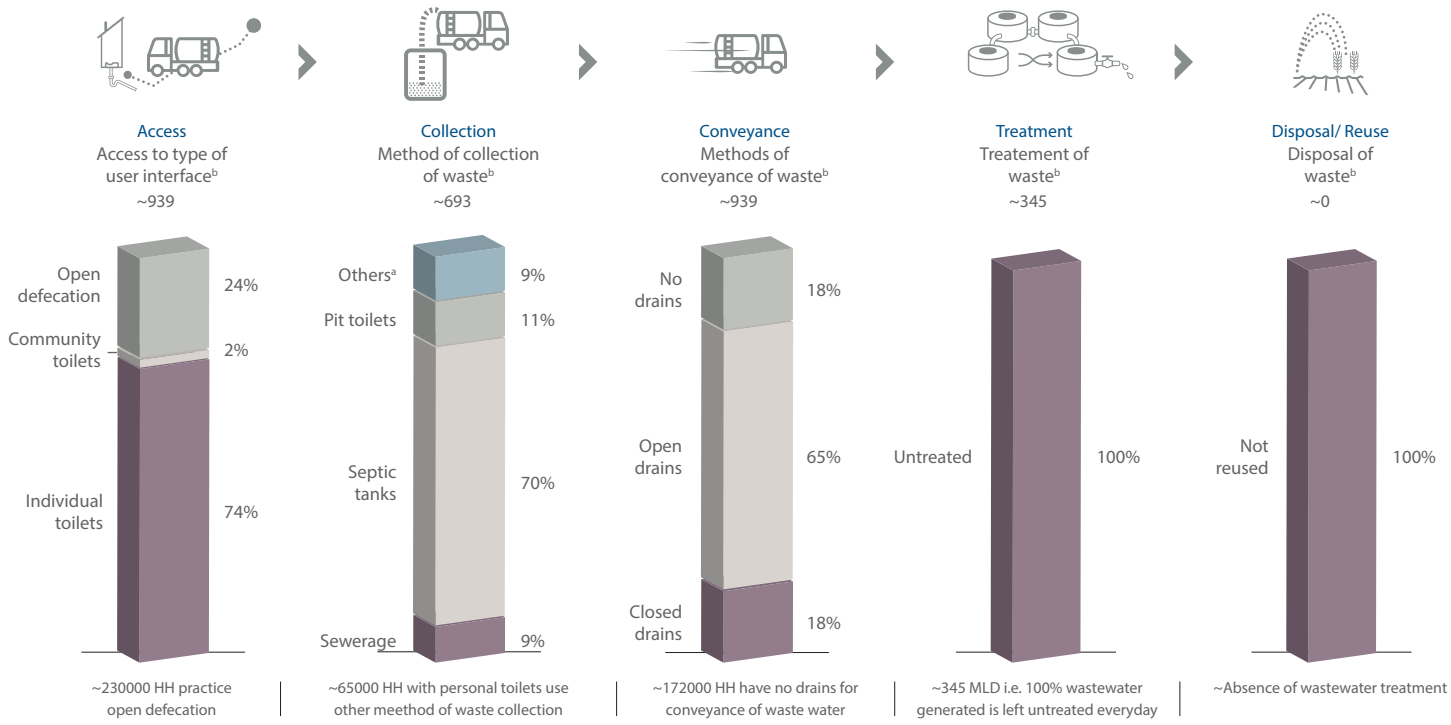


Figure 7: Significant Gaps exist across the Sanitation Value Chain: Non-AMRUT cities of Rajasthan (Source: CEPT)

Number of ULBs[1] : 165

Source: [a] Census 2011 – Tables on Households Amenities | [b] CEPT Analysis using information from (i) Draft Note on State Sewerage & Waste Water Policy 2015, Department of Local Self Government, Government of Rajasthan (http:// www.ruifdco.rajasthan.gov.in/Content/Water_Policy_Draft_CMAR_06102015.pdf) (ii) Inventorization of sewage treatment plants, Central Pollution Control Board 2015 (http://www.cpcb.nic.in/upload/NewItems/NewItem_210_Inventorization_of_Sewage-Treatment_Plant.pdf) ; (iii) Service Level Benchmarking Gazette Notification 2013-14, (http://cmar-india.org/Downloads.aspx?id=13)

4.1.2 Status of Sewerage Coverage

Out of the 3.4 million plus households that make up urban Rajasthan, 24% are connected to the underground drainage system, while 67% are still dependent on on-site sanitation systems. 9% of these households do not have access to any form of toilet facilities and thus resort to open defecation or the toilets are directly connected to open drains. Only about 11% of sewage gets transported and effectively treated. The remaining 89% is dumped into water bodies, onto agricultural land or in the domestic environment. The absence of post-toilet infrastructure poses a huge risk to public health and the environment at large.

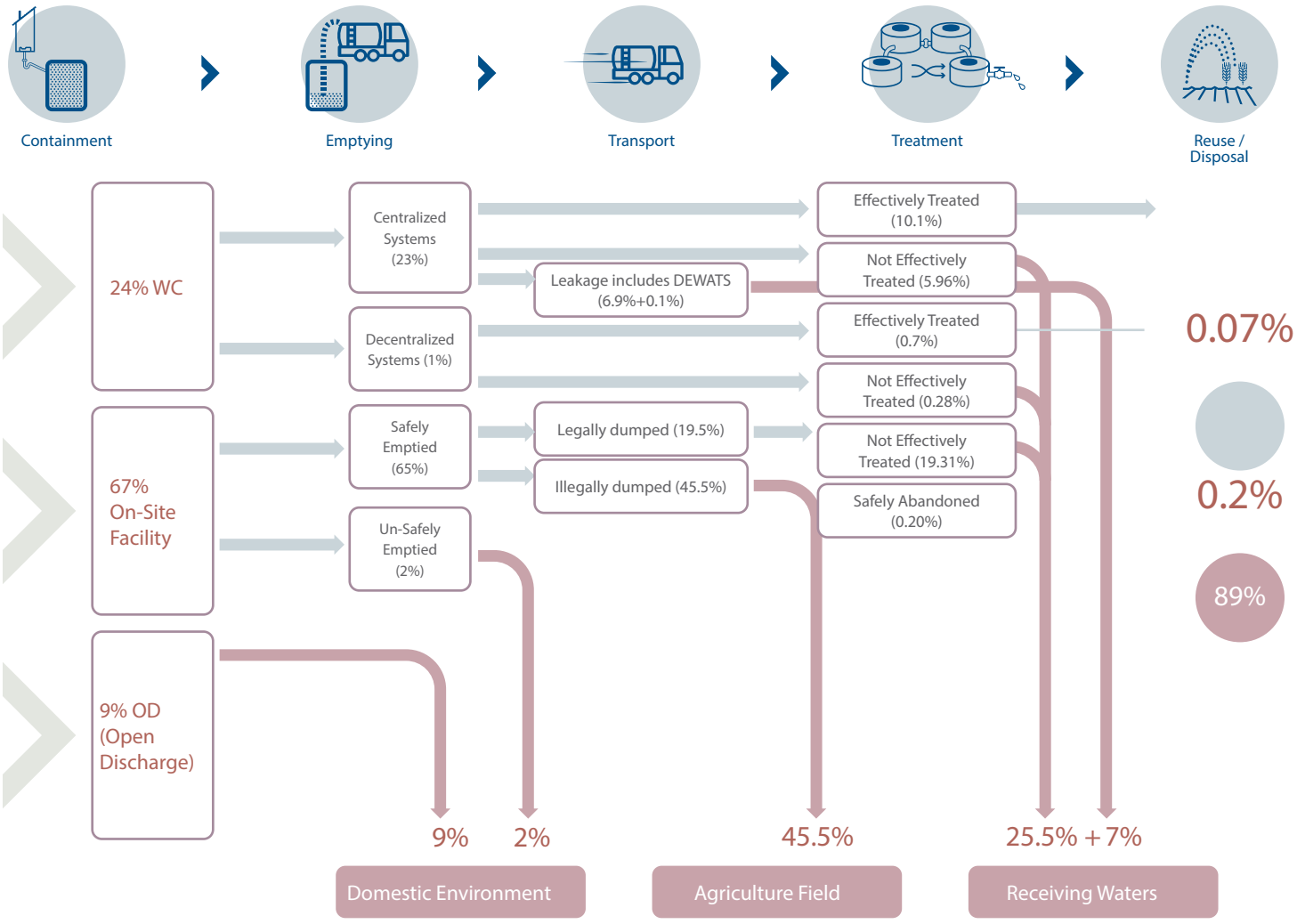


Figure 8: Shit Flow Diagram for Urban Rajasthan (2016)

According to the Census 2011, only 2 cities in Rajasthan had more than 50% underground drainage system coverage. Both of them have a population more than a million. Figure 9 below has been computed based on the data from Census 2011. Figure 10 shows an updated version of the above, based on the data available from the State Sewerage and Wastewater Policy passed by Rajasthan in 2016. The situation has improved marginally, only 2 more towns in the last 6 years have more than 50% drainage network coverage, with population between 50,000 to 1 Lakh, indicative of more attention being paid to larger cities (Department of Self Governance, Rajasthan, 2016).

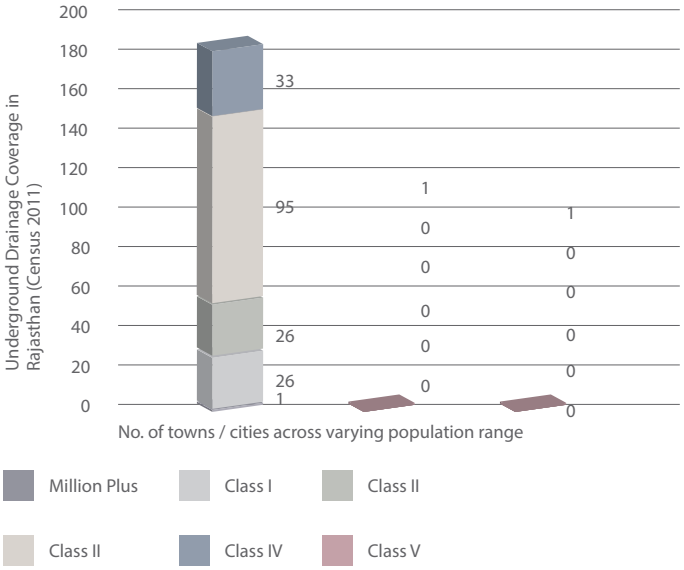


Figure 9: Underground Drainage Coverage in Rajasthan (Census 2011)

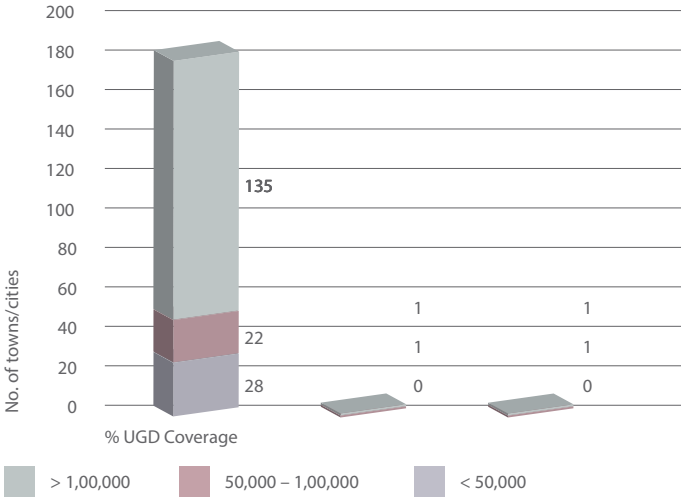


Figure 10: Current Underground Drainage Coverage in Rajasthan (Source: State Sewerage and Waste Water Policy 2016)

4.2 Sanitation Schemes and Policies at State level

The State Sewerage and Waste Water Policy, 2016 aims to ensure 100% sanitised cities and better management of wastewater and sewerage with a pointed focus on reuse. The document also indicates the state's intention to improve water supply and reduce use of potable water for non-drinking purposes.

The policy document encourages making of City Sanitation Plans for 30 years or at least 5 years as per guidelines provided in the Manual on Sewage Treatment Systems (MoUD, GoI, 2013) and SBM guidelines. Treated wastewater is encouraged for use specifically for irrigation and for other purposes, if deemed fit as per WHO guidelines. Septic tanks are to comply with CPHEEO standards in urban areas and particular attention is to be paid to protection of groundwater.

The policy clearly outlines how sewage treatment related projects will be prioritised. Cities with water supply equal to or greater than 135 LPCD, district headquarters, towns with heritage sites, tourist attractions or important water bodies and cities with population over 50,000 will be prioritised for such projects. There is no attention given to the environmental vulnerability of towns when it comes to prioritising them for sewage treatment. Criteria for suitable on-site sanitation systems are also specified in the document for cities not eligible for sewerage facilities depending on the substrata, water absorption capacity of the soil, space availability and social acceptability. Off-site sanitation is prescribed in the policy, keeping in mind prerequisites such as a minimum of 135 LPCD water supply for adequate sewerage flow, which, as will be seen in coming sections, is not achievable in majority of urban spaces in Rajasthan. Decentralised sewage treatment has been recommended for high rise buildings, but no such recommendations have been made for cities which cannot meet the criteria for centralised sewage treatment or offsite treatment of sewage. The stress on reuse of wastewater is commendable.

The policy also promotes self-sustainability of systems to achieve the objectives of the policy, with broad suggestions for achieving the same in towns and cities already under financial constraints which the policy also recognises. Involvement of private parties is also welcomed by the policy to improve effectiveness, efficiency

and financial stability of the systems. The policy states that recovery of O&M costs of sewerage systems would be entirely from the consumers.

With the increase in toilets by at least 15%, the amount of faecal sludge collected will also increase by approximately 30%[12]. The policy proposes treatment of all the waste that is generated.

Assessments need to be done for the OPEX challenges of the currently functional Sewerage Treatment Plants in the large towns and cities, as well as for the new STPs that are being set up under RUIDP and RUDSICO for smaller towns.

4.3 Governance and Institutional Status

The Department of Local Self Government, Jaipur is the nodal agency for administration of Urban Local Bodies. They coordinate, monitor and evaluate the performance of the ULBs. They also oversee the financial performance and requirements of the ULBs. Water Supply and Sewerage is covered in towns by the Public Health and Engineering Department (PHED). The Urban Local Body, according to Rajasthan Municipalities Act, 2009 (amended in 2010) is responsible for providing proper sanitation arrangements for the area under its jurisdiction for maintaining good public health, in a town/city and for protecting the environment.

At the state level, parastatal bodies like Rajasthan Urban Drinking Water Sewerage & Infrastructure Corporation (RUDSICO) and Rajasthan Urban Infrastructure Development Project (RUIDP) work for infrastructure development of urban Rajasthan. RUDSICO is the State Level Nodal Agency (SLNA) for projects funded by Govt. of India like AMRUT, Smart City, UIDSSMT, UIG, Eleven City Sewerage and the projects funded by the State Government like ROB-RUB, Smart Raj, Seven Cities Sewerage and Affordable Housing. RUIDP is a special purpose vehicle supported by Government of India and Asian Development Bank, which aims to enhance the capacities of urban local bodies (ULBs) and create awareness among communities for effective participation.

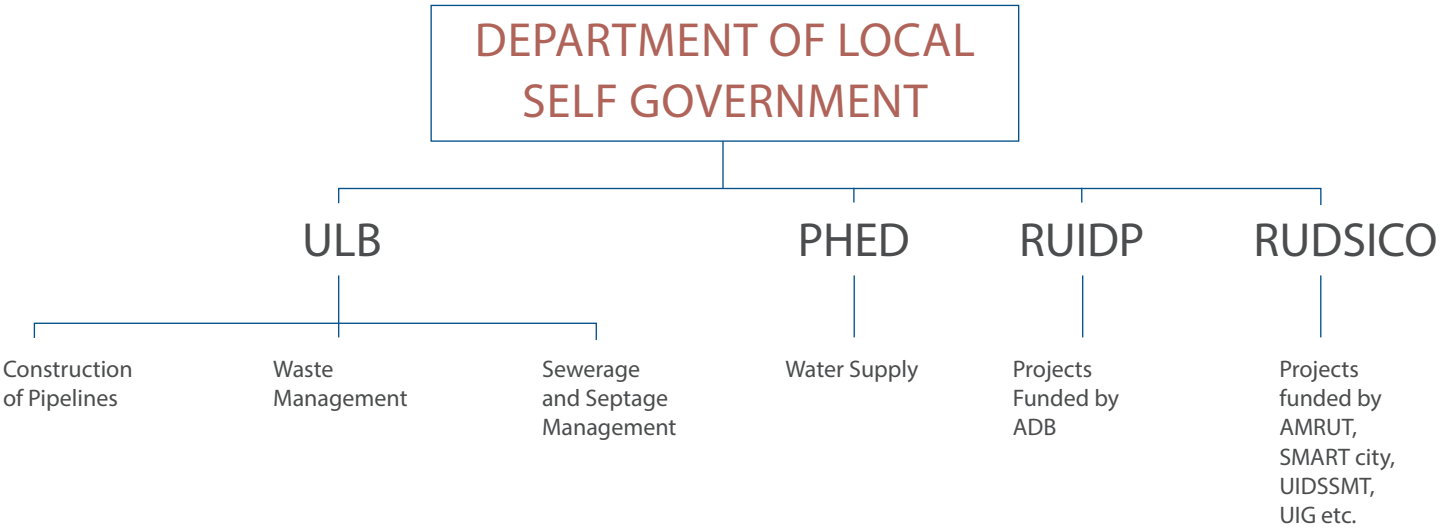


Figure 11: Governance of Sanitation Issues in Urban Rajasthan

[12] Year 2011: Population- 1,58,07,765, Number of HH- 28,63,817, Sewerage coverage- 27%, HH having septic tanks- 13,14,362 (45.8%), HH having pits- 2,15,578 (7.5%) FS Generation= (0.458*Pop*0.00021)+(0.075*Pop*0.00018)= 1,733.79 cum/day Year 2019: Assuming no change in population, Sewerage Coverage- 32.9% (If we take the SBM numbers as absolute and consider that the remaining will be connected by the UGD), HH having Septic tanks- 13,14,362 + 393767(SBM Target)= 17,08,123 (59.6%), HH having pits- 2,15,578 (7.5%) FS Generation = (0.596*Pop*0.00021)+(0.075*Pop*0.00018)= 2,191.8 cum/day

Table 4: Sources of Funds for Sanitation Services (Department of Local Self Government, Rajasthan, 2016)

Fund Source	No. of Towns	Fund Source	No. of Towns
UIDSSMT	23	JMC	1
AMRUT	25	RIICO	1
NCRPB	15	RHB	1
Smart City	3	JNNURM	1
UIT	1	JoDA	1
ULB	1	JoMC	1
RUIDP	58	Heritage Projects	1
State Fund	6	Own Resources	101
JDA	1		

4.4 Finance for Sanitation Projects

Funding for water and sanitation has seen a sharp rise in the recent budgets. In FY 2016-2017, 16% of the INR 7474 Cr earmarked for Housing and Urban Development was for infrastructure of sanitation and water and sewage treatment projects. The 16% consists of funding through programs like SBM, AMRUT, UIDSSMT apart from the funds allocated for building sewage treatment plants and water treatment projects. This was a sharp jump as compared to the 2% apportioned for sanitation through SBM and water treatment projects out of the funds earmarked for Housing and Urban Development in the last FY 2015-2016.

The Draft State Sewerage and Waste Water Policy (SSWWP) of 2015, estimated fund requirement for Sewerage and Water Supply Sectors at Rs.19,000 crore, out of which Rs.12,000 crore was for Sewerage sector and Rs.7,000 crore for Water Sector. Out of a total of 189 towns listed in the SSWWP of Rajasthan, 41 towns have multiple sources of funding for sewerage related projects, while 101 have no source of funding at all. All these 101 towns lie in the less than 50,000 population bracket. The criteria for such programs and grants are often linked to the size of the city, water supply limit (100 LPCD Minimum) and historical and political significance of an urban area.

The policy prescribes service level benchmarks to be achieved by the towns, with specific timelines, targeted for cities and towns based on their political significance and population. The timeline for district headquarters is 5 years; for heritage towns, towns with population more than a lakh and between 50,000 to a lakh is 10 years. For all towns less than 50,000 population, this timeline is 15 years. 70.2% of the urban centres in Rajasthan have a population of less than 50,000 with 22% of the total population residing in them. The 15-year timeline for these cities makes the policy weak, and reduces pressure on the state to achieve any of the benchmarks mentioned in the Policy.

Table 5: Service Level Benchmarks to be Met According to SSWWP, 2016

S. NO.	PROPOSED INDICATOR	BENCHMARK
1.	Coverage of toilets	100%
2.	Coverage of sewage network services	100%
3.	Collection efficiency of sewage network	100%
4.	Adequacy of sewage treatment capacity	100%
5.	Quality of sewage treatment	100%
6.	Extent of reuse and recycling of sewage	20%
7.	Efficiency of redressal of customer complaints	80%
8.	Extent of cost recovery in sewage treatment	100%
9.	Efficiency in collection of sewage charges	90%

Further analysis of the financial situation revealed that the revenue generation capacity of the ULBs is very poor. ULBs in Rajasthan are largely dependent on transfers and grants from state or central government, mainly on octroi compensation grants (67%), central and state finance commission grants, and state's general and specific purpose grants. The major component of their own revenue is non-tax revenue (82%) property tax which has been redefined as urban development tax contributes only 6% of their own revenue.

Table 6: Composition of Revenue of all ULBs of Rajasthan from Different Sources

HEAD OF REVENUE	2005 - 06	2006 - 07	2007 - 08	2008 - 09	2009 - 10
Own Revenue	19.58	20.12	16.85	16.05	18.56
Transfers and Grants	80.42	79.88	83.15	83.95	81.44
Revenue Income	100.00	100.00	100.00	100.00	100.00

Source: 4th State Finance Commission Report

City/Town	Funding
Alwar	AMRUT
Bhilwara	AMRUT
Jhunjhunu	UIDSSMT I
Karauli	RUIDP II
Kota	AMRUT
Mount Abu	UIDSSMT I
Abu Road	RUIDP IV
Ajmer	RUIDP I
Ajmer	JNNURM
Ajmer	Smart Cities
Ajmer	AMRUT
Ajmer	NRCB

City/Town	Funding
Alwar	RUIDP II
Alwar	NCRPB
Badi	RUIDP IV
Balotra	State Fund
Balotra	RUIDP IV
Bandikui	RUIDP IV
Banswara	State Fund
Banswara	RUIDP IV
Baran	AMRUT
Bari Sadri	UIDSSMT (T)
Barmer	RUIDP II
Barmer	RUIDP IV

City/Town	Funding
Bayana	NCRPB
Beawar	AMRUT
Behror	NCRPB
Bhadra	UIDSSMT (T)
Bharatpur	RUIDP II
Bharatpur	AMRUT
Bharatpur	NCRPB
Bhilwara	RUIDP III
Bhiwadi	AMRUT
Bhiwadi	NCRPB
Bhusawar	NCRPB
Bikaner	RUIDP I

Table 7: Towns and Cities with Sources of Funding

City/Town	Funding
Bikaner	RUIDP III
Bikaner	UIDSSMT I
Bikaner	AMRUT
Bundi	RUIDP II
Bundi	AMRUT
Chirawa	UIDSSMT (T)
Chittorgarh	RUIDP II
Chittorgarh	AMRUT
Chomu	RUIDP IV
Sambhar	RUIDP IV
Sardarshaher	RUIDP IV
Sardarshaher	UIDSSMT I
Sawai Madhopur	RUIDP II
Sawai Madhopur	RUIDP III
Udaipur	Smart Cities
Udaipur	AMRUT
Udaipur	UIT
Udaipur	NLCP
Churu	RUIDP II
Churu	AMRUT
Dausa	RUIDP IV
Deeg	RUIDP IV
Deeg	NCRPB
Dholpur	RUIDP II
Dholpur	AMRUT
Didwana	State Fund
Didwana	RUIDP IV
Dungarpur	RUIDP IV
Fatehnagar	UIDSSMT (T)
Fatehpur	State Fund
Fatehpur	RUIDP IV
Gangapur City	AMRUT
Hanumangarh	RUIDP III
Hanumangarh	UIDSSMT I
Hanumangarh	AMRUT
Hindon City	AMRUT
Jaipur	RUIDP I
Jaipur	JDA
Jaipur	JMC
Jaipur	RHB
Jaipur	RIICO
Jaipur	JNNURM
Jaipur	Smart Cities
Jaipur	AMRUT
Jaisalmer	RUIDP II
Jaisalmer	RUIDP IV
Jaitaran	UIDSSMT (T)
Jalore	RUIDP IV
Jalore	UIDSSMT I
Jhalawar	RUIDP II
Jhalawar	RUIDP IV
Jhalawar	AMRUT
Jhalrapatan	RUIDP IV
Jhalrapatan	UIDSSMT I
Jhunjhunu	RUIDP III
Jhunjhunu	AMRUT
Jobner	RUIDP IV
Jodhpur	RUIDP I
Jodhpur	UIDSSMT I
Jodhpur	AMRUT
Jodhpur	JoDA
Jodhpur	JoMC
Sawai Madhopur	AMRUT
Sikar	AMRUT
Sirohi	RUIDP IV
Sri Dungargarh	RUIDP IV
Sriganganagar	State Fund
Sriganganagar	RUIDP III
Ware	NCRPB
Kaman	RUIDP IV
Kaman	NCRPB
Karauli	RUIDP IV
Khairthal	NCRPB
Kherli	NCRPB
Khetri	RUIDP IV
Kishangarh	UIDSSMT I
Kishangarh	AMRUT
Kishangarh Bas	NCRPB
Kota	RUIDP I
Kota	RUIDP III
Kota	UIDSSMT I
Kota	Smart Cities
Kota	NRCB
Kuchaman	RUIDP IV
Kumher	NCRPB
Kushalgarh	UIDSSMT (T)
Ladnu	RUIDP IV
Laxmangarh	RUIDP IV
Laxmangarh	UIDSSMT (T)
Makrana	State Fund
Makrana	RUIDP IV
Mandawa	RUIDP IV
Mount Abu	RUIDP III
Nadbhai	NCRPB
Nagaur	NCRPB
Nagaur	RUIDP II
Nagaur	AMRUT
Nathdwara	State Fund
Nawalgarh	RUIDP IV
Nawalgarh	UIDSSMT (T)
Nimbheda	RUIDP IV
Nimbheda	UIDSSMT (T)
Nokha	RUIDP IV
Pali	RUIDP III
Pali	UIDSSMT I
Pali	AMRUT
Pilibanga	RUIDP IV
Pratapgarh	RUIDP IV
Rajasmand	RUIDP II
Rajasmand	RUIDP IV
Rajgarh	RUIDP IV
Rajgarh	NCRPB
Ramghar Shekhawati	UIDSSMT (T)
Ratangarh	RUIDP IV
Sriganganagar	AMRUT
Sujangarh	AMRUT
Sumerpur	UIDSSMT I
Suratgarh	RUIDP IV
Suratgarh	UIDSSMT (T)
Tijara	NCRPB
Tonk	RUIDP III
Tonk	AMRUT

Table 8: Fund Amount Allocated Under Various Schemes

FUNDING SCHEME/ PROGRAM	FUNDS ALLOCATED	REMARKS
RUIDP Phase I	INR 1854 Cr.	INR 1085 Cr. contributed by ADB and INR 769 Cr. contributed by both State and ULB
RUIDP Phase II	INR 2509.45 Cr.	INR 1756.61 Cr. contributed by ADB and INR 752.83 Cr. contributed by State and other agencies
UIDSSMT Phase I UIDSSMT (T)	INR 250.91 Cr.	INR 200.73 Cr. contributed by Government of India, INR 25.09 Cr. contributed by State and INR 25.09 Cr. borne by ULB
JDA	INR 66.32 Cr.	Funds earmarked for sewerage and drainage related works. This value is the total expenditure up to June 2015.
JMC	INR 1715.90 Cr.	Proposed funds for the financial year 2017-18. This proposed budget is for all city development works.
JNNURM	INR 297.89 Cr.	Funds earmarked for sewerage projects in Ajmer-Pushkar and Jaipur.
Smart City	INR 6729 Cr.	Funds for mobility, heritage and tourism, infrastructure, solid waste, water supply, parking, solar rooftop power plant etc.
AMRUT	INR 2294.56 Cr.	Funds for sewerage and septage management projects, updated for 2016-17
NLCP	INR 200.58 Cr.	Sanctioned for 5 lakhs

Analysis of revenue expenditure of ULBs in Rajasthan revealed that expenditure on health and sanitation is the largest expenditure for a ULB. General administration accounts for (25%) of expenditure whereas health and sanitation accounts for (55%) and other major works are street lighting (8%) and maintenance of roads and paths (5%).

However, 70-80% expenditure for health and sanitation can be accounted for salaries of public health and sanitation staff of this department and only 20-30% is for operation and maintenance works. Operation and maintenance works are mainly related to solid waste management and medical expenses. The ULBs expenditure statement does not have a break up of expenditures for septage management. It seems that user charges and expenditure related to septage management are not included in the municipal budgets of Rajasthan.


शौचालय बनवाएं,
स्वच्छता अपनाएं!
अध्यक्ष
श्री तेजपाल सिंधी
न. पा. मण्डल, कुचेरा
दो गड्ढे वाला जलबद्ध शौचालय
उसका
उपयोग करें
शौचालय
बनवाएं
शौचालय निर्माण हेतु आवश्यक जमीन 40 से 60 वर्ग फीट
शौचालय से 30 मीटर के दायरे में सीवर लाईन
उपलब्ध होने की स्थिति में गड्ढो का निर्माण की आवश्यकता नहीं
शौचालय निर्माण योजना का वित्तीय लाभ प्राप्त करने के लिये
नगर पालिका, कुचेरा, जिला-नागौर में सम्पर्क करें
आइये.... हम सब मिलकर अपने क्षेत्र को खुले में शौच से मुक्त बनायें
एवं स्वच्छ राजस्थान के निर्माण में सहभागी बने।
स्वच्छ भारत मिशन (शहरी)
नगर पालिका मण्डल, कुचेरा

5
OVERVIEW OF 100 TOWNS

5.1 General Sanitation Situation of 100 towns in Rajasthan

The 100 cities covered during the survey varied greatly in terms of depth to water level, soil type, and water supply. In all the towns, except two, no wastewater treatment existed (elaborated later in this section).

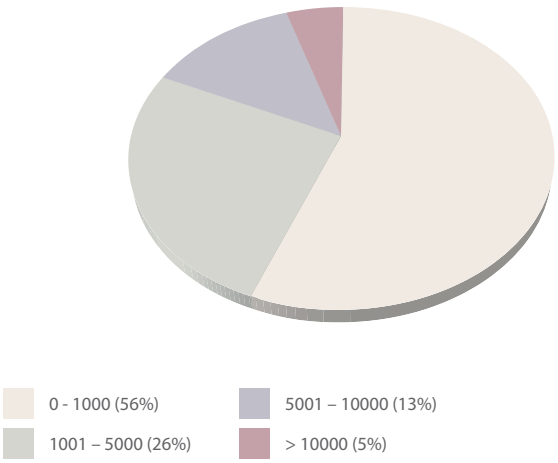


Figure 12: Size of Slum Settlements

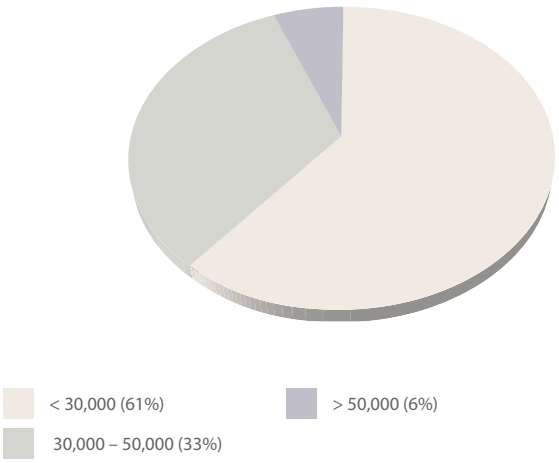


Figure 13: Categorisation of Towns Based on Population Distribution

- The population in the towns surveyed varied from around 8,700 to 81,500.
- The towns had pukka settlements, with slum settlements with less than 1000 population in around 56% of the cities.
- There were exceptions in a few cities where more than 10,000 people were residing in slums, which may require unconventional and customized sanitation solutions, such as Shadulshahr, Antah, Deshnoke and more.

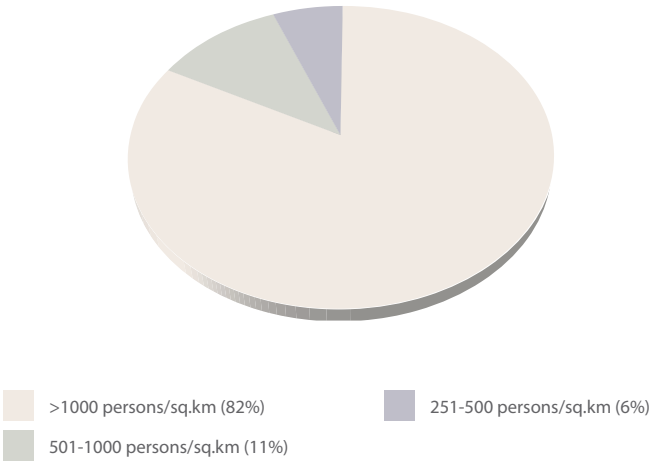


Figure 14: Distribution of Cities Based on Population Density

The towns surveyed also varied in population density.

- The range found was from 490 persons/sq.km. to 10,630 persons/sq.km. The average population density was around 2885 persons/sq.km.
- 82% of the surveyed towns were densely populated with more than 1001 persons per square kilometre. For reference, Jaipur's population density is 6,300 persons/sq.km.

To simplify analysis and presentation of the findings thereof, this section has two parts: General findings are presented for each part of the sanitation value chain in the first part and more pointed and in-depth findings are presented in the later part where the cities are typified and potential solutions are provided for the gaps identified.

5.2 Situation Across the Sanitation Value Chain in 100 Towns

5.2.1 User Interface: Toilets

Progress shown in implementation of Swachh Bharat Mission was more or less consistent across most towns, barring a few exceptions.

- Out of the 100 towns surveyed, 33 claimed to be closing in on ODF status.
- A town is declared ODF by a ULB on complete utilisation of SBM fund or assuming 100% households with access to toilets if toilet construction has begun but not completed in all households.

The next Figure shows distribution of towns on the basis of access to toilets as reported in the service level benchmark of the respective towns.

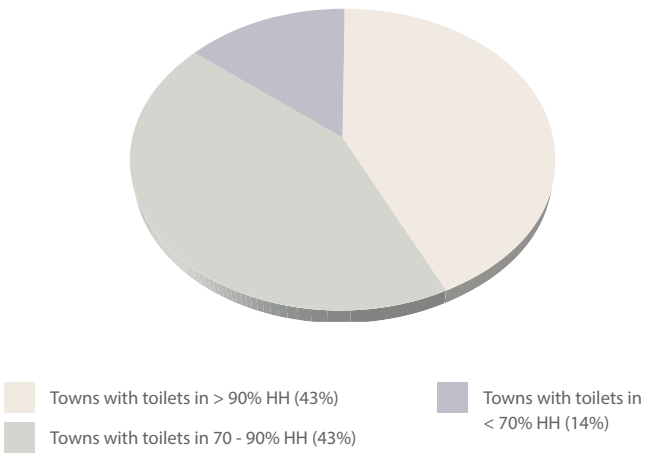


Figure 15:Distribution of Towns on Basis of Access to Toilets

5.2.2 Containment Systems

Toilets built under Swachh Bharat Mission were mandated to have on site sanitation systems, however the design of the OSS varied from town to town. After observing the types of containment systems used we narrowed down the typology to two basic types:

- Lined containment systems
- Unlined containment systems

The various types of containment systems which fall under the two broad categories are shown in Figures 23 and 24. Though the types of containment systems varied (Figures 21, 22), the typology in a town or a cluster of towns in an area usually followed a pattern. More than half the towns had unlined pits as the predominant type of containment system

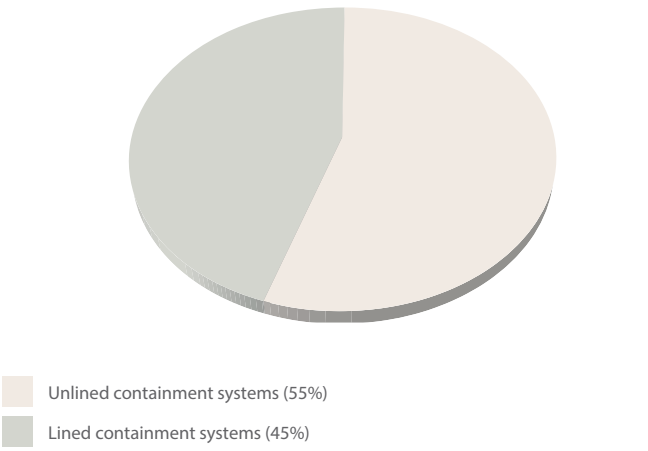


Figure 16: Distribution of Towns Based on Containment System

Figure 17: A Toilet with Cistern, Following the SBM Norms.

Figure 18: Mobile Toilet

Figure 19: Public Toilet with Supernatant from OSS flowing into Open Drain

Figure 20: An Ill-maintained Individual Household Toilet

Typology of Containment Systems in Rajasthan-Unlined Containment Systems (Source: CDD Society)

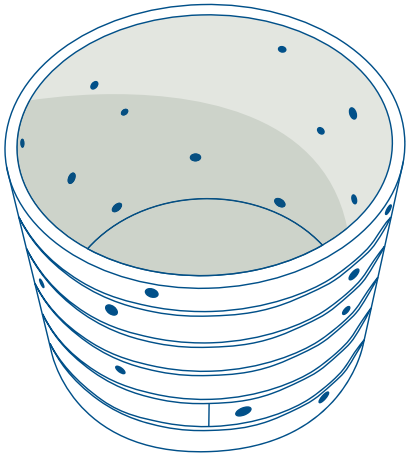


Figure 21: Unlined Single Pit

Shape: Cylindrical / Cuboidal
Construction: Made with Pre-cast concrete rings, stone masonry, brick masonry with staggered holes on side for the passage of water.
Size: Varies from 15 to 30 ft in depth and 1.15 to 2.5 ft in width.
Also known as "Dhamaka Kuin" locally.

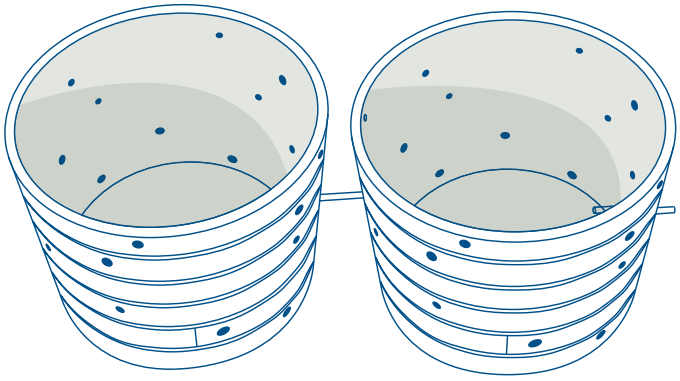


Figure 21: Unlined Double Pit

Shape: Cylindrical / Cuboidal
Construction: Two separate pits made with Pre-cast concrete rings, stone masonry, brick masonry with staggered holes on side for the passage of supernatant.
Does not function as a traditional Twin pit.
Size: Varies from 15 to 30 ft in depth and 1.15 to 2.5 ft in width.

Typology of Containment Systems in Rajasthan : Lined Containment Systems (Source: CDD Society)

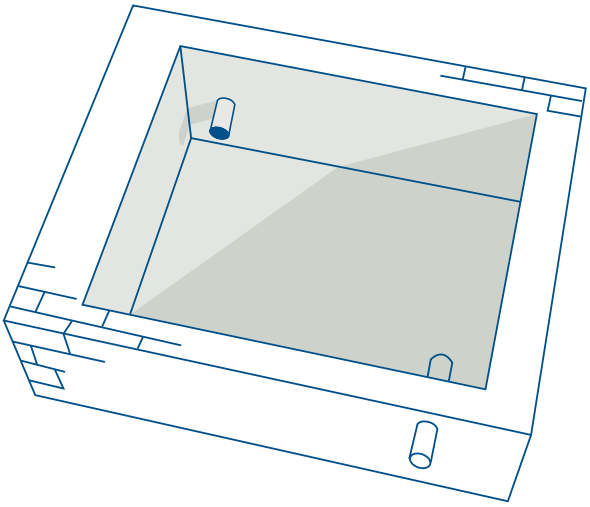


Figure 22: Lined Single Pit (Water-Tight)

Shape: Cuboid
Construction: Brick masonry work, with no partitions, but an outlet to let the supernatant collected flow over to the storm drain.
Size: Variable

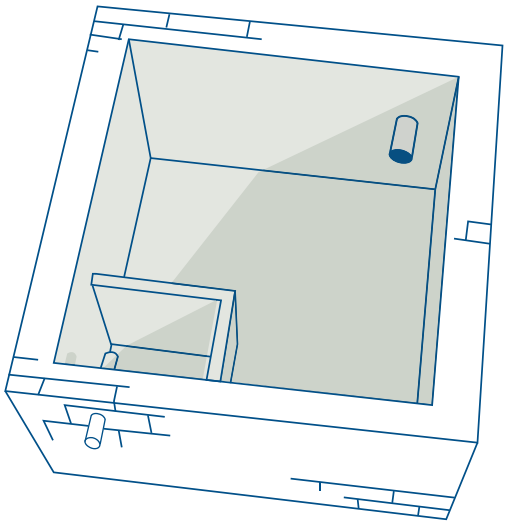


Figure 22: Lined Septic Tank with 1 Small Chamber

Shape: Cuboid
Construction: Single chambered septic tanks with 1 small chamber in the corner constructed using brick masonry work, also have an outlet to let the supernatant collected flow over to the storm drain.
Size: Variable

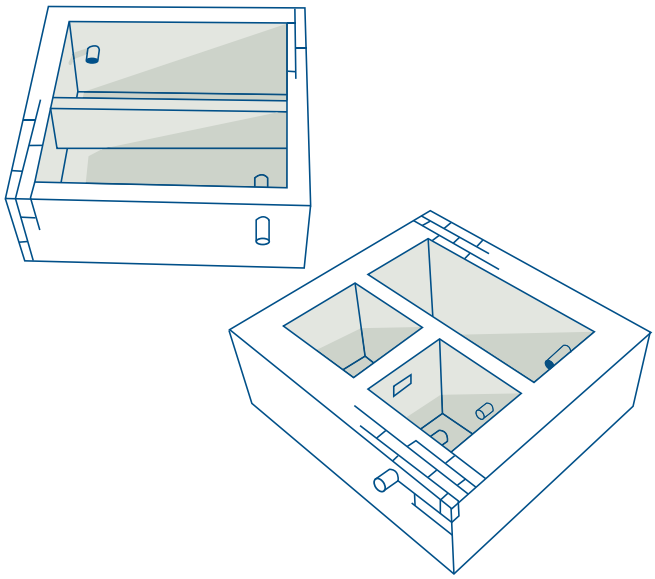


Figure 22: Lined Septic Tank with 2 or 3 chambers

Shape: Cuboid
Construction: Brick masonry work, may have 1 or 2 partitions constructed using stone or brick masonry, but an outlet to let the supernatant collected flow over to the storm drain.
Size: Variable

Figure 23: Unlined Pit (25 feet deep)

Figure 24: A Three Chamber Lined Tank with Outlet for Supernanent

- The twin pits being insisted upon SBM guidelines are proving to be a hurdle in achieving targets of truly ODF towns.
- A twin pit construction costs a minimum of Rs. 8,000-10,000 and requires double the space that a single pit requires.

The same is the issue with building a soak pit for a septic tank. Thus, it is rare to find a twin pit or a septic tank (designed as prescribed prescribed by the SBM guidelines) in households either due to high cost or lack of space. It would be wrong not to mention the lack of awareness of risks that a badly constructed containment system poses to the town. Many misconceptions prevail as a result and make the general public declare a typical septic tank or twin pit unnecessary even if they have the means and space to construct it.

5.2.3 Emptying

With the implementation of SBM comes the necessity of FSM, since most toilets have been designed with a containment system which will need emptying sooner or later. However, emptying frequency data was difficult to collect as most toilets built in the 100 towns visited were new and have not been desludged even once.

The frequency of desludging is dependent on the capacity and design of the containment system.

- In Rajasthan, the desludging frequency was observed to be invariably low (once every 8-10 years).
- The low desludging frequency can be attributed to either the unlined nature of the pits or in case of tanks, their large size and the provision for the supernatant to flow out of the tank into the storm drain.
- Unlined pits and septic tanks allow, the liquid component of the faecal sludge to percolate into the soil.
- Seepage of this liquid component takes place very efficiently in sandy soil.

The first desludging can take as long as 10-20 years and in some cases even more. Once desludged, the desludging interval decreases as the soil around the pit becomes saturated with liquids and clogged with sludge particles.

On the contrary the containments constructed in regions having black soil are made completely watertight with both base and side lining, requiring shorter desludging intervals.

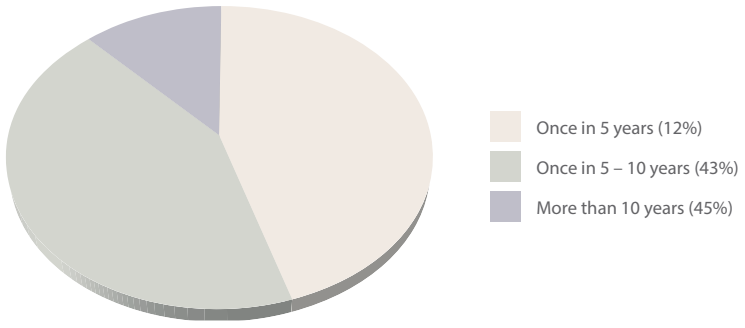
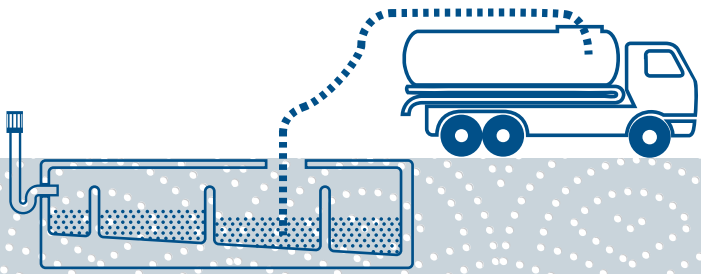
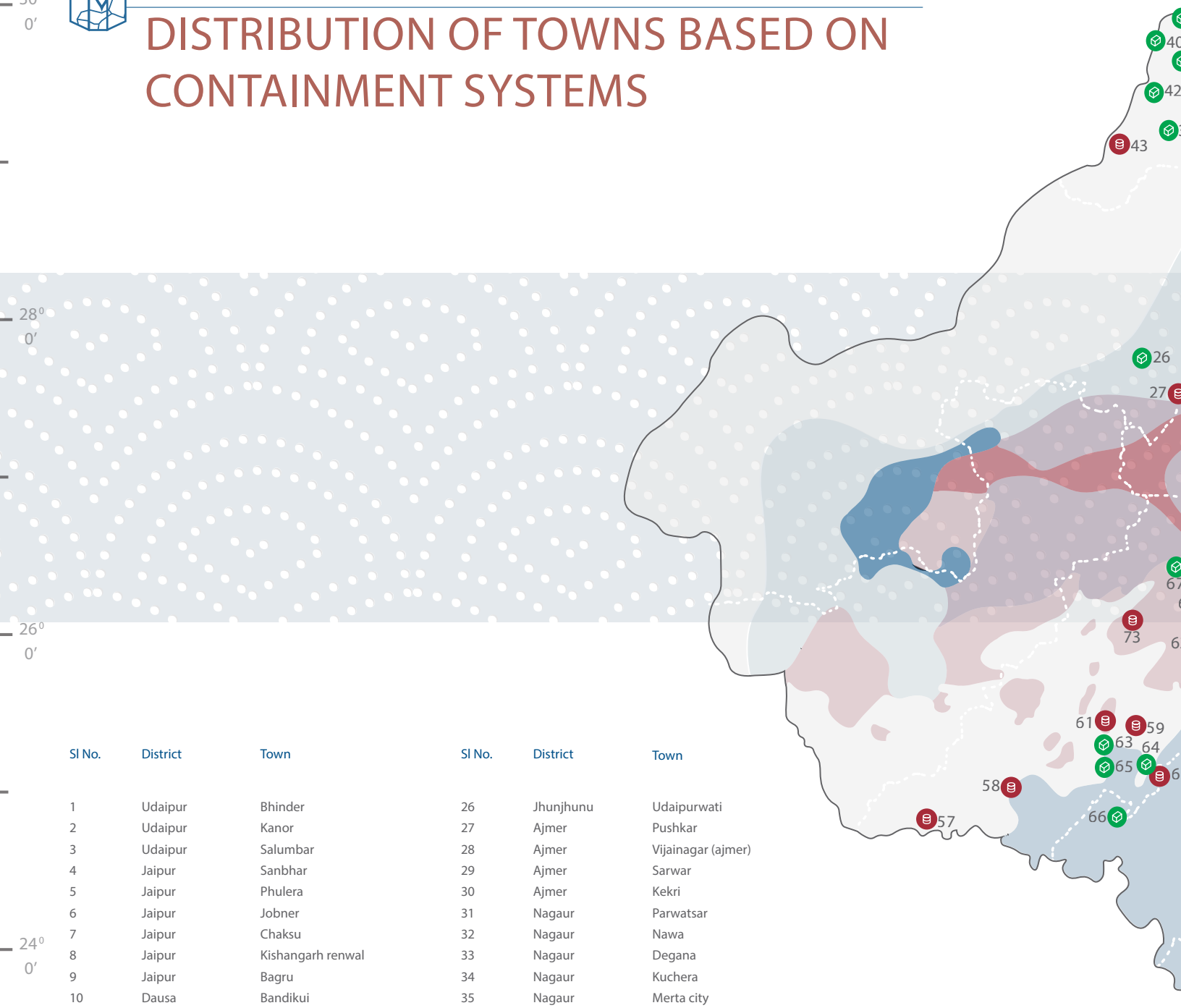


Figure 25: Distribution of Towns Based on Desludging Frequency of OSS



DISTRIBUTION OF TOWNS BASED ON CONTAINMENT SYSTEMS

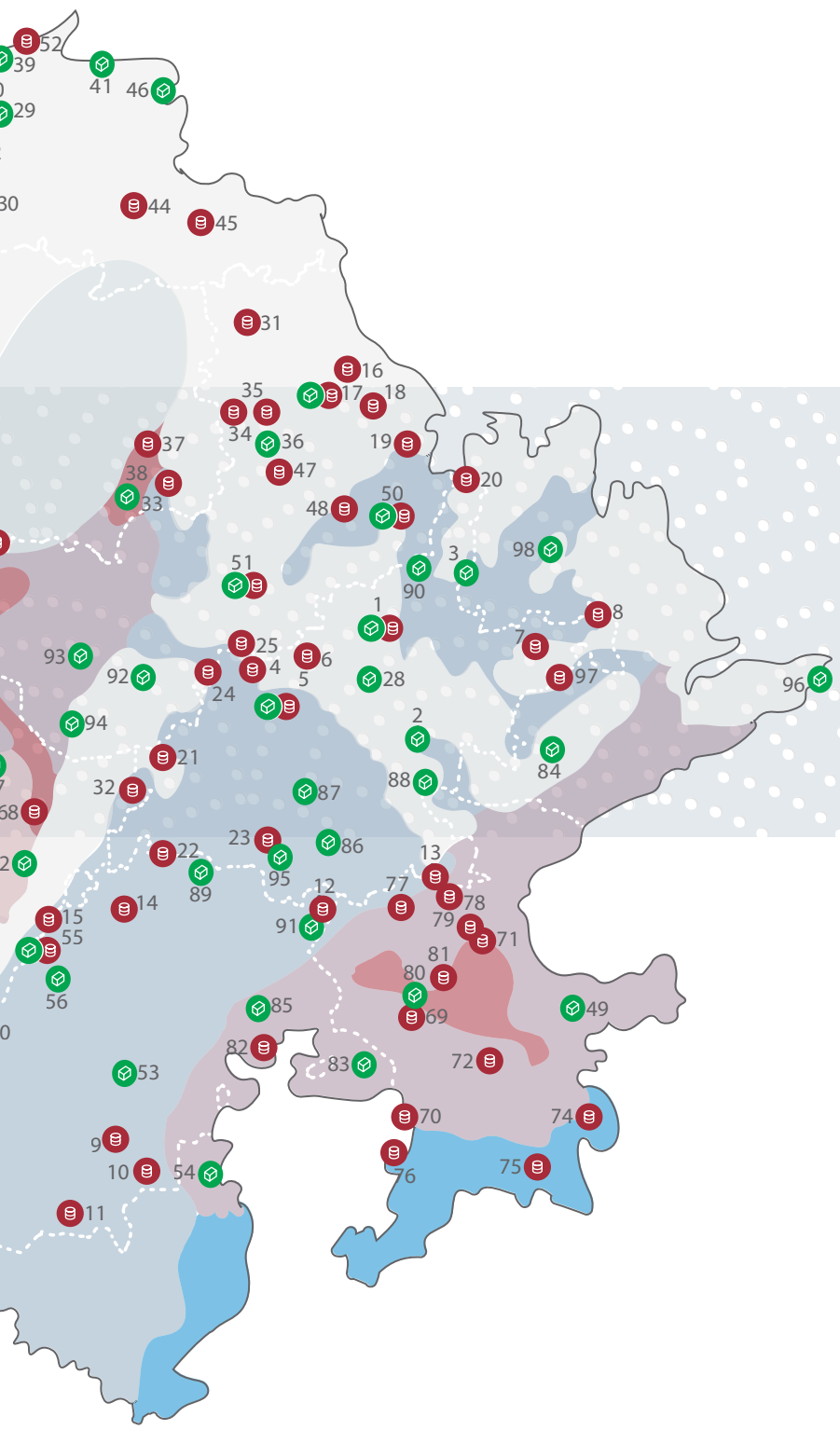
DISTRIBUTION OF TOWNS BASED ON CONTAINMENT SYSTEMS



Sl No.	District	Town	Sl No.	District	Town
1	Udaipur	Bhinder	26	Jhunjhunu	Udaipurwati
2	Udaipur	Kanor	27	Ajmer	Pushkar
3	Udaipur	Salumbar	28	Ajmer	Vijainagar (ajmer)
4	Jaipur	Sanbhar	29	Ajmer	Sarwar
5	Jaipur	Phulera	30	Ajmer	Kekri
6	Jaipur	Jobner	31	Nagaur	Parwatsar
7	Jaipur	Chaksu	32	Nagaur	Nawa
8	Jaipur	Kishangarh renwal	33	Nagaur	Degana
9	Jaipur	Bagru	34	Nagaur	Kuchera
10	Dausa	Bandikui	35	Nagaur	Merta city
11	Dausa	Lalsot	36	Tonk	Deoli
12	Sikar	Ramgarh shekhawati	37	Tonk	Uniara
13	Sikar	Khandela	38	Tonk	Todaraisingh
14	Sikar	Neem ka thana	39	Tonk	Malpura
15	Sikar	Losal	40	Tonk	Niwai
16	Alwar	Behror	41	Bhilwara	Asind
17	Alwar	Kherli	42	Bhilwara	Gulabpura
18	Jhunjhunu	Bissau	43	Bhilwara	Shahpura
19	Jhunjhunu	Mandawa	44	Bhilwara	Gangapur
20	Jhunjhunu	Baggar	45	Bhilwara	Mandalgarh
21	Jhunjhunu	Pilani	46	Bhilwara	Jahazpur
22	Jhunjhunu	Vidyavihar	47	Bikaner	Deshnoke
23	Jhunjhunu	Surajgarh	48	Bikaner	Nokha
24	Jhunjhunu	Khetri	49	Sriganganagar	Gajsinghpur
25	Jhunjhunu	Mukandgarh	50	Sriganganagar	Padampur

Sl No.	District	Town
51	Sriganganagar	Vijainagar (g)
52	Sriganganagar	Kesrisinghpur
53	Sriganganagar	Shri karanpur
54	Sriganganagar	Sadulshahar
55	Sriganganagar	Raisinghnagar
56	Sriganganagar	Anupgarh
57	Churu	Taranagar
58	Churu	Ratangarh

Figure 26: Distribution of Towns Based on Containment Systems



Sl No.	District	Town
59	Churu	Rajaldesar
60	Churu	Bidasar
61	Churu	Chhapar
62	Dungarpur	Sagwara
63	Banswara	Kapasan
64	Banswara	Begun
65	Pratapgarh	Choti sadri
66	Rajasmand	Deogarh

Sl No.	District	Town
67	Rajasmand	Amet
68	Jalore	Sanchore
69	Jalore	Bhinmal
70	Pali	Rani
71	Pali	Sadri
72	Pali	Takhatgarh
73	Pali	Sojat
74	Pali	Falna

Sl No.	District	Town
75	Pali	Bali
76	Sirohi	Shoeganj
77	Sirohi	Pindwara
78	Jodhpur	Piparcity
79	Jodhpur	Bilara
80	Hanumangarh	Rawatsar
81	Hanumangarh	Nohar
82	Hanumangarh	Sangaria
83	Kota	Kaithoon
84	Kota	Ramganj mandi
85	Kota	Itawa
86	Kota	Sangod
87	Baran	Antan
88	Baran	Chhabra
89	Jhalawar	Aklera
90	Jhalawar	Bhawani mandi
91	Bundi	Nainwa
92	Bundi	Indergarh
93	Bundi	Lakheri
94	Bundi	Keshoraipatan
95	Bundi	Kaprain
96	Dhaulpur	Rajakhera
97	Karauli	Todabhim
98	Bharatpur	Roopbas

74° 0′ 76° 0′ 78° 0′

Black soil is very retentive of moisture. It swells greatly and becomes sticky when wet. This kind of soil has a tendency to shrink in the hot and dry season.

Discussions with masons and households made it evident that if unlined pits were made in regions having black soil then the horizontal seepage of water would damage the foundation of the building and thereby increases its susceptibility to settling. However, to esnure desludging can be postponed as much as possible, the size of the tanks (if affordable) are large and there are outlets for the supernatant to flow out of the tank into the storm drains.

There were a few towns that were prepared for on-site sanitation systems and desludging service providers.

- A sewer network is perceived as less expensive by the general public and a permanent solution to the problem of wastewater and faecal sludge management by most Nagar Palikas.
- However, it is important to note the scarcity of water, whereas 100 LPCD water is an essentiality for the optimal performance of a UGD system[13].

This is quite contrary to the actual existing conditions in the towns, which is depicted in the figure showing distribution of towns based on water supply stating that around 59% towns get only 40-70 LPCD water supply as compared to the 100 LPCD, the minimum requirement for a UGD.

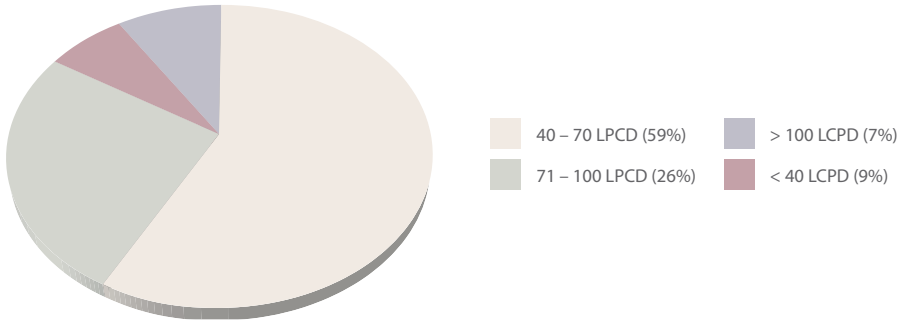


Figure 27: Distribution of Towns Based on Water Supply (LPCD)

[13] A minimum of 100 LPCD is recommended for optimal performance of UGD systems, according to EEO Manual on Sewerage and Sewage Treatment.

Figure 28: A Defunct Desludging Vehicle Owned by a ULB

Figure 29: Indiscriminate Disposal of Faecal Sludge

5.2.4 Transportation

Desludging is primarily done by private operators. Clusters of small towns may be served by one or more private operators and used for multiple purposes apart from the desludging. The state has also provisioned most ULBs with a similar desludging vehicle. However, the inaccessible areas of all these towns continue to depend on non-mechanical desludging. The desludging user charges also vary greatly from town to town.

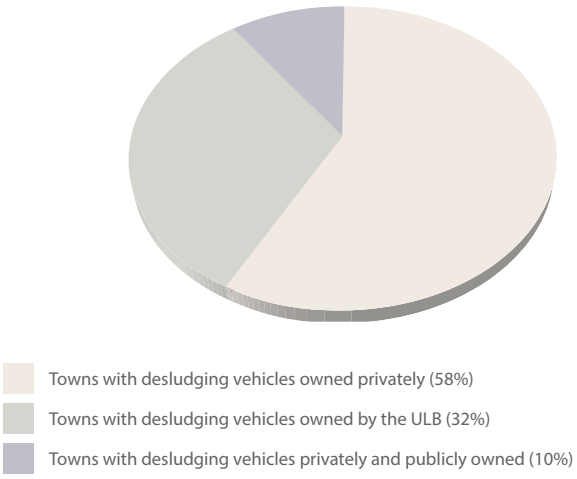
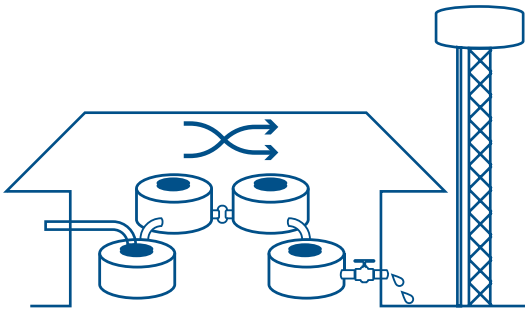
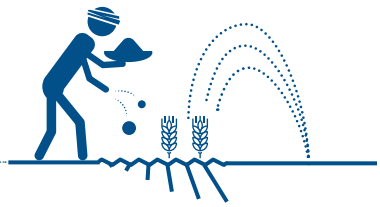


Figure 30: Distribution of Towns Based on the Type of Desludging Service Provision



5.2.5 Treatment

There was very little awareness on the need for treatment of faecal sludge amongst all the stakeholders interviewed in the process of data collection in the towns visited .Neither was wastewater treated in any but 2 towns, Nokha and Vidyavihar. Lack of wastewater management was an issue that plagued more than 75% of the towns visited.



5.2.6 Reuse

There is a cultural stigma attached to reuse of faecal sludge or even wastewater in the surveyed towns of Rajasthan, raw faecal sludge was used (admittedly with a lot of hesitation) in only 10% of the towns visited. The perception towards reuse of wastewater in agriculture was more positive. In 37% of the towns surveyed wastewater reuse was prevalent, also, it was found that the practice of auctioning wastewater for agriculture was popular in districts like Sri Ganganagar, but the High Court decreed it illegal to auction untreated wastewater due to which this practice was stopped. However the Town Municipal Councils do not object when farmers pump out wastewater from collection areas in the town or divert water from greywater channels or storm drains into their fields to use the water in agriculture.

Figure 31: An Association of Desludging Vehicles in Ganganagar

Figure 32: Desludging a Drain in Nokha to Remove Blockages Obstructing Wastewater Flow

5.3
BUSINESS OF DESLUDGING SERVICE IN SMALL TOWNS OF RAJASTHAN

5.3 Business of Desludging Service in Small Towns of Rajasthan

5.3.1 Faecal Sludge Collection & Conveyance

As of today, septic tanks and pits are cleaned in a sporadic and inefficient manner, which can cause water pollution and other health and environmental hazards.

In Rajasthan desludging services are provided by both ULBs and private operators.

5.3.2 The Characteristics of the Business of Transport and Conveyance of Faecal Sludge in Rajasthan in 100 Small Towns:

There are a total of 44 cesspool vehicles operated by the ULBs and more than 100 vehicles operated privately within these 100 ULBs. The procurement of desludging vehicles has been done by respective ULBs and are tractor mounted. They are mainly procured from three companies- Maniar, Ensol and Ecotech. Most of these trucks have a faecal sludge storage capacity of around 3500 L to 4500 L.

There are 53 ULBs which do not own cesspool vehicles and rely on private operators to provide the desludging services. Most such private service providers procure the tanks from either Jaipur or Delhi and have a capacity range of 4000 L to 6000 L.

The tractor which is used for cesspool vehicle is used for multiple purposes. The same tractor is used for solid waste management or collection of construction & demolition waste.

There are two types of pumps- where the pump is attached to the vehicle pump and where it is attached to axle. Cost per desludging (per 1 trip) varied from Rs 500 to Rs 4000. It is dependent on demand for desludging where sometimes the operators travel for 20-30 Kms to provide desludging services.

The disposal of faecal sludge is primarily done at the solid waste dumping site or barren lands outside the town and open drains.

Table 9: Operation

TYPE OF CESSPOOL VEHICLES	NUMBER OF TRUCKS	VOLUME (AVERAGE)	TYPE AND DETAILS
Government Owned	44	3500 L	Tractor mounted retrofitted
Privately Owned	100+	4500 L	Tractor mounted retrofitted

PART OF THE CESSPOOL VEHICLE	CAPITAL COST
Tractor	4-5 Lakh Rupees
Vaccuum pump and tank	2-3 Lakh Rupees

6
GAP ANALYSIS AND RECOMMENDATIONS

The analysis presented so far gives a general picture of sanitation and septage issues prevalent in the towns of Rajasthan. An effective sanitation management system for the 100 towns of Rajasthan would require integrating inputs from technology and enabling systems to ensure that pollution and adverse impacts on public health can be prevented. The implementation model for solutions should therefore synchronise technical intervention with facilitation factors like promotion and awareness building and with support systems like appropriate policy, legal frameworks, financial access and developing knowledge and skills for operating and managing the system.

In order to identify the gaps that could then be used to come up with recommendations to fulfil the enabling environment framework as highlighted above, a PESTEL (refer Table 10) analysis was carried out. These towns are facing problems that go beyond merely infrastructural inadequacies. The lack of awareness among ULBs for FSM, improper drainage system, no treatment of solid waste or wastewater are a few of the glaring problems these towns are dealing with on a daily basis. The PESTEL analysis as shown in Table 10, closely examines the reasons due to which these towns are unable to provide sanitation services for all their citizens.

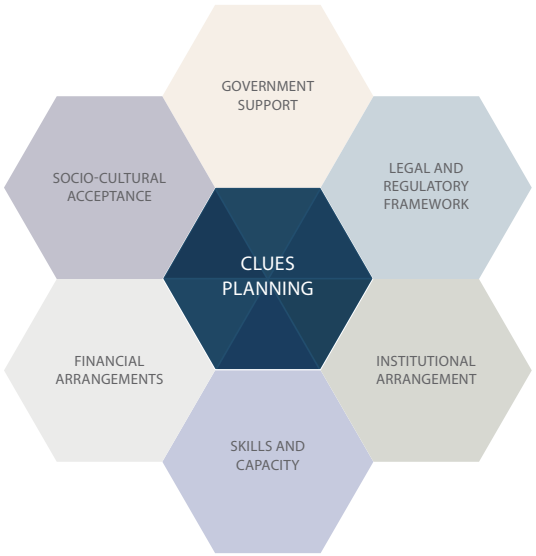


Figure 33: CLUES Enabling Environment Framework (Source: EAWAG-SANDEC, 2011)

Based on the above gap analysis recommendations are suggested for technical intervention as well as for creating an enabling environment.

Table 10: PESTEL Analysis of Sanitation Situation in 100 Towns

Political	• The Executive Officer of the Nagar Palika changes frequently, a disincentive for the officer • Chairman and councillor have different and conflicting interests, for example the chairman was more interested in lighting the town rather than solving the accumulation of stagnating wastewater, a ward councillor's concern in one of the towns studied. • Low levels of awareness about FSM among local leaders and local body staff • Conflicting programs and processes which can hinder smooth governance
Environmental	• Highly vulnerable to droughts and heat spells, water scarcity acute in more than 150 blocks • Soil contamination in towns' fringes (disposal points) and around wastewater pools • Poor environmental hygiene in most cases due to poor waste and wastewater management • High instances of communicable diseases such as malaria and typhoid especially in socio-economically weaker communities that happen to be adjacent in the town adjacent to wastewater ponds
Social	• Low concern for environment • Socio-economically weaker sections in the society are more vulnerable to impacts of environmental pollution • Stigma attached to reuse of faecal sludge, and to some extent wastewater in some areas • Lack of awareness on negative effect of faecal contamination of ground water • Lack of awareness of impact of blackwater flowing in the open • Non-mechanical desludging still prevalent, and reflects lack of social equality

Technical	• 100% toilet coverage has still not been achieved • Scientific containment systems (as per standard designs) do not exist and are not being built • Indiscriminate dumping of faecal sludge and overflow of partially treated wastewater into open drains and/or leading to water bodies • Treatment of wastewater absent in most towns • Technical designs (as by SBM) for containment systems not followed • Technical specifications of containment systems as recommended by CPHEEO especially related to ground water table levels, disposal of effluent, is not being followed • Unscientific desludging practices practiced by ULB/private players
Economic	• Limited funding for towns from state or centre • Urban Development Tax collection efficiency is low • Lack of manpower impedes ULBs' efforts to collect taxes/pecuniary charges • No standard fee for desludging services currently among private players
Legal	• Inadequate policy and legislative framework for implementation of FSM and reuse of wastewater • Poor enforcement of existing environmental laws • Lack of attention towards safe practices of waste management or desludging services • Lack of personnel for enforcement of existing regulations

Figure 34: A Hand Pump Adjacent to a Drain at Risk of Contamination

Figure 35: Water Percolating in a Well from a Nearby Polluted Lake Contaminating the Well

Figure 36: A Wastewater Body in a Town Completely Covered in Hyacinth due to Eutrophication

Figure 37: A Drain Blocked by Solid Waste

6.1 General Technical Recommendations

Technical inadequacies have been identified across the Sanitation Value Chain[14] in the 100 towns surveyed in Rajasthan. These gaps need to be addressed systematically.

6.1.1 Number of toilets

The survey revealed that more than 95% of the 100 towns are still to reach 100% toilet coverage. SBM funds are being used to fill this gap. Enabling factors such as adequate funds, close monitoring and awareness building are essential for fulfilling implementation of toilets to achieve 100% coverage.

Assessments and special drives may be needed to address the barriers to achieving ODF towns. Where individual toilets are difficult, community toilets should be promoted and their O&M prioritised.

6.1.2 Type of Containment Systems

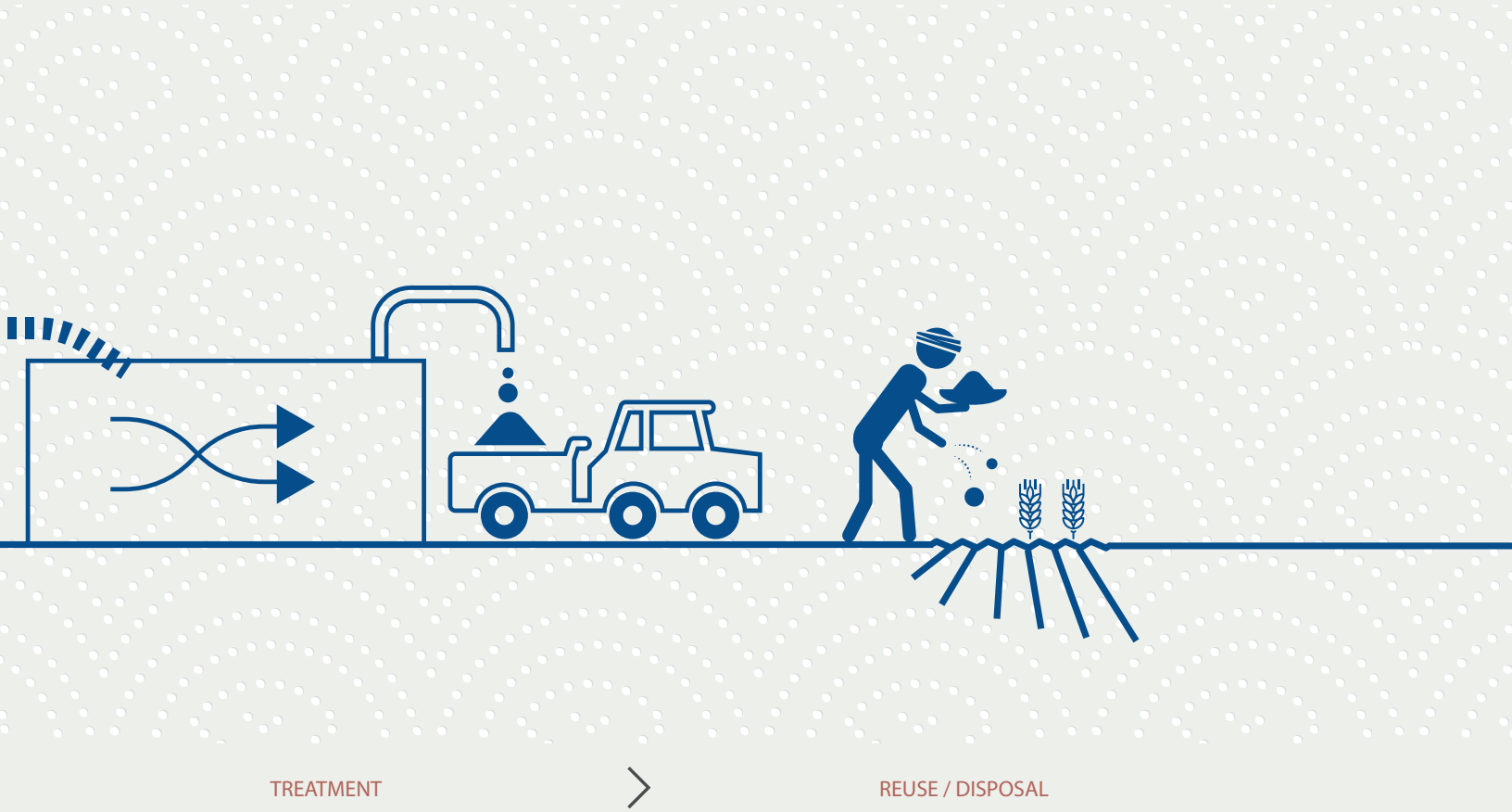
Observations during the survey highlight that the containment systems are not built as per recommended technical standards[15]. Refurbishing of existing containment systems will be difficult as a first step but can be taken up later. All new containment systems being built should follow the standards. A monitoring system to check the quality of implementation needs to be established.

6.1.3 Emptying

Desludging of pits or septic tanks should be carried out as per the CPHEEO recommendation of between 1.5 years to 3 years based on the design capacity of the pit/tank. While desludging, the pit/tank should not be emptied completely. Around 10 cm. of activated sludge should be left in pit/tank to act as an inocculum for the decomposition of the fresh faecal sludge. Care should be

[14] The Sanitation Value Chain, a concept of representing sanitation across the globe in components by BMGF comprises of 5 stages: Capture (the user interface or toilet and containment system), Empty, Transport, Treatment and Reuse.

[15] Containment System standards are mentioned in Chapter 9 of CPHEEO Manual on Water Supply and Treatment, 1999



taken during desludging of unlined pits/tanks to ensure that the earth/soil does not collapse. This can be done by desludging in intervals rather than continuously, verifying the state of the soil wall in between each desludging activity.

6.1.4 Transportation

Observations during the survey highlighted various road types and widths as well as variable accessibility distances between roads and location of containment systems. Desludging trucks are available for 3000 and 6000 litres of faecal sludge. These trucks have a motor with suction power ranging from 70 HP to 120 HP (directly proportionate to the capacity of the tank). Such a truck can pump out sludge from pits/tanks efficiently from a maximum distance of 18 m, beyond this distance desludging takes longer time and thicker solids may not be emptied[16]. An alternative into desludging smaller tank and transporting to the bigger truck or transfer station on the main road may be considered. For cities which are compact, and have narrow roads, it is recommended to use smaller trucks of 3000 L capacity. Roads narrower than 1.5 m were found in most towns. Even small desludging trucks cannot access such roads, in such cases solutions such as using a gulper may be thought of as proposed by WaterAid.

In areas where septic tanks are available with outlet pipes (no soak pits are available), it is recommended to ensure that this effluent is channelled to treatment units.

[16] Information obtained via discussions with manufacturers of desludging vehicles.

Figure 38: A Drain with Blackwater from a Series of Houses with Insanitary Toilets

Figure 39: Insanitary Toilet, Directly Ejecting Faecal Matter into Storm Drains

Figure 40: Stagnant Wastewater in the Middle of a Mohalla

6.1.5 Treatment

Typology of towns for treatment recommendations

In order to come up with treatment approaches, an assessment of environmental vulnerability and preparedness of towns was carried out. Towns that have more than 20 desludging events in a month and have high risk of ground water or surface water body contamination need priority attention. From a technology approach perspective, three typologies have been listed as shown in Table 11 below. In every case treatment of faecal sludge and septage is necessary as all the 100 towns studied have pits and/or septic tanks that are mostly unlined suggesting high possibility of contamination of surface and groundwater for both cases. In areas with septic tanks that have overflow pipes, it is recommended to build lined drains and provide a wastewater treatment facility. In areas that have open drains with overflows directly from toilets, or where faecal sludge/septage is being disposed in drains or surface water bodies, it is recommended to have wastewater treatment facilities along with FSM. The recommendations are strategic in nature, and in-depth analysis of the sanitation situation is needed to arrive at the best suited solutions for each town.

Table 11: Typology of Towns Based on Ground Water Level and Type of Containment System and Corresponding Recommendation

S. NO.	TYPOLOGY	TOWNS
1	Towns with more than 70% unlined pits	35
1.1	Towns with high water table	7
1.2	Towns with low water table	28
2	Towns with more than 70% lined pits, with supernatant flowing out into storm drains	39
3	Towns with unusually high frequency (>20/month) of desludging	16

The rationale for the recommended approach for the six typologies is given below :

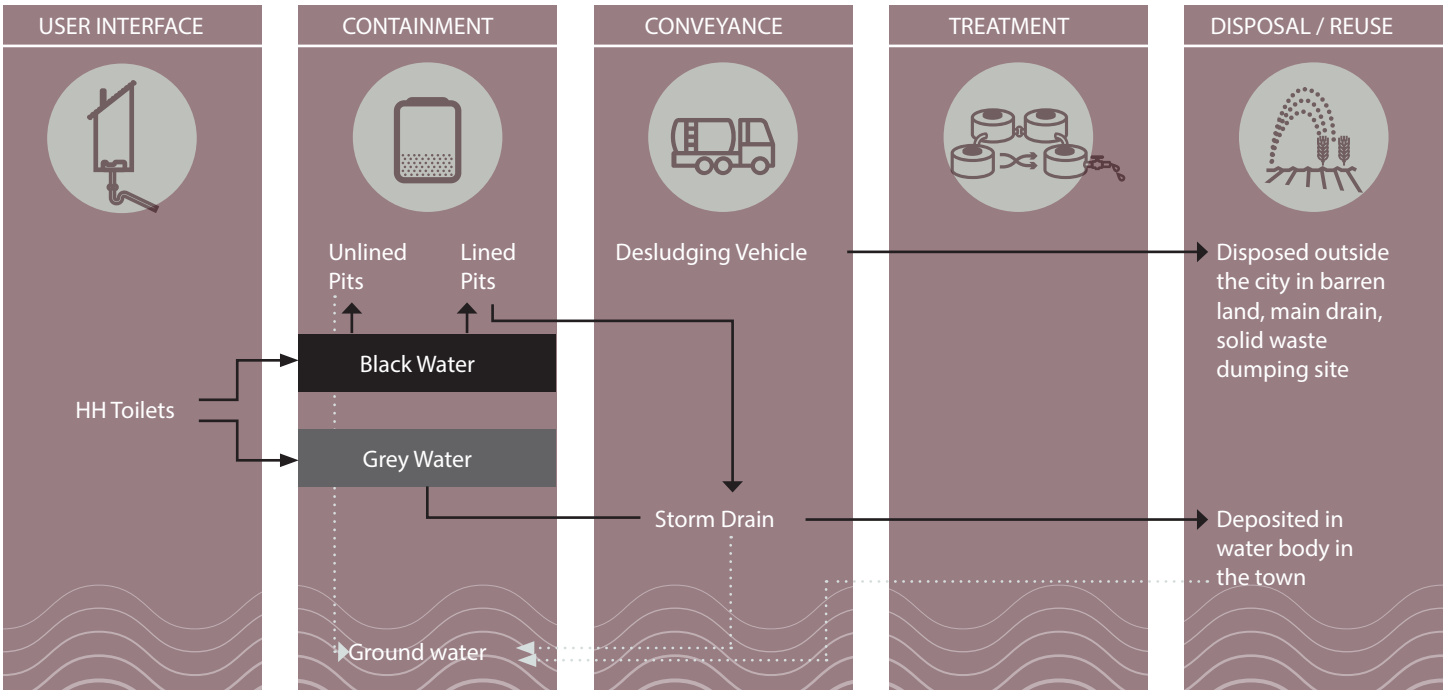
6.1.5.1 Towns with more than 70% Unlined Pits

These towns have unlined pits which are usually made with concrete rings, with staggered holes between the rings and no lining at the base. These pits are between 1.5 to 3 feet wide and may range from 15 to 30 feet in depth, and are locally called "kuin". The faecal sludge that collects in such pits is emptied once in 10-30 years. However, anecdotal observations suggest this is so for the first desludging. Post that the frequency increases to once in 1-2 years. The liquids contained in the pit seep into the soil vertically and horizontally.

Studies have associated pit latrines' use with the transport of microbes (typically faecal coliforms, although one study assessed adenovirus and rotavirus) and chemicals (e.g. Nitrate, phosphate, chloride and ammonia) through soil and into local water sources. Microbes and chemicals usually travelled less than 15 m from latrines, although some studies reported contamination up to about 25 meters away. Viruses were detected up to 50 meters from pit latrines[17].

[17] Pit Latrines and Groundwater Contamination, Environmental Health Perspectives, Volume 121, Number 5, May 2013.

Current Situation



Recommendation

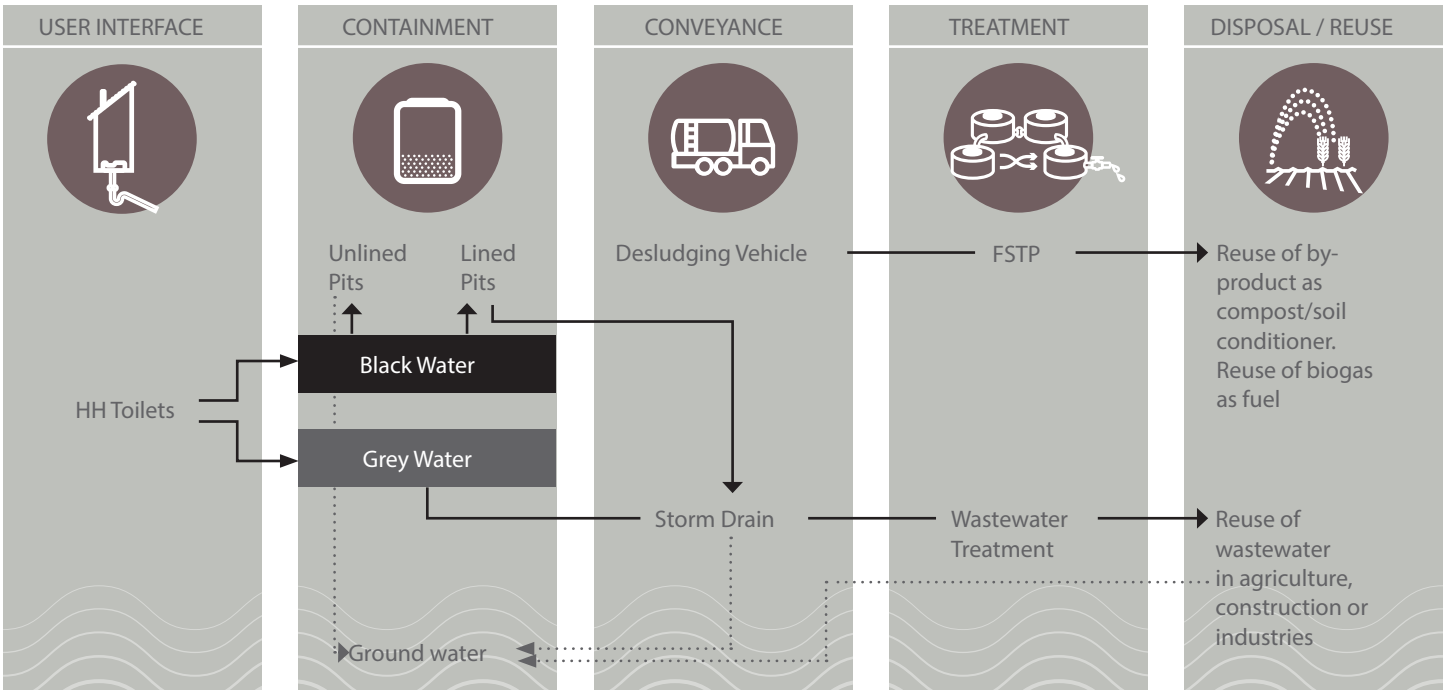


Figure 41: Type I Towns with > 70% Unlined Pits

a. In areas with high water table

In areas with ground water table found at higher than 50 feet, the risk of groundwater contamination is higher than other towns

b. In areas with low water table

In towns where the ground water table is lower than 50 feet, pits do not really pose a direct threat to the health of the ground water, however, the faecal sludge that accumulates in pits which are not desludged regularly has higher BOD and COD due to poor decomposition of organic matter than faecal sludge emptied from regularly maintained containment systems. The treatment is thus expensive and time consuming for faecal sludge with such high BOD and COD.

Table 12: Towns with more than 70% Unlined Pits

TOWNS WITH MORE THAN 70% UNLINED PITS				
High Water Table				
Shahpura	Pindwara	Kesrisinghpur	Uniara	Merta City
Low Water Table				
Nokha	Shahpura	Pindwara	Kesrisinghpur	Uniara
Shoeganj	Bidasar	Bilara	Rani	Bali
Mandalgarh	Bagru	Falna	Lalsot	Todabhim
Khetri	Ramgarh Shekhawati	Pilani	Nohar	Sanbhar
Bhinmal	Pushkar	Mukandgarh	Chhapar	Taranagar
Sojat	Jobner	Degana	Mandawa	Losal
Kishangarh Renwal	Kuchera	Parwatsar	Nawa	Surajgarh
Behror	Gangapur	Bandikui	Ratangarh	Bissau
Baggar	Piparcity	Vidyavihar	Deshnoke	Neem Ka Thana
Khandela				

6.1.5.2 Towns with more than 70% Lined Pits, with Supernatant Flowing out into Storm Drains

Lined containment systems have either one chamber without any solid liquid separation, or are dual or triple chambered which allows separation. Considering the low desludging frequency, the partition becomes futile as the effluent quality degrades with the passage of time.

In the absence of a soak pit, the overflow supernatant usually mixes with the grey water and flows through the open drains and merges with the local water body or collects as a pool of wastewater. This untreated wastewater poses a major risk to human health since it contains waterborne pathogens that can cause serious human illness, affects aquatic ecosystems and make the town aesthetically unpleasant, thus, reducing opportunities for tourism and allied livelihoods.

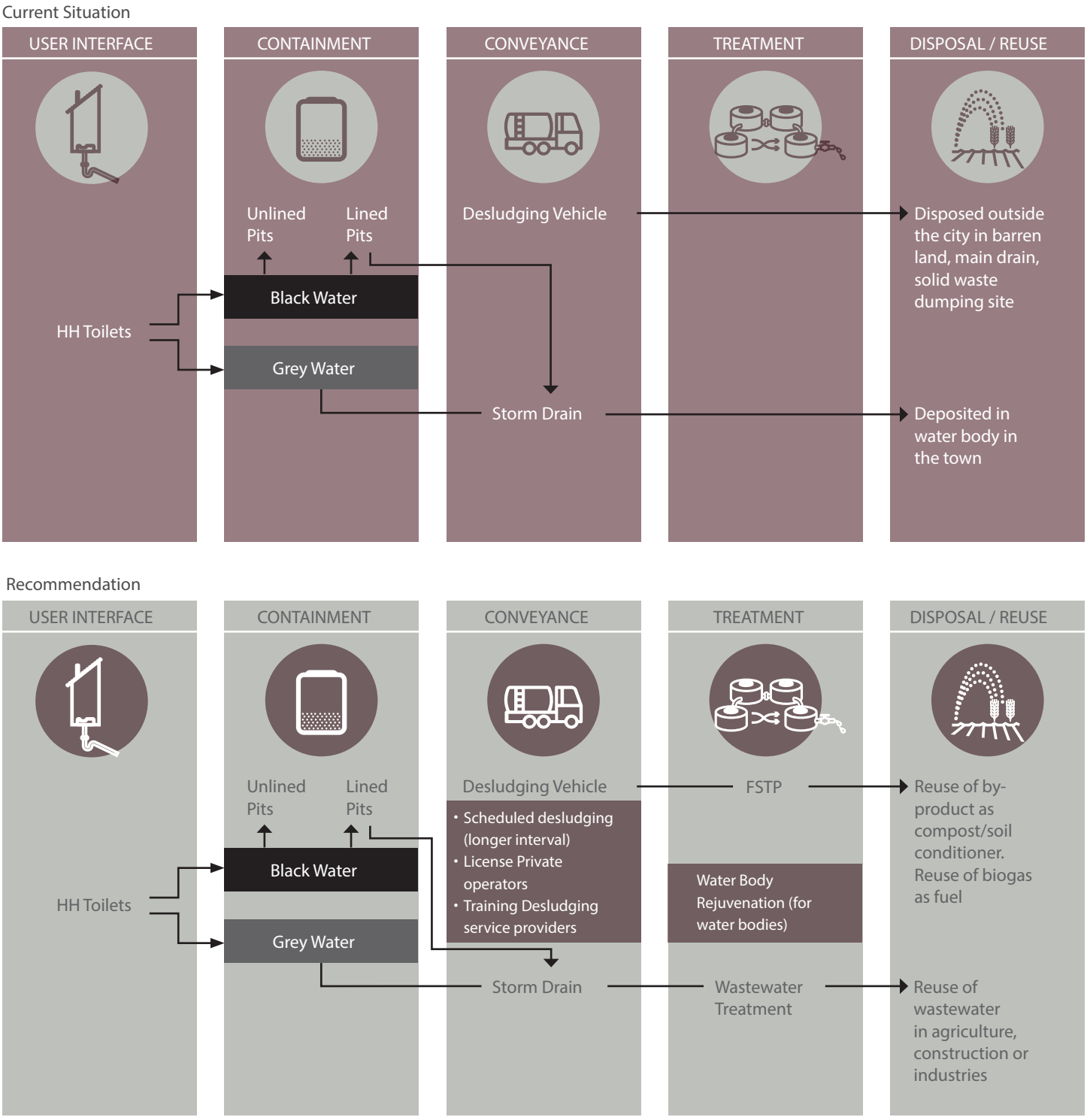


Figure 42: Type II Towns with more than 70% Lined Tanks

Table 13: Towns with more than 70% Lined Tank

TOWNS WITH MORE THAN 70% LINED PITS				
Kaprain	Rawatsar	Bhawani Mandi	Gulabpura	Aklera
Shri Karanpur	Sadulshahar	Gajsinghpur	Niwai	Salumbar
Itawa	Jahazpur	Sagwara	Keshoraipatan	Deoli
Deogarh	Amet	Kapasan	Kekri	Antan
Todaraisingh	Roopbas	Anupgarh	Choti Sadri	Begun
Kaithoon	Malpura	Sarwar	Vijainagar (Ajmer)	Rajakhera
Asind	Kanor	Nainwa	Chhabra	Lakheri
Indergarh	Sangod	Ramganj	Mandi	Udaipurwati

6.1.5.3 Towns with High Frequency of Desludging (more than 20/month)

In the absence of any designated disposal site for faecal sludge, in towns with a relatively high number of desludgings there were fields of barren lands observed with sludge disposed, in some cases freshly disposed sludge. Interviews with desludging service providers revealed that drains and other water bodies are also dumping grounds.

This practice leads to concentration of hazardous raw faecal sludge on soil or water, potentially poisoning it by loading it with organic matter with very high BOD and COD values, as well as microorganisms which are vectors of various diseases (Charles B. Niwagaba, 2014).

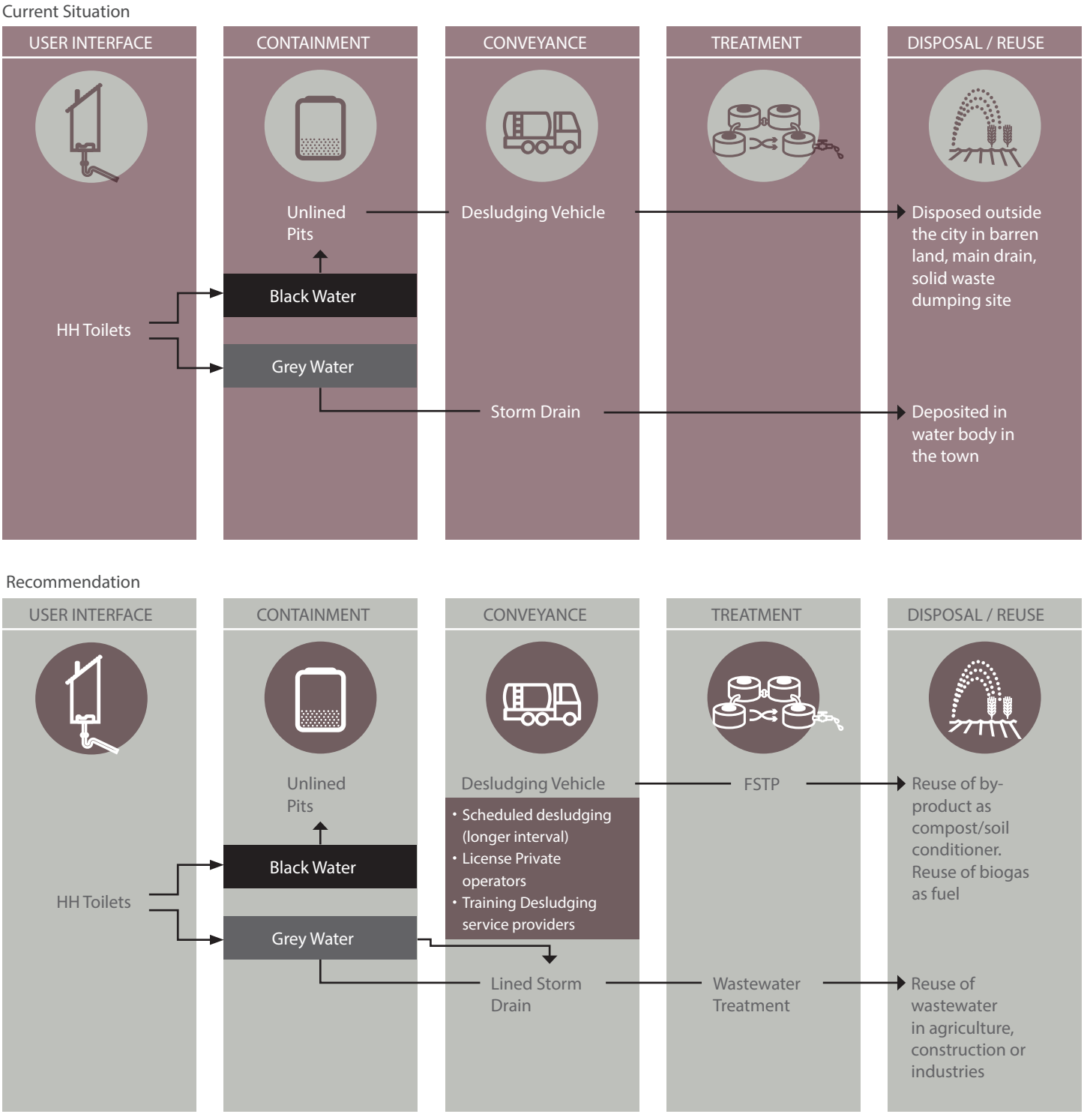


Figure 43: Type III - Towns with High Desludging

Table 14: Towns with Relatively High Number of Desludgings (>20/month)

TOWNS WITH RELATIVELY HIGH NUMBER OF DESLUDGINGS (>20/MONTH)				
Taranagar	Chhapar	Behror	Mandawa	Pilani
Vidyavihar	Kishangarh Renwal	Losal	Bissau	Mukandgarh
Ratangarh Chaksu	Bandikui	Malpura	Jobner	Ramgarh Shekhawati

6.1.6 Community Contribution and Engagement

Community awareness, engagement and contribution processes are central to the approach of increased project awareness understanding, ownership, and long-term sustainability. As new toilets are being built under SBM and community contribution is very minimal or non-existent, financial contributions from local community for faecal sludge or wastewater treatment infrastructure is not expected. However, for operation and maintenance an additional tariff can be explored as a sanitation fee or through taxation. A detailed analysis needs to be carried out for developing such systems with appropriate stakeholder engagement.

Strategic interactions and engagement with the community using a variety of locally adopted methods and approaches is required once a decision has been made on. The engagement process should be carried out throughout the project stages to build trust, project acceptance, and to meet the varied needs of the stakeholders the project is working with and serving. Therefore, four specific categories are recommended to help frame the different community engagement approaches, each with their own expected level of community participation and intended outcome(s) outlined as follows:

- Awareness Raising and Education:
  - Level of Participation: passive to active participation in the awareness raising and learning process
  - Intended Outcome(s): to gain insight into the project and into sanitation in general.
- Capacity Development:
  - Level of Participation: active participation in the learning process
  - Intended Outcome(s): to transfer knowledge to the participants to enhance existing and/or develop new skills and knowledge about the project, roles and responsibilities, and gain insight into the project and environmental sanitation
- Community Participation:
  - Level of Participation: active participation in project implementation, monitoring, and leading and steering certain project outcomes, as well as indirect active participation in operation and maintenance
  - Intended Outcome(s): to ensure overall sustainability through ongoing participation in core implementation, monitoring, and operation and maintenance areas (through fee/tax payment)
- Progress 'Report Card' / Reporting:
  - Level of Participation: passive participation in being updated/informed on project progress
  - Intended Outcome(s): to ensure all project stakeholders are aware and updated on the current and next project implementation stage, roadblocks, timelines, etc.

Depending on the type of activity and the stakeholders involved various IEC tools and materials as well as training modules can be developed to accomplish the engagement requirements.

6.1.7 Institutional Arrangements

The town municipalities are the responsible agencies for implementing sanitation projects. However, in most cases human resource as well as skill and knowledge capacities are limited at municipality level. Considering that FSM is a relatively new subject for municipalities in India, it is recommended that a Technical Advisory Committee be formed at the State level with experts from private or parastatal agencies that can advise and guide the planning, design and implementation of recommended FSM and wastewater technical interventions for the towns. After pilot interventions, municipalities should ensure that they have adequate capacities to plan, design, implement and operate and maintain the systems that have been implemented to ensure sustainable sanitation in their towns.

6.1.8 Capacity Development

To ensure that the Municipalities have the required knowledge and skills, the first step would be to identify technical and other additional skills required/missing to ensure the implementation, management and on-the-job training of the recommended FSM and wastewater systems. This should be followed by developing required training modules and conducting training and exposure programmes.

6.1.9 Policies and Legal Framework

I. Rajasthan has drafted its first State Sewerage and Wastewater Policy, 2016. This policy should be implemented at the earliest including elements stated below
II. Scheduled desludging to improve quality of septage to be treated
III. License private operators in an area which has to be renewed to keep a check on them and prevent indiscriminate disposal
IV. Train desludging service providers for better service and personnel safety
V. Pass policy resolutions for creating an enabling environment for effective implementation of recommended solutions.
VI. To ensure the legality of the policy recommendations, bye-laws should be modified at the town/city level or suitable resolutions should be passed by the elected representatives after consulting with DLB

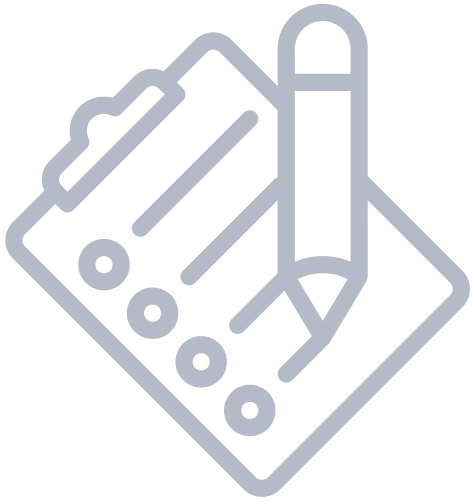
6.1.10 Monitoring and Evaluation Framework

A state level Dashboard for Monitoring the progress on addressing Faceal Sludge Management for all the Urban Local Bodies is required to ensure that the ULBs are made to report how many septic tanks are there in their jurisdiction, their cleaning frequency every month and the treatment or disposal of the emptied sludge. Monitoring can be done by the DoLSG at state level and grants for septage interventions can be released to the better performing ULBs.

6.1.11 Financial Management

The state can float a few options for funding ULBs for FSM interventions, on the lines of the Rapid Assessment Tool promoted by MoUD in 2015. ULBs can be encouraged to apply for grants for addressing the safe treatment and disposal of septage first and then the waste water, in two phases. This study provides a thumb rule based estimate of both septage treatment and waste water treatment of 100 towns. This can be used by the DoLSG for initiating a state level scheme for FSM for small towns, utilising the Finance Commission Grants from the Central and State govt. It is recommended to carry out a detailed cost estimate of all the technical interventions required in a town as per the local conditions including the operation and maintenance and system expansion, if required. Based on the estimates, the capability of the Municipality to generate the estimated requirements will have to be assessed.

Funds may be requested under specific schemes of the State/ Central government and PPP or hybrid annuity models will need to be explored. Based on a Cost Benefit Analysis for the specific town, a fee/tax structure can also be developed along with private investments for implementation, operation and maintenance



7
WAY FORWARD

For effective implementation one needs to ensure that solutions are exemplified and the concept is adopted by the local bodies governing the cities. The solutions for each town needs to be customised in tandem, to ensure –

- Idea of a model town is the same for both the town's governing body and the planner/expert;
- The solutions are effective, which will only happen if the sanitation plan takes into account the town's layout, environment, land use and other typical intricacies which are best known to the urban local body.

For the state of Rajasthan, we propose a phase wise list of activities which will enable the state to show exemplary solutions/ model towns; build capacity among stakeholders to customise given solutions for each town, own it and implement it; and finally replicate the impact (not the solution) in each town.

Phase I:

- Identify towns which are environmentally vulnerable but are better prepared to implement solutions as pilot towns. The lessons learned in these pilot towns will be used to fine-tune the implemented solutions, which can then serve as best-practice examples for other towns.
- In depth analysis of the pilot towns followed by ideation and planning for implementation of solutions for
    - Technical aspects of sanitation
    - Bridging gaps in capacity and technical know how
    - Creating and enabling institutional framework and policy guidelines
- Submit DPRs for the pilot towns
- Implement projects in the selected towns

Phase II

- Capacity building of stakeholders through trainings and workshops
    - State level officials
    - Town/city level officials
    - Masons
    - Desludging service providers
    - Potential contractors (who may be contracted for construction to implement technical solutions)
    - Training of trainers
- IEC Activities for multiple stakeholders such as households and desludging service providers
    - For maintenance of containment systems, proper use of toilets for general public
    - Proper safety practices for desludging service providers
    - Safe practices to be implemented for prevention of communicable diseases due to poor sanitation (such as fighting malaria/dengue borne from stagnating wastewater, household water treatment and safe storage, especially, water during monsoons when houses get flooded etc.)
- Advocacy for change in institutional framework
    - Faecal sludge and septage management policy for Rajasthan
    - Establishing a dedicated body for faecal sludge and septage management
    - Advocating policy change for reuse of treated wastewater and faecal sludge.
- Knowledge management and dissemination
    - Compendium of technical solutions for gaps in sanitation situation across Rajasthan
    - Training modules and guidebooks for training/capacity building of trainers and various stakeholders
    - Dissemination plan and training schedule for periodic update of skills and capacities of stakeholders as required

Phase III

- In-depth analysis of sanitation situation in the remaining towns of Rajasthan
- Planning and submission of DPRs with customised solutions for the remaining cities
- Large scale implementation of technical solutions customised for the city
- Continue with IEC activities, capacity building and efforts towards behaviour change in a more granular fashion. (at town level).

Detailed way forward for a town:

The following steps may be taken for inception of FSM plan and its implementation in a ULB. As understanding pf FSM is still evolving, and also considering the limited capacity of ULBs, project

management or technical consultants be involved as technical and management experts by the ULB.

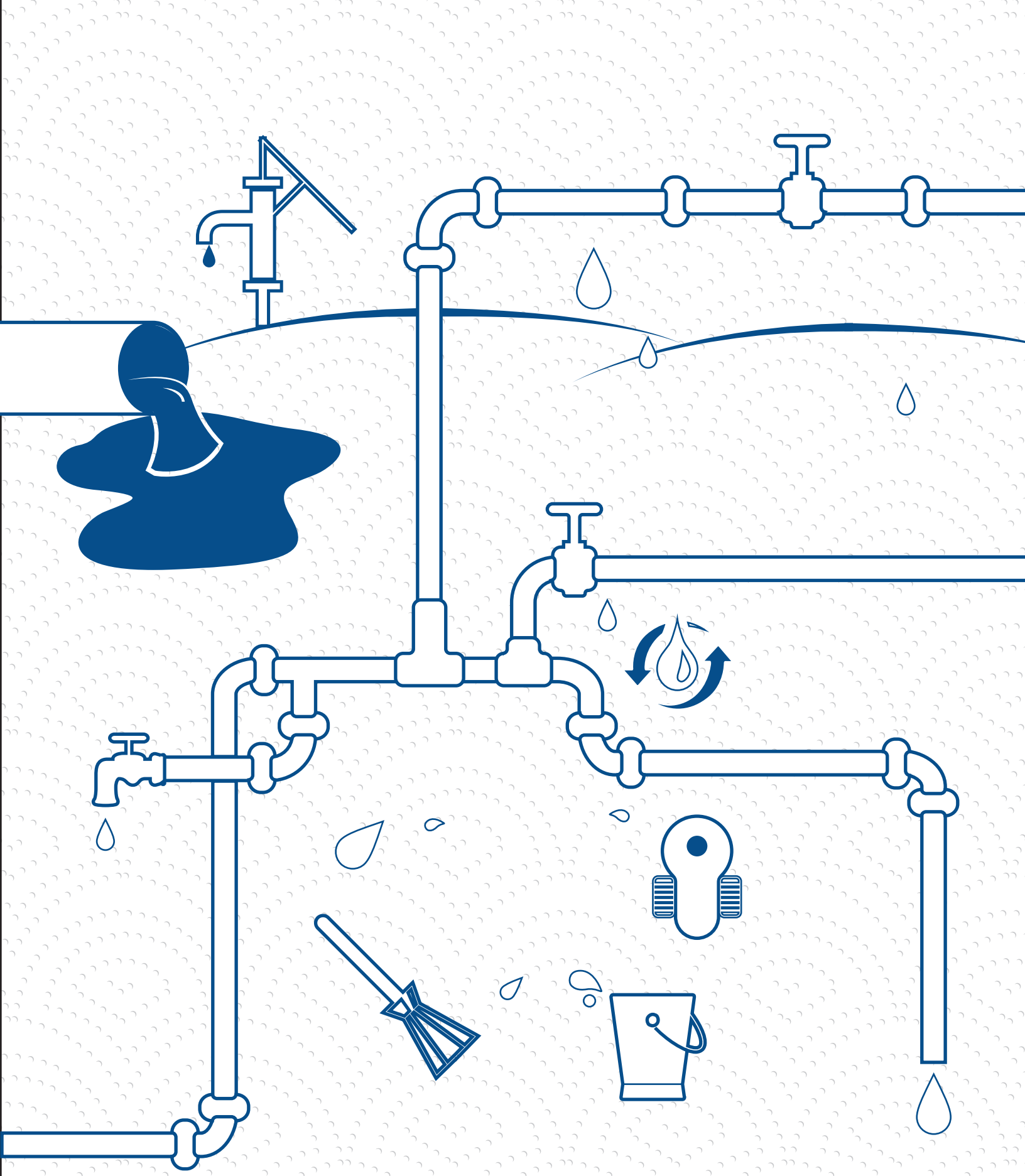
1. Introduction of the concept of FSM and decentralised wastewater management (WWM) to officials in the ULB through an orientation meeting.
2. Understand the existing infrastructure in relation to faecal sludge and wastewater management and determine the data collection techniques to be adopted through site visits.
3. Obtain all secondary data (existing CSPs, DPRs, maps, land, and budgets) about the city selected.
4. Based on the data obtained formulate solutions or strategies regarding FSM and WWM solutions in the selected city.
5. Prepare DPR with detailed treatment concept including details for:
    a. Technology being applied for faecal sludge and wastewater treatment
    b. Collection of faecal sludge
    c. Establishment or improvement of simplified sewer network
    d. Business Model proposed for sustainability
    e. Facilities and resources available
6. Collect necessary data from the city to check if they can validate the FSM concept proposed for the city. This involves:
    a. Conducting Baseline Survey-HH survey, cesspool operator survey, farmer, mason and ULB survey
    b. Determining of Faecal Sludge Quantity
    c. Faecal Sludge Quality through sample collection
    d. Wastewater quantity assessment
    e. Feasibility assessment of Site Conditions
    f. Assessment of Hydrogeological and climate data
    g. Assessment of ULB finances
7. Based on the data obtained and analysed the proposed FSTP solutions will be evaluated by the ULB and validated for the city. The FSM Plan will consist of five components
    a. FSTP Treatment Technology and DPR preparation
    b. FSTP Operation & Truck Operations
    c. Policy Framework
    d. Business Model
    e. Capacity Building & IEC Campaigns
8. IEC Activities for residents, ULB Staff and desludging service providers
9. Implementation of FSM Plan-creating infrastructure required (FSTP, Desludging Service Provider Network etc.)
10. Train personnel for operation and maintenance of FSTP, STP, and desludging service
11. Monitoring and evaluation of FSM and WWM system implemented
12. Make changes in the ULB's policies to ensure smooth implementation and sustainability of FSM and WWM systems

A compendium of possible technology options for treatment of wastewater and faecal sludge has been attached to the Report as Annexure 4. In-depth analysis of the sanitation situation in towns is needed before choosing appropriate options. Also, the compendium is merely suggesting popular technologies and is not exhaustive. Local techniques which have been used in the past to effectively treat faecal sludge and wastewater may also be explored.

For cities with existing funds:

Cities which are already a part of funding schemes mentioned in the previous section may need a separate strategy for FSM and wastewater management, since the funding and approaches taken for these cities differ.

1. Analyse steps proposed under the scheme eg. Analysis of DPRs made, projects started etc in the town/city
2. Map stakeholders who are and will be involved in the project
3. Through orientation meetings, trainings, workshops or group discussions ensure buy-in from all stakeholders
4. Training and skill building of ULB staff and technical staff hired for the operation and maintenance of the project
5. To ensure the sustainability of the project implemented:
    a. Create a suitable policy environment by bringing in policy changes by passing resolutions in the ULB for changing by-laws as required
    b. Setup a system of revenue generation or fee collection for the city to take care of the O&M itself, and reduce dependency on external funding



8

PRIORITISATION OF TOWNS FOR PILOT PHASE

To implement FSM thirty cities have been recommended, based on criteria below:

1. Towns with more than 20 desludgings a month
    a. These towns are exposed to soil and water contamination with highest risk among the 100 towns studied, hence they require immediate attention
2. Towns having more than 80% unlined pits and high water table
    a. These towns have unlined pits as on-site sanitation systems which are potentially polluting the groundwater, which is found at 50 feet and above in these towns.
3. Towns having more than 80% lined tanks.
    a. The major threat here is the contamination of greywater flowing in storm drains, since (as discussed in previous sections) there are no soak pits for the supernatant to flow, and the supernatant flows into the storm drains. The tanks are not emptied every three years as CPHEEO stipulates it, due to which the effectiveness of tanks reduces and the microbial load in the supernatant increases, further contaminating the wastewater in the drains.

Chhapar
Jobner
Chaksu
Losal
Merta City
Bhawani Mandi
Taranagar
Behror

Shahpura
Chaksu
Gulabpura
Kishangarh Renwal
Pindwara
Aklera
Bandikui
Mukandgarh

Kesrisinghpur
Kaprain
Shri Karanpur
Malpura
Bissau
Uniara
Rawatsar
Gajsinghpur
Niwai


नगर पालिका मण्डल डेगाना
पुरुष
पेशाब घर
स्वच्छ भारत
नगर पालिका मण्डल डेगाना
महिला
पेशाब घर
स्वच्छ भारत

9
INVESTMENT PLAN

The recommendations which could be given after a rapid assessment of the 100 towns in Rajasthan are very conceptual in nature. The exact technology and approach should be decided after more in-depth analysis of the sanitation situation in each town. Having said that the following estimates give a ball park figure for the fund that would be needed to resolve the issues and gaps observed in the sanitation value chain across the assessed towns.

I. The cumulative quantification of faecal sludge with the assumption that Swachh Bharat Mission reaches its target by 2019 and all toilets are built adhering to design standards is 897 cubic metres[18]. This is the tentative amount of faecal sludge that will need to be treated, as per the findings of the rapid assessment carried out in the 100 select towns in Rajasthan.

II. If we need to build a treatment plant for all of these towns individually, roughly INR 110 crore will be needed to build infrastructure[19] for the 100 towns, which includes a faecal sludge treatment plant running on the principles of anaerobic digestion and solar drying as well as purchasing desludging vehicles for maintenance of containment systems.

III. An additional INR 14.85 Cr. for plant operation and maintenance will also be required if they are built in isolation. However it is recommended to cluster together towns in close proximity and build a treatment plant to serve the cluster of towns for optimal performance, efficiency and sustainability.

IV. Though the study began with a focus on FSM, it became apparent that the wastewater situation in these towns cannot be ignored if a robust solution is the ultimate goal. An approximate estimate of the wastewater produced in 100 towns on a daily basis would be around 110 MLD.

V. To treat this water a bouquet of technologies exists such as Activated Sludge Process (CAPEX INR 110 Cr), Sequential Batch Reactor (CAPEX INR 138 Cr), Moving Bed Biofilm Reactor (CAPEX INR 174), or DEWATS (CAPEX INR 229 Cr).

VI. Operations of these systems would require additional operational costs ranging from INR 10 to 60 Cr cumulatively for the 100 towns depending on the technology employed. It is noteworthy that the cost mentioned does not include the cost of laying sewer lines which in itself is challenging to fund as has been mentioned in the literature.

VII. Thus, a rough figure of INR 350 Cr. may be considered as the capital expenditure for implementation of the technical recommendations alone[20].

VIII. Apart from the capital expenditure, a total of roughly INR 75 Crore (on the higher side) is needed annually for operation and maintenance of the implemented technology for wastewater treatment and faecal sludge treatment.

IX. Moreover, funds need to be allocated for skill building, training, IEC activities and advocacy for policy change also to

Faecal Sludge Treatment Plant CAPEX	1.1 Cr.
Faecal Sludge Treatment Plant OPEX	15 Lakh
Wastewater Treatment CAPEX	2.29 Cr.
Wastewater Treatment OPEX	60 lakh

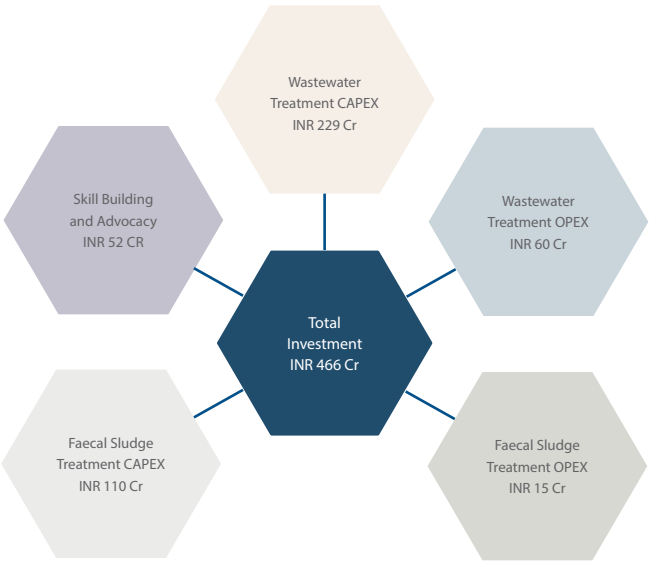


Figure 44: Investment Estimated

[18] Quantification of Faecal Sludge accumulated in lined and unlined pits have been done for 100 towns using data received from the ULB during the study. FS accumulated per day in a town in cubic metre= Population*% of HH dependent on lined pits*0.00021 + Population*% of HH dependent on unlined pits*(0.067/365). FS accumulated in a lined pit per day = 0.00021 and FS accumulated in an unlined pit per year = 0.067 as per CPHEEO manual on septage and sewerage management.

[19] The Faecal Sludge Treatment Plant considered in this analysis is based on the principle of DEWATS and anaerobic digestion. The technology has been chosen keeping in mind the financial constraints observed for its low capital and maintenance cost.

[20] If we assume the technology implemented is DEWATS and FSTP built is as described before, purely due to its low cost of operation and maintenance. The capital and operational costs will change with change in technology.

10
CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

Urbanisation is fast changing the physical and demographic landscape of our country and poses many challenges.

As a social process, urbanisation has an immense potential to break old barriers and bondage faced by some social groups and individuals, offering new avenues of social and personal development. It can also create new social divisions based on segregation and denial of access to public infrastructure.

Urbanisation poses a major environmental sustainability challenge. Density of urban population, uneven and often unplanned growth makes it difficult for large cities to be sustainable in any meaningful way. Not only carbon footprint but water use and waste water generation, pose-a major challenge for urbanising India.

Our growing towns and cities need dedicated cadre of town and city planners architects, demographers and social services. Setting up multiple project teams to address individual problems and to deliver multiple development schemes, may not work in the near future.

The study of sanitation and septage challenges of 100 small towns of Rajasthan was conducted by NIUA and CDD Society Bangalore, early this year. It is part of the Sanitation Capacity Building Platform initiative that includes – Technical and Capacity Building support. This is supported by a 3 year Gates Foundation grant operational since 2016.

Recommendations:

Urbanising India gathered from the 100 towns the following are our recommendations:

FSM is an effective, immediate, and low cost complement to the long term treatment options available in sanitation. This is especially true for a state where more than 59% of the small towns studied receive only 40-70 LPCD of water.

1. FSM should therefore be promoted as a part of state level Policy for sanitation. Rapid and program mode deployment of FSM systems can provide basic town level sanitation in the shortest possible time across the state.
2. Private desludging operators are providing an essential service across the state. Such service providers should be recognized and provided regulatory support, while ensuring that proper disposal practices are enforced.
3. The state should promote adoption of safe sanitation norms - lined properly designed septic tanks as per CPHEEO standards that are viable containment and primary treatment systems. Unlined septic tanks that are large storage pits are polluting the ground water and a major health hazard. Appropriate regulations integrated into town level by-laws along with capacity building for effective enforcement during and after building approvals are crucial.
4. Intercepting and treating sewage/septage before it reaches surface water bodies through open drains forms an important part of an FSM system and should be prioritized for towns highlighted in the report.
5. Sanitation infrastructure is most effective when coverage extends beyond 90%. It is therefore essential to assess unserved areas in large cities and AMRUT towns. Priority should be for connecting these areas with the existing sewerage system, if not then co-treatment of septage conveyed by trucks to existing STPs with unutilized capacity can be proposed. If both are not possible then setting up FSTPs for left out urban settlements should be considered.
6. A comprehensive state wide initiative addressing all stakeholders – from desludging operators to municipal personnel to state officials – rolled out in tandem with an FSM implementation program will enhance the effectiveness of any infrastructure investment several fold.
7. Committing funds, developing city-wise incentives and building a sense of healthy competition among ULBs will speed up adoption of FSM systems.
8. A state-wide MIS for FSM implementation and post-implementation monitoring will help disseminate outcomes across the state.

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ANNEXURE 1: LIST OF CITIES SURVEYED

Aklera
Amet
Antah
Anupgarh
Asind
Baggar
Bagru
Bali
Bandikui
Begun
Behror
Bhinder
Bhawani Mandi
Bhinmal
Bidasar
Bilara
Bissau
Chaksu
Chhabra
Chhapar
Choti Sadri
Degana
Deogarh
Deoli
Deshnoke
Falna
Gajsinghpur
Gangapur
Gulabpura
Indergarh
Itawa
Jahazpur
Jobner
Kaithoon
Kapasan
Kaprain
Kekri
Keshoraipatan
Kesrisinghpur
Khandela
Kherli
Khetri
Kishangarh
Renwal
Kuchera
Lakheri
Lalsot
Losal
Malpura
Mandalgarh
Mandawa
Merta City
Mukandgarh
Nainwa
Nawa
Neem Ka Thana
Niwai
Nohar
Nokha
Padampur
Parwatsar
Phulera
Pilani
Pindwara
Piparcity
Pushkar
Raisinghnagar
Rajakhera
Rajaldesar
Ramganj Mandi
Ramgarh Shekhawati
Rani
Ratangarh
Rawatsar
Roopbas
Sadri
Sadulshahar
Sagwara
Salumbar
Sambhar
Sanchore
Sangaria
Sangod
Sarwar
Shahpura
Shoeganj
Shri Karanpur
Sojat
Surajgarh
Takhatgarh
Taranagar
Todabhim
Todaraisingh
Udaipurwati
Uniara
Vidyavihar
Vijainagar (Ajmer)
Vijainagar (G)
Chomu
Viratnagar

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ANNEXURE 2: LIST OF TOWNS IN EACH PHASE

Phase 1

The initial survey was conducted at three cities (Chaksu, Chomu and Viratnagar) using the SAT and FAT tools developed by AIT, Bangkok. The entire survey team was then oriented with the action plan and it was decided to conduct survey at 33 towns listed below as a first phase of survey. A team of 12 divided into 6 groups (2 per team) were then assigned to do the survey at these 33 towns. The towns were selected at each division in Rajasthan, with 2-3 towns per district.

Duration: 06 Feb 2017 to 11 Feb 2017

District	City	District	City	District	City
Ajmer	Bijainagar (Ajmer)	Jhunjhunu	Pilani	Tonk	Deoli
Ajmer	Pushkar	Jhunjhunu	Surajgarh	Tonk	Uniara
Ajmer	Sarwar	Jhunjhunu	Vidyavihar	Udaipur	Bhinder
Churu	Chhapar	Bikaner	Deshnoke	Udaipur	Kanore
Churu	Ratangarh	Bikaner	Nokha	Udaipur	Salumbar
Churu	Taranagar	Nagaur	Nawa	Jaipur	Jobner
Dausa	Bandikui	Nagaur	Parwatsar	Jaipur	Phulera
Jhunjhunu	Bissau	Sikar	Ramgarh Shekhawati	Jaipur	Sambhar
Jhunjhunu	Mandawa	Sriganganagar	Gajsinghpur	Alwar	Kherli
Jhunjhunu	Baggar	Sriganganagar	Padampur	Alwar	Behror
Jhunjhunu	Khetri	Sriganganagar	Sri Vijainagar (G)	Bhilwara	Asind

Phase 2

Duration: 20 Feb 2017 to 11 March 2017

2 Teams (each team had 2 members)

Towns surveyed: 32

The SAT and FAT tools were analysed for the towns visited during phase 1 and based on those learnings survey questionnaire were then revised before use.

District	City	District	City	District	City
Banswara	Kapasan	Pali	Rani	Sikar	Neem Ka Thana
Churu	Bidasar	Pali	Sadri	Sirohi	Pindwara
Churu	Rajaldesar	Pali	Sojat	Sirohi	Shoeganj
Dungarpur	Sagwara	Pali	Takhatgarh	Sriganganagar	Anupgarh
Hanumangarh	Nohar	Jhunjhunu	Mukundgarh	Sriganganagar	Kesrisinghpur
Hanumangarh	Rawatsar	Jhunjhunu	Udaipurwati	Sriganganagar	Raisinghnagar
Hanumangarh	Sangariya	Pratapgarh	Choti sadri	Sriganganagar	Sadulshahar
Jodhpur	Bilara	Rajasmand	Amet	Sriganganagar	Shri Karanpur
Jodhpur	Piparcity	Rajasmand	Deogarh	Jalore	Bhinmal
Pali	Bali	Sikar	Khandela	Jalore	Sanchore
Pali	Falna	Sikar	Losal		

Phase 3

Duration: 22 March 2017 to 9 April 2017

2 Teams (each team had 2 members)

Towns surveyed: 34

The final phase of survey was carried out with same approach as phase 2, with limited team members.

District	City
Ajmer	Kekri
Banswara	Begun
Baran	Antan
Baran	Chhabra
Bharatpur	Roopvas
Bhilwara	Gulabpura
Bhilwara	Jahazpur
Bhilwara	Shahpura
Bhilwara	Gangapur
Bhilwara	Mandalgarh
Bundi	Indergarh
Bundi	Kaprain

District	City
Bundi	Keshoraipatan
Bundi	Lakheri
Bundi	Nainwa
Chittaurgarh	Rawat Bhata
Dhaulpur	Rajakhera
Jaipur	Bagru
Jaipur	Kishangarh Renwal
Jhalawar	Aklera
Jhalawar	Bhawani Mandi
Karauli	Todabhim
Kota	Itawa
Kota	Kaithoon

District	City
Kota	Ramganj Mandi
Kota	Sangod
Nagaur	Degana
Nagaur	Kuchera
Nagaur	Merta City
Tonk	Malpura
Tonk	Niwai
Tonk	Todaraisingh
Dausa	Lalsot
Dausa	Mahwa

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ANNEXURE 3: SITUATION AND FINANCIAL ASSESSMENT TOOLS

13.1 FSM Situational Assessment Tool

FSM Situational Assessment Tool is developed to analyse the existing Faecal Sludge Management practices and to plan for better FSM. The tool is specifically designed to address the needs of "informed users" and is moderately data intensive. This tool is a simple excel data entry form that includes questionnaires reflecting the aspects (regulatory, institutional, technical, financial, advocacy and capacity building) of FSM for the entire sanitation value chain i.e., containment, emptying, transportation, treatment, reuse.

The tool is applicable to areas where households are served by on-site sanitation systems (OSS) and is not applicable to areas which are totally sewered and are provided with centralized sewage treatment plant. Below is a brief of all the sections of the tool:

S. NO.	THEME	DESCRIPTION
1.	Introduction	Details of the location, surveyor, respondent and contact numbers
2.	General	Contains the demographic information of the town along with other advocacy, monitoring and socio cultural probing questions targeted to the urban local body
3.	Containment	Type of toilets, containments, volume of OSS, soil type and ground water table along with softer initiatives like subsidies and advocacy material
4.	Emptying	Accessibility of areas, desludging frequency, licensing norms, awareness regarding OSS design and adherence to building codes
5.	Transportation	Demarcation of service and disposal areas, Certifications/permits/trainings regarding process of de-sludging, monitoring of route and disposal sites, CAPEX and OPEX of the vehicles
6.	Treatment	Existing treatment infrastructure, land availability, permits and effluent standards
7.	Reuse	Existing reuse practices, ill-effects of untreated faecal sludge, complaints, awareness campaigns and advocacy initiatives

13.1.1 Critique of the FSM Situational Assessment Tool:

Although the tool is quite comprehensive in its approach to understand the FSM scenario at the town level, but the usage of the tool made the data collection quite tedious due to the following:

1. Granular Data unavailability
2. Faulty Excel Functions
3. Missing intra and inter sheet linkages
4. Non-availability of data like percentage breakup of toilet type, soil type, containment type on field, which requires a detailed assessment
5. Missing conceptual clarifications (desludgable vs. accessible) and assumptions used
6. The exercise of transferring data from all the excel sheets to a master sheet had to be done manually, proving to be time consuming and increasing room for errors.

13.2 FSM Technical and Financial Tool

The FSM Technical and Financial Tool is intended for three target user groups: City Planners, Consultants and Donors. It has the following components:

S. NO.	ASSESSMENT TYPE	DESCRIPTION
1.	Baseline Assessment	Sanitation characteristics of HH's, commercial establishments and institutions within the town/city's jurisdiction
2.	Technology Selection	Overview of primary and secondary faecal sludge treatment technologies
3.	Financial viability assessment	Financial model generates the cash flow statement, income statements and balance sheets with outputs as the financial viability indicators

S. NO.	PARTICULARS	DESCRIPTION
1.	FS Volume	Computes the faecal sludge volume generated by HH, commercial establishments and institutions
2.	Number of Trucks	Estimates the number of trucks required to operate the system based on the FS volume
3.	Treatment and technology	Provides and overview of the various primary and secondary FS treatment options
4.	Cost and financing	Provides an estimate of the costs of the vacuum trucks and the treatment plant
5.	Debt	Generates the debt repayment schedule based on the financing assumptions
6.	Revenue	Generates the revenue projections based on the proposed tariff
7.	CS, IS, BS	Generates the cash flows statement, income statement and balance sheets
8.	Summary	Summary of the resulting financial indicators

13.2.1 Critique of the FSM Technical and Financial Tool:

1. All cost units are in USD which makes the assessment difficult at a town scale.
2. Assumptions related to desludging vehicle availability is not in sync with the small town reality.
3. The technology options are basic but assessing the IRR and all the financial implications is unclear and difficult.
4. Verification has to be done on the units of measurement of the reuse products being planned
5. The tool asks for an expected cost of construction of the plant which is difficult to estimate in a rapid assessment survey.
6. The financing assumptions are hard to interpret.
7. The level of detail required in FAT is not suitable in a rapid assessment of towns.

Due to the above shortcomings of the SAT and FAT, and a pilot of 33 towns, the questionnaire was revised. All the redundant questions were removed and more context specific questions were added. FAT as a tool was entirely eliminated.

BASELINE ASSESSMENT - GENERAL				
FEASIBILITY ASSESSMENT ACROSS 99 CITIES OF RAJASTHAN				
	Name of the surveyor:			
	Name of organization			
S. NO.	DATA REQUIREMENTS FOR SITUATIONAL ASSESSMENT TOOL (SAT)			NOTES TO SURVEYOR
	BACKGROUND INFORMATION - INTRODUCTION SHEET			
1	Name (municipality/city/town /State/ Province) (Place of assessment)			
2	State			
3	Province/District			
4	City			
5	Respondent's name and email ID			
6	What is the type of Urban Local Body (ULB)?			
7	In which year was the ULB established			
	OVERALL INFORMATION ON FSM - GENERAL SHEET			
	DEMOGRAPHIC AND PHYSIOGRAPHIC PROFILES	UNITS	INPUT DATA	
1	Total population in the coverage area	Number		
2	Total informal settlements (slum) population in the coverage area	Number		
3	Total number of households	Number		
4	Number of slum households	Number		
5	Number of municipal wards (election wards)	Number		
6	Number of commercial establishments in the coverage area (*Note: Commercial establishments include recognized number of shops, cinemas, theaters, hotels and restaurants)	Number		
7	Number of institutional establishments in the coverage area (*Note: Institutional establishment include recognized number of schools, universities, hospitals, government office and private office)	Number		
8	Nature of area	Isolated urban area Urban area on the periphery of larger urban region Rural		
9	Total land area	In sq.km		

S. NO.	DEMOGRAPHIC AND PHYSIOGRAPHIC PROFILES	UNITS	INPUT DATA	NOTES TO SURVEYOR
10	Average population density	in persons per sq.km		Collect the Ward wise breakup of population
11	Average population growth rate (annual)	%		
12	What are the slabs and respective rates at which you charge property tax	Residential:_____ Industrial:_____ Commercial:_____		
13	What is the demand of Property tax/Urban development tax for the last three years	2013 2014 2015		
14	What is the collection of Property tax/Urban development tax for the last three years	2013 2014 2015		The surveyor is required to collect the summary sheet of annual budget of the previous 3 years
15	Is there a provision to charge a sanitation cess/tax	Yes / In-process / No		
16	Does the city run a database (online) or management information system (MIS)?	Yes / In-process / No		
17	What are the municipal services covered in the MIS	Open ended		
	WATER SUPPLY DATA			
18	No of households with municipal piped water supply connections	Number		
19	What are the other sources of water provided to the citizens	☐ River ☐ Canal ☐ Borewell ☐ Private Tankers Others		
20	Average water consumption per capita per day	LPCD		
21	Also note: Frequency and duration of supply:	For_____ Hours in _____day/s		
22	How much water is supplied to the town/city	MLD		
23	How much does the ULB charge for water supply	Residential:_____ Industrial:_____ Commercial:_____		
24	How is your water supply charged	☐ Metered ☐ On basis of the pipe diameter ☐ Fixed billing ☐ Others		

S. NO.	DEMOGRAPHIC AND PHYSIOGRAPHIC PROFILES	UNITS	INPUT DATA	NOTES TO SURVEYOR
		SANITATION SITUATION		
25	Coverage of sewerage system in the area	a) Full (100%) b) Partial (30-99%) c) Poor (0-29%)		
26	Percentage of population practicing Open Defecation in the area	%		Collect any recent DPR's that were prepared for the city for SWM, WW, SDM,Sewerage, Roads etc.
27	Percentage of population covered by On-site Sanitation (OSS) system in the area	%		
28	Have any recent DPRs been made for sewerage , SWM, FSM	Yes / No		
		FSM		
	LEGAL FRAMEWORK AND ENFORCEMENT RELATED QUESTIONS			
29	Are you aware of FSM legislation or legal framework, policies, strategies or development plans at these following levels of governance at the national level.	Yes / In-process / No		
30	If yes, please elaborate			Name of legislation, body responsible for implementation etc
	FINANCE			
31	Does the city/municipality provide FSM services	Yes / In-process / No		
32	Does the city/municipality have financial statements for its FSM operations	Yes / In-process / No		
33	Does the city/municipality plan to undertake FSM projects	Yes / In-process / No		
34	Is there a funding allocation for FSM projects	Yes / In-process / No		
35	Does the city need technical/financial support towards preperation of FSM concept studies	Yes / In-process / No		
	ADVOCACY			
36	Have there been any FSM advocacy activities conducted on FSM?	Yes / In-process / No		

S. NO.	ADVOCACY	UNITS	INPUT DATA	NOTES TO SURVEYOR
37	Type of Advocacy Materials used if advocacy activities till date or in process	a) Publications b) Audio c) Video d) Multimedia e) Others, please specify:		
38	Type Advocacy Methods	a) Advertising b) Campaigning c) Events: organizing FSM events d) Media- Press release, press conferences, TV interviews		
	CONTAINMENT			
39	How many individual toilets are there in the city	Number		
40	How many community toilets are there in the city	Number		
41	How many public toilets are there in the city	Number		
42	How are the public toilets operated?	☐ PPP model ☐ Operated by the ULB ☐ Others		
43	Are the permits required for the construction of on-site sanitation systems(OSS) in existing or new buildings?	a) Yes b) No		
44	Institutional organization issuing the permits for construction of OSS, if permit is needed	Open ended		
45	Are the new installations of OSS inspected upon completion - for compliance with buillding codes, tested for leaks or damages?	a) Yes b) No		
46	Are there penalties for non-compliance?	a) Yes b) No If Yes, what is the penalty:_____		

Notes:

a. Last three years budget book summary

b. Map of the municipality with ward boundary (both soft and hard copy)

c. SLB Data, Election Commission Ward map, SBM Data, DPRs in any, Master plan, ward wise break up of population, truck operations log book/income earned

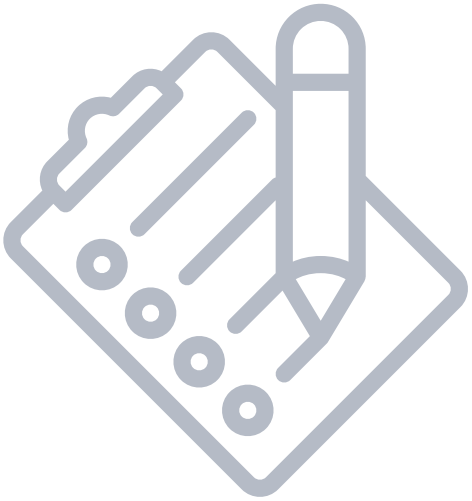
S. NO.	CONTAINMENT	UNITS	INPUT DATA	NOTES TO SURVEYOR
47	Type of toilet used	a) Flush toilet b) Pour flush c) Urine Diversion Dry Toilets (UDDT) d) Pit latrines e) VIP f) Others		
48	Groundwater table in the containment area	In feet		
49	Soil type in the containment area	a) Clayey b) Silty c) Sand/Gravel d) Rocky		
50	Household OSS			
	a) Percentage of HH with Septic tanks b) Percentage of HH with Single pit latrine c) Percentage of HH with Twin pit latrine	% % %		
51	% of HH with no connection i.e. Public/ communal toilets percentage	%		
	Average volume of OSS			
52	For Household:			
	a) HH septic tanks b) HH single pit latrine c) HH twin pit latrine d) Others	L ___ B___ H___(Ft) L ___ B___ H___(Ft) L ___ B___ H___(Ft) L ___ B___ H___(Ft)		
53	Materials used for constructing OSS	Wall_____ Base_____ Cover_____		
54	Percentage of commercial establishments with OSS (Mention type and dimensions)	_____ % L ___ B___ H___(Ft)		
55	Percentage of Institutional establishments with OSS (Mention type and dimensions)	_____ % L ___ B___ H___(Ft)		
	SBM DETAILS			
56	How much money is given under SBM for constructing toilets and in how many installments?			Collect SBM latest data entry
57	What types of construction is funded under SBM?	☐ New Toilets ☐ Converting insanitary toilets ☐ Making twin pit from pit ☐ Others_____		

S. NO.	CONTAINMENT	UNITS	INPUT DATA	NOTES TO SURVEYOR
58	Is there a practice of mandatory (scheduled) desludging organised by the ULB?	a) Yes b) No c) In-process		
59	Frequency of desludging	a) 3 years b) 4 years c) 5 years d) Other, please specify		
60	Institutional body that provides the emptying services, if any permit or license is required	a) Private b) Public c)Public-Private Partnership (PPP) d) Others, please specify:		
61	The most common method of emptying fecal sludge	a) Manual b) Mechanical c) Both d) Other, please specify:		
62	Fee for manual emptying	In Rupees		
63	Fee for mechanical emptying	In Rupees		
64	Number of working days per year (for desluging operator)	Number		
65	Estimated drive time to home or business	Number (e.g. In Hours)		
66	Estimated time to pump the septic tank	Number (e.g. In Hours)		
67	Estimated drive time from collection site to treatment plant	Number (e.g. In Hours)		
68	Estimated unloading time at treatment facility	Number (e.g. In Hours)		
69	Estimated drive time to the next home or business	Number (e.g. In Hours)		
70	Hours of operation per day	Number (e.g. In Hours)		
71	Cost of the desludging vehicle	Rs.		
72	Cost of operating the truck (petrol + maintenance + miscellaneous) in a month			

S. NO.	TRANSPORTATION	UNITS	INPUT DATA	NOTES TO SURVEYOR
73	Are the FS disposal areas clearly identified for the designated operators?	a) Yes b) No		The surveyor is required to demarcate the FS disposal location on the ward map of the town
74	Are the trucks monitored regularly for durability issues? (leakage)	a) Yes b) No		
75	Are the operators provided with certification/ permits for disposal of FS?	a) Yes b) No c) In-process		
76	What is the area of operation served by a truck	Within city_____ Adjacent rural areas / Cities_____		
77	Type of transport are used for FSM	a) Manual transport b) Motorised Transport c) both d) others, please specify:		
78	Type of motorized transport used	a) Tractor with tankers b) mini lorries mounted with tanks c) Vaccutug toed with pick-up d) lorries e) speciallised desludging truks f) other____		
79	Average number of trips/week	Trips / week		
80	Number of trucks based on truck capacity and their use for transportation of fecal sludge	Numbers		
81	Are the trucks owned by the municipality or by a private operator?	a) Municipality b) Private Operator		
82	No of trucks owned by Municipality	Number		
83	Capacity of Trucks owned by Municipality	Number		
84	No of trucks owned by Private Operator	Number		
85	Capacity of Trucks owned by Private Operator	Number		
86	FSM tariff charged to the clients			
87	% Area of location accessible by this truck size	%		

S. NO.	TRANSPORTATION	UNITS	INPUT DATA	NOTES TO SURVEYOR
88	Is there a Treatment Plant in the City?	a) Yes b) No c) In-process		
89	If No, has a treatment site been identified in the city	a) Yes b) No c) In-process		The surveyor is required to demarcate the location of treatment site on a map
90	Are there the Effluent standards?	a) Yes b) No		
91	FS Collection (*average quantity of faecal sludge that has been collected from service area annually)	m^3/year		
92	Availability of land to build the treatment plant	a) Yes b) No		
93	Size of Land available for construction of TP			
94	Cost of land available for treatment	Local currency/area		
95	Treatment site flood prone or not	a) Yes b) No		
96	Land identified for treatment site, flood prone or not	a) Yes b) No		
97	Electricity available for treatment in the selective area	a) Yes b) No		
98	Groundwater table in the treatment area	in feet		
99	Soil type in the treatment area	a) Clayey b) Silty c) Sand/Gravel d) Rocky		
100	Are permits required for treatment?	a) Yes b) No		
101	Organization who issues the permit for treatment of FS, if permit is needed	Open Ended		
102	Existing treatment plant in the city	a) Yes b) No		The surveyor is required to demarcate the treatment plant on a map
103	Existing TP enough to meet the demand of generated FS in the city	a) Yes b) No		
104	% FS untreated	%		
105	Is the Treatment plant meeting effluent standards	a) Yes b) No		

S. NO.	TRANSPORTATION	UNITS	INPUT DATA	NOTES TO SURVEYOR
106	Accessibility of the treatment site	a) Difficult to reach b) Moderate c) Easy to reach		
107	Treatment plant has safety standards or not	a) Yes b) No		
108	Are the safety standards monitored?	a) Yes b) No		
109	Are the waste haulers paid at the site?	a) Yes b) No		
110	Are the regulations in place that outline the requirements / standards for sludge re-use?	a) Yes b) No c) In-process		
111	Which organization is responsible for checking the compliance of standards for reuse? (quality)	Open Ended		
112	Total quantity of treated septage (manure) derived from treatment facility per year	m^3/year		
113	If, no treatment plant is functional, is the un treated end product reused?	a) Yes b) No		
114	Is treated end product reused?	Open Ended		
115	The users of end product	Open Ended		
116	Are farmers using untreated fecal sludge for agricultural purposes?	a) Yes b) No		
117	General openness to reuse in agriculture?	Open Ended		
118	Total Cultivable land within the town	Number (in hectares)		
119	Agricultural activities observed specifically across wastewater stream or at sewage outfall	Open Ended		
120	Is there awareness about the ill effects of untreated fecal sludge?	a) Yes b) No		
121	Are consumers aware that the agricultural products they consume are contaminated with untreated fecal sludge?	a) Yes b) No		
122	Is there any campaign on ill effects of untreated fecal sludge?	a) Yes b) No c) In Process		
123	Are there any advocacy materials that highlight the hazards of untreated fecal sludge?	a) Yes b) No		
124	Percentage of raw fecal sludge (FS) directly sold to farmers	%		
125	Unit price of raw fecal sludge	Local currency/m^3		



14

ANNEXURE 4: COMPENDIUM OF TECHNOLOGY OPTIONS

SL NO	TECHNOLOGY NAME	TECHNOLOGY DESCRIPTION	TREATMENT PRINCIPLE ADDRESSED	
1	Imhoff Tank	Imhoff tank is a primary treatment technology for raw wastewater. It is designed for solid-liquid separation and digestion of the settled sludge. Imhoff tanks are ideal for small communities.	Solid-liquid separation	
2	Screening	The screen and Grit chamber is a basin to trap large solids (rags, paper, plastics, and metals)using different size screens and for settling of grits (sand, gravel, cinder). The solids collected in this chamber removed regularly and disposed safely	Screening	
3	Geotextile bags and tubes	Geo tube - Dee bags are porous tubular containers fabricated with high strength woven geo-textiles (polyethylene material) mainly used for dewatering sludge. The solids are contained in the bag, whereas the filtrate is drained out of the pores in the bags.	Solid-Liquid Seperation	
4	Deep Row Entrenchment	Deep row entrenchment is a process which involves digging deep pits or trenches, filling them up with sludge and covering with soil. Trees which are then planted on top benefit from the organic matter and nutrients that are slowly released from the faecal sludge (FS).	Sludge Stabilisation	
5	Unplanted Drying Bed	UPDB are shallow filter tank filled with graded gravel mainly used for dewatering of stabilized sludge. The drying process in a drying bed is based on drainage of liquid through the sand and gravel to the bottom of the bed, and evaporation of water from the surface of the sludge.	Dewatering	
6	Planted Drying Bed	PDBs are loaded with layers of sludge that are subsequently dewatered and stabilised through multiple physical and biological mechanisms	Sludge Stabilization and Dewatering	
7	Thermal Drying-LadePa & Pulse Combustion Dryer	The LaDePa (Latrine Dehydration Pasteurisation) is a drying technique which is a combination of a belt and a Medium Wave Infrared Radiation drying section	NA	

	LAND REQUIREMENT	CAPEX IN INR	OPEX IN INR	TREATMENT EFFICIENCY	REUSE OPTIONS	STAND ALONE (YES/NO)
	Variable			It removes 25 to 50% of COD (Chemical Oxygen Demand), reduces suspended solids by 50 to 70% but pathogen removal remains low		No
	Variable					No
	Variable	1200 – 1500 per m^3		Effluent can reach the discharge standard of 30mg/l in 11 minutes after the liquid passes through the fabrics.		No
	Typically between 100 to 120 m^2 (200 m long, 0.6 m width and 1.2 to 1.5 m depth	Depends on labor cost		Able to achieve the capture of 98% of solids from the sludge		Yes
	Total area depends on the daily generation of FS and drying period	10000 - 12500 per m^2	10000/ month	SS :- 60 - 80 % COD :- 70 -90% NH_4+_N :- 40 -60% TS :- 80% N-NH_4 :- 50% SLR :- 70-475 kg TS/m^2.yr Helminth eggs :- 100% BOD :- 60% N removals of 35-70%.		No
	50 to 70 m^2/m^3/day	800 to 2000 per sq. ft	8000/ month	Ts content of the Dewatered sludge varied from 20- 25% 70-80% TS, 96-99% SS, and 95-98% tot. COD (TCOD) removals were achieved in the liquid fraction of the septage.		No
	NA	NA	NA	NA		Yes

Continued to next page

SL NO	TECHNOLOGY NAME	TECHNOLOGY DESCRIPTION	TREATMENT PRINCIPLE ADDRESSED	
8	Settling tank	Settling tank is a pre-treatment devise which ensures maximum settling (gravity settling or forced settling through addition of lime) of solid particles present in the faecal sludge waste for fixed duration of time.	Solid-Liquid Separation	
9	Soil biotechnology (SBT)	SBT is a major paradigm shift in waste processing. Sewage treatment is just one application among many – it can be used for arsenic/iron removal, hospital waste processing, industrial wastewater processing & air purification and so on. Unlike a conventional STP or septic tank where periodically the sludge has to be offloaded, everything is consumed within the plant in this SBT based STP	Effluent Treatment (Sedimentation, Filtration, Biochemical Process)	
10	Waste stabilization pond	The treatment system – two twin batch-Operated sedimentation tanks. The treatment system – two twin batch-operated sedimentation tanks followed by a series of ponds treating septage and public toilet sludge	Septage and Effluent Treatment	
11	Activated Sludge Process	An activated sludge process refers to a multi-chamber reactor unit that makes use of highly concentrated microorganisms to degrade organics and remove nutrients from wastewater to produce a high-quality effluent. To maintain aerobic conditions and to keep the activated sludge suspended, a continuous and well-timed supply of oxygen is required.	Effluent Treatment	
12	Upflow Anaerobic Sludge Blanket	The upflow anaerobic sludge blanket reactor (UASB) is a single tank process in an anaerobic centralised or decentralised industrial wastewater or blackwater treatment system achieving high removal of organic pollutants.	Effluent/WW Treatment	
13	Sequential Batch Reactor	It is a type of activated sludge system for wastewater treatment, in this system wastewater is added to a single batch reactor to remove undesirable components and then discharged or reused.	Effluent/WW Treatment	
14	Membrane Bio reactor (MBR)	MBR is a wastewater treatment processes where a perm-selective membrane eg microfiltration or ultrafiltration is integrated with a biological process – a suspended growth bioreactor.	Effluent/WW Treatment	
15	Moving Bed Bio Reactor (MBBR)	MBBR system consists of an aeration tank (similar to a activated sludge tank) with special plastic carriers that provide a surface where a biofilm can grow. The carriers are made of a material with a density close to the density of water (1 g/cm3)	Effluent/WW Treatment	
16	Vermi-composting	Vermicompost is the product of the composting process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast. This process of producing vermicompost is called vermicomposting	Treatment of Sewage Sludge/Dried Sludge from FSTP	

	LAND REQUIREMENT	CAPEX IN INR	OPEX IN INR	TREATMENT EFFICIENCY	REUSE OPTIONS	STAND ALONE (YES/NO)
	Depends on Volume of Sludge	10000 to 15000 per Cum	NA	Reduce the load/volume of liquid entering the dewatering modules		No
	5kld – tens of MLD	10,000 – 15,000/kld	1000 – 1500 kld/ year		Horticulture, cooling systems	Yes
	0.80-2.3 ha/MLD	1.5-4.5 millions/MLD	0.06 – 0.1 millions/ MLD/year	SS > 5000 mg/l BOD > 500 mg/l (75-80%0 NH4 = 800 - 1000 mg/l TS: 75-80% COD: 74-78% E.coli: 60.99.9%		Yes for waste water only
	0.15-0.25 ha/MLD	20-40lakhs/ MLD	3-5lakhs/ MLD/year	BOD < 20mg/l (85-92%) TSS < 30mg/l SS: 75-80% COD: 93-94% E.coli: 60-90%		Yes for waste water only
	0.2-0.3 ha/MLD	25-35lakhs/ MLD	80000-170000/ MLD/year	TS: 75 – 80% SS: 75-85% BOD- 60-80%		Yes for waste water only
	0.055 ha/MLD	11.5 million/ MLD	45.12 millions/ MLD/year	BOD removal: 85-98 % TSS : 85-98%		Yes for waste water only
	0.045 ha/MLD	10.8 millions/ MLD	83.25 millions/ MLD/year	BOD upto 2mg/l (90%) COD upto 20mg/l (95%) TSS upto 2mg/l SS: 90%		Yes for waste water only
	0.055ha/MLD	11 millions/ MLD	63.81 millions/ MLD/year		Toilet flushing, Horticulture	Yes for waste water only
	1,000m2/MLD	3,00,00,000 / MLD	8,00,00, 000/MLD/ year	Pathogen removal/pathogen inactivation	Fertiliser for farming/ agriculture	No

Continued to next page

SL NO	TECHNOLOGY NAME	TECHNOLOGY DESCRIPTION	TREATMENT PRINCIPLE ADDRESSED	
17	Co-Composting	Co-composting is composting of a mixture of organic solid waste and faecal sludge with pre-defined moisture content (40-60%) at specified condition	Pathogen Removal/in Activation of FS	
18	Trickling Filter	Cocopeat works under the principle of physical and bio-filtration. The treatment module is used as a secondary treatment system for treatment of concentrated wastewater from different sources.	Effluent Treatment	
19	DEWATS	DEWATS applications are based on the principle of low-maintenance since most important parts of the system work without technical energy inputs for treatment of organic wastewater from different sources	Effluent and WW Treatment	
20	Lime Stabilization	Lime is added to the sludge mainly for thickening the sludge which leads to easier settling of solids, reduction in inactivation of pathogens and considerable amount of sludge stabilization. Usually 5 kg of lime per cum of sludge is added	FS treatment, solid-Liquid Separation, Sludge Stabiilisation	
21	Anaerobic Digestion	This treatment unit works on the principle of anaerobic digestion where the organic matter is converted more stable organic components.	Sludge Stabilization and Digestion	
22	Omni Processor	Omni Processor is a combination of physical, biological or chemical treatment processes for treating faecal sludge in developing countries.	Complete Processing of FS	
23	Oxidation Pond	Oxidation ponds, also called lagoons or stabilization ponds are large, shallow ponds designed to treat wastewater through the interaction of sunlight, bacteria, and algae.	Effluent/WW Treatment	
24	Duckweed Pond	The duckweed based waste water treatment system in conjunction with pisciculture is one such technology that has the potential of offering effective wastewater treatment besides providing economic returns as well as generating employment opportunities in the rural areas.	Wastewater Treatment	

	LAND REQUIREMENT	CAPEX IN INR	OPEX IN INR	TREATMENT EFFICIENCY	REUSE OPTIONS	STAND ALONE (YES/NO)
	150 to 200 m2 for a load of 1 ton/day	12 - 15 Lacs per ton		Pathogen inactivation and increase in carbon content of dried FS	Fertiliser for farming/ agriculture	No
	3 to 5 m2 per m3	1.5 Lacs per cubic meter			Treated effluent can be used for farming or safely dipose	No, screening might be required
	5 to 8 sq.m per Cum	40000 to 60000 per Cum	3 to 5% of CAPEX	Treatment efficiency falls in the range of 80-90%	Irrigation, toilet flushing, horticulture	Yes
	Depends on the volume of sludge to be treated	10000 to 15000 per Cum	High			No
	Depends on volume of FS	15000 to 25000 per Cum		Efficient stabilization, removal of moisture content is faster in further modules		No, process of dewatering and filtration after this
					Treated wastewater of drinking quality	Yes, it is a complete unit of FS treatment
		30-80 million/MLD	0.2-1.0 millions/ MLD/year	BOD: 90% COD: 85% TSS: 90%	Farming	No
	2-6ha/MLD With 6-7days of retention time	1.5 – 4.5 million/MLD	0.18 million/ MLD/year		Pisiculture, farming	Yes

Table 15: Modules Used for Different Stages in Wastewater Treatment

SL.NO	SCREENING	SOLID-LIQUID	SLUDGE STABILIZATION	DEWATERING	PATHOGEN REMOVAL	EFFLUENT TREATMENT
1	Screen and Grit chamber	Settling Tank	Deep Row Entrenchment	Unplanted drying beds	Co-composting	Duckweed pond
2	-	Imhoff tank	Planted drying bed	Geotextile bags and tubes	Vermicomposting	Oxidation pond
3	-	-	Anaerobic digestion	-	Lime stabilization	DEWATS
4	-	-	Lime stabilization	-	-	Trickling filter
5	-	-	-	-	-	Waste stabilization pond

The treatment options listed below are for Wastewater and Faecal Sludge treatment. Faecal Sludge Treatment Plants are designed based on the following principles of wastewater treatment itself, which are namely solid-liquid separation, sludge stabilization, dewatering and pathogen removal. The explanation of each of the modules, land area required, capital and O&M cost, reuse options and other basic details are provided above

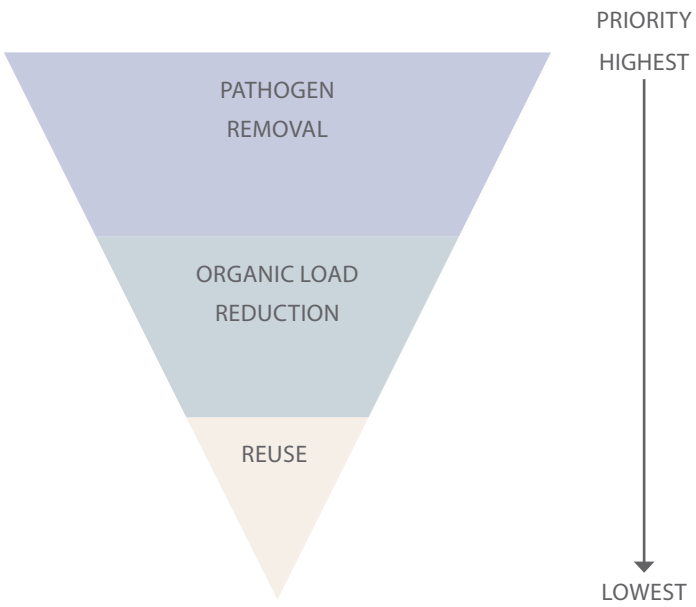


Figure 45: Selection of Treatment Options Based on Achievement of Following Objectives

For treatment of wastewater, the following treatment options have been suggested to bridge the gaps identified in the cities related to effluent treatment.

Table 16: Action Plan for Gaps in Wastewater Management in 100 Cities

SL.NO	EXISTING PROBLEMS	ACTION PLAN
1	Grey water disposal into storm water drains	To provide grey water treatment solutions at a decentralized or centralized locations
2	Septic tank outlet connected to storm water drains	Providing soak pits at places where space is available or identifying the decentralized locations and providing treatment system for the storm water mixed with black and grey water
3	Presence of silt and sand in storm drains causing blockage	De-silting silt and sand from drains before and after the rainy season, to ensure smooth flow of rainwater
4	Presence of solid waste in storm water drains and water bodies	Provide cover slabs for small drains and fencing around large drains. Create awareness in public on not to dispose SW into drains
5	Water stagnation around HH premises	Filling the ground surface with appropriate material and provide a channel to ensure flow of WW into storm water drains
6	Presence of unlined storm water drains causing water percolation into ground	Identification of storm water drains without lining and rectification of drains by providing lining
7	The outlet of storm water drains end into a water body (lake, pond, river) or creates a artificial water stagnation in a town	Provide bioremedation at suitable points within or along the drain. Suitable points – the outlet of the drain to be identified where all the water enters lake/river/any water body.

The action points mentioned are based on the observations made during rapid assessment and solutions suggested are very brief and superficial, a detailed technical assessment has to be carried out to provide specific solutions for each town.

14.2.2 Recommended options for Faecal Sludge Treatment

The following are a set of treatment options which can be taken into consideration for designing solutions for specific towns. The options have their own advantages and constraints which need to be considered.

Treatment Option 1:

1. Preferred for small quantity - less than 5 cum per day
2. Simple in operation
3. Less capital cost
4. High recurring cost for lime dosing
5. Large area requirement
6. Moderate treatment efficiency
7. High ground water table may be an issue

Treatment Option 2:

Faecal Sludge/Septage

Screen Chamber

Sand and Grit Removal

Settling Tank

Separation - Free Water

Disinfection - Lime

Liquid

Solids

Liquid

Geotube Bag

Minimum Stabilization

Dewatering

Disposal

End can be dumped in the lindfil site

Liquid Treatment

DEWATS

Trickling Filter

Rootzone treatment

Disposal

Effluent is discharged into agricultural fields or drain

1. Preferred for small quantity - less than 5 cum per day
2. Simple in operation
3. Less capital cost
4. High recurring cost for purchace of Geotube bags - 1500 INR per cum
5. Area requirement is less and good for emergency
6. Treatment efficiency is very minimal

Treatment Option 3:

Faecal Sludge/Septage

Screen Chamber

Sand and Grit Removal

Settling Tank

Separation - Free Water

Liquid

Solids

Liquid

Deep Entrenchment

Dewatering

Minimum Stabilization

Disposal

Solids

Co-composting

Stabilization

Disinfection

Reuse

Endproduct is compost. Can be used as soil conditioner

Disposal

End product can be dumped in the landfill site

Liquid Treatment

DEWATS

Trickling Filter

Disposal

Effluent is discharged into agricultural fields or drain

1. Simple in operation
2. Moderate capital cost
3. Large area requirement
4. Moderate treatment efficiency
5. Operating cycle is approx 30 days
6. Regular feeding is not an issue
7. Option adopted if cocomposting ensured / reuse

Treatment Option 4:

Faecal Sludge/Septage

Screen Chamber

Sand and Grit Removal

Settling Tank

Separation - Free Water

Liquid

Solids

Liquid

Anaerobic digester

Stabilization

Liquid-solid seperationv

Solids

Unplanted drying bed

Dewatering

Solids

Liquid

Liquid Treatment

DEWATS

Cocopeat

Disposal

Effluent is discharged into agricultural fields, drain or water body

Co-composting

Disinfection

Enriching fertilizer value

Disposal

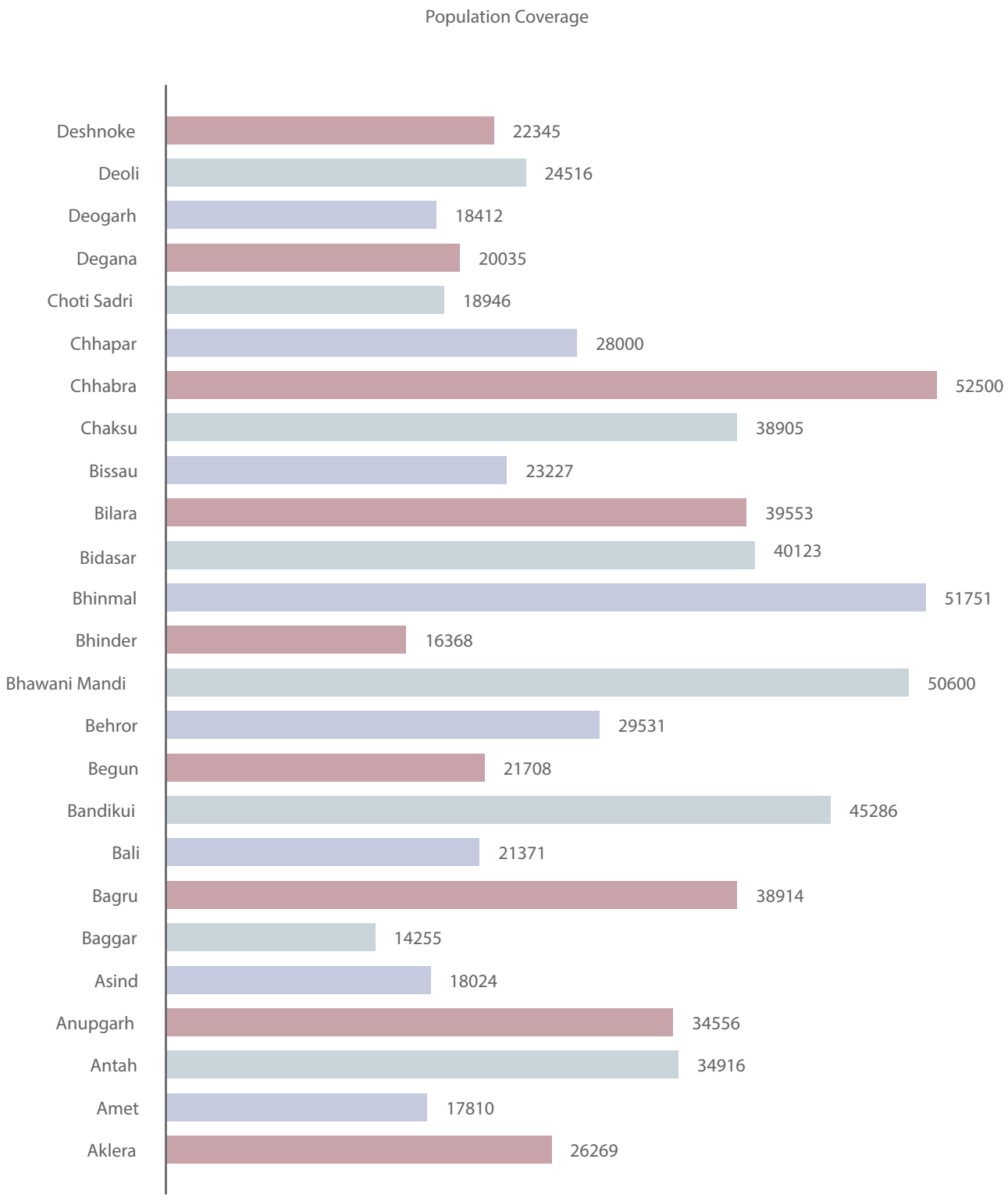
Endproduct is compost. Can be used as soil conditioner

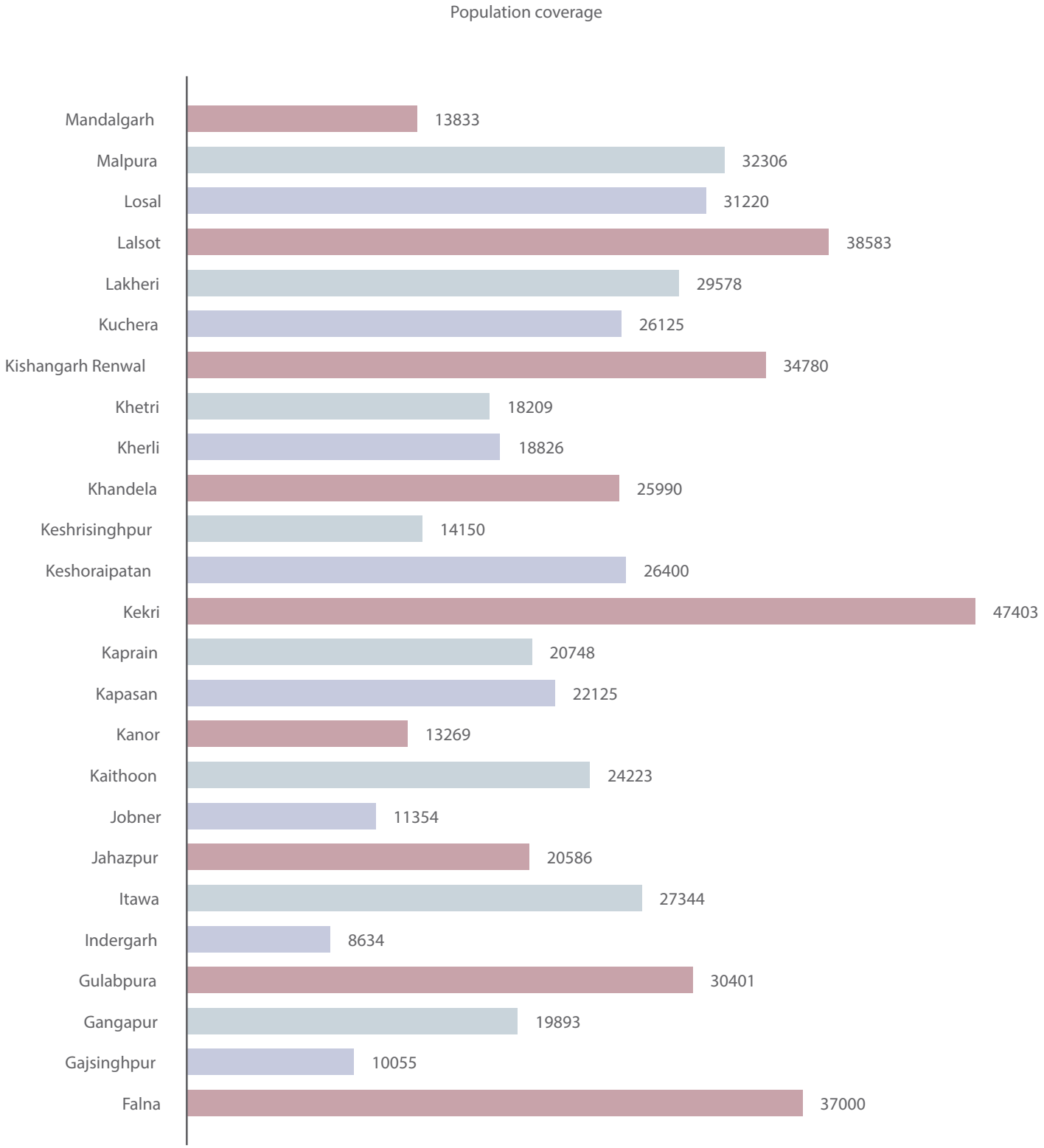
1. Regular operator is required. O&M is simple
2. Capital cost is high and recurrent cost is minimal
3. Large area requirement (UG+OG)
4. Suitable for large quantity
5. Good treatment efficiency
6. Regular feeding is not an issue

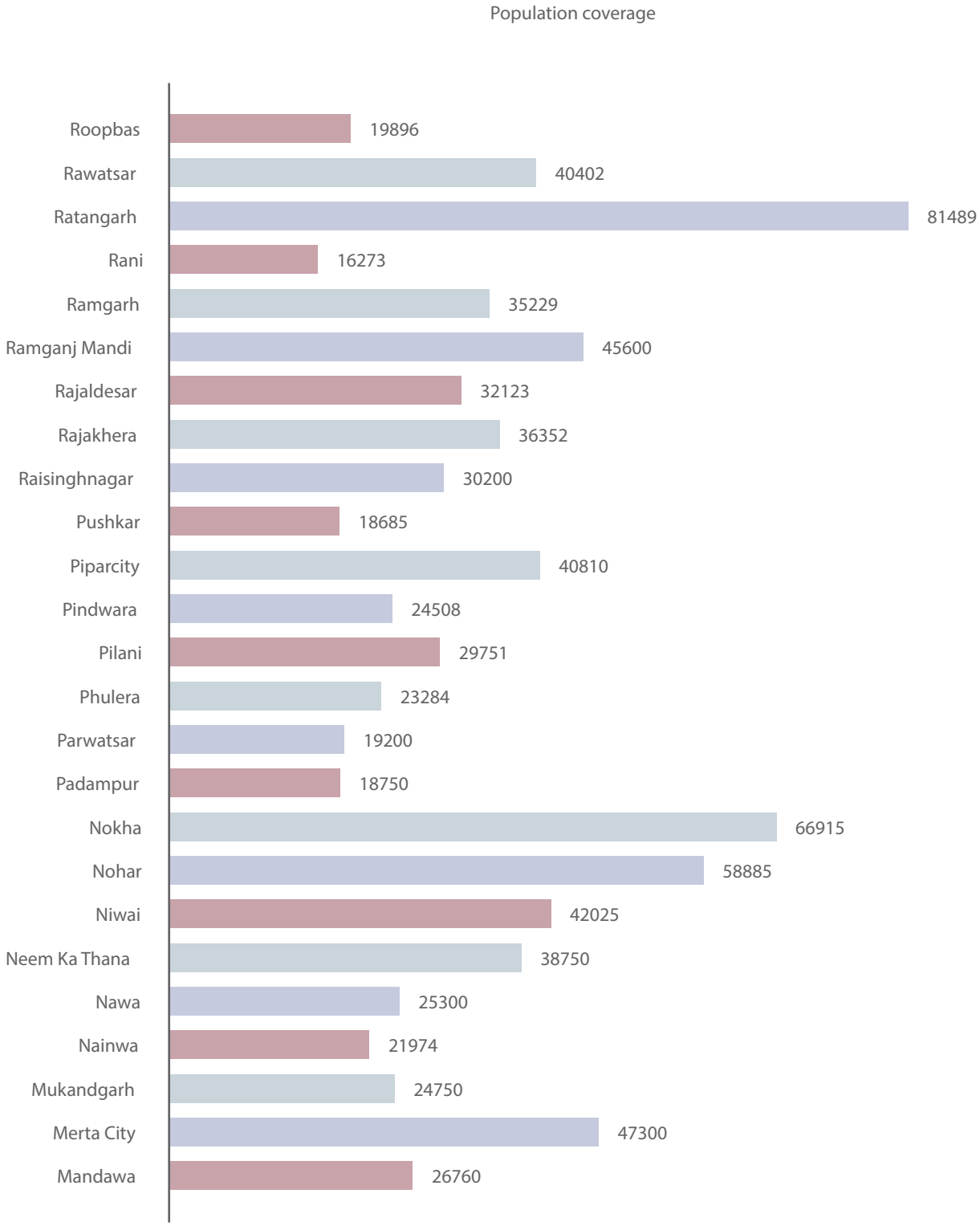
15

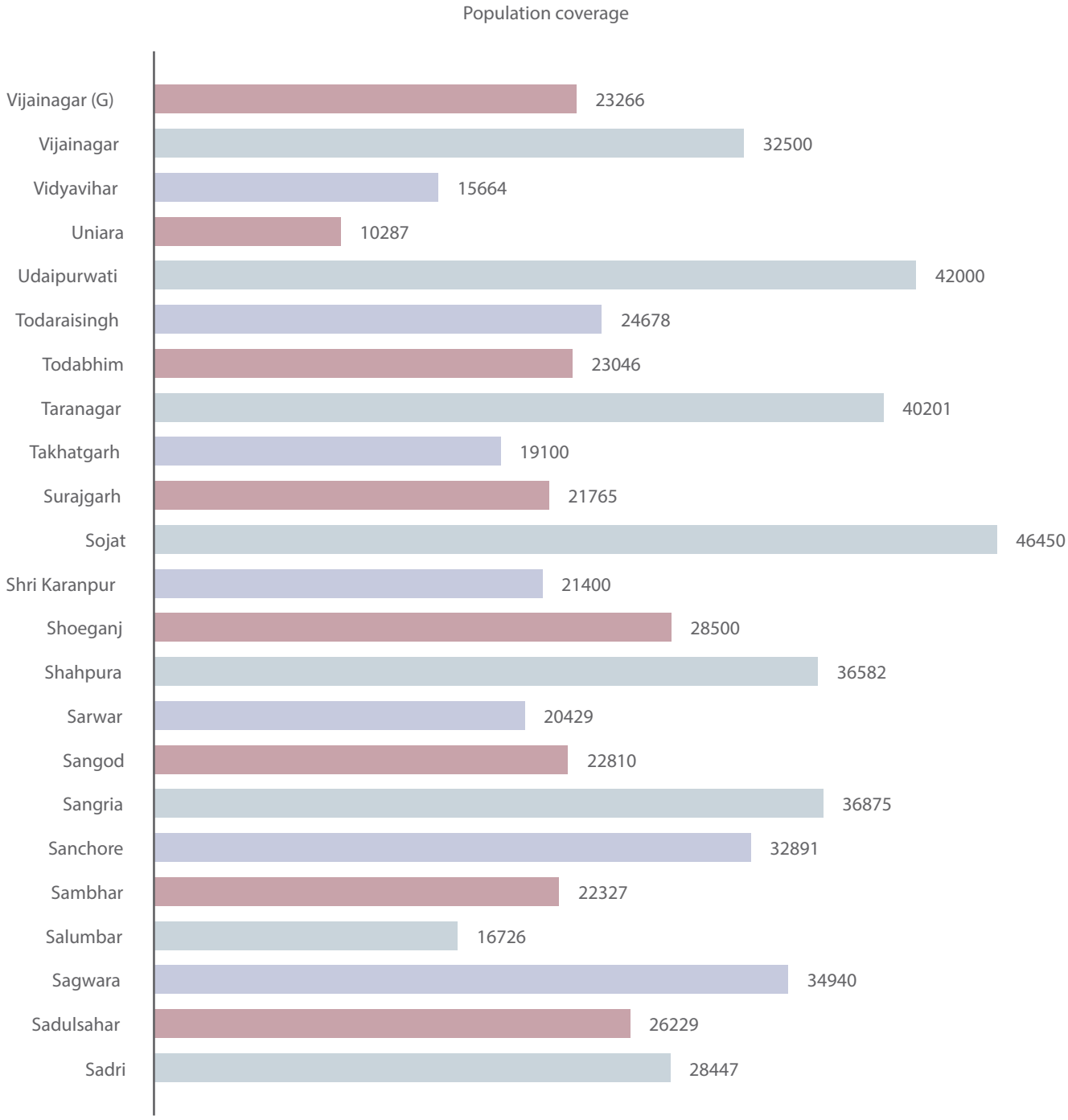
ANNEXURE 5: 100 CITY DATA

15.1 Population Data

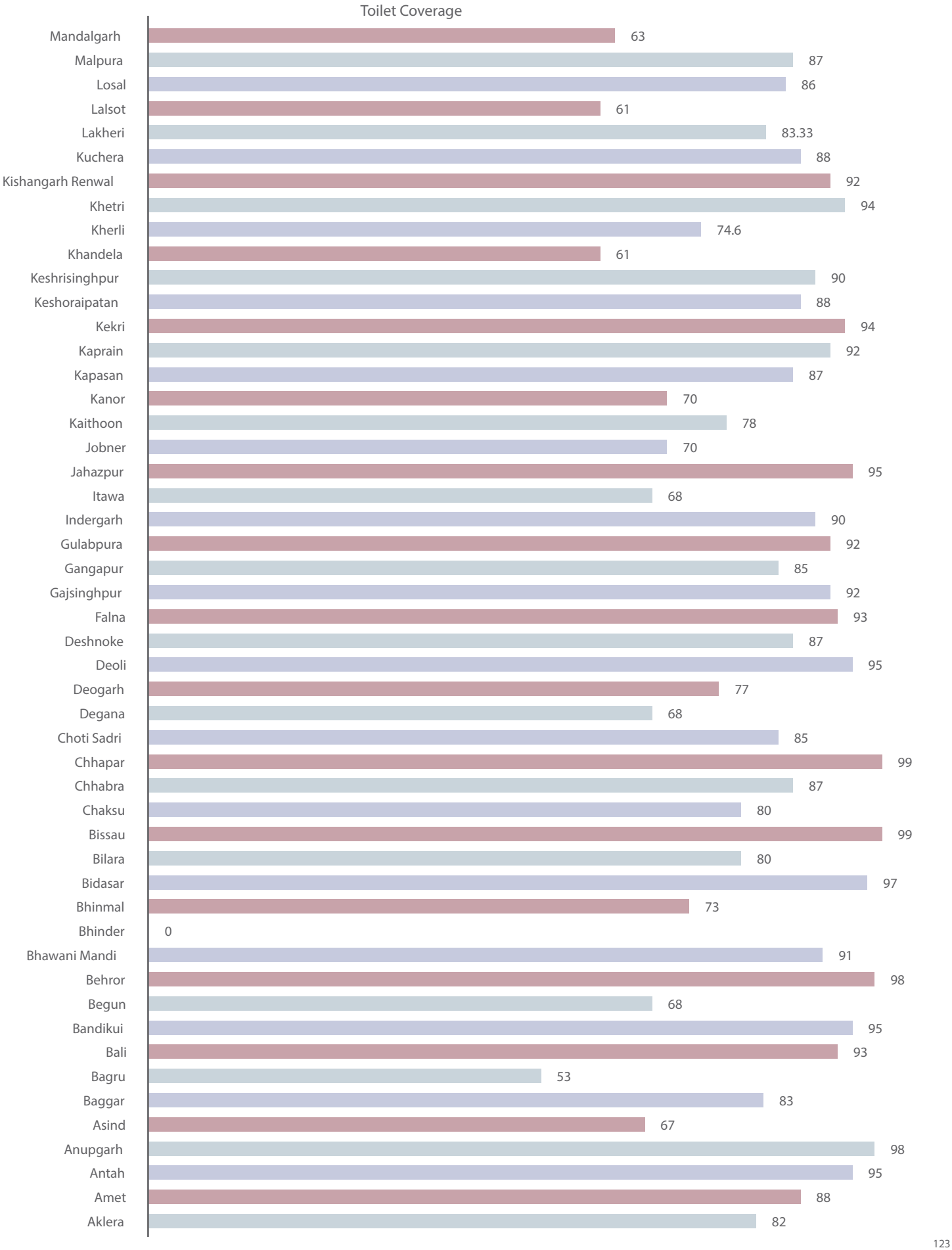


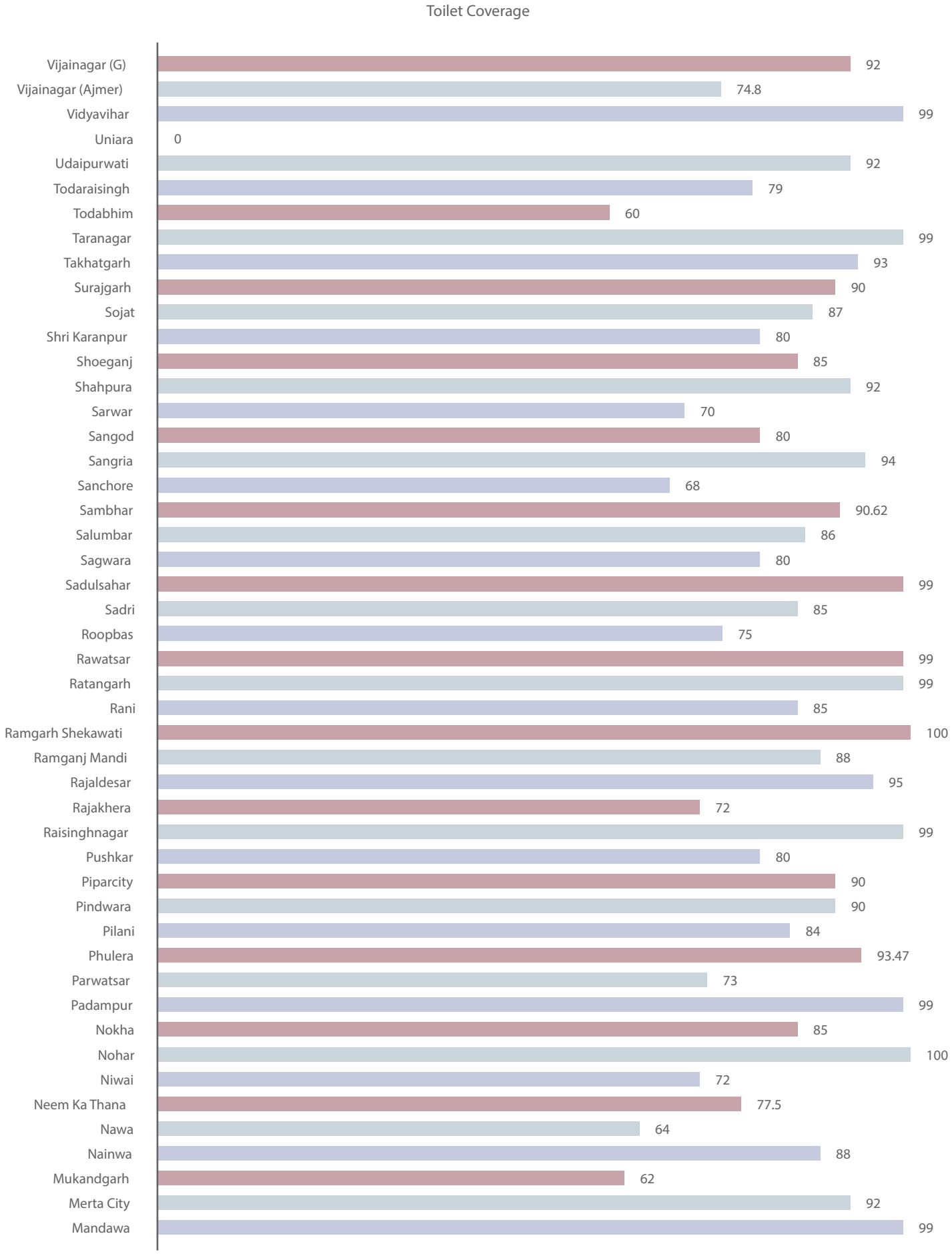

Population coverage
Mandalgarh
13833
Malpura
32306
Losal
31220
Lalsot
38583
Lakheri
29578
Kuchera
26125
Kishangarh Renwal
34780
Khetri
18209
Kherli
18826
Khandela
25990
Keshrisinghpur
14150
Keshoraipatan
26400
Kekri
47403
Kaprain
20748
Kapasan
22125
Kanor
13269
Kaithoon
24223
Jobner
11354
Jahazpur
20586
Itawa
27344
Indergarh
8634
Gulabpura
30401
Gangapur
19893
Gajsinghpur
10055
Falna
37000


Population coverage
Roopbas
19896
Rawatsar
40402
Ratangarh
81489
Rani
16273
Ramgarh
35229
Ramganj Mandi
45600
Rajaldesar
32123
Rajakhera
36352
Raisinghnagar
30200
Pushkar
18685
Piparcity
40810
Pindwara
24508
Pilani
29751
Phulera
23284
Parwatsar
19200
Padampur
18750
Nokha
66915
Nohar
58885
Niwai
42025
Neem Ka Thana
38750
Nawa
25300
Nainwa
21974
Mukandgarh
24750
Merta City
47300
Mandawa
26760

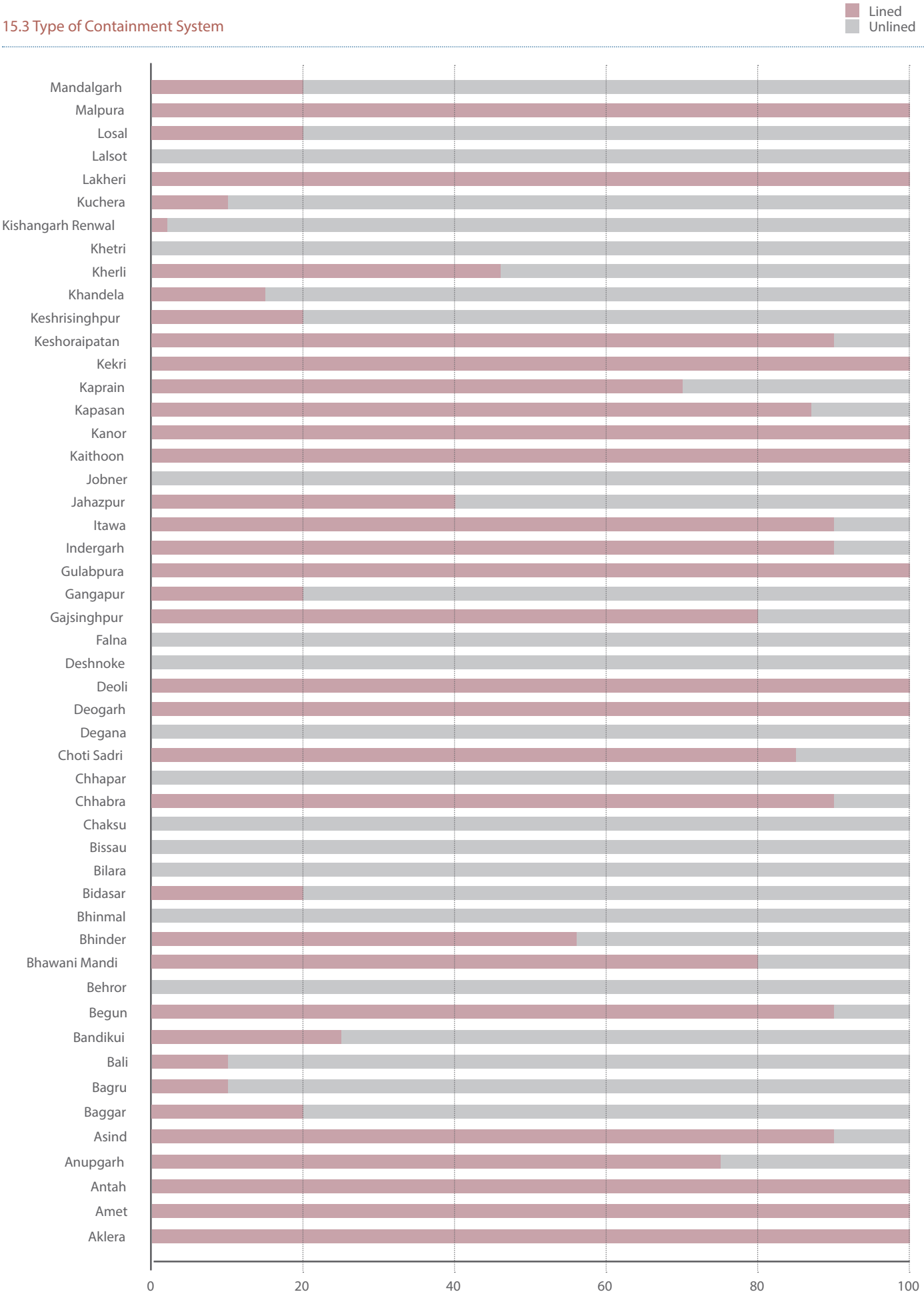

Population coverage
Vijainagar (G) 23266
Vijainagar 32500
Vidyavihar 15664
Uniara 10287
Udaipurwati 42000
Todaraisingh 24678
Todabhim 23046
Taranagar 40201
Takhatgarh 19100
Surajgarh 21765
Sojat 46450
Shri Karanpur 21400
Shoeganj 28500
Shahpura 36582
Sarwar 20429
Sangod 22810
Sangria 36875
Sanchore 32891
Sambhar 22327
Salumbar 16726
Sagwara 34940
Sadulsahar 26229
Sadri 28447

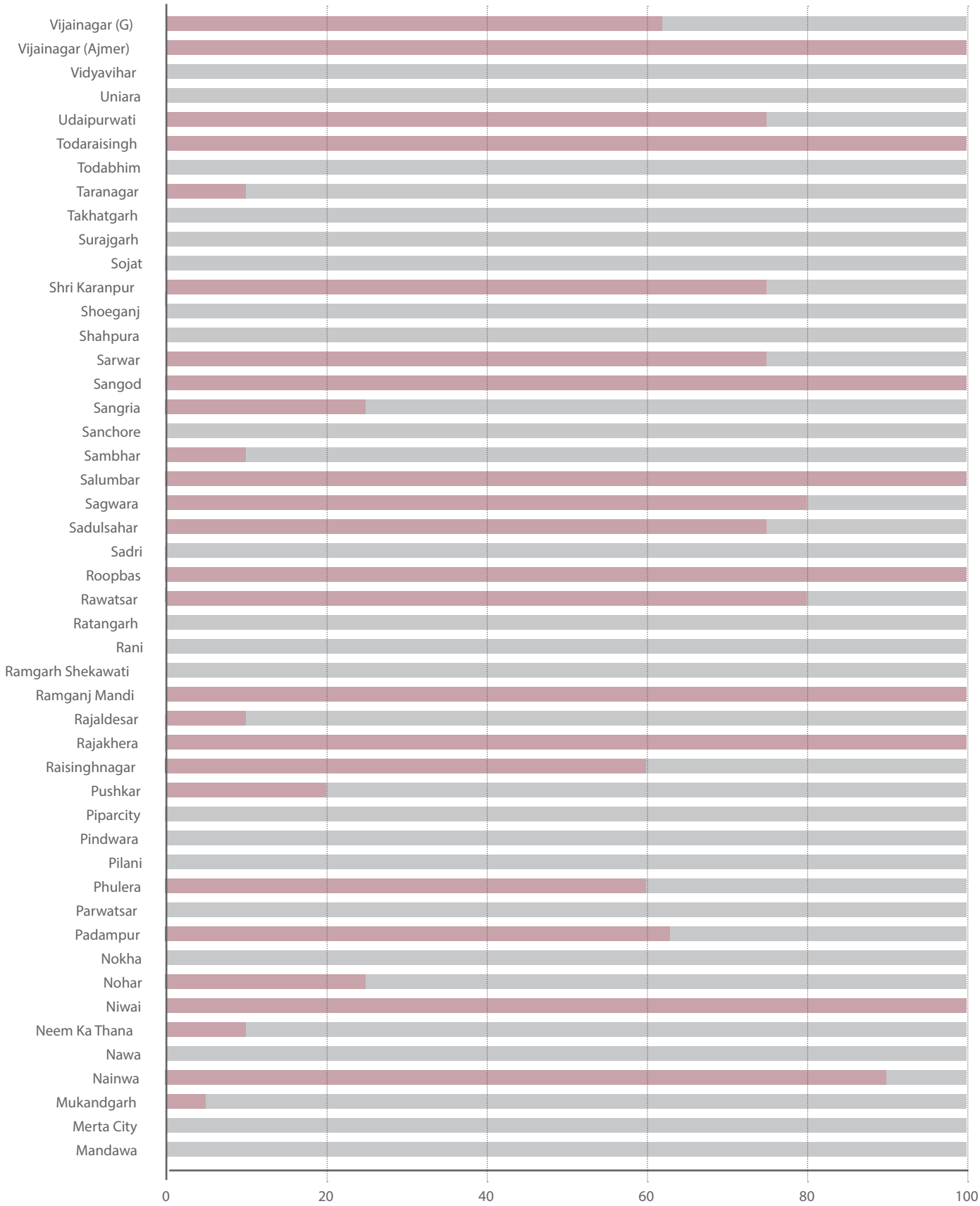
15.2 Toilet Coverage (% Households Having Access to Toilets)




Toilet Coverage
Vijainagar (G) 92
Vijainagar (Ajmer) 74.8
Vidyavihar 99
Uniara 0
Udaipurwati 92
Todaraisingh 79
Todabhim 60
Taranagar 99
Takhatgarh 93
Surajgarh 90
Sojat 87
Shri Karanpur 80
Shoeganj 85
Shahpura 92
Sarwar 70
Sangod 80
Sangria 94
Sanchore 68
Sambhar 90.62
Salumbar 86
Sagwara 80
Sadulsahar 99
Sadri 85
Roopbas 75
Rawatsar 99
Ratangarh 99
Rani 85
Ramgarh Shekawati 100
Ramganj Mandi 88
Rajaldesar 95
Rajakhera 72
Raisinghnagar 99
Pushkar 80
Piparcity 90
Pindwara 90
Pilani 84
Phulera 93.47
Parwatsar 73
Padampur 99
Nokha 85
Nohar 100
Niwai 72
Neem Ka Thana 77.5
Nawa 64
Nainwa 88
Mukandgarh 62
Merta City 92
Mandawa 99

15.3 Type of Containment System




Vijainagar (G)
Vijainagar (Ajmer)
Vidyavihar
Uniara
Udaipurwati
Todaraisingh
Todabhim
Taranagar
Takhatgarh
Surajgarh
Sojat
Shri Karanpur
Shoeganj
Shahpura
Sarwar
Sangod
Sangria
Sanchore
Sambhar
Salumbar
Sagwara
Sadulsahar
Sadri
Roopbas
Rawatsar
Ratangarh
Rani
Ramgarh Shekawati
Ramganj Mandi
Rajaldesar
Rajakhera
Raisinghnagar
Pushkar
Piparcity
Pindwara
Pilani
Phulera
Parwatsar
Padampur
Nokha
Nohar
Niwai
Neem Ka Thana
Nawa
Nainwa
Mukandgarh
Merta City
Mandawa
0
20
40
60
80
100

15.4 Raw Data: Population, Toilet Coverage and Open Defecation

SL NO.	DISTRICT	TOWN	TOTAL POPULATION IN THE COVERAGE AREA	TOILET COVERAGE IN THE TOWN	% OF POPULATION RESORTING TO OPEN DEFECATION
1	Udaipur	Bhinder	16368	No Data	No Data
2	Udaipur	Kanor	13269	70	30
3	Udaipur	Salumbar	16726	86	3
4	Jaipur	Sambhar	22327	90.62	9.38
5	Jaipur	Phulera	23284	93.47	6.53
6	Jaipur	Jobner	11354	70	30
7	Jaipur	Chaksu	38905	80	20
8	Jaipur	Kishangarh Renwal	34780	92	8
9	Jaipur	Bagru	38914	53	47
10	Dausa	Bandikui	45286	95	5
11	Dausa	Lalsot	38583	61	39
12	Sikar	Ramgarh Shekhawati	35229	100	0
13	Sikar	Khandela	25990	61	39
14	Sikar	Neem Ka Thana	38750	77.5	22.5
15	Sikar	Losal	31220	86	14
16	Alwar	Behror	29531	98	2
17	Alwar	Kherli	18826	74.6	25.4
18	Jhunjhunu	Bissau	23227	99	1
19	Jhunjhunu	Mandawa	26760	99	1
20	Jhunjhunu	Baggar	14255	83	17
21	Jhunjhunu	Pilani	29751	84	16
22	Jhunjhunu	Vidyavihar	15664	99	1
23	Jhunjhunu	Surajgarh	21765	90	10
24	Jhunjhunu	Khetri	18209	94	6
25	Jhunjhunu	Mukandgarh	24750	62	38
26	Jhunjhunu	Udaipurwati	42000	92	8
27	Ajmer	Pushkar	18685	80	20
28	Ajmer	Vijainagar (Ajmer)	32500	74.8	25.2
29	Ajmer	Sarwar	20429	70	30
30	Ajmer	Kekri	47403	94	6

SL NO.	DISTRICT	TOWN	TOTAL POPULATION IN THE COVERAGE AREA	TOILET COVERAGE IN THE TOWN	% OF POPULATION RESORTING TO OPEN DEFECATION
31	Nagaur	Parwatsar	19200	73	27
32	Nagaur	Nawa	25300	64	36
33	Nagaur	Degana	20035	68	32
34	Nagaur	Kuchera	26125	88	12
35	Nagaur	Merta City	49380	92	8
36	Tonk	Deoli	24516	95	5
37	Tonk	Uniara	10287	0	0
38	Tonk	Todaraisingh	24678	79	21
39	Tonk	Malpura	32306	87	13
40	Tonk	Niwai	42025	72	28
41	Bhilwara	Asind	18024	67	33
42	Bhilwara	Gulabpura	30401	92	8
43	Bhilwara	Shahpura	36582	92	8
44	Bhilwara	Gangapur	19893	85	15
45	Bhilwara	Mandalgarh	13833	63	37
46	Bhilwara	Jahazpur	20586	95	5
47	Bikaner	Deshnoke	22345	87	13
48	Bikaner	Nokha	66915	85	15
49	Sriganganagar	Gajsinghpur	10035	92	8
50	Sriganganagar	Padampur	18750	99	1
51	Sriganganagar	Vijainagar (G)	23266	92	8
52	Sriganganagar	Kesrisinghpur	14150	90	10
53	Sriganganagar	Shri Karanpur	21400	80	20
54	Sriganganagar	Sadulshahar	26229	99	1
55	Sriganganagar	Raisinghnagar	30200	99	1
56	Sriganganagar	Anupgarh	34556	98	2
57	Churu	Taranagar	40201	99	1
58	Churu	Ratangarh	81489	99	1
59	Churu	Rajaldesar	32123	95	5
60	Churu	Bidasar	40123	97	3
61	Churu	Chhapar	28000	99	1
62	Dungarpur	Sagwara	34940	80	20

SL NO.	DISTRICT	TOWN	TOTAL POPULATION IN THE COVERAGE AREA	TOILET COVERAGE IN THE TOWN	% OF POPULATION RESORTING TO OPEN DEFECATION
63	Banswara	Kapasan	22125	87	13
64	Banswara	Begun	21708	68	32
65	Pratapgarh	Choti sadri	18946	85	15
66	Rajasmand	Deogarh	18412	77	23
67	Rajasmand	Amet	17810	88	12
68	Jalore	Sanchore	32891	68	32
69	Jalore	Bhinmal	51751	73	27
70	Pali	Rani	16273	85	15
71	Pali	Sadri	28447	85	15
72	Pali	Takhatgarh	19100	93	7
73	Pali	Sojat	46450	87	13
74	Pali	Falna	37000	93	7
75	Pali	Bali	21371	93	7
76	Sirohi	Shoeganj	28500	85	15
77	Sirohi	Pindwara	24508	90	10
78	Jodhpur	Piparcity	40810	90	10
79	Jodhpur	Bilara	39553	80	20
80	Hanumangarh	Rawatsar	40402	99	1
81	Hanumangarh	Nohar	58885	100	0
82	Hanumangarh	Sangaria	36875	94	6
83	Kota	Kaithoon	24223	78	22
84	Kota	Ramganj Mandi	45600	88	12
85	Kota	Itawa	27344	68	32
86	Kota	Sangod	22810	80	20
87	Baran	Antah	34916	95	5
88	Baran	Chhabra	52500	87	13
89	Jhalawar	Aklera	26269	82	12
90	Jhalawar	Bhawani Mandi	50600	91	9
91	Bundi	Nainwa	21974	83	17
92	Bundi	Indergarh	8634	90	10
93	Bundi	Lakheri	29578	83.33	16.77
94	Bundi	Keshoraipatan	26400	88	12

SL NO.	DISTRICT	TOWN	TOTAL POPULATION IN THE COVERAGE AREA	TOILET COVERAGE IN THE TOWN	% OF POPULATION RESORTING TO OPEN DEFECATION
95	Bundi	Kaprain	20748	92	8
96	Dhaulpur	Rajakhera	36352	72	28
97	Karauli	Todabhim	23046	60	40
98	Bharatpur	Roopbas	19896	75	25

15.5 Raw Data: Total Households, Slum Population, Commercial Settlements

SL NO.	DISTRICT	TOWN	TOTAL NUMBER OF HOUSEHOLDS	TOTAL SLUM POPULATION IN THE COVERAGE AREA	NUMBER OF COMMERCIAL ESTABLISHMENTS IN THE COVERAGE AREA
1	Udaipur	Bhinder	No Data	No Data	No Data
2	Udaipur	Kanor	13269	112.5	1305
3	Udaipur	Salumbar	3200	0	0
4	Jaipur	Sambhar	5648	699	900
5	Jaipur	Phulera	5126	0	1831
6	Jaipur	Jobner	3880	0	1076
7	Jaipur	Chaksu	3000	0	550
8	Jaipur	Kishangarh Renwal	5809	0	1615
9	Jaipur	Bagru	5220	0	2719
10	Dausa	Bandikui	6174	0	4395
11	Dausa	Lalsot	11500	0	500
12	Sikar	Ramgarh Shekhawati	7280	1055	5768
13	Sikar	Khandela	6480	0	628
14	Sikar	Neem Ka Thana	4870	0	2220
15	Sikar	Losal	6460	0	3445
16	Alwar	Behror	4700	0	1545
17	Alwar	Kherli	5485	0	725
18	Jhunjhunu	Bissau	4742	0	100
19	Jhunjhunu	Mandawa	3747	0	1050
20	Jhunjhunu	Baggar	4008	0	1650

SL NO.	DISTRICT	TOWN	TOTAL NUMBER OF HOUSEHOLDS	TOTAL SLUM POPULATION IN THE COVERAGE AREA	NUMBER OF COMMERCIAL ESTABLISHMENTS IN THE COVERAGE AREA
21	Jhunjhunu	Pilani	2331	0	1048
22	Jhunjhunu	Vidyavihar	7146	0	210
23	Jhunjhunu	Surajgarh	2660	0	517
24	Jhunjhunu	Khetri	6000	0	1009
25	Jhunjhunu	Mukandgarh	5700	0	253
26	Jhunjhunu	Udaipurwati	5694	0	1293
27	Ajmer	Pushkar	5445	0	1293
28	Ajmer	Vijainagar (Ajmer)	4635	4403	375
29	Ajmer	Sarwar	4264	0	625
30	Ajmer	Kekri	3,600	9800	77
31	Nagaur	Parwatsar	10774	6644	1717
32	Nagaur	Nawa	3850	0	45
33	Nagaur	Degana	3865	0	545
34	Nagaur	Kuchera	2150	0	30
35	Nagaur	Merta City	6614	1521	160
36	Tonk	Deoli	8316	2820	550
37	Tonk	Uniara	6129	0	1080
38	Tonk	Todaraisingh	0	0	0
39	Tonk	Malpura	4915	465	1100
40	Tonk	Niwai	6925	0	NA
41	Bhilwara	Asind	4998	0	26
42	Bhilwara	Gulabpura	3300	7040	185
43	Bhilwara	Shahpura	6025	1700	3385
44	Bhilwara	Gangapur	7800	3525	1200
45	Bhilwara	Mandalgarh	6804	276	437
46	Bhilwara	Jahazpur	2822	539	87
47	Bikaner	Deshnoke	4062	6720	200
48	Bikaner	Nokha	3700	12080	450
49	Sriganganagar	Gajsinghpur	10900	15860	2400
50	Sriganganagar	Padampur	3161	4370	293
51	Sriganganagar	Vijainagar (G)	3744	1320	2136
52	Sriganganagar	Kesrisinghpur	4113	3079	244
53	Sriganganagar	Shri Karanpur	2758	7560	4

SL NO.	DISTRICT	TOWN	TOTAL NUMBER OF HOUSEHOLDS	TOTAL SLUM POPULATION IN THE COVERAGE AREA	NUMBER OF COMMERCIAL ESTABLISHMENTS IN THE COVERAGE AREA
54	Sriganganagar	Sadulshahar	4533	4136	290
55	Sriganganagar	Raisinghnagar	4950	18550	115
56	Sriganganagar	Anupgarh	9200	5575	1210
57	Churu	Taranagar	7747	515	2249
58	Churu	Ratangarh	7680	0	850
59	Churu	Rajaldesar	14020	0	5600
60	Churu	Bidasar	6500	0	1342
61	Churu	Chhapar	6270	0	1386
62	Dungarpur	Sagwara	3125	0	180
63	Banswara	Kapasan	9110	5442	1730
64	Banswara	Begun	6307	4200	1575
65	Pratapgarh	Choti Sadri	5850	1784	0
66	Rajasmand	Deogarh	3916	1929	880
67	Rajasmand	Amet	4028	713	612
68	Jalore	Sanchore	4107	327	420
69	Jalore	Bhinmal	10028	1250	196
70	Pali	Rani	12765	5535	3370
71	Pali	Sadri	3255	245	1280
72	Pali	Takhatgarh	7416	3762	43
73	Pali	Sojat	6130	14105	475
74	Pali	Falna	16560	6020	830
75	Pali	Bali	6950	2090	67
76	Sirohi	Shoeganj	6353	323	22
77	Sirohi	Pindwara	8200	3196	1905
78	Jodhpur	Piparcity	7484	2264	30
79	Jodhpur	Bilara	7500	0	910
80	Hanumangarh	Rawatsar	8250	720	95
81	Hanumangarh	Nohar	7258	6540.8	2751
82	Hanumangarh	Sangaria	14921	2770	1936
83	Kota	Kaithoon	7578	0	473
84	Kota	Ramganj Mandi	4462	6005	524
85	Kota	Itawa	8650	2279	900
86	Kota	Sangod	7586	3612	784

SL NO.	DISTRICT	TOWN	TOTAL NUMBER OF HOUSEHOLDS	TOTAL SLUM POPULATION IN THE COVERAGE AREA	NUMBER OF COMMERCIAL ESTABLISHMENTS IN THE COVERAGE AREA
87	Baran	Antah	6368	5292	1513
88	Baran	Chhabra	4614	11301	0
89	Jhalawar	Aklera	8750	6540	270
90	Jhalawar	Bhawani Mandi	6094	2270.4	690
91	Bundi	Nainwa	9,660	0	320
92	Bundi	Indergarh	3925	2648	385
93	Bundi	Lakheri	1722	554	10
94	Bundi	Keshoraipatan	6092	0	5940
95	Bundi	Kaprain	4720	2873	753
96	Dhaulpur	Rajakhera	4165	1750	0
97	Karauli	Todabhim	5880	403	No Data
98	Bharatpur	Roopbas	3755	0	592

15.6 Raw Data: Water Supply, Ground Water, Soil Type

SL NO.	DISTRICT	TOWN	WATER SUPPLY (LPCD)	GROUNDWATER TABLE	SOIL TYPE IN THE CONTAINMENT AREA
				(IN FEET)	A) SILTY B) SANDY C) GRAVEL D) ROCKY E) CLAYEY F) BLACK G) LOAMY H) SLATEY I) OTHERS
1	Udaipur	Bhinder	No Data	40	-
2	Udaipur	Kanor	47	-	a
3	Udaipur	Salumbar	32	112.5	b / c / d
4	Jaipur	Sambhar	55	0	b
5	Jaipur	Phulera	60	699	b
6	Jaipur	Jobner	60	0	b
7	Jaipur	Chaksu	65	0	f / g
8	Jaipur	Kishangarh Renwal	37	0	b / f
9	Jaipur	Bagru	33	0	c
10	Dausa	Bandikui	56	0	b
11	Dausa	Lalsot	69	0	c

SL NO.	DISTRICT	TOWN	WATER SUPPLY (LPCD)	GROUNDWATER TABLE (IN FEET)	SOIL TYPE IN THE CONTAINMENT AREA A) SILTY B) SANDY C) GRAVEL D) ROCKY E) CLAYEY F) BLACK G) LOAMY H) SLATEY I) OTHERS
12	Sikar	Ramgarh Shekhawati	60	150	b
13	Sikar	Khandela	54	>600	b / c / d
14	Sikar	Neem Ka Thana	60	>600	b / c / d
15	Sikar	Losal	55	200	b / e / f
16	Alwar	Behror	65	250	b / d / e
17	Alwar	Kherli	100	250	b
18	Jhunjhunu	Bissau	60	300	b
19	Jhunjhunu	Mandawa	60	200	b
20	Jhunjhunu	Baggar	80	300	b / e
21	Jhunjhunu	Pilani	60	150	b / d
22	Jhunjhunu	Vidyavihar	84	350	i
23	Jhunjhunu	Surajgarh	135	250	b
24	Jhunjhunu	Khetri	100	150	b / c / d
25	Jhunjhunu	Mukandgarh	92	200	b
26	Jhunjhunu	Udaipurwati	77	600	b / d
27	Ajmer	Pushkar	108	175	b / e
28	Ajmer	Vijainagar (Ajmer)	62	175	e
29	Ajmer	Sarwar	96	175	a / b
30	Ajmer	Kekri	70	80	f
31	Nagaur	Parwatsar	50	225	b
32	Nagaur	Nawa	62	225	b / c
33	Nagaur	Degana	80	200	b / e
34	Nagaur	Kuchera	88	225	b / e / f
35	Nagaur	Merta City	40	45	d
36	Tonk	Deoli	55	70	c
37	Tonk	Uniara	0	40	f
38	Tonk	Todaraisingh	72	80	b / d
39	Tonk	Malpura	70	150	f
40	Tonk	Niwai	70	40	i

SL NO.	DISTRICT	TOWN	WATER SUPPLY (LPCD)	GROUNDWATER TABLE (IN FEET)	SOIL TYPE IN THE CONTAINMENT AREA A) SILTY B) SANDY C) GRAVEL D) ROCKY E) CLAYEY F) BLACK G) LOAMY H) SLATEY I) OTHERS
41	Bhilwara	Asind	45	200	a / e
42	Bhilwara	Gulabpura	50	20	f
43	Bhilwara	Shahpura	70	16	d
44	Bhilwara	Gangapur	100	250	i
45	Bhilwara	Mandalgarh	No Data	100	d
46	Bhilwara	Jahazpur	65	65	d
47	Bikaner	Deshnoke	96	500	b
48	Bikaner	Nokha	92	650	b
49	Sriganganagar	Gajsinghpur	38	40	e
50	Sriganganagar	Padampur	70	59.4	e
51	Sriganganagar	Vijainagar (G)	35	30	e
52	Sriganganagar	Kesrisinghpur	165	25	b / e / f
53	Sriganganagar	Shri Karanpur	135	25	b / e / f
54	Sriganganagar	Sadulshahar	100	25	b / e / f
55	Sriganganagar	Raisinghnagar	90	70	b / c
56	Sriganganagar	Anupgarh	135	100	b / c
57	Churu	Taranagar	50	200	b
58	Churu	Ratangarh	60	300	b / c
59	Churu	Rajaldesar	55	70	b / e / f
60	Churu	Bidasar	70	80	b / e / f
61	Churu	Chhapar	30	200	b / d
62	Dungarpur	Sagwara	54	70	c / d
63	Banswara	Kapasan	40	75	f
64	Banswara	Begun	73	100	f
65	Pratapgarh	Choti Sadri	70	100	f
66	Rajasmand	Deogarh	70	70	d
67	Rajasmand	Amet	55	70	d
68	Jalore	Sanchore	100	70	b
69	Jalore	Bhinmal	100	164	b
70	Pali	Rani	70	100	a / b

SL NO.	DISTRICT	TOWN	WATER SUPPLY (LPCD)	GROUNDWATER TABLE (IN FEET)	SOIL TYPE IN THE CONTAINMENT AREA A) SILTY B) SANDY C) GRAVEL D) ROCKY E) CLAYEY F) BLACK G) LOAMY H) SLATEY I) OTHERS
71	Pali	Sadri	100	70	b
72	Pali	Takhatgarh	80	70	b / c
73	Pali	Sojat	70	200	b / d
74	Pali	Falna	70	150	b / d
75	Pali	Bali	65	100	b
76	Sirohi	Shoeganj	100	80	c
77	Sirohi	Pindwara	60	25	f
78	Jodhpur	Piparcity	70	328	b / c / d
79	Jodhpur	Bilara	70	100	b / c / d
80	Hanumangarh	Rawatsar	57	10	b / e / f
81	Hanumangarh	Nohar	44	150	b / f
82	Hanumangarh	Sangaria	90	50	b / e / f
83	Kota	Kaithoon	37	100	f / d
84	Kota	Ramganj Mandi	No Data	400	d
85	Kota	Itawa	No Data	60	f
86	Kota	Sangod	43	400	f
87	Baran	Antah	40	80	f
88	Baran	Chhabra	50	250	f
89	Jhalawar	Aklera	34	20	f
90	Jhalawar	Bhawani Mandi	No Data	20	f
91	Bundi	Nainwa	70	250	c,d
92	Bundi	Indergarh	48	400	c,d
93	Bundi	Lakheri	116	300	d
94	Bundi	Keshoraipatan	77	70	f
95	Bundi	Kaprain	90	30	f
96	Dhaulpur	Rajakhera	70	180	e / g
97	Karauli	Todabhim	69	150	b / d
98	Bharatpur	Roopbas	40	90	a / c / f

Raw Data: HH with % of on Site Sanitation Systems

SL NO.	DISTRICT	TOWN	% HH WITH ON-SITE SANITATION SYSTEMS			
			SEPTIC TANKS	SINGLE PIT	TWIN PITS	INSANITARY
1	Udaipur	Bhinder	56	0	0	44
2	Udaipur	Kanor	100	0	0	0
3	Udaipur	Salumbar	100			0
4	Jaipur	Sambhar	10	85	0	5
5	Jaipur	Phulera	60	0	35	5
6	Jaipur	Jobner	0	50	25	25
7	Jaipur	Chaksu	0	90	10	0
8	Jaipur	Kishangarh Renwal	2	90	8	0
9	Jaipur	Bagru	10	90	0	0
10	Dausa	Bandikui	25	75	0	0
11	Dausa	Lalsot	0	100	0	0
12	Sikar	Ramgarh Shekhawati	0	99	1	0
13	Sikar	Khandela	15	85	0	0
14	Sikar	Neem Ka Thana	10	90	0	0
15	Sikar	Losal	20	80	0	0
16	Alwar	Behror	0	95	5	0
17	Alwar	Kherli	46	42	0	12
18	Jhunjhunu	Bissau	0	100	0	0
19	Jhunjhunu	Mandawa	0	100	0	0
20	Jhunjhunu	Baggar	20	70	10	0
21	Jhunjhunu	Pilani	0	100	0	0
22	Jhunjhunu	Vidyavihar	0	100	0	0
23	Jhunjhunu	Surajgarh	0	100	0	0
24	Jhunjhunu	Khetri	0	90	10	0
25	Jhunjhunu	Mukandgarh	5	90	2	3
26	Jhunjhunu	Udaipurwati	75	25	0	0
27	Ajmer	Pushkar	20	30	0	50
28	Ajmer	Vijainagar (Ajmer)	100	0	0	0
29	Ajmer	Sarwar	75	25	0	0
30	Ajmer	Kekri	100	0	0	0
31	Nagaur	Parwatsar	0	79	11	10
32	Nagaur	Nawa	0	86	14	0

SL NO.	DISTRICT	TOWN	% HH WITH ON-SITE SANITATION SYSTEMS			
			SEPTIC TANKS	SINGLE PIT	TWIN PITS	INSANITARY
33	Nagaur	Degana	0	90	10	0
34	Nagaur	Kuchera	10	90	0	0
35	Nagaur	Merta City	0	8	0	92
36	Tonk	Deoli	100	0	0	0
37	Tonk	Uniara	0	0	0	100
38	Tonk	Todaraisingh	100	0	0	0
39	Tonk	Malpura	100	0	0	0
40	Tonk	Niwai	100	0	0	0
41	Bhilwara	Asind	90		10	0
42	Bhilwara	Gulabpura	100	0	0	0
43	Bhilwara	Shahpura	0	100	0	0
44	Bhilwara	Gangapur	20	0	80	0
45	Bhilwara	Mandalgarh	20	0	80	0
46	Bhilwara	Jahazpur	40	0	0	60
47	Bikaner	Deshnoke	0	90	10	0
48	Bikaner	Nokha	0	100	0	0
49	Sriganganagar	Gajsinghpur	80	20	0	0
50	Sriganganagar	Padampur	63	37	0	0
51	Sriganganagar	Vijainagar (G)	62	38	0	0
52	Sriganganagar	Kesrisinghpur	20	70	2	8
53	Sriganganagar	Shri Karanpur	75	25	0	0
54	Sriganganagar	Sadulshahar	75	25	0	0
55	Sriganganagar	Raisinghnagar	60	40	0	0
56	Sriganganagar	Anupgarh	75	25	0	0
57	Churu	Taranagar	10	90	0	0
58	Churu	Ratangarh	0	99	1	0
59	Churu	Rajaldesar	10	90	0	0
60	Churu	Bidasar	20	80	0	0
61	Churu	Chhapar	0	100	0	0
62	Dungarpur	Sagwara	80	20	0	0
63	Banswara	Kapasan	87	13	0	0
64	Banswara	Begun	90	0	10	0
65	Pratapgarh	Choti Sadri	85	15	0	0

SL NO.	DISTRICT	TOWN	% HH WITH ON-SITE SANITATION SYSTEMS			
			SEPTIC TANKS	SINGLE PIT	TWIN PITS	INSANITARY
66	Rajasmand	Deogarh	100	0	0	0
67	Rajasmand	Amet	100	0	0	0
68	Jalore	Sanchore	0	100	0	0
69	Jalore	Bhinmal	0	12	0	88
70	Pali	Rani	0	70	30	0
71	Pali	Sadri	0	76	24	0
72	Pali	Takhatgarh	0	78	22	0
73	Pali	Sojat	0	80	20	0
74	Pali	Falna	0	100	0	0
75	Pali	Bali	10	70	20	0
76	Sirohi	Shoeganj	0	50	0	50
77	Sirohi	Pindwara	0	100	0	0
78	Jodhpur	Piparcity	0	100	0	0
79	Jodhpur	Bilara	0	100	0	0
80	Hanumangarh	Rawatsar	80	20	0	0
81	Hanumangarh	Nohar	25	75	0	0
82	Hanumangarh	Sangaria	25	75	0	0
83	Kota	Kaithoon	100	0	0	0
84	Kota	Ramganj Mandi	100	0	0	0
85	Kota	Itawa	90	0	10	0
86	Kota	Sangod	100	0	0	0
87	Baran	Antah	100	0	0	0
88	Baran	Chhabra	90	0	10	0
89	Jhalawar	Aklera	100	0	0	0
90	Jhalawar	Bhawani Mandi	80	0	20	0
91	Bundi	Nainwa	90	10	0	0
92	Bundi	Indergarh	90	10	0	0
93	Bundi	Lakheri	100	0	0	0
94	Bundi	Keshoraipatan	90	10	0	0
95	Bundi	Kaprain	70	0	30	0
96	Dhaulpur	Rajakhera	100	0	0	0
97	Karauli	Todabhim	0	100	0	0
98	Bharatpur	Roopbas	100	0	0	0

15.7 Raw Data: Number of Desludgings per month, Common Method of Emptying Faecal Sludge and Type of Transport are used for FSM

SL NO.	DISTRICT	TOWN	FREQUENCY OF DESLUDGING	THE MOST COMMON METHOD OF EMPTYING FAECAL SLUDGE	TYPE OF TRANSPORT ARE USED FOR FSM
			IN YEARS	a) MANUAL b) MECHANICAL c) BOTH d) OTHER, PLEASE SPECIFY:	a) MANUAL TRANSPORT b) MOTORISED TRANSPORT c) BOTH
1	Udaipur	Bhinder	NA	NA	NA
2	Udaipur	Kanor	11	a	a
3	Udaipur	Salumbar	20	a	a
4	Jaipur	Sambhar	7	b	b
5	Jaipur	Phulera	5	b	b
6	Jaipur	Jobner	7	b	b
7	Jaipur	Chaksu	8	b	b
8	Jaipur	Kishangarh Renwal	12.5	b	b
9	Jaipur	Bagru	12.5	b	b
10	Dausa	Bandikui	18	b	b
11	Dausa	Lalsot	8.5	b	b
12	Sikar	Ramgarh Shekhawati	8	b	b
13	Sikar	Khandela	10	b	b
14	Sikar	Neem Ka Thana	15	b	b
15	Sikar	Losal	2	b	b
16	Alwar	Behror	2	b	b
17	Alwar	Kherli	10	b	b
18	Jhunjhunu	Bissau	2	b	b
19	Jhunjhunu	Mandawa	10	b	b
20	Jhunjhunu	Baggar	5	b	b
21	Jhunjhunu	Pilani	17	b	b
22	Jhunjhunu	Vidyavihar	7	b	b
23	Jhunjhunu	Surajgarh	10	b	b
24	Jhunjhunu	Khetri	8	b	b
25	Jhunjhunu	Mukandgarh	15	b	b
26	Jhunjhunu	Udaipurwati	10	b	b

SL NO.	DISTRICT	TOWN	FREQUENCY OF DESLUDGING	THE MOST COMMON METHOD OF EMPTYING FAECAL SLUDGE	TYPE OF TRANSPORT ARE USED FOR FSM
			IN YEARS	a) MANUAL b) MECHANICAL c) BOTH d) OTHER, PLEASE SPECIFY:	a) MANUAL TRANSPORT b) MOTORISED TRANSPORT c) BOTH
27	Ajmer	Pushkar	No Data	b	b
28	Ajmer	Vijainagar (Ajmer)	10	b	b
29	Ajmer	Sarwar	10	b	b
30	Ajmer	Kekri	8.5	b	b
31	Nagaur	Parwatsar	10	b	b
32	Nagaur	Nawa	12	b	b
33	Nagaur	Degana	17.5	b	b
34	Nagaur	Kuchera	17.5	b	b
35	Nagaur	Merta City	0	c	c
36	Tonk	Deoli	9	b	c
37	Tonk	Uniara	0	0	0
38	Tonk	Todaraisingh	10	b	b
39	Tonk	Malpura	17.5	b	b
40	Tonk	Niwai	22.5	b	b
41	Bhilwara	Asind	12	c	c
42	Bhilwara	Gulabpura	17.5	b	b
43	Bhilwara	Shahpura	22.5	b	b
44	Bhilwara	Gangapur	10	c	c
45	Bhilwara	Mandalgarh	10	a	a
46	Bhilwara	Jahazpur	30	b	b
47	Bikaner	Deshnoke	25	c	c
48	Bikaner	Nokha	20	b	b
49	Sriganganagar	Gajsinghpur	10	b	b
50	Sriganganagar	Padampur	7	b	b
51	Sriganganagar	Vijainagar (G)	4	b	b
52	Sriganganagar	Kesrisinghpur	15	b	b
53	Sriganganagar	Shri Karanpur	10	b	b
54	Sriganganagar	Sadulshahar	10	b	b

SL NO.	DISTRICT	TOWN	FREQUENCY OF DESLUDGING	THE MOST COMMON METHOD OF EMPTYING FAECAL SLUDGE	TYPE OF TRANSPORT ARE USED FOR FSM
			IN YEARS	a) MANUAL b) MECHANICAL c) BOTH d) OTHER, PLEASE SPECIFY:	a) MANUAL TRANSPORT b) MOTORISED TRANSPORT c) BOTH
55	Sriganganagar	Raisinghnagar	15	b	b
56	Sriganganagar	Anupgarh	10	b	b
57	Churu	Taranagar	5	b	b
58	Churu	Ratangarh	15	b	b
59	Churu	Rajaldesar	No Data	b	b
60	Churu	Bidasar	No Data	b	b
61	Churu	Chhapar	No Data	b	b
62	Dungarpur	Sagwara	10	a / b	a / b
63	Banswara	Kapasan	8	b	b
64	Banswara	Begun	10	b	b
65	Pratapgarh	Choti Sadri	20	b	b
66	Rajasmand	Deogarh	10	a / b	a / b
67	Rajasmand	Amet	30	b	b
68	Jalore	Sanchore	20	b	b
69	Jalore	Bhinmal	3	b	b
70	Pali	Rani	25	b	b
71	Pali	Sadri	50	b	b
72	Pali	Takhatgarh	35	b	b
73	Pali	Sojat	10	b	b
74	Pali	Falna	9	b	b
75	Pali	Bali	10	a / b	a / b
76	Sirohi	Shoeganj	11	b	b
77	Sirohi	Pindwara	22.5	b	b
78	Jodhpur	Piparcity	10	b	b
79	Jodhpur	Bilara	35	b	b
80	Hanumangarh	Rawatsar	No Data	b	b
81	Hanumangarh	Nohar	No Data	b	b
82	Hanumangarh	Sangaria	No Data	b	b

SL NO.	DISTRICT	TOWN	FREQUENCY OF DESLUDGING	THE MOST COMMON METHOD OF EMPTYING FAECAL SLUDGE	TYPE OF TRANSPORT ARE USED FOR FSM
			IN YEARS	a) MANUAL b) MECHANICAL c) BOTH d) OTHER, PLEASE SPECIFY:	a) MANUAL TRANSPORT b) MOTORISED TRANSPORT c) BOTH
83	Kota	Kaithoon	10	c	c
84	Kota	Ramganj Mandi	10	b	b
85	Kota	Itawa	10	c	c
86	Kota	Sangod	10	c	c
87	Baran	Antah	10	b	b
88	Baran	Chhabra	10	a	a
89	Jhalawar	Aklera	25	c	b
90	Jhalawar	Bhawani Mandi	5	a	b
91	Bundi	Nainwa	8-10	b	b
92	Bundi	Indergarh	8	c	c
93	Bundi	Lakheri	10	c	c
94	Bundi	Keshoraipatan	10	c	c
95	Bundi	Kaprain	>5	b	b
96	Dhaulpur	Rajakhera	27.5	b	b
97	Karauli	Todabhim	20	b	b
98	Bharatpur	Roopbas	22.5	b	b

15.8 Raw Data: Desludging Trucks Available, Availability of Land for Treatment Plant, Reuse of Faecal Sludge and Wastewater

SL NO.	DISTRICT	TOWN	NO. OF TRUCKS AVAILABLE IN THE TOWN		IS THERE AVAILABILITY OF LAND TO BUILD THE TREATMENT PLANT	REUSE OF RAW FAECAL SLUDGE	REUSE OF WASTEWATER
			PRIVATE OWNERSHIP	PUBLIC OWNERSHIP	YES / NO	YES / NO	YES / NO
1	Udaipur	Bhinder	NA	NA	Yes	No	Yes
2	Udaipur	Kanor	0	0	Yes	No	no
3	Udaipur	Salumbar	0	0	Yes	No	No
4	Jaipur	Sambhar	1	1	Yes	No	No
5	Jaipur	Phulera	1	1	Yes	No	No
6	Jaipur	Jobner	2	1	Yes	No	No
7	Jaipur	Chaksu	2	0	Yes	No	No
8	Jaipur	Kishangarh Renwal	2	1	Yes	No	No
9	Jaipur	Bagru	2	1	Yes	No	Yes
10	Dausa	Bandikui	2	0	Yes	Yes	Yes
11	Dausa	Lalsot	0	1	Yes	No	No
12	Sikar	Ramgarh Shekhawati	3	0	Yes	No	No
13	Sikar	Khandela	0	0	No	Yes	No
14	Sikar	Neem Ka Thana	0	0	No	No	No
15	Sikar	Losal	0	0	Yes	No	No
16	Alwar	Behror	0	1	No	No	No
17	Alwar	Kherli	0	1	Yes	No	no
18	Jhunjhunu	Bissau	4	0	No	No	No
19	Jhunjhunu	Mandawa	6	0	Yes	No	No
20	Jhunjhunu	Baggar	1	0	Yes	No	No
21	Jhunjhunu	Pilani	3	0	Yes	No	No
22	Jhunjhunu	Vidyavihar	3	1	No	No	No
23	Jhunjhunu	Surajgarh	0	1	Yes	No	No
24	Jhunjhunu	Khetri	0	1	Yes	No	No

SL NO.	DISTRICT	TOWN	NO. OF TRUCKS AVAILABLE IN THE TOWN		IS THERE AVAILABILITY OF LAND TO BUILD THE TREATMENT PLANT	REUSE OF RAW FAECAL SLUDGE	REUSE OF WASTEWATER
			PRIVATE OWNERSHIP	PUBLIC OWNERSHIP	YES / NO	YES / NO	YES / NO
25	Jhunjhunu	Mukandgarh	0	0	Yes	No	Yes
26	Jhunjhunu	Udaipurwati	1	0	Yes	No	Yes
27	Ajmer	Pushkar	0	1		Yes	No
28	Ajmer	Vijainagar (Ajmer)	0	1	Yes	No	No
29	Ajmer	Sarwar	0	1	Yes	No	No
30	Ajmer	Kekri	1	0	Yes	Yes	Yes
31	Nagaur	Parwatsar	0	1	Yes	No	No
32	Nagaur	Nawa	1	1	Yes	No	No
33	Nagaur	Degana	0	0	No	No	No
34	Nagaur	Kuchera	0	1	Yes	No	No
35	Nagaur	Merta City	0	0	Yes	No	No
36	Tonk	Deoli	0	0	Yes	No	No
37	Tonk	Uniara	0	0	No	No	0
38	Tonk	Todaraisingh	0	1	Yes	No	No
39	Tonk	Malpura	3	1	Yes	No	No
40	Tonk	Niwai	0	1	Yes	No	Yes
41	Bhilwara	Asind	0	0	Yes	No	No
42	Bhilwara	Gulabpura	0	0	Yes	No	No
43	Bhilwara	Shahpura	0	1	Yes	No	Yes
44	Bhilwara	Gangapur	0	0	Yes	Yes	Yes
45	Bhilwara	Mandalgarh	0	0	Yes	No	Yes
46	Bhilwara	Jahazpur	0	1	Yes	No	Yes
47	Bikaner	Deshnoke	1	0	Yes	Yes	No
48	Bikaner	Nokha	0	0	No	No	Yes
49	Sriganganagar	Gajsinghpur	0	0	No	No	Yes
50	Sriganganagar	Padampur	0	0	No	No	Yes
51	Sriganganagar	Vijainagar (G)	0	0	Yes	No	Yes

SL NO.	DISTRICT	TOWN	NO. OF TRUCKS AVAILABLE IN THE TOWN		IS THERE AVAILABILITY OF LAND TO BUILD THE TREATMENT PLANT	REUSE OF RAW FAECAL SLUDGE	REUSE OF WASTEWATER
			PRIVATE OWNERSHIP	PUBLIC OWNERSHIP	YES / NO	YES / NO	YES / NO
52	Sriganganagar	Kesrisinghpur	0	0	No	No	Yes
53	Sriganganagar	Shri Karanpur	0	0	No	No	Yes
54	Sriganganagar	Sadulshahar	0	0	no	No	YEs
55	Sriganganagar	Raisinghnagar	1	0	No	No	Yes
56	Sriganganagar	Anupgarh	0	0	No	No	Yes
57	Churu	Taranagar	3	0	Yes	No	No
58	Churu	Ratangarh	2	0	Yes	No	No
59	Churu	Rajaldesar	0	0	No	No	No
60	Churu	Bidasar	0	0	No	No	No
61	Churu	Chhapar	3	0	Yes	Yes	No
62	Dungarpur	Sagwara	0	1	Yes	No	No
63	Banswara	Kapasan	0	1	Yes	No	Yes
64	Banswara	Begun	0	0	Yes	Yes	y
65	Pratapgarh	Choti Sadri	0	1	No	No	No
66	Rajasmand	Deogarh	0	1	Yes	No	No
67	Rajasmand	Amet	0	0	Yes	No	No
68	Jalore	Sanchore	0	1	Yes	No	No
69	Jalore	Bhinmal	0	1	No	No	No
70	Pali	Rani	0	1	yes	No	No
71	Pali	Sadri	0	1	No	No	No
72	Pali	Takhatgarh	0	1	No	No	No
73	Pali	Sojat	0	0	Yes	No	No
74	Pali	Falna	0	1	Yes	No	No
75	Pali	Bali	0	1	Yes	No	No
76	Sirohi	Shoeganj	0	1	Yes	No	No
77	Sirohi	Pindwara	0	0	No	No	No
78	Jodhpur	Piparcity	0	1	Yes	Yes	No
79	Jodhpur	Bilara	0	1	Yes	No	No
80	Hanumangarh	Rawatsar	0	0	No	No	Yes

SL NO.	DISTRICT	TOWN	NO. OF TRUCKS AVAILABLE IN THE TOWN		IS THERE AVAILABILITY OF LAND TO BUILD THE TREATMENT PLANT	REUSE OF RAW FAECAL SLUDGE	REUSE OF WASTEWATER
			PRIVATE OWNERSHIP	PUBLIC OWNERSHIP	YES / NO	YES / NO	YES / NO
81	Hanumangarh	Nohar	0	0	No	Yes	Yes
82	Hanumangarh	Sangaria	0	0	No	No	Yes
83	Kota	Kaithoon	0	1	Yes	No	Yes
84	Kota	Ramganj Mandi	0	1	Yes	No	Yes
85	Kota	Itawa	0	0	Yes	No	Yes
86	Kota	Sangod	0	0	Yes	No	Yes
87	Baran	Antah	0	0	Yes	No	Yes
88	Baran	Chhabra	0	0	Yes	No	Yes
89	Jhalawar	Aklera	0	0	Yes	No	Yes
90	Jhalawar	Bhawani Mandi	0	4	Yes	No	Yes
91	Bundi	Nainwa	0	1	yes	No	Yes
92	Bundi	Indergarh	0	0	No	No	No
93	Bundi	Lakheri	0	0	Yes	No	Yes
94	Bundi	Keshoraipatan	0	0	Yes	No	No
95	Bundi	Kaprain	0	0	Yes	Yes	yes
96	Dhaulpur	Rajakhera	0	1	Yes	No	Yes
97	Karauli	Todabhim	0	0	Yes	No	Yes
98	Bharatpur	Roopbas	1	0	No	Yes	No

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ANNEXURE 6: COST OF TREATMENT OF FAECAL SLUDGE FOR 100 TOWNS

SL NO	TOWN NAME	TREATMENT CAPACITY NEEDED (KLD)	NUMBER OF TRUCKS NEEDED	TREATMENT COST[21] (IN INR)	COST OF TRUCK[22] (IN INR)	O&M COST – TRUCK (1 YEAR) (IN INR)	OPEX-FSTP[23] (1 YEAR) (IN INR)	TOTAL INVESTMENT FOR FSM (IN INR)
1	Aklera	8	2	84,00,000	30,00,000	16,00,000	5,04,000	1,35,04,000
2	Amet	6	1	63,00,000	15,00,000	8,00,000	3,78,000	89,78,000
3	Antan	11	2	1,10,00,000	30,00,000	16,00,000	6,60,000	1,62,60,000
4	Anupgarh	11	2	1,10,00,000	30,00,000	16,00,000	6,60,000	1,62,60,000
5	Asind	6	1	63,00,000	15,00,000	8,00,000	3,78,000	89,78,000
6	Baggar	5	0	60,00,000	-	-	3,60,000	63,60,000
7	Bagru	12	0	1,20,00,000	-	-	7,20,000	1,27,20,000
8	Bali	7	1	73,50,000	15,00,000	8,00,000	4,41,000	1,00,91,000
9	Bandukui	14	1	1,40,00,000	15,00,000	8,00,000	8,40,000	1,71,40,000
10	Begun	7	2	73,50,000	30,00,000	16,00,000	4,41,000	1,23,91,000
11	Behror	9	1	94,50,000	15,00,000	8,00,000	5,67,000	1,23,17,000
12	Bhawani Mandi	16	0	1,60,00,000	-	-	9,60,000	1,69,60,000
13	Bhinder	5	1	60,00,000	15,00,000	8,00,000	3,60,000	86,60,000
14	Bhinmal	16	2	1,60,00,000	30,00,000	16,00,000	9,60,000	2,15,60,000
15	Bidasar	12	2	1,20,00,000	30,00,000	16,00,000	7,20,000	1,73,20,000
16	Bilara	12	1	1,20,00,000	15,00,000	8,00,000	7,20,000	1,50,20,000
17	Bissau	7	0	73,50,000	-	-	4,41,000	77,91,000
18	Chaksu	12	0	1,20,00,000	-	-	7,20,000	1,27,20,000
19	Chhabra	16	3	1,60,00,000	45,00,000	24,00,000	9,60,000	2,38,60,000
20	Chhapar	9	0	94,50,000	-	-	5,67,000	1,00,17,000
21	Choti Sadri	6	0	63,00,000	-	-	3,78,000	66,78,000
22	Degana	6	1	63,00,000	15,00,000	8,00,000	3,78,000	89,78,000
23	Deogarh	6	0	63,00,000	-	-	3,78,000	66,78,000
24	Deoli	8	2	84,00,000	30,00,000	16,00,000	5,04,000	1,35,04,000
25	Deshnoke	7	1	73,50,000	15,00,000	8,00,000	4,41,000	1,00,91,000

[21] Cost per KLD ranges from INR 10,50,000 to INR 12,00,000, inversely proportionate to volume of treatment plant based on experience in Devanahalli, Trichy, Nepal and other FSTP Projects

[22] Cost of truck estimated to be INR 15,00,000 based on experience in Devanahalli, Trichy, Bhagalpur and other work

[23] 20 % of capital cost based on experience in FSTP, Devanahalli and Nepal

SL NO	TOWN NAME	TREATMENT CAPACITY NEEDED (KLD)	NUMBER OF TRUCKS NEEDED	TREATMENT COST (IN INR)	COST OF TRUCK (IN INR)	O&M COST – TRUCK (1 YEAR) (IN INR)	OPEX- FSTP (1 YEAR) (IN INR)	TOTAL INVESTMENT FOR FSM (IN INR)
26	Falna	12	1	1,20,00,000	15,00,000	8,00,000	7,20,000	1,50,20,000
27	Gajsinghpur	4	1	48,00,000	15,00,000	8,00,000	2,88,000	73,88,000
28	Gangapur	6	1	63,00,000	15,00,000	8,00,000	3,78,000	89,78,000
29	Gulabpura	10	2	1,05,00,000	30,00,000	16,00,000	6,30,000	1,57,30,000
30	Indergarh	3	1	36,00,000	15,00,000	8,00,000	2,16,000	61,16,000
31	Itawa	9	2	94,50,000	30,00,000	16,00,000	5,67,000	1,46,17,000
32	Jahazpur	7	1	73,50,000	15,00,000	8,00,000	4,41,000	1,00,91,000
33	Jobner	4	0	48,00,000	-	-	2,88,000	50,88,000
34	Kaithoon	8	1	84,00,000	15,00,000	8,00,000	5,04,000	1,12,04,000
35	Kanor	4	1	48,00,000	15,00,000	8,00,000	2,88,000	73,88,000
36	Kapasan	7	1	73,50,000	15,00,000	8,00,000	4,41,000	1,00,91,000
37	Kaprain	7	2	73,50,000	30,00,000	16,00,000	4,41,000	1,23,91,000
38	Kekri	15	2	1,50,00,000	30,00,000	16,00,000	9,00,000	2,05,00,000
39	Keshoraipatan	8	2	84,00,000	30,00,000	16,00,000	5,04,000	1,35,04,000
40	Kesrisinghpur	5	1	60,00,000	15,00,000	8,00,000	3,60,000	86,60,000
41	Khandela	8	2	84,00,000	30,00,000	16,00,000	5,04,000	1,35,04,000
42	Kherli	6	0	63,00,000	-	-	3,78,000	66,78,000
43	Khetri	6	0	63,00,000	-	-	3,78,000	66,78,000
44	Kishangarh Renwal	11	0	1,10,00,000	-	-	6,60,000	1,16,60,000
45	Kuchera	8	1	84,00,000	15,00,000	8,00,000	5,04,000	1,12,04,000
46	Lakheri	9	2	94,50,000	30,00,000	16,00,000	5,67,000	1,46,17,000
47	Lalsot	12	1	1,20,00,000	15,00,000	8,00,000	7,20,000	1,50,20,000
48	Losal	10	2	1,05,00,000	30,00,000	16,00,000	6,30,000	1,57,30,000
49	Malpura	10	0	1,05,00,000	-	-	6,30,000	1,11,30,000
50	Mandalgarh	5	1	60,00,000	15,00,000	8,00,000	3,60,000	86,60,000
51	Mandawa	9	0	94,50,000	-	-	5,67,000	1,00,17,000
52	Merta City	15	3	1,50,00,000	45,00,000	24,00,000	9,00,000	2,28,00,000
53	Mukandgarh	8	2	84,00,000	30,00,000	16,00,000	5,04,000	1,35,04,000
54	Nainwa	7	1	73,50,000	15,00,000	8,00,000	4,41,000	1,00,91,000
55	Nawa	8	0	84,00,000	-	-	5,04,000	89,04,000
56	Neem Ka Thana	12	2	1,20,00,000	30,00,000	16,00,000	7,20,000	1,73,20,000

SL NO	TOWN NAME	TREATMENT CAPACITY NEEDED (KLD)	NUMBER OF TRUCKS NEEDED	TREATMENT COST (IN INR)	COST OF TRUCK (IN INR)	O&M COST – TRUCK (1 YEAR) (IN INR)	OPEX- FSTP (1 YEAR) (IN INR)	TOTAL INVESTMENT FOR FSM (IN INR)
57	Niwai	13	2	1,30,00,000	30,00,000	16,00,000	7,80,000	1,83,80,000
58	Nohar	18	3	1,80,00,000	45,00,000	24,00,000	10,80,000	2,59,80,000
59	Nokha	21	4	2,10,00,000	60,00,000	32,00,000	12,60,000	3,14,60,000
60	Padampur	6	1	63,00,000	15,00,000	8,00,000	3,78,000	89,78,000
61	Parwatsar	6	0	63,00,000	-	-	3,78,000	66,78,000
62	Phulera	7	0	73,50,000	-	-	4,41,000	77,91,000
63	Pilani	9	0	94,50,000	-	-	5,67,000	1,00,17,000
64	Pindwara	8	2	84,00,000	30,00,000	16,00,000	5,04,000	1,35,04,000
65	Piparcity	13	2	1,30,00,000	30,00,000	16,00,000	7,80,000	1,83,80,000
66	Pushkar	6	0	63,00,000	-	-	3,78,000	66,78,000
67	Raisinghnagar	10	1	1,05,00,000	15,00,000	8,00,000	6,30,000	1,34,30,000
68	Rajakhera	11	1	1,10,00,000	15,00,000	8,00,000	6,60,000	1,39,60,000
69	Rajaldesar	10	2	1,05,00,000	30,00,000	16,00,000	6,30,000	1,57,30,000
70	Ramganj Mandi	14	2	1,40,00,000	30,00,000	16,00,000	8,40,000	1,94,40,000
71	Ramgarh Shekhawati	11	0	1,10,00,000	-	-	6,60,000	1,16,60,000
72	Rani	5	0	60,00,000	-	-	3,60,000	63,60,000
73	Ratangarh	25	3	2,50,00,000	45,00,000	24,00,000	15,00,000	3,34,00,000
74	Rawatsar	13	3	1,30,00,000	45,00,000	24,00,000	7,80,000	2,06,80,000
75	Roopbas	6	0	63,00,000	-	-	3,78,000	66,78,000
76	Sadri	9	1	94,50,000	15,00,000	8,00,000	5,67,000	1,23,17,000
77	Sadulshahar	8	2	84,00,000	30,00,000	16,00,000	5,04,000	1,35,04,000
78	Sagwara	11	1	1,10,00,000	15,00,000	8,00,000	6,60,000	1,39,60,000
79	Salumbar	6	1	63,00,000	15,00,000	8,00,000	3,78,000	89,78,000
80	Sanbhar	7	0	73,50,000	-	-	4,41,000	77,91,000
81	Sanchore	10	1	1,05,00,000	15,00,000	8,00,000	6,30,000	1,34,30,000
82	Sangaria	12	2	1,20,00,000	30,00,000	16,00,000	7,20,000	1,73,20,000
83	Sangod	7	2	73,50,000	30,00,000	16,00,000	4,41,000	1,23,91,000
84	Sarwar	7	1	73,50,000	15,00,000	8,00,000	4,41,000	1,00,91,000
85	Shahpura	11	1	1,10,00,000	15,00,000	8,00,000	6,60,000	1,39,60,000
86	Shoeganj	9	1	94,50,000	15,00,000	8,00,000	5,67,000	1,23,17,000

SL NO	TOWN NAME	TREATMENT CAPACITY NEEDED (KLD)	NUMBER OF TRUCKS NEEDED	TREATMENT COST (IN INR)	COST OF TRUCK (IN INR)	O&M COST – TRUCK (1 YEAR) (IN INR)	OPEX- FSTP (1 YEAR) (IN INR)	TOTAL INVESTMENT FOR FSM (IN INR)
87	Shri Karanpur	7	2	73,50,000	30,00,000	16,00,000	4,41,000	1,23,91,000
88	Sojat	14	3	1,40,00,000	45,00,000	24,00,000	8,40,000	2,17,40,000
89	Keshoraipatan	7	1	73,50,000	15,00,000	8,00,000	4,41,000	1,00,91,000
90	Mukandgarh	6	0	63,00,000	-	-	3,78,000	66,78,000
91	Taranagar	13	0	1,30,00,000	-	-	7,80,000	1,37,80,000
92	Todabhim	7	2	73,50,000	30,00,000	16,00,000	4,41,000	1,23,91,000
93	Todaraisingh	8	1	84,00,000	15,00,000	8,00,000	5,04,000	1,12,04,000
94	Udaipurwati	13	2	1,30,00,000	30,00,000	16,00,000	7,80,000	1,83,80,000
95	Uniara	4	1	48,00,000	15,00,000	8,00,000	2,88,000	73,88,000
96	Vidyavihar	5	0	60,00,000	-	-	3,60,000	63,60,000
97	Vijainagar (Ajmer)	10	1	1,05,00,000	15,00,000	8,00,000	6,30,000	1,34,30,000
98	Vijainagar (G)	7	2	73,50,000	30,00,000	16,00,000	4,41,000	1,23,91,000
	Grand Total	897	116	92,81,00,000	17,40,00,000	9,28,00,000	5,56,86,000	1,25,05,86,000

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ANNEXURE 7: COST OF TREATING WASTEWATER USING DEWATS[24]

SL NO.	TOWN	WATER SUPPLY	TOTAL WW GENERATED	CAPEX	OPEX
		(LPCD)	KLD	INR	INR/ANNUM
1	Bhinder	0	-	-	-
2	Kanor	47	371	1,11,32,028	5,56,601
3	Salumbar	32	318	95,53,891	4,77,695
4	Sanbhar	55	731	2,19,19,532	10,95,977
5	Phulera	60	831	2,49,37,164	12,46,858
6	Jobner	60	405	1,21,60,134	6,08,007
7	Chaksu	65	1,505	4,51,39,526	22,56,976
8	Kishangarh Renwal	37	766	2,29,70,451	11,48,523
9	Bagru	33	764	2,29,22,292	11,46,115
10	Bandikui	56	1,509	4,52,67,886	22,63,394
11	Lalsot	69	1,584	4,75,20,752	23,76,038
12	Ramgarh Shekhawati	60	1,258	3,77,30,259	18,86,513
13	Khandela	54	835	2,50,51,761	12,52,588
14	Neem Ka Thana	60	1,383	4,15,01,250	20,75,063
15	Losal	55	1,022	3,06,50,235	15,32,512
16	Behror	65	1,142	3,42,63,343	17,13,167
17	Kherli	100	1,120	3,36,04,410	16,80,221
18	Bissau	60	829	2,48,76,117	12,43,806
19	Mandawa	60	955	2,86,59,960	14,32,998
20	Baggar	80	679	2,03,56,140	10,17,807
21	Pilani	60	1,062	3,18,63,321	15,93,166
22	Vidyavihar	84	783	2,34,86,602	11,74,330
23	Surajgarh	135	1,748	5,24,48,209	26,22,410
24	Khetri	100	1,083	3,25,03,065	16,25,153
25	Mukandgarh	92	1,355	4,06,44,450	20,32,223
26	Udaipurwati	77	1,924	5,77,26,900	28,86,345

[24] Capital cost of DEWATS is around INR 30,000/KLD and OPEX 1500/KLD/annum

SL NO.	TOWN	WATER SUPPLY	TOTAL WW GENERATED	CAPEX	OPEX
		(LPCD)	KLD	INR	INR/ANNUM
27	Pushkar	108	1,201	3,60,20,943	18,01,047
28	Vijainagar (Ajmer)	62	1,199	3,59,67,750	17,98,388
29	Sarwar	96	1,167	3,50,07,134	17,50,357
30	Kekri	70	1,974	5,92,30,049	29,61,502
31	Parwatsar	50	571	1,71,36,000	8,56,800
32	Nawa	62	933	2,79,99,510	13,99,976
33	Degana	80	954	2,86,09,980	14,30,499
34	Kuchera	88	1,368	4,10,37,150	20,51,858
35	Merta City	40	1,175	3,52,57,320	17,62,866
36	Deoli	55	802	2,40,68,583	12,03,429
37	Uniara	0	-	-	-
38	Todaraisingh	72	1,057	3,17,16,166	15,85,808
39	Malpura	70	1,346	4,03,66,347	20,18,317
40	Niwai	70	1,750	5,25,10,238	26,25,512
41	Asind	45	483	1,44,77,778	7,23,889
42	Gulabpura	50	904	2,71,32,893	13,56,645
43	Shahpura	70	1,524	4,57,09,209	22,85,460
44	Gangapur	100	1,184	3,55,09,005	17,75,450
45	Mandalgarh	0	-	-	-
46	Jahazpur	65	796	2,38,84,907	11,94,245
47	Deshnoke	96	1,276	3,82,90,392	19,14,520
48	Nokha	92	3,663	10,98,87,813	54,94,391
49	Gajsinghpur	38	227	68,06,741	3,40,337
50	Padampur	70	781	2,34,28,125	11,71,406
51	Vijainagar (G)	35	485	1,45,35,434	7,26,772
52	Kesrisinghpur	165	1,389	4,16,75,288	20,83,764
53	Shri Karanpur	135	1,719	5,15,68,650	25,78,433
54	Sadulshahar	100	1,561	4,68,18,765	23,40,938
55	Raisinghnagar	90	1,617	4,85,16,300	24,25,815
56	Anupgarh	135	2,776	8,32,71,321	41,63,566
57	Taranagar	50	1,196	3,58,79,393	17,93,970
58	Ratangarh	60	2,909	8,72,74,719	43,63,736

SL NO.	TOWN	WATER SUPPLY	TOTAL WW GENERATED	CAPEX	OPEX
		(LPCD)	KLD	INR	INR/ANNUM
59	Rajaldesar	55	1,051	3,15,36,755	15,76,838
60	Bidasar	70	1,671	5,01,33,689	25,06,684
61	Chhapar	30	500	1,49,94,000	7,49,700
62	Sagwara	54	1,123	3,36,78,666	16,83,933
63	Kapasan	40	527	1,57,97,250	7,89,863
64	Begun	73	943	2,82,86,609	14,14,330
65	Choti Sadri	70	789	2,36,73,027	11,83,651
66	Deogarh	70	767	2,30,05,794	11,50,290
67	Amet	55	583	1,74,84,968	8,74,248
68	Sanchore	100	1,957	5,87,10,435	29,35,522
69	Bhinmal	100	3,079	9,23,75,535	46,18,777
70	Rani	70	678	2,03,33,114	10,16,656
71	Sadri	100	1,693	5,07,77,895	25,38,895
72	Takhatgarh	80	909	2,72,74,800	13,63,740
73	Sojat	70	1,935	5,80,39,275	29,01,964
74	Falna	70	1,541	4,62,31,500	23,11,575
75	Bali	65	827	2,47,95,703	12,39,785
76	Shoeganj	100	1,696	5,08,72,500	25,43,625
77	Pindwara	60	875	2,62,48,068	13,12,403
78	Piparcity	70	1,700	5,09,92,095	25,49,605
79	Bilara	70	1,647	4,94,21,474	24,71,074
80	Rawatsar	57	1,370	4,11,07,015	20,55,351
81	Nohar	44	1,542	4,62,48,279	23,12,414
82	Sangaria	90	1,975	5,92,39,688	29,61,984
83	Kaithoon	37	533	1,59,98,080	7,99,904
84	Ramganj Mandi	0	-	-	-
85	Itawa	0	-	-	-
86	Sangod	43	584	1,75,07,816	8,75,391
87	Antah	40	831	2,49,30,024	12,46,501
88	Chhabra	50	1,562	4,68,56,250	23,42,813
89	Aklera	34	531	1,59,42,656	7,97,133
90	Bhawani Mandi	0	-	-	-

SL NO.	TOWN	WATER SUPPLY	TOTAL WW GENERATED	CAPEX	OPEX
		(LPCD)	KLD	INR	INR/ANNUM
91	Nainwa	70	915	2,74,56,513	13,72,826
92	Indergarh	48	247	73,97,611	3,69,881
93	Lakheri	116	2,041	6,12,44,207	30,62,210
94	Keshoraipatan	77	1,210	3,62,85,480	18,14,274
95	Kaprain	90	1,111	3,33,31,662	16,66,583
96	Rajakhera	70	1,514	4,54,21,824	22,71,091
97	Todabhim	69	946	2,83,84,606	14,19,230
98	Roopbas	40	474	1,42,05,744	7,10,287
	Total Expenditure		1,09,823	3,29,47,04,180	16,47,35,209

स्वच्छ भारत
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SCBP

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