

Investigation for Urban-Rural FSSM Linkages in Maharashtra

under
Urban-Rural Linkages in
Service Delivery / addressing challenges
with Peri-Urban Areas



Research Study
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RCUES
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Regional Centre for Urban & Environmental Studies
All India Institute of Local Self-Government, Mumbai

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Preface

The launch of Swachh Bharat Mission on 2nd October, 2014 had set an ambitious target of making India clean and open defecation free with a special focus on construction of toilets and behaviour change. A number of urban FSTP were also constructed under this phase. The second phase of SBM is now focused on management of waste i.e., increasing the access to safely managed sanitation.

According to a preliminary survey of Faecal sludge and Septage Treatment Plants (FSTP) carried out by Maharashtra Urban WASH and Environmental Sanitation Coalition (Maha-UWES-Coalition) and All India Institute of Local Self Government (AIILSG), Mumbai, many FSTPs constructed under the GR No. SMM 2019/C.R.124/UD-34 issued by Government of Maharashtra are currently underutilized. Looking at the underutilization of these FSTPs and proximity of villages to the urban local bodies, FSSM linkage was identified as a possible option to optimize the resources. Therefore, to analyze the viability of linkage, an analysis was required to identifying the scope and complexities associated with it. Hence, the study aims at understanding the potential of Urban-Rural linkage and preparing recommendations for the establishment of the linkage.

The study was conducted in 16 villages in Indapur tehsil. The identified villages had byroad distance of less than 10 Km from the FSTP. For the purpose of the study, data in the areas of Health, Water, Sanitation and Hygiene was collected in the form of household survey, Key Informant interviews and Gram Panchayat questionnaire. The questionnaire consisted of quantitative as well as qualitative questions. Respondents were selected through random sampling technique. A total of 400 responses were obtained as a part of the household survey, 12 Gram Sevak survey and 4 KIIs were performed during data collection.

The obtained data was analyzed. The results obtained were studied to determine the possibilities of the linkages. Discussion on various aspects of the linkages have been presented in the Discussion Section. A list of recommendation is then presented in order to successfully establish the linkage. Furthermore, the same recommendations may be used to prepare Action Plans for establishing the linkage.

Acknowledgement

I take this opportunity to put on record our deep appreciation for the Ministry of Housing & Urban Affairs (MoHUA), Government of India (GoI) for providing us an opportunity to working on this study.

I also take this opportunity to express my gratitude towards Shri. Ranjit Chavan, President, All India Institute of Local Self Government for providing valuable guidance and support to complete this report. I also express my sincere thanks to Dr. Jairaj Phatak, IAS (Retd.), Director General, All India Institute of Local Self Government for his continued support in completing this report.

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I am thankful to the RCUES's Research team for their continued support in completion of this research study report.

Director
RCUES, AILSG, Mumbai

Executive Summary

Safe Sanitation can be defined as the safe management of solid, liquid and sludge which is vital in maintaining health, hygiene and wellbeing of communities and their surrounding environment. Urban Maharashtra with total 50 million population with 384 ULBs was declared ODF in 2017 within 3 years of inception of Swachh Bharat Mission. Considering the criticality of safe sanitation and strive nation towards ODF+ and ODF++, Government of Maharashtra in 2019 issued the Government Resolution on setting up an FSTPs in urban local bodies of Maharashtra envisaged the sustainability status of ODF and safe disposal of generated faecal sludge and septage in towns.

This study was carried out to understand current condition of sanitation chain of Indapur town and its adjacent villages. Indapur is a class III town situated at the bank of river Bhima, near Ujjani dam in Pune district of Maharashtra. Urban Indapur has 100% access to toilets, out of which 20.7% of the population depends on community toilets and remaining have individual household toilets. 100 % of households have pour flush toilets connected to septic tanks followed by underground drainage. The wastewater i.e., mixture of septic effluent and grey water from drain is disposed in the Bhima River without treatment.

Indapur District has 142 villages out of which 16 villages which are around peripheral distance of 10KM from FSTP were surveyed in this study. Village identification and sampling strategy was decided on the basis of driving distance from FSTP and number of households in village. 67.3% households have flush toilets connected to septic tanks, 30.1% of households have toilets connected to soak pits and 2.6% are using pit latrines. The outlet of septic tanks is connected to soak pits, open drains, open grounds and no outlets. The septic tanks do not follow the IS Code 2470 Bureau of Indian Standards and are significantly larger in size. As a consequence of this, demand desludging with average desludging frequency of 10 to 15 years is being practiced across the district. The demand estimation based on the data collected suggests that the FSTP having capacity of 10 KLD can cater to current demand desludging of both Indapur town and its neighboring 16 villages.

SFD suggests that there is urgent need of STP in Indapur town as the wastewater flowing through underground drainage disposing in nearby Bhima River without treatment, which is further used by farmers in their agriculture land. Indapur is bounded with two major rivers Bhima and Nira. As Indapur is dependent on surface water, wastewater management becomes essential part to avoid water pollution. The current need of rural Indapur is provision of desludging services on demand basis with affordable price for safe disposal of FS. The provision of desludging services to villages is possible if urban rural linkage is established. Administrative willingness plays very important role for linkage which is seen lacking in Indapur. Urban rural linkage is possible if Indapur has enabling environment and acceptance towards linkage and its benefits. Urban rural linkage is a feasible and viable option while practicing demand desludging. Immediate construction of STP with co-treatment facility will fulfil the demand of desludging in Indapur. Urban rural linkage will be successful and become sustainable model for FSSM in ULBs if timely administrative measures, regular sensitization and awareness takes places which will also help to achieve ODF+ and ODF ++ status by 2030.

Table of Contents

Executive Summary.....	iii
List of Figures	vi
List of Tables	vii
Abbreviations.....	viii
Glossary.....	ix
1 Background.....	2
1.1 Project Introduction.....	2
1.2 Indapur Profile	3
1.3 Sanitation Profile.....	4
1.4 FSTP Profile	5
2 Approach and Methodology.....	8
2.1 Stakeholder Mapping & Characterization.....	10
2.2 Village Identification	11
2.3 Sampling Strategy	12
2.4 Data Collection.....	14
2.4.1 Household Survey	14
2.4.2 Gram Sevak Survey	15
2.4.3 ULB Data Collection.....	16
2.4.4 Key Informant Interview	16
3 Data Analysis.....	18
3.1 Household Survey	18
3.2 Faecal Sludge Treatment Plant	18
3.3 Shit Flow Diagram	18
4 Results.....	20
4.1 General Information	20
4.2 User Interface	20
4.3 Containment Unit.....	21
4.4 Conveyance/Transport.....	22
4.5 Reuse/Disposal.....	23
4.6 Shit Flow Diagram	23
4.7 Desludging Options for Linkage	24
5 Discussion	27
5.1 Technical feasibility.....	28
5.2 Administrative Willingness	28
5.3 Financial Feasibility	29

5.4	People awareness	29
5.5	SWOT Analysis.....	29
6	Recommendation	32
6.1	Short Term action	32
6.2	Midterm action	33
6.3	Long term action	33
7	Annexure	35
7.1	Annexure 1: List of Officials	35
7.2	Annexure 2: Enumerator Training Slide deck	36
7.3	Annexure 3: Household Survey Questionnaire.....	46
7.4	Annexure 4: Gram Panchayat Data.....	51
7.5	Annexure 5: Indapur Urban Data.....	54
7.6	Annexure 6: Key Informant Interview.....	56
7.7	Annexure 7: Desludging Tariff Calculation.....	64
7.8	Annexure 8: List of FSTP: Maharashtra.....	65

List of Figures

Figure 1 Temperature Variation for Indapur Tehsil	3
Figure 2 Map of Administrative Boundary of Indapur	4
Figure 3 Sanitation Chain: Indapur Town.....	4
Figure 4 Desludging Vehicle- Indapur	5
Figure 5 Treatment Chain: Indapur FSTP	5
Figure 6 Location of FSTP	6
Figure 7 Treatment Unit: Indapur FSTP	6
Figure 8 Methodology adopted for the project.....	8
Figure 9 Villages for Individual Household Survey.....	11
Figure 10 M-water Platform	15
Figure 11 Household Survey	15
Figure 12 Source of Water for Villages	20
Figure 13 User Interface and Containment/Disposal Unit Distribution.....	21
Figure 14 Containment and Disposal Unit	21
Figure 15 Septic Tank (Rural)	22
Figure 16 Septic Tank Outlet Connection	22
Figure 17 Mode of Disposal (Septic Tank Effluent).....	23
Figure 18 Shit Flow Diagram	24
Figure 19 Factors affecting urban rural FSSM linkage	27
Figure 20 SWOT Analysis of Urban – Rural Linkage for Indapur Taluka	30
Figure 21 Prioritization matrix	32

List of Tables

Table 1 Project Progress	9
Table 2 Stakeholder Mapping	10
Table 3 Stakeholder Characterization.....	11
Table 4 List of Villages.....	12
Table 5 Sample size for Individual household survey	14
Table 6 Scenario A: Demand desludging in urban and rural habitat	25
Table 7 Scenario B: Scheduled desludging in urban and demand desludging in rural habitat.....	25
Table 8 Scenario C: Scheduled desludging in urban and rural habitat	25

Abbreviations

AIIISG	All India Institute of Local Self Government
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
BDO	Block Development Officer
CBO	Community Based Organization
CEO	Chief Executive Officer
CO	Chief Officer
DMA	Director of Municipal Administration
ESF	Ecosan Services Foundation
FSSM	Faecal Sludge and Septage Management
FSTP	Faecal sludge and Septage Treatment Plant
GR	Government Resolutions
HH	Household
IEC	Information, Education and Communication
IMC	Indapur Municipal Council
KII	Key Informant Interview
KLD	Kilo Liters per Day
MLD	Million Liters per Day
NA	Not Applicable
NGO	Non-Governmental Organization
NMCG	National Mission for Clean Ganga
ODF	Open Defection Free
QCI	Quality Council of India
RLBs	Rural Local Bodies
SBM	Swachh Bharat Mission
SFD	Shit Flow Diagram
STP	Sewage Treatment Plant
UDD	Urban Development Department
ULBs	Urban Local Bodies
UTs	Union Territory
WASH	Water, Sanitation and Hygiene
WSSD	Water Supply and Sanitation Department
WSSO	Water and Sanitation Support Organization
ZP	Zilla Parishad

Glossary

Bylaws	Regulation made by a local governing authority.
Co-composting	Co-composting is the controlled aerobic degradation of the organics using more than one material (faecal sludge and organic municipal solid waste)
Community toilets	Community toilets are toilets located in or near the community area and used by defined users residing in the community.
Compost	It is decomposed organic matter that results from a controlled aerobic degradation of organic solid waste.
Containment Unit	It is a unit which collects, stores and sometimes treats the products generated at the user interface.
Conveyance	It describes the technology used for transport of products between the functional groups. (User interface/containment unit to treatment facility)
Deep row entrenchment	It is a technique used for safe disposal of faecal sludge and septage. It consists of digging deep trenches, filling them with sludge and covering them with soil.
Desludging	The process of removing the accumulated sludge or septage from a septic tank
Drains	A channel carrying off liquid discharge such as septic effluent from septic tank, grey water or stormwater. Drains can be lined, unlined, closed or open.
Effluent	It is a general term for a liquid that leaves the treatment unit, in this context it is used for blackwater or sludge after it has undergone solids separation.
Enumerator	Person responsible for conducting survey using survey tool such as tablet or a physical survey form.
Faecal sludge	It is a raw or partially digested, a slurry or semisolid sludge as a result from the collection and storage/treatment of excreta or blackwater, with or without greywater.
IEC activities	Information, Education and Communication (IEC) activities are public health system approach aiming at changing behaviors in a target audience, concerning a specific problem and within a pre-defined period of time, through communication methods and principles.
Onsite sanitation system	A sanitation system in which excreta and wastewater are collected, stored and/or treated on the plot where they are generated.
Pit latrine	It is a type of toilet that collects human feces in a hole in a ground. Urine and feces enter the pit through a drop hole in the floor, which might be connected to a toilet seat or a squatting pan for user comfort.
Septic tank	A septic tank is a watertight chamber made of brick work, concrete, fibre glass, PVC or plastic, through which blackwater from cistern or pour-flush toilets and greywater through a pipe from inside a building or an outside toilet flows for primary treatment.
Sewerage system	A sewerage system, or wastewater collection system, is a network of pipes, pumping stations, and appurtenances that convey sewage from its points of origin to a point of treatment and disposal.
Shared toilet	A toilet facility shared by more than one household.
Shit Flow Diagram	A shit flow diagram is an illustration used to display how excreta moves through a location, and functions as a tool to identify where improvements are needed. The diagram has a particular focus on treatment of waste, and its final disposal or use.

Sludge	It is a mixture of solids and liquids, containing mostly excreta and water, in combination with sand, grit, metals, trash and/or various chemical compounds.
Soak pits	A soak pit, also known as a soak away or leach pit, is a covered, porous-walled chamber that allows water to slowly soak into the ground.
Supernatant	The layer of liquid overlaying the settled solid which have separated from it.
Survey	It is a research methodology used for collecting data from a predefined group of respondents to gain information and insights into various topics of research.
User Interface	It describes the type of toilet, pedestal, pan, or urinal with which the user comes in contact; it is the way by which the user accesses the sanitation system.

Section

01

BACKGROUND

1 Background

The launch of the Swachh Bharat Mission on 2nd October 2014 had set an ambitious target of making India clean and Open Defecation Free (ODF). According to a report of an independent survey released by the Quality Council of India (QCI), phase I of this mission increased the household access of toilet coverage to 62.5 % and usage of the toilet to 91.3%.

The government has recognized a gap in safe and proper sanitation coverage which made India the first country to announce national policy on FSSM in 2017. By 2018 many states and UTs had adopted the policy and, many state governments had made their guidelines according to the current status of their states and UTs. In 2019, the government launched ODF+ and ODF++ protocols emphasizing FSSM in Swachh Survekshan and allocated certain financial budgets under AMRUT and NMCG missions.

The Government of Maharashtra had issued a Government Resolution (GR) in 2019 to set up FSTPs in urban Maharashtra. Several urban FSTPs have been constructed under this phase. Out of 384 cities/towns in the state of Maharashtra, 73 cities have regular and safe disposal treatment facilities. In the remaining 311 cities, FSTPs have been constructed as per guidelines, the capacities of FSTPs were decided as per the administrative population of the respective ULBs.

Swachh Bharat Mission (SBM) Grameen had a special focus on the construction of toilets and behavior change to achieve the goal of making the India Open Defecation Free. The second phase of SBM 2.0 is now focused on the management of this waste generated from the constructed toilet i.e., increasing the access to safely managed sanitation facilities and improving sanitation value change of urban and rural India.

FSSM plays a critical role in proper and safe sanitation value chain of any city or town. As per a preliminary survey of FSTPs carried out by Maharashtra Urban WASH and Environmental Sanitation Coalition (Maha-UWES-Coalition) and All India Institute of Local Self Government (AIIISG), Mumbai, FSTPs constructed under ULBs in Maharashtra are underutilized as several ULBs are still practicing demand desludging. The performance and efficiency of FSTPs gets affected due to the underutilized status of the plant and it might help to manage rural FSSM.

Considering the above aspects, AIIISG of RCUES, Mumbai, and ESF, Pune decided to carry out a pilot study to understand and investigate the possibilities of urban-rural FSSM linkage in Maharashtra.

1.1 Project Introduction

The pilot study in for Indapur can answer as to how the underutilized FSTPs will be fully utilized within the existing capacity and how FSSM will get better after urban rural linkage. The objective of the study is that

- Investigate the potential of urban-rural linkage of FSSM in Maharashtra.
- Investigate its affordability to households, ULBs and Gram Panchayat
- Business viability check of FSSM including occupational health and safety.

To find out the urban rural FSSM status, current demand and supply and possibility of linkage various methodology was adopted mentioned in Section 2.

1.2 Indapur Profile

As per census 2011, Indapur tehsil has an approximate population of 3,83,183 out of which town population is 25515 (5228 households) and rural population is around 3,57,668 (74455 households) from 142 villages. The percentage decadal increase in population from 2001 to 2011 census of the town is 18.2% and for the villages is and average of 9.4%.

Indapur has dry climate as it receives scanty rainfall. The average temperature in Indapur ranges from 20°C to 30°C with May being the hottest month having temperature of up to 40°C, and January being the coldest with temperature going down to 13°C. The average relative humidity in Indapur is 54.5%. August has the highest relative humidity of 83% and the least humid is March at 28%¹. Figure 1 shows the temperature variation for Indapur tehsil.

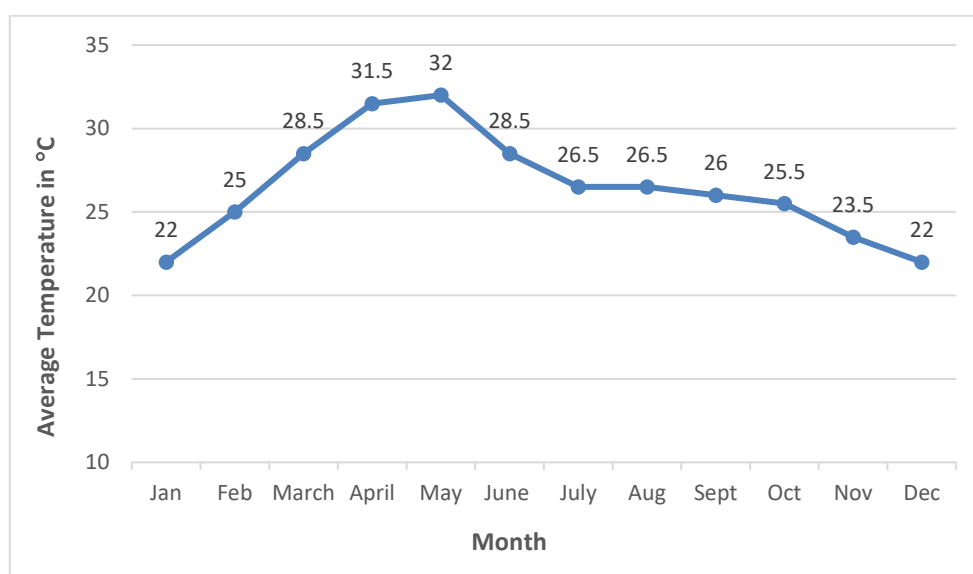
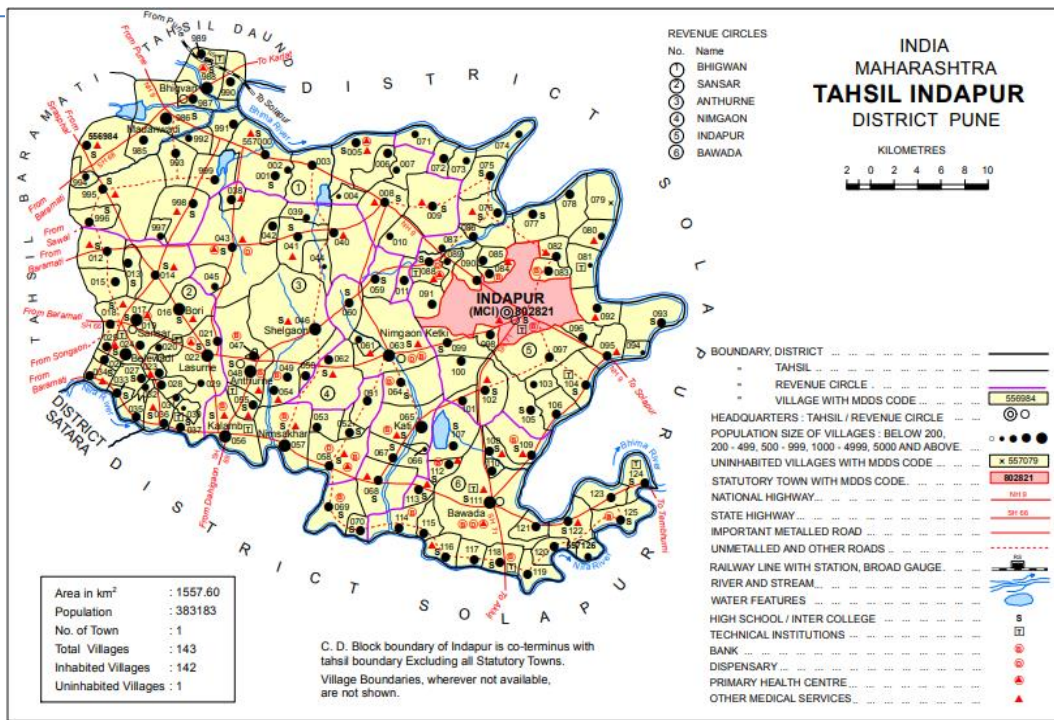


Figure 1 Temperature Variation for Indapur Tehsil

The Indapur tashil is bound between the two rivers Bhima and Nira. The major irrigation and water supply source to Indapur town is Ujjani dam backwater along with Nira left canal and Khadakwasla canal system.

¹ <https://wanderlog.com/weather/9242/1/indapur-weather>



(Source: District Census Directory, Census 2011)

Figure 2 Map of Administrative Boundary of Indapur

1.3 Sanitation Profile

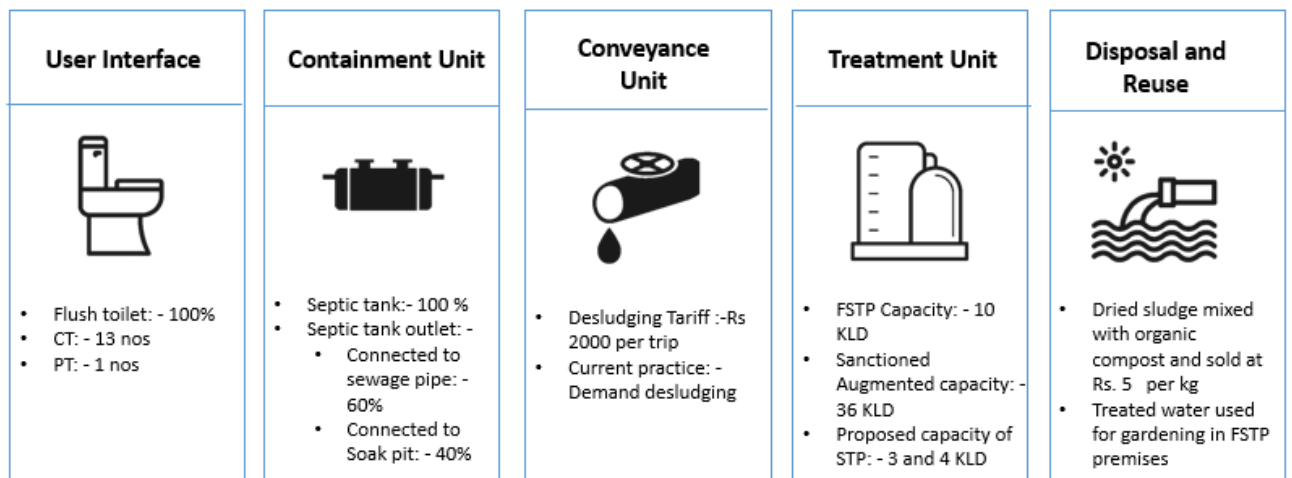


Figure 3 Sanitation Chain: Indapur Town

(Source: KII with ULB Official)

Indapur ULB was declared ODF in September 2016² since Indapur town has 100% access to toilet and safe sanitation facilities. According to the KII with an ULB official the town has 13 community toilets which serves approximately 800 households i.e., 5300 population. A public toilet is located at bus stand. Out of the 13 community toilets, 6 are located in slum, it gets cleaned everyday by sanitation worker appointed by Indapur Municipal Council. As informed by the ULB official all toilets in the town

² ODF declared cities, MoUD- 2016

are connected to septic tanks. 60% of the septic tanks in town are connected to underground drainage network whereas 40% are connected to soak pits. Indapur has 100% underground drainage network to which grey water from bathrooms, kitchen and septic tank effluents and outlet of septic tanks are connected. The wastewater carried by this underground drainage network is disposed without treatment into Bhima River. Currently, there is no STP installed in town to cater to this generated wastewater. As per information provided by the engineer of council, two STPs are proposed to urban development department of capacity 3 MLD and 4 MLD.

Indapur council has 2 desludging vehicles, a trailer-mounted suction machine of 3000 L capacity and a suction truck of 4000 L capacity. Household contact municipal council for desludging services at a charge of INR 2000 per trip from household. A digital log book at FSTP is maintained by the ULB. The O&M cost of FSTP is recovered from multiple sources- (a) sanitation tax collected from each household which is INR 100 per W.C., (b) desludging fee paid by households and (c) sell of compost at INR 5 per Kg. Farmers buy the compost and use it in their farms whereas the treated wastewater from FSTP is been reused for gardening in the FSTP premises. Currently, the farmers are also using untreated wastewater from underground drainage for farming which is not permissible as per Indian standards³.



Figure 4 Desludging Vehicle- Indapur

1.4 FSTP Profile

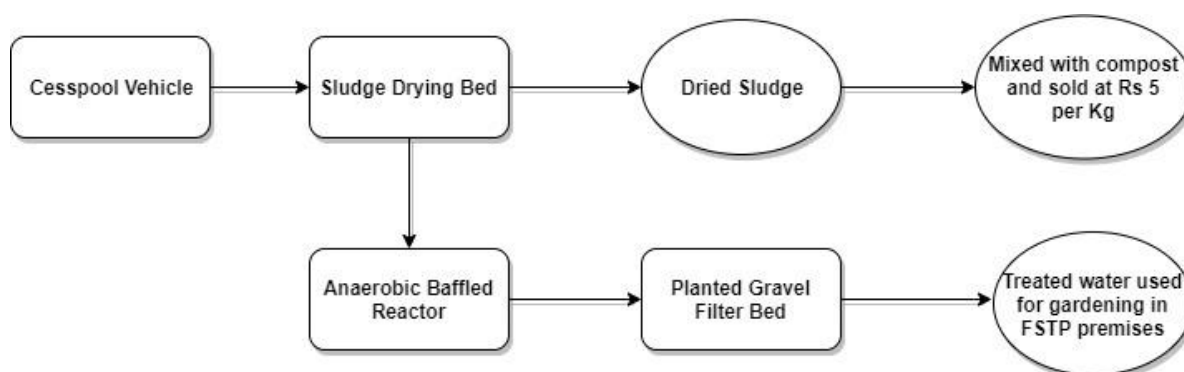


Figure 5 Treatment Chain: Indapur FSTP

The design capacity of Indapur FSTP is 10 KLD. It is situated at the outskirts of town beside the solid waste management plant. The Figure 6 shows the location of Indapur with respect to the boundary of

³ The Environment (Protection) Rules, 1986

the town. The construction of FSTP was as per Government of Maharashtra GR (GR No. SMM 2019/C.R.124/UD-34)⁴. An augmented capacity of 36 KLD has been sanctioned for Indapur as per UDD GR (GR No. SMM-2020/C.R.85/UD-34)⁵. It is a natural treatment process with sludge drying beds for solid-liquid separation and drying of sludge whereas liquid after separation flows to anaerobic baffled tanks and constructed wetland for treatment.

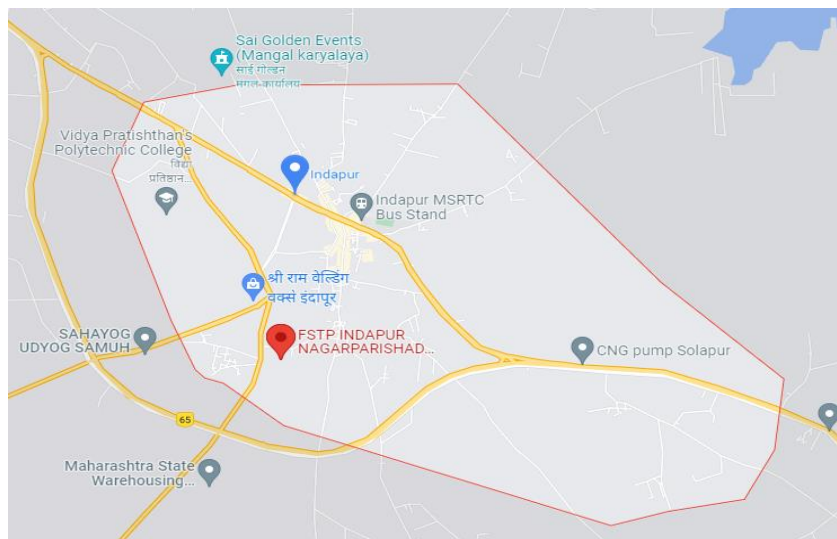


Figure 6 Location of FSTP



Figure 7 Treatment Unit: Indapur FSTP

⁴ Maharashtra Government Resolution for setting up of FSTP: [GR No. SMM 2019/C.R.124/UD-34](#)

⁵ Maharashtra Government Resolution for augmentation of existing FSTP capacities: [GR No. SMM-2020/C.R.85/UD-34](#)

Section

02

**APPROACH &
METHODOLOGY**

2 Approach and Methodology

The project methodology consists of five steps as mentioned below in Figure 6. Desk research was conducted to understand the stakeholder's profile and determine their engagement in the project. To carry out the household survey, village identification and mapping activity was carried out. The sampling strategy was decided considering the number of households in the village and the distance of village from FSTP. Secondary and primary data was collected from urban and rural Indapur. After data collection and data cleaning, data analysis was performed to assess the sanitation service delivery. The gaps in the service delivery were identified to draw conclusion and recommendation for urban and rural FSSM linkage in Indapur Tehsil.

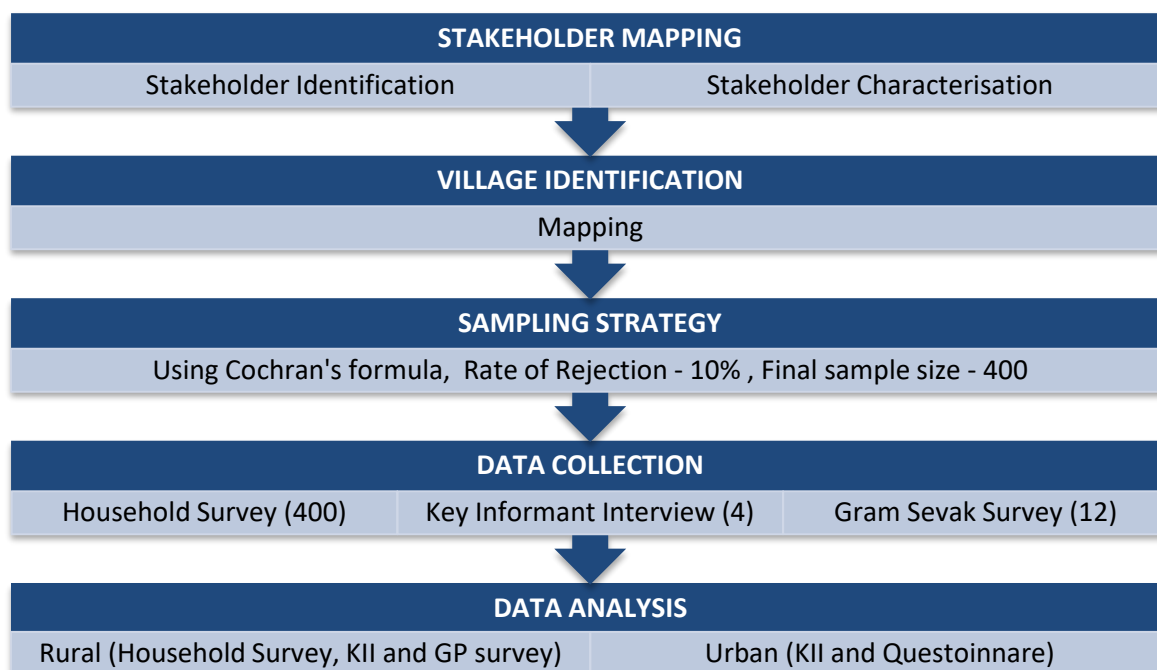


Figure 8 Methodology adopted for the project.

There was deviation in the timeline of the project previously submitted in the inception report. The progress of the project is shown in the below Gantt chart.

Table 1 Project Progress

Sr. No.	Activities	21-Nov				21-Dec				22-Jan				22-Feb				22-Mar			
		W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
1	Stakeholder mapping and characterization																				
2	Preparations of maps and secondary data survey questionnaire																				
3	Designing Household Survey, KII and sampling strategy																				
4	Permission from UDD and WSSD																				
5	Communication with ULB officials																				
6	Visit to ULB and FSTP																				
7	Identification and Trainings of Enumerators																				
8	Household Survey																				
9	KII with Gram sevak																				
12	KII with government officials																				
13	KII with desludging operators																				
14	Data analysis and Feasibility assessment report																				
15	Submission of draft report																				
16	Final submission of the report																				

2.1 Stakeholder Mapping & Characterization

Success of a FSSM project depends on how efficiently the desludging services are provided to the households and the other key stakeholders involved in advocacy, design, implementation and operation of the sanitation service chain. A stakeholder mapping exercise was performed to understand the administrative landscape pertaining to sanitation in urban and rural Maharashtra. Table 2 shows the output of the stakeholder mapping exercise at a glance.

The Urban Development Department (UDD), Director of Municipal Administration (DMA), and Urban Local Body (ULB) are collectively responsible for the proper functioning of urban sanitation and wastewater system. The ULB is responsible for planning of urban water and wastewater projects. Technical review and financial sanctioning of the project is done by UDD. The UDD also looks after policy formation, regulation and actual implementation of schemes and plans of state and central government at the urban level. As per the municipal acts⁶, ULBs have a dual role of service provision for public services (construction of drains, sewerage systems, community toilets, etc.) and regulations of activities of households (construction of household latrines, service connections, etc.). DMA is responsible for the monitoring, supervision, coordination, and governance of the system whereas service provision is the responsibility of the ULB.

Table 2 Stakeholder Mapping

Stages	Containment / Connection	Collection & Conveyance	Treatment	Reuse and Disposal
Stakeholders in FSSM	Municipal councils/Nagar Panchayat Households	Municipal councils/Nagar Panchayat Desludging Operators	UDD/Municipal councils/Nagar Panchayat	Maharashtra Pollution Control Board
Stakeholders in Sewered Sanitation	Municipal councils/Nagar Panchayat Households	Construction: DMA & O&M: Municipal Council/ Nagar Panchayat		

The Water Supply and Sanitation Department (WSSD) is the institution at the apex for sanitation projects in rural Maharashtra. They look after the policy formation, regulation, coordination, and governance of the rural sanitation system. The Water and Sanitation Support Organization (WSSO) is responsible for planning whereas the Zilla Parishad (ZP) and Rural Local Body (RLB) are responsible for implementation and service provision.

Stakeholder characterization helps to derive the engagement model for different stakeholders. For characterization of stakeholders, the influence - interest matrix was used to determine the engagement level.

Table 3 informs us whom to consult, inform and with whom one should collaborate during the project to improve FSSM in urban and rural Maharashtra.

⁶ [The Maharashtra Municipal Council Nagar Panchayat and Industrial Township Act, 1965](#)

Table 3 Stakeholder Characterization

	High Interest	Low Interest
High Influence	<p>KEY STAKEHOLDER ENGAGE CLOSELY Municipal Councils, Gram Panchayat (Gram Sevak) Desludging Operators, Households</p> <p>CONSULT COLLABORATE EMPOWER</p>	<p>Meet their needs Keep Satisfied</p> <p>DMA/ZP</p> <p>CONSULT AND INFORM</p>
Low Influence	<p>Show consideration Keep informed</p> <p>UDD/ZP</p> <p>CONSULT AND EMPOWER</p>	<p>Least Important Minimal Efforts</p> <p>Maharashtra Pollution Control Board</p> <p>INFORM</p>

2.2 Village Identification

Travel distance and access to roads are the major factors affecting the desludging services. The distance of the village from the treatment facility inversely affects the financial viability of the desludging services. Therefore, the road distance of a village from FSTP was an essential factor for the identification of a village for the study. Villages located within the 10 km of aerial distance were filtered out from the 142 villages. Villages having a driving distance of less than 10 km were identified and selected for the part of the study. Out of 142 villages in Indapur Tehsil, 16 villages were selected to carry out the household survey, and are shown in Figure 9. These 16 villages were under 12 different Gram panchayats having a total population of around 30,336 with a total number of households of 6,243.

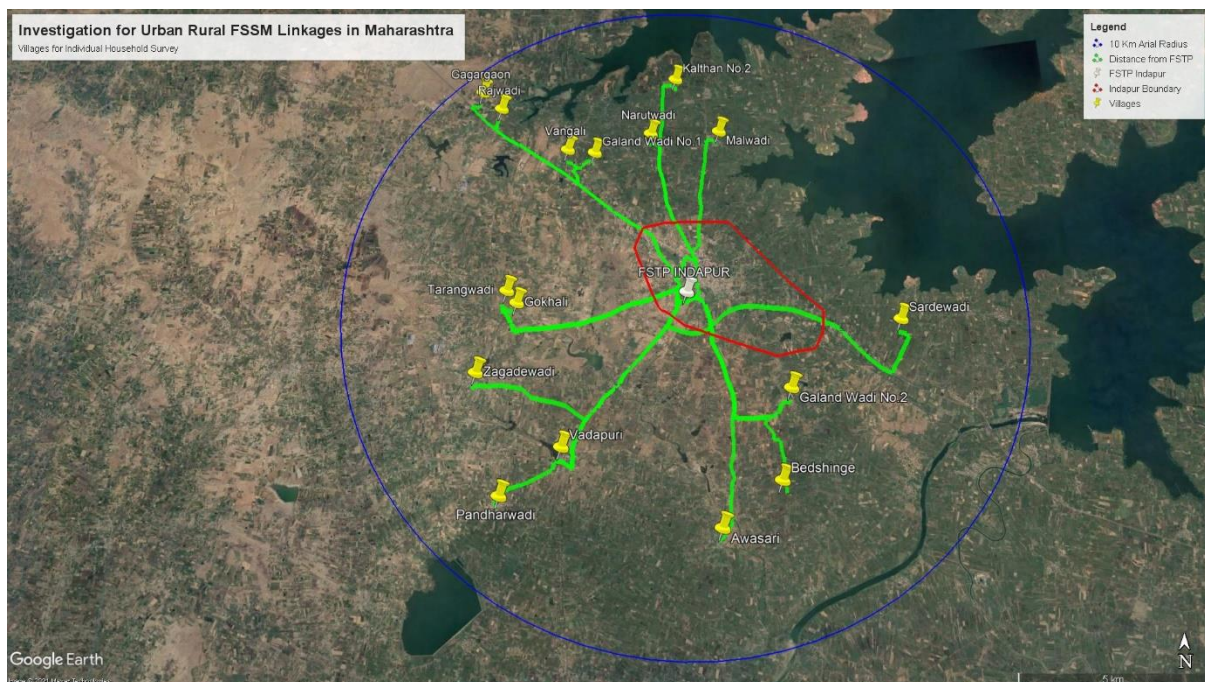


Figure 9 Villages for Individual Household Survey

Table 4 List of Villages

Sr. No.	Villages	Population	Households	Driving Distance from FSTP (Km)
1	Awasari	2011	496	8.10
2	Bedshinge	759	183	8.20
3	Gagargaon	709	152	10.10
4	Galandwadi 1	1873	370	6.70
5	Galandwadi No.2	2299	470	5.10
6	Gokhali	1608	373	7.00
7	Kalthan No.2	1188	256	9.00
8	Malwadi	4263	848	6.70
9	Narutwadi	1331	224	6.50
10	Pandharwadi	1198	235	9.20
11	Rajwadi	508	104	8.90
12	Sardewadi	3187	604	10.20
13	Tarangwadi	2557	513	6.80
14	Vadapuri	4401	919	6.70
15	Vangali	1251	265	6.50
16	Zhagadewadi	1193	231	8.50
	Total	30336	6243	124.2

2.3 Sampling Strategy

The total number of households and driving distance from FSTP is a known factor, so the sample size for the survey is found using Cochran's formula. The Cochran formula is generally used to calculate an ideal sample size given a desired level of precision, desired confidence level, and the estimated proportion of the attribute present in the population. Cochran's formula is considered appropriate in situations where large populations and households need to be surveyed. Using Cochran's formula, we could find out the sample size for the survey as the number of households is a known variable in the formula.

$$n_0 = \frac{Z^2 pq}{e^2}$$

were

n_0 = Proportion for unknown population = 384

Z = constant coefficient of confidence level of 95% = 1.96 (From Z-table)

p = Standard deviation

q = 1-p

e = desired level of precision (margin of error) = ±5%

So, a random sample of 384 households in our target population should be enough to give the confidence level needed.

Cochran's formula: -

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

were

n = Cochran's sample size of unknown population = 361.80 household

n₀ = number of populations for known households = 384

N = Total number of households known = 6243

The sample size for individual household surveys using Cochran's formula came out as 361.80, 10% rate of rejection was added to the determined value. The sample size was finalized as 400. Distance from FSTP and the number of households in 16 villages are the two main factors considered while distributing 400 sample sizes for household survey. Villages near Indapur Municipal Council's FSTP will be more economical and affordable for operators and households to carry out a desludging activity, so nearer is the village more is the sample size of the household survey is considered in the sampling strategy. The allocation of sample size for each village is carried out based on proportional allocation with 70% to the distance of the village from FSTP and 30% weightage to the number of households per village.

Higher weightage has been assigned to distance as only one household is covered per trip and hence, if the village is far, the cost-of-service increases. So even if the demand for the service is high, it will not lead to lowering of service charges.

Table 5 provides the distribution of the number of households to be surveyed per village based on the weightage assigned based on distance and population.

Table 5 Sample size for Individual household survey

Sr. No.	Villages	Sample Size allocation (70% Distance as a major factor and 30 % number of households as a minor factor)
1	Awasari	26
2	Bedshinge	20
3	Gagargaon	15
4	Galandwadi 1	27
5	Galandwadi No.2	32
6	Gokhali	26
7	Kalthan No.2	20
8	Malwadi	36
9	Narutwadi	25
10	Pandharwadi	19
11	Rajwadi	17
12	Sardewadi	24
13	Tarangwadi	30
14	Vadapuri	38
15	Vangali	25
16	Zhagadewadi	20
	Total	400

2.4 Data Collection

The modes of data collection were household surveys, survey of the Gram Sevaks of Gram Panchayats and key Informant Interview with stakeholders. The data collection methods aimed to understand the on-ground sanitation system and practices in the urban and rural context of Indapur Tehsil.

2.4.1 Household Survey

The survey questionnaire was aimed to understand the sanitation practice in the villages and the willingness of households to pay for the FSSM services. The survey questionnaire was related to water, sanitation, and waste management practices at household level. Six local enumerators were identified to conduct the survey. The survey was conducted with the help of M-water platform. A one-day online workshop was organized on 17th February 2022, to train the enumerators, familiarize them with sanitation systems, and questions and options occurring in the questionnaire. The slide deck used for training is available in Annexure 2: Enumerator Training Slide deck.

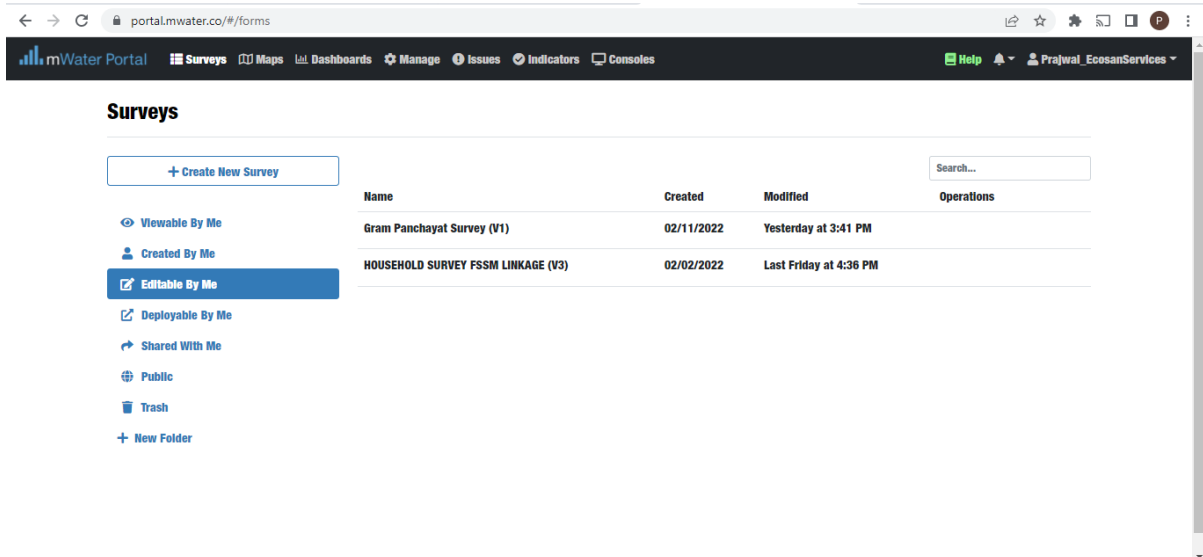


Figure 10 M-water Platform

M-water surveyor app was used for conducting households survey. Data like GPS location of the house, photos of toilets, containment unit and roads were included in the questionnaire to keep a quality check of received survey forms. A complete household questionnaire is attached in Annexure 3: Household Survey Questionnaire. To avoid any biases in the data collected, the enumerators were instructed to avoid selecting adjacent households for the survey. The household survey was conducted from February 19th to 27th, 2022.

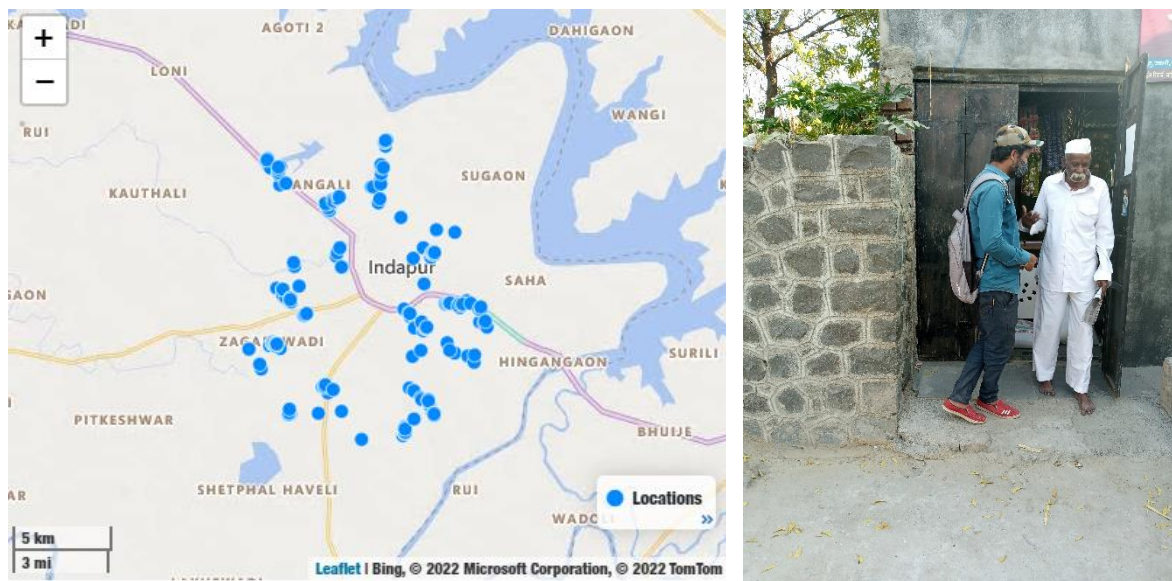


Figure 11 Household Survey

2.4.2 Gram Sevak Survey

The process of rural data collection became smooth and easy with the help of Mr. Milind Tonpe, Deputy CEO, Zilla Parishad, Mr. Kudve, SBM Officer, ZP who connected the team with Mr. Vijaykumar Parit, Block Development Officer, Panchayat Samiti Indapur and Mr. Solapuri, Block Coordinator, Panchayat Samiti Indapur. The contact details of gram sevaks were provided by Panchayat Samiti officials. All the gram sevaks were contacted to carry out the household surveys in villages.

The Gram Panchayat surveys were conducted simultaneously during the household survey. A total of 12 Gram Sevaks of 16 villages were surveyed. The M-water platform and M-water surveyor app was used for conducting the survey. Results obtained from the survey helped to cross verify the results obtained from the household survey. The data obtained from Gram Panchayat is available in Annexure 4: Gram Panchayat Data.

2.4.3 ULB Data Collection

A meeting was held with Mr. Ranjit Kapre, CO, Indapur Municipal Council to explain the prospect of the linkage. Permission and cooperation for data collection and FSTP visit were provided by ULB officials. A questionnaire was developed to obtain the urban data. The questionnaire aimed to understand the current sanitation practice in the town. It consisted of data regarding access to toilet, type of toilet, containment unit, means of wastewater disposal etc. A filled ULB data sheet is available in Annexure 5: Indapur Urban Data.

2.4.4 Key Informant Interview

Four key Informant Interviews were conducted with various stakeholders to understand the current sanitation system of Indapur. The willingness of various stakeholders to establish urban-rural linkages was also studied. ULB officials, a Panchayat Samiti official, Gram Sevaks, and the council appointed desludging operator were interviewed to collect data, understand the current scenario, future FSSM plans and the overall activities conducted by them. The KIIs were performed in form of discussions and question and answer session. KII discussions and outcomes are available in Annexure 6: Key Informant Interview.

Section

03

DATA ANALYSIS

3 Data Analysis

Data analysis is one of the important parts of the research which drives the study in the direction of final results and conclusion leading to important recommendations for Urban Rural FSSM Linkage in the study.

3.1 Household Survey

Household survey was conducted in 16 villages covering 400 households. Out of the received responses, 10 were rejected during data cleaning due to incompetent data. As the number of accepted responses is greater than the sample size of 362, the strategy of adding 10% of sample size as the rate of rejection helped to achieve statistically adequate data for data analysis and research.

Quantitative analysis was performed on the data collected through household surveys to understand the sanitation infrastructure in the villages. Percentages of components of sanitation service chain were determined to analyze the scope of FSSM in the surveyed villages. Quantitative analysis of responses to questions regarding IEC, water treatment and water borne diseases helped to understand the awareness of FSSM and the effect of improper FSSM on ground water, environment etc. was a huge part of the household survey analysis. The findings from data analysis are presented in Section 4.1 to 4.5.

3.2 Faecal Sludge Treatment Plant

The household survey served its purpose to identify the scope of FSSM but the analysis would have been incomplete without evaluating the demand of desludging, quantity of septage to be managed daily and capacity of FSTP under various possibilities of linkages. Therefore, to understand the longevity and durability of linkages under various conditions based on the capacity of the FSTP the following analysis was undertaken: -

Based on type of desludging three various approaches of the linkages are possible. The possible approaches are;

- a. Demand Desludging for Urban and Rural
- b. Scheduled Desludging for Urban and Demand Desludging in Rural
- c. Scheduled Desludging for Urban and Rural

3.3 Shit Flow Diagram

The main aim of establishing an Urban-Rural linkage is for safe management of faecal sludge for Indapur Municipal Council and the 16 neighboring villages thereby improving the economics of sanitation service chain. To analyze the current situation and identify the gaps in the service chain, a comprehensive SFD of Indapur Municipal Council and its neighboring villages was made. To prepare a combined SFD, weighted analysis of all the components of rural and urban sanitation chain was important so that the generated SFD will show reliable picture of current sanitation ground situation.

The required sanitation data for weighted calculations was found out from the household survey data analysis, KII and from urban questionnaire. For obtaining the SFD, weighted calculations were considered for parameters such as percentage of various containment units connected to various conveyance or disposal units. The SFD is presented in the results in Section 4.6.

Section

04

RESULTS

4 Results

This section presents various findings of analysis performed on data collected from households pertaining to the current water, sanitation and environment statutes of the villages.

4.1 General Information

The major occupation of people residing in villages in Indapur is farming. Approximately 83.10% population in village having farming as a main source of income. Some other occupations in which the village population is involved are salary jobs, traders/shopkeepers and daily wage employee.

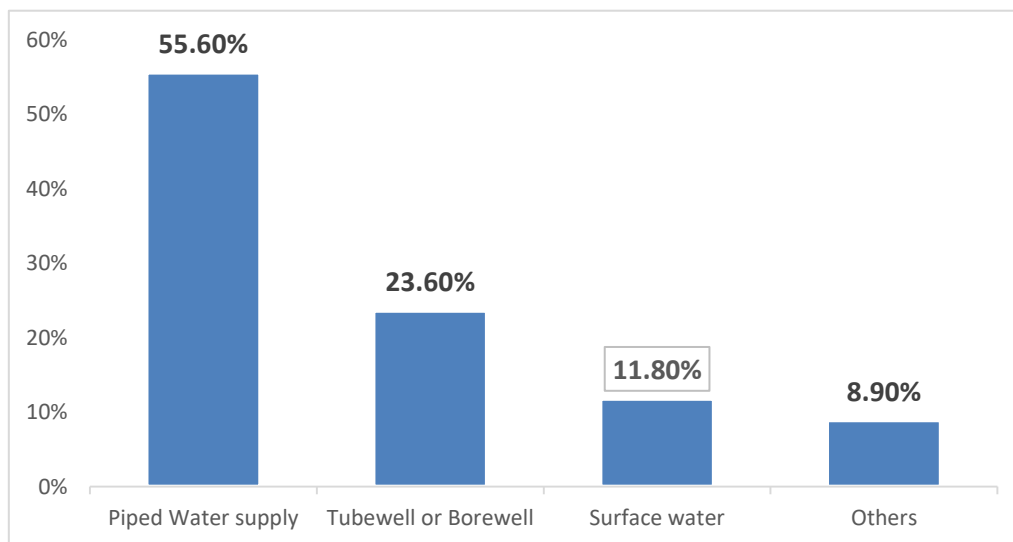


Figure 12 Source of Water for Villages

The main source of water for people in villages is piped water connections whose raw water source is dug wells and bore wells. Another 23.60% households have tube well or borewell in the household premise. Therefore, more than 79.2% of the households depends on ground water. Water from these sources is available throughout the year. Use of water filter at household level before consuming is the most common practice of the villagers, 81.2 % of households have filters installed in their houses and some of them are dependent on RO treatment plant installed by the Gram Panchayats. As per aquifer maps and ground water management plan 2018 ⁷, ground water in Indapur has chemical parameters which are beyond the maximum permissible limit for drinking indicating that such water is not fit for drinking if directly consumed without further treatment. 11.78% of the people consume water directly without treatment. Nevertheless, no outbreak of water borne disease have been experienced in the 16 surveyed villages.

4.2 User Interface

Almost 97% of households in villages have access to individual household toilets. Flush toilets either bucket flush or cistern flush are preferred and prevalent type of toilet. The usage of pit latrines was also observed in Vangali, Galandwadi No 1, Galandwadi No 2, Sardewadi, Tarangwadi, Gokhali and Zhagadewadi villages. In absence of individual household toilets, the residents used shared toilets.

⁷ [Aquifer Maps and Ground Water Management Plan, Ministry of Water Resources, River Development And Ganga Rejuvenation Government Of India, 2018](#)

4.3 Containment Unit

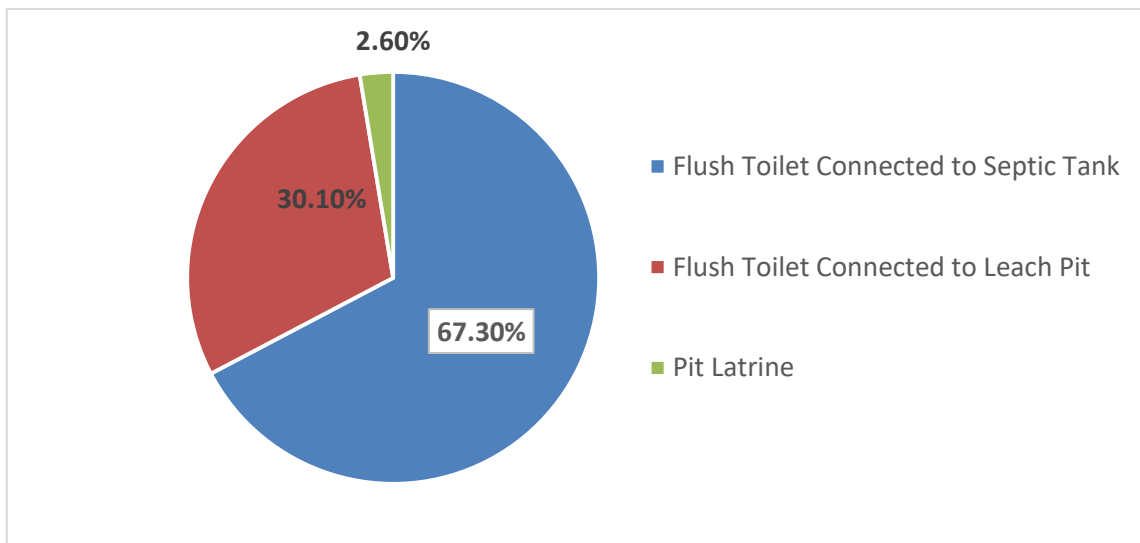


Figure 13 User Interface and Containment/Disposal Unit Distribution

The most prominent on-site sanitation system found in villages are flush toilet connected to septic tank. Approximately 67.3 % of households have flush toilets connected to septic tanks. 30.1% households have toilets connected to soak pits. Approximately, 2.6% of the households still use pit latrines.



Figure 14 Containment and Disposal Unit



Figure 15 Septic Tank (Rural)

The most common type of containment unit found in villages are three chambers septic tank. They account for 90% of the septic tanks found in the villages. The average dimensions of the septic tank are 2.7m length X 1.9m width X 2.4m depth. The average dimensions of the leach pits in villages are 1.2m diameter and 2.1m depth.

During the survey, it was observed that the septic tanks are not build according to the standards and are constructed oversized. The inlets of septic tank are given inappropriately. No vent pipes are provided to the septic tanks.

4.4 Conveyance/Transport

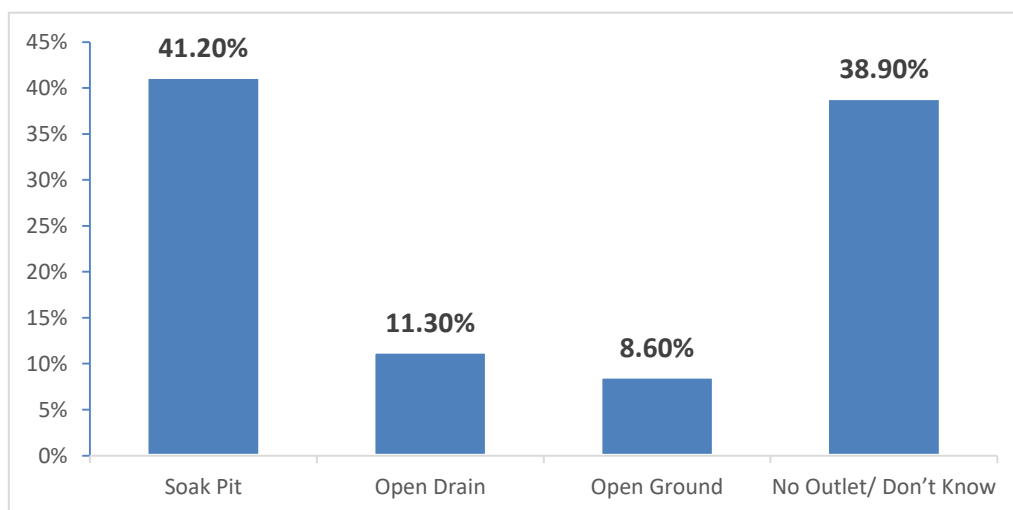


Figure 16 Septic Tank Outlet Connection

The above Figure 16 shows an illustration of how the supernatant of septic tank are conveyed/disposed. The supernatant from the septic tank is disposed in soak pit, open drains or on open ground. Approximately 41.2% of the outlet of septic tanks are connected to soak pit. Almost 38.9 % of the households surveyed are unaware of the mode of disposal of the septic tank effluent.



Figure 17 Mode of Disposal (Septic Tank Effluent)

Only 0.01% which is 4 households responded that they had emptied the containment unit. Out of these 4 households, 2 households emptied the soak pit. The average cost of desludging was INR 4800. The household had contacted Municipal Council for availing the desludging service. Households expressed their willingness to opt for desludging services in near future.

4.5 Reuse/Disposal

There are no treatment facilities available for the treatment of faecal sludge or supernatant at the village level. Households having twin leach pits are been instructed by the gram panchayats to use the content after 2 years as a manure. Households are willing to use the content as manure. The disposal of supernatant is unhygienic and not environment friendly when disposed in open drains, open grounds and water bodies which creates nuisance in the village causes breeding of flies and mosquitoes.

4.6 Shit Flow Diagram

Currently, Indapur and all 16 villages completely depends on on-site sanitation system. To generated SFD weighted calculation was conducted for town and 16 villages. In urban Indapur, toilets connected to septic tanks and then connected to underground drainage are 27% whereas septic tank connected to soak pits for both rural and urban are 29%. The septic tanks connected to open drains, open ground and no outlet are 3%, 3% and 21% respectively. In villages toilets connected to soak pits and pit latrines are 17%. The generated SFD shows that 60% of total faecal sludge in the study area is contained but not emptied. This can be co-related to the fact that 29% of the septic tanks in the study area are connected to soak pits and 27% are connected to underground drainage system. It can be observed that 26% of generated faecal sludge is neither contained nor disposed of safely.



Figure 18 Shit Flow Diagram

Almost 100% of the urban supernatant flows through the undergoing drainage network constructed in Indapur, although the supernatant is transported safely it do not reach any treatment facility resulting in contamination of water body at the city level. The rural supernatant flows through open drains or is disposed on open ground and hence is neither safely managed nor treated. To ensure a successful Urban-Rural linkage it is of utmost importance to contain and safely manage and treat supernatant and faecal sludge. The suggestions and recommendations to safely manage the supernatant and faecal sludge are provided in the Section 6.

4.7 Desludging Options for Linkage

To evaluate the load received under various scenario of linkage mentioned in Section 3.2 technical calculations were performed on the population data derived from the census 2011. According to the Census on India, the decadal population growth rate for Indapur Municipal Council were taken as 18% whereas 10% for rural Indapur. Considering the decadal growth, population projection for next 15 years were calculated with base year as 2020. The amount of sludge received per day was calculated for the projected years, considering the desludging frequency for demand desludging as 15 years, this frequency was found out from gram sevak surveys and KII. For schedule desludging, frequency was considered as 3 years as per government resolutions⁸. The number of working days was considered as 300.

Table 6, Table 7 and Table 8 provides a summary of the load received at FSTP per day under various approaches and the capacity required to sustain the load. The below calculation is on the basis of current population.

⁸ Maharashtra Government Resolution for setting up of FSTP: [GR No. SMM-2020/C.R.85/UD-34](#), 2020

Table 6 Scenario A: Demand desludging in urban and rural habitat

Demand Desludging (U&R)	
<ul style="list-style-type: none"> Septage to be managed: 10.8 KLD Septic tanks to be serviced: 3/day Vehicles required: 1 	<ul style="list-style-type: none"> Most suitable option in long run due to oversized septic tanks

Scenario A: Demand desludging is practiced in urban and rural habitat

When demand desludging is practiced in both urban and rural habitat a maximum of three septic tanks per day can be desludged. Considering the current rate of desludging as 15 years, a maximum load of 10.8 KLD per day is expected at the FSTP. Assuming that the desludging truck can perform three trips per day, only one vehicle is needed to fulfill the requirement of demand desludging in urban and rural habitat.

Table 7 Scenario B: Scheduled desludging in urban and demand desludging in rural habitat

Scheduled (U) – Demand (R) Desludging	
<ul style="list-style-type: none"> Septage to be managed: 32.8 KLD Septic tanks to be serviced: 9/day Vehicles required: 3 	<ul style="list-style-type: none"> Possible only under augmented capacity of 36 KLD with a need of next augmentation after 6 years

Scenario B: Scheduled (U) – Demand (R) Desludging

When scheduled desludging is practiced in urban habitat, the total septage to be managed per day will be 32.8 KLD. This load cannot be sustained by the current 10 KLD FSTP capacity. Hence to establish this form of linkage, augmentation of FSTP is needed. Under this approach septic tanks from eight urban households and one rural household needs to be desludged every day. To cater to this demand three desludging vehicles of capacities 3000L or 4000L will be needed.

Table 8 Scenario C: Scheduled desludging in urban and rural habitat

Scheduled Desludging (U&R)	
<ul style="list-style-type: none"> Septage to be managed: 54.2 KLD Septic tanks to be serviced: 15/day Vehicles required: 5 	<ul style="list-style-type: none"> Very challenging to achieve scheduled desludging due to need of very efficient management of resources.

Scenario C: Scheduled Desludging (U&R)

When the desludging frequency for both urban and rural habitat is considered as 3 years, a daily load of 52.4 KLD will be received at the FSTP. Eight septic tanks in urban habitat and seven septic tanks in rural habitat needs to be desludged per day. Five desludging vehicles of capacities 3000L or 4000 L will be required to fulfill the demand. For complete discussion on the suitability of the various scenarios of linkage for Indapur refer Section 5.1.

Section

05

DISCUSSION

5 Discussion

Indapur FSSM is largely affected by oversized construction of septic tanks which affected the desludging frequency and coming load at FSTP. In data analysis it was observed that oversized septic tanks are seen in both urban and rural settings. As the tanks are not as per Indian standards ideally, they cannot be called as septic tanks but a collection tank. It is also important to understand why construction of septic tanks are comparatively more in rural area than construction of twin pits. Construction of twin pits in rural areas will reduce the need and demand of FSSM.

The SFD in Section 4.6 gives a clear picture of the current sanitation value chain of urban and rural Indapur. Shit Flow Diagram (SFD) of Indapur town and 16 villages indicates that regular emptying and treatment of faecal sludge and wastewater need attention.

During discussion with panchayat samiti officials, Zilla Parishad Pune under District Planning and Development Council allotted funds for the current year and are planning to run a pilot project in rural areas of Pune district by giving trailed mounted suction machine to bigger gram panchayat to perform desludging activity and dispose this FS safely by constructing deep row entrenchment facility in village or gram panchayat boundary to check the feasibility of such project in near future to achieve ODF++ protocols of rural India. This project is a feasible option in rural areas as it will reduce the cost of fuel for carrying FS from village to urban FSTP but might increase the OPEX cost of vehicle, salary of the driver and helper as rural area are practicing demand desludging. According to the current situation of rural Indapur the average desludging frequency of septic tanks is 10 to 15 years, the trucks will become a liability to gram panchayat which they have to look for the operation and maintenance of the trucks, paying salary to truck driver and operator. Hence, this is not a feasible option on individual gram panchayat basis but if clustering of gram panchayats with one treatment facility might help to reduce this cost. Figure 19 shows factors that affects urban rural FSSM linkage in Indapur.

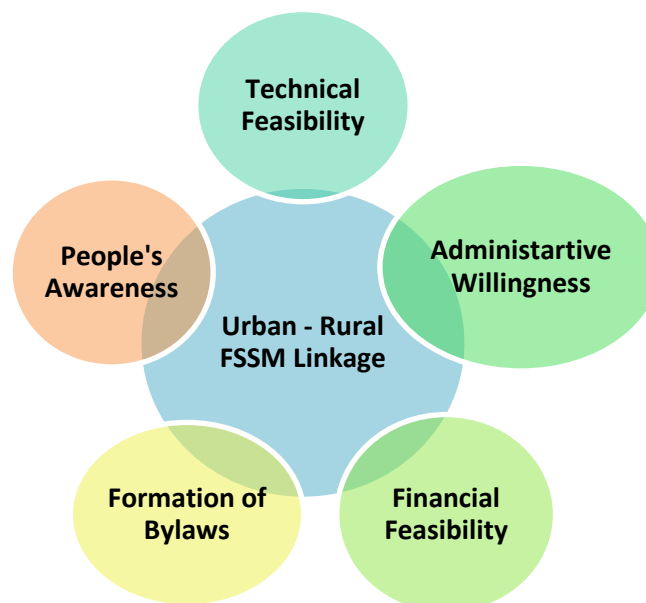


Figure 19 Factors affecting urban rural FSSM linkage

5.1 Technical feasibility

Data collection and analysis shows that urban Indapur has 100% access to toilet facilities with 100% septic tanks connected to underground drainage or soak pits. As per the information provided by the operator during KII, the FSTP is currently receiving a load of one truck per month. Hence, the FSTP is currently underutilized. This underutilized capacity of FSTP can be utilized at the fullest if desludging services are provided to nearby villages. In rural Indapur, the launch of SBM has not only increased the construction of toilet but also increased the use which led to increase in accumulation of faecal sludge and septage.

Currently, Indapur rural has 67.3 % of households connected to septic tanks which need desludging in near future. Therefore, substantial amount of faecal sludge will be generated in rural area which will need safe disposal and treatment. The generated faecal sludge from villages can be treated at urban FSTP instead of having new treatment facility for rural areas.

The analysis performed in Section 3.2 indicates that establishing of urban-rural linkage in Indapur is technically feasible. From the results obtained in Section 4.7 it can be inferred that the most suitable option of establishing the linkage is by Scenario A. Indapur currently has a 10 KLD FSTP which can cater to the need of demand desludging in both the urban and rural habitant. According to results presented in Table 6, a single desludging vehicle is needed for sustaining the need of the linkage. Indapur currently has a trailer mounted desludging machine of 3000L and hence no Capex will be required. The existing treatment technology is quite robust to sustain the fluctuation of load of faecal sludge and can cater to occasional increase of sludge load at FSTP. Hence, the council currently satisfies all the technical requirements needed for establishing demand-based linkage.

Establishing linkage as per Scenario B stated in Section 4.7 will need augmentation of FSTP. According to the calculations presented in Table 7, nine households need to be desludged per day under Scenario B which is impossible with two desludging vehicles the council currently owns. Therefore, an extra desludging vehicle will be needed to cope up with the demand. This will increase the Capex and Opex cost associated with the linkage. Other factors like time needed for augmentation, lack of awareness among households regarding scheduled desludging and the large size of septic tank can have a negative effect on establishing linkage under the stated scenario. This type of linkage will also require frequent augmentation of FSTP with the next augmentation in six years.

The third scenario of establishing linkage based on schedule desludging in both urban and rural habitant will be challenging as the size of FSTP required to cater the demand and the number of desludging resources required for the service delivery is large. It will require proper management of resources. The capex and opex cost associated with the scenario also increases. Currently the council lacks municipals byelaws and the household are unaware of the need of scheduled desludging and thus functioning of this scenario of linkage will be a challenge.

5.2 Administrative Willingness

During discussion with officials of council and panchayat samiti as mentioned in KIIs, the administrative willingness of officials from both the department was lacking for urban rural FSSM linkage. As the administrative work will increase and two department will be involved in the linkage which might create internal conflicts. Administrative feasibility is possible if roles and responsibilities

of each department can be made clear during planning for the linkage which might reduce these conflicts. Financial clarity for managing FSSM resources shall be clearly mention and agreed by both the administrative bodies during planning of linkage to avoid internal conflicts

5.3 Financial Feasibility

Linkage is possible if the cost of desludging is affordable for rural and urban households. Linkage is beneficial for ULBs if they can very well recover the cost of O&M of vehicles, FSTP, salary of operators and drivers. ULBs can make a revenue generation model out of linkage if planned properly during formation of bylaws stage.

Currently, ULB is charging INR 2000 per trip per household for providing desludging service in town. Currently the charges for desludging are high and need revision to make desludging service affordable for households. Hence, for establishing linkage the base price can be fixed and can be kept common to urban and rural which will vary depending upon the distance from Indapur town. The total cost for desludging should be around INR 600 to INR 1000 per trip depending upon the distance. As per calculation base price can be fixed at INR 600 per trip for urban habitant. Tariff for rural desludging can be calculated using below formula.

$$\text{Desludging Tariff} = \text{Base price} + (\text{distance of town from village} * \text{diesel price per Km})$$

Currently, the compost is made from organic waste and mixed with dried sludge and sold to farmers at the cost of INR 5 per kg bag, likewise council can also sell these bags to rural farmers considering the regular monitoring of that compost as per FCO standards. Rural households have willingness to pay for the desludging services whether it is for desludging service from council or from any private operator. Rural household survey analysis gave clear idea on affordability of villagers to pay for desludging service. Council should have their own bylaws for charging fixed tipping fees from households depending upon the distance of households, number of trips or cost per 1000 L.

5.4 People awareness

It is important to conduct extensive IEC campaigns in Indapur to create awareness amongst rural households regarding the regular use of toilet, suitable type of containment and collection unit, desludging of septic tanks, use of compost for farming etc.

Capacity building of officials will help to keep FSSM facilities functional, operational and useable for households. During KII it is found that desludging operators are not getting regular training on operation of truck, occupational safety and health hazards and important of use of PPE during desludging activity. Enforcement of bylaws will also help to keep occupational safety of these operators and workers work in confined spaces.

5.5 SWOT Analysis

SWOT analysis is a technique which is used to analyze the collected data and drive the study towards proper steps to be taken during planning, implementation and monitoring stage. The SWOT analysis gives clear picture if the urban rural linkage has been adopted what will be the strengths, weaknesses, opportunities and threats and what will be the factors affecting this linkage in near future.

The below Figure 20 is result of SWOT analysis done after analyzing the possibilities of urban rural FSSM linkage in Indapur after considering all the outcomes from data collection and KIIs and considering the above factors that might affect the linkage.

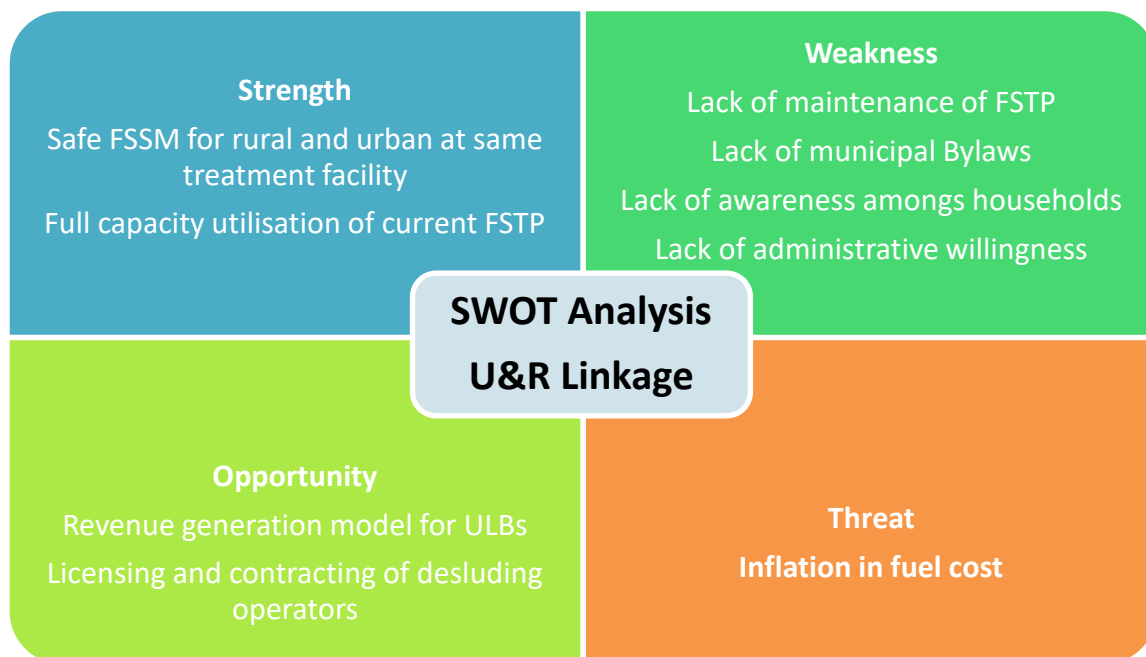


Figure 20 SWOT Analysis of Urban – Rural Linkage for Indapur Taluka

Strength

If linkage is established between rural and urban then the FS which is not contained, not being emptied and unsafely managed seen in SFD can be safely managed and treated. Desludging services provided by ULB will help to manage rural FS safely and will create enabling environment for villagers to sustain ODF status. Currently, FSTP is underutilized which affects the treatment efficiency. This FSTP will be fully utilized if urban rural linkage will establish as mention in section 5.1. Capital investment of augmentation of current FSTP can be avoided if ULB are going to practice demand desludging in tehsil.

Weakness

Currently, ULB is lacking in maintaining FSTP and enforcing bylaws. To establish the linkage, maintaining FSSM infrastructure will be an essential factor. So, O&M of FSTP and maintaining records will play important role. During data collection and analysis, it is observed that lack of awareness and communication gap between households and RLBs led to improper FSSM in rural. During KII with ULB official, it is observed that they are not in favor of linkage and as their willingness is the major factor for linkage this can become biggest weakness and can affect linkage in near future.

Opportunity

As mentioned in section 5.3 linkage will not only increase demand but will equally increase revenue of ULB. If demand increases, ULB can give license to private operators and can make a contract with the operator on demand basis.

Threat

Increase in fuel price can be threat to the linkage. An increase in fuel price will increase the cost of desludging which can affect the affordability of the service to the households.

Section

06

RECOMMENDATION

6 Recommendation

The study highlighted some very important factors that might affect the sanitation value chain of urban and rural India. 1 is a prioritization matrix which shows urgent and important actions that should be taken by administrative bodies to establish FSSM linkage in Indapur. This section describes the short term, mid-term and long-term actions which need to be taken by decision makers and governing bodies.

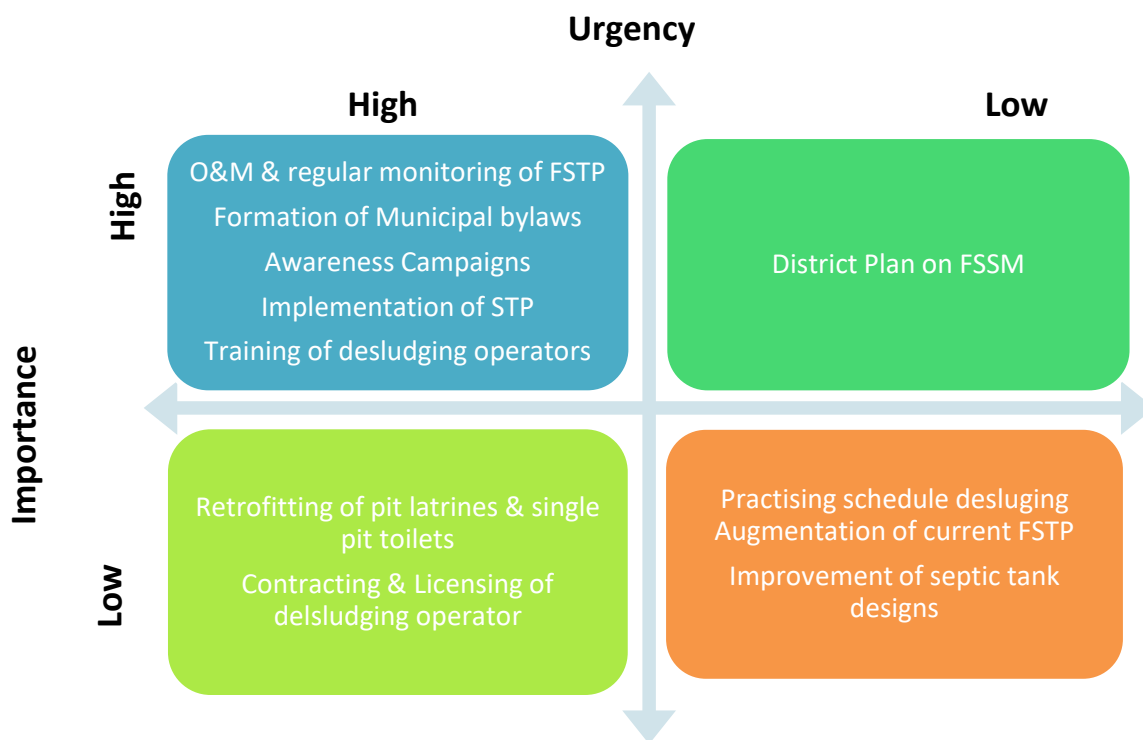


Figure 21 Prioritization matrix

6.1 Short Term action

- Current FSTP looks dysfunctional and need more attention in terms of operation and maintenance and monitoring of byproducts to reach to the Indian standards of reuse.
- Involvement of different stakeholders and decision makers during planning stage can be done which led to infrastructure sustainability and proper management of services.
- Formation and enforcement of municipal bylaws for sanitation service delivery in urban area will play an important role to keep sustainability of FSSM facilities, to keep FSTP run at the full capacity and will help households to avail the desludging services at affordable cost. Tipping fees need to be fixed for desludging services depending upon the distance of the household or cost per thousand liter can be charged.
- Urgent need of STP as the supernatant from septic tanks flows through underground drainage get dispose of in water body which is further used by local farmers. The STP should be constructed with cotreatment facility to cater the irregular demand of desludging.
- Implementation of STP will solve the problem of unsafe disposal of wastewater but will also cater to irregular demand of desludging if constructed with cotreatment facility.

- Regular capacity building of ULB and RLB officials will help to make them understand the importance of FSSM in rural area.
- Frequent IEC campaigns must be conducted by Gram Panchayats and Councils to convey the need and importance of desludging to the households.
- Training of desludging and plant operators with providing proper PPE kits are going to help operators to understand the importance of using PPE and how to keep themselves safe and healthy.

6.2 Midterm action

- Linkage will need better and prompt desludging service in town in terms of availability of desludging operators with affordable price. Licensing and contracting of private operators should be adopted to cater to the demand of irregular desludging.
- In rural survey analysis it is observed that around 20% toilets in rural area are single pit/ pit latrines. Retrofitting of such pit latrines/single pit toilets to twin pit toilets is necessary to make the surrounding safe and environment friendly and will not need desludging activity.
- Promoting implementation of twin pit toilets will help to reduce load of rural desludging as twin pit toilets doesn't need FSSM.
- Formulation of district level FSSM plan which will help in making strategy, planning, implementation and monitoring of sanitation facilities in towns and villages. From this plan ULB can make their own strategy, plan of implementation and monitoring and evaluation.

6.3 Long term action

- Creating awareness on improving septic tank designs and retrofitting of septic tanks as per Indian standards.

The section 5 of the report suggest that urban rural FSSM linkage is a feasible, viable, adoptable and replicable model to cater to the current demand of desludging in urban and rural areas. Linkage will also save capital investment and operational cost of augmented FSTPs and will utilize current FSTP with full capacity. The linkage is a better revenue generation model for ULBs which will increase revenue cost. Linkage model will become successful only if both the administrative bodies play their roles and responsibility at the fullest. Overall urban rural linkage will create lot of impact on FSSM sustainability of taluka in near future.

Section

07

ANNEXURE

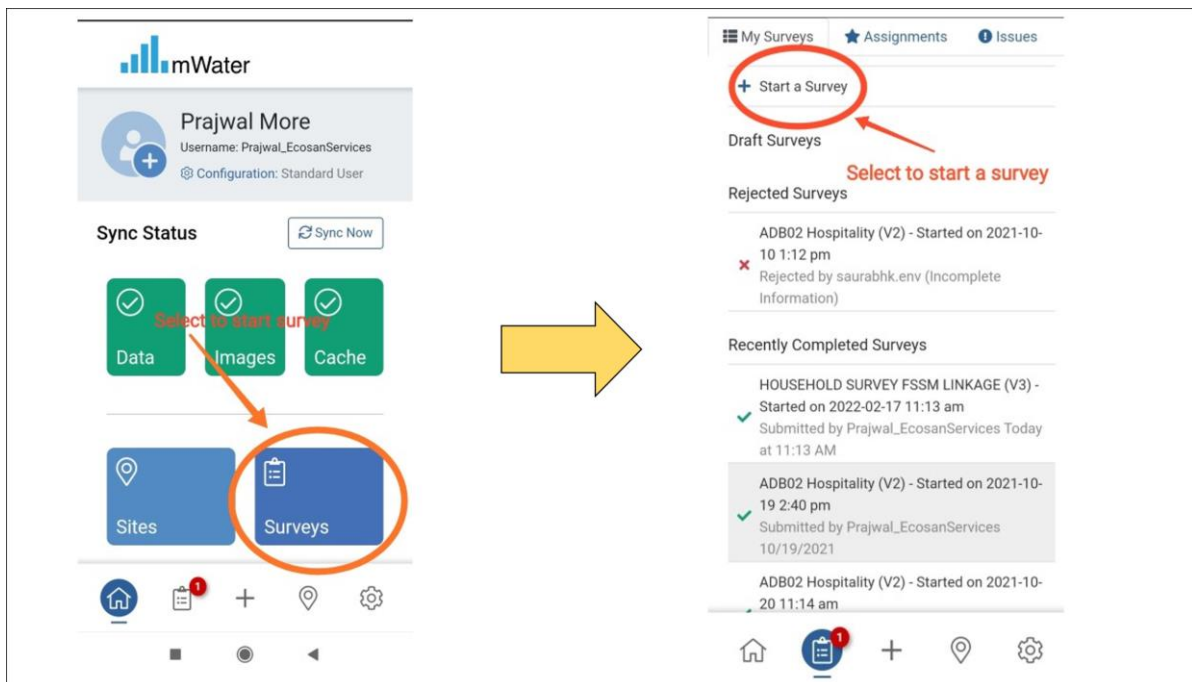
7 Annexure

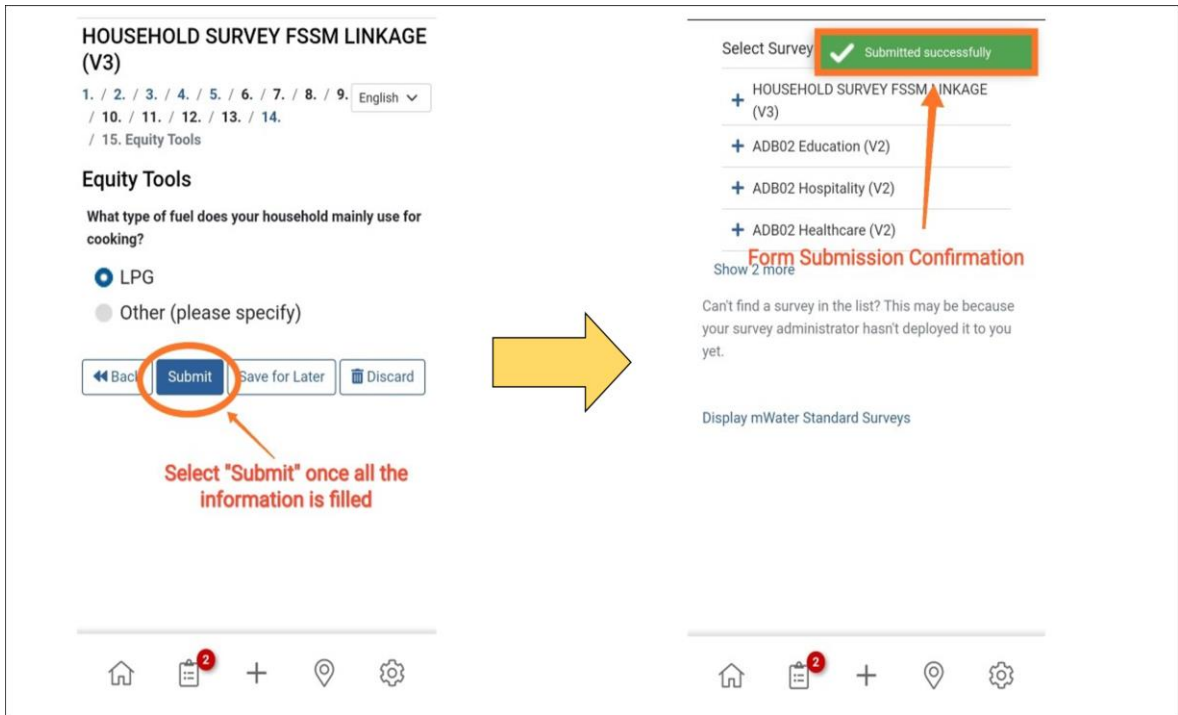
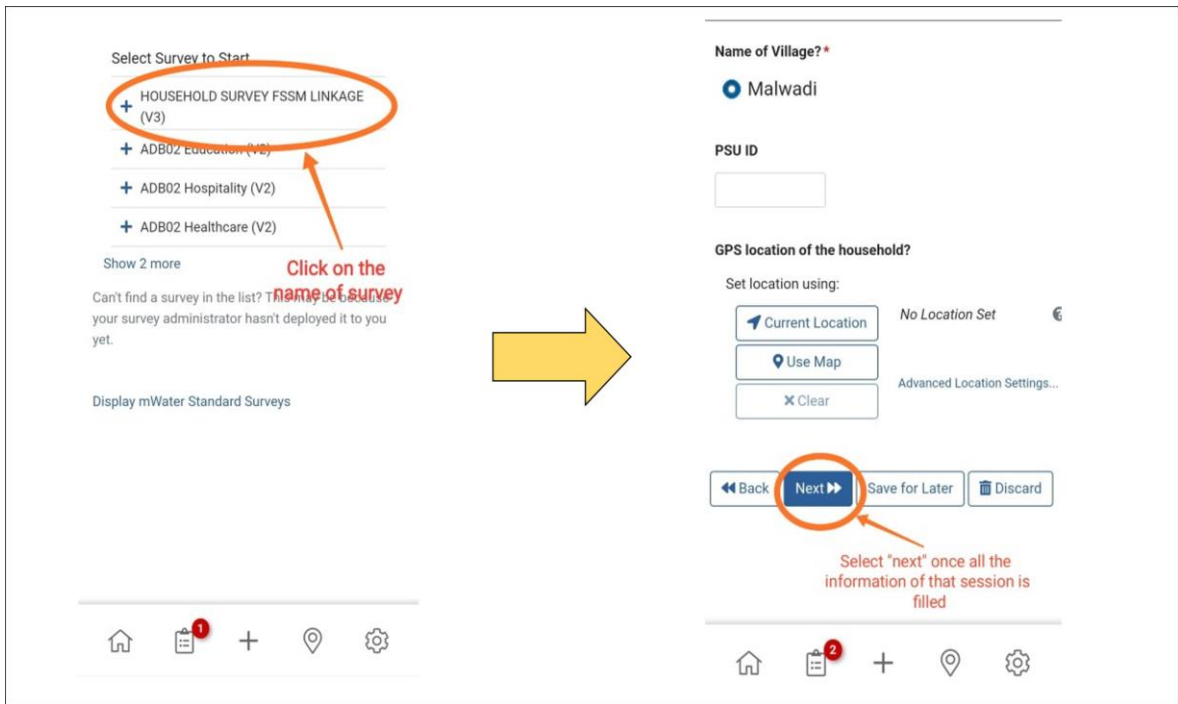
7.1 Annexure 1: List of Officials

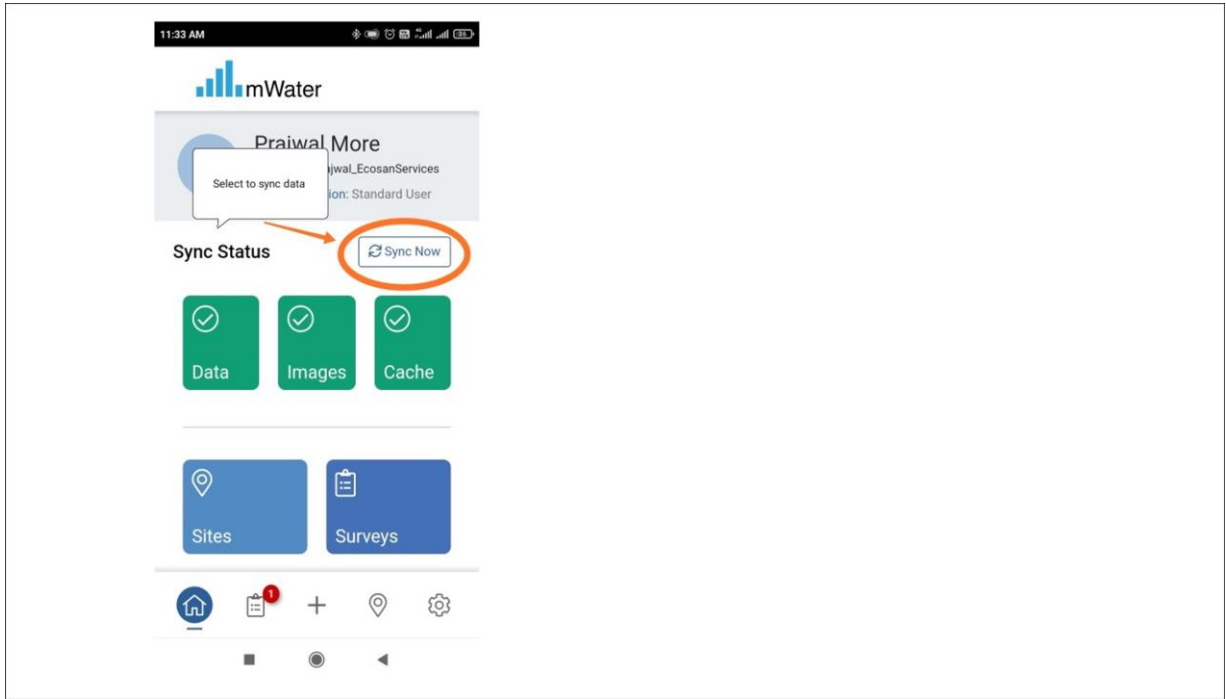
Sr. No.	Name of officials	Designation
1	Mr. Milind Tonpe,	Deputy CEO, Zilla Parishad, Pune
2	Mr. Kudve,	SBM Officer, Zilla Parishad, Pune
3	Mr. Ranjit Kapre	Chief Officer, Indapur Municipal Council
4	Mrs. Rashmi Baraskar	Water Supply Engineer, Indapur Municipal Council
5	Mr. Barge	SBM officer, Indapur Municipal Council
6	Mr. Vijaykumar Parit	Block Development Officer, Panchayat Samiti Indapur
7	Mr. Solapuri	Block Coordinator, Panchayat Samiti Indapur
8	Ms. Lodhe	Gram Sevak, Sardewadi
9	Mr. Atole	Gram Sevak, Malwadi No. 1
10	Mr. Bhalerao	Gram Sevak, Kaltan No. 2

7.2 Annexure 2: Enumerator Training Slide deck

M-WATER SURVEY PROCEDURE







TYPE OF TOILETS (शौचालयाचा प्रकार)

SANITATION USAGE ARRANGEMENT (स्वच्छता वापर व्यवस्था)

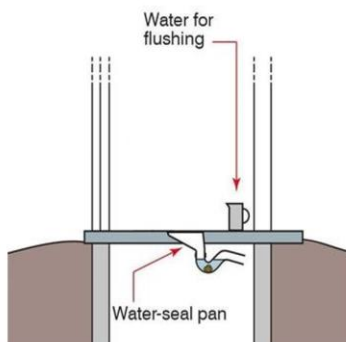


COMMUNITY TOILET (सामुदायिक शौचालय)

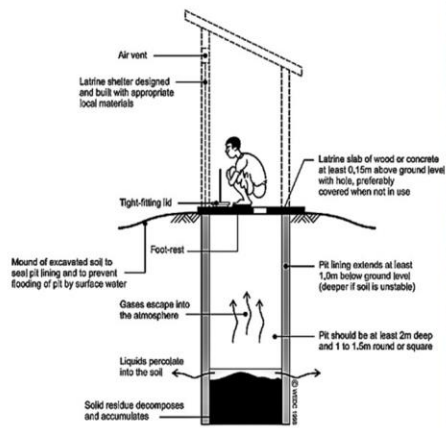


PUBLIC TOILET (सार्वजनिक शौचालय)

FLUSH/ POUR FLUSH TOILETS



PIT LATRINE WITH SLAB



PIT LATRINS WITHOUT SLAB

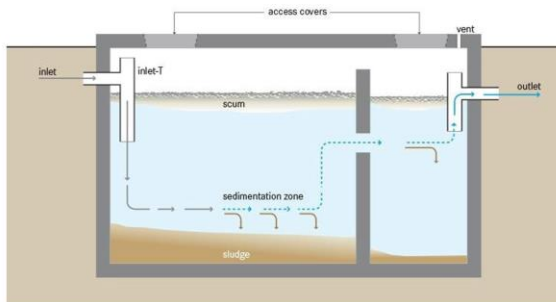


HANGING TOILETS

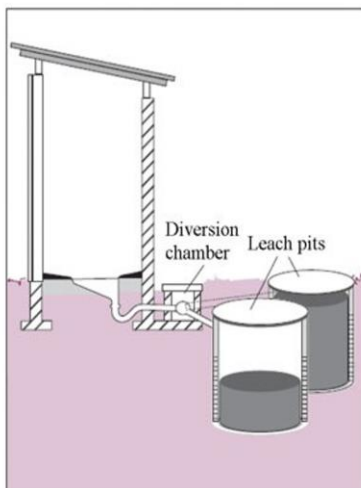


TYPE OF CONTAINMENT UNIT

SEPTIC TANK



SOAK PITS



MODE OF DISPOSAL

DRAINS



TYPE OF DRAIN



Unlined, open drains



Lined, open drains



Lined, covered drains

OPEN GROUND DISPOSAL



DESLUDGING VEHICLE

**TRUCK-MOUNTED
SUCTION MACHINE**



**TRAILER
SUCTION MACHINE**



**3 WHEELER MOUNTED
SUCTION MACHINE**



DESLUDGING VEHICLE



Gulper



Vacu Tug

7.3 Annexure 3: Household Survey Questionnaire

Questionnaire Individual Households (Rural)

1. Consent

Do you want to participate in the interview?

- Yes
- No

2. General Information

- a. Gram Panchayat
- b. Village
- c. PSU Id
- d. GPS Location

3. Socio economic demographic

- a. Family Size
Male, female (<6, 6-18, more 18)
- b. Main source of income/occupation
 - Farming
 - Salary Job
 - Daily wage employee
 - Traders (small shops)
 - Others (specify)

4. Housing

- a. Ownership of house
 - Landlord
 - Tenant
 - Others
- b. Is the HH ever been affected by natural calamities?
 - Yes
 - No

(If Is the HH ever been affected by natural calamities? Is Yes)

- c. Which of the following natural calamities has the household been affected with?
 - Flood
 - Landslides
 - Earthquake

- Others (If others mention which)

(If, do you want to participate in the interview? Is Yes)

5. Sanitation usage arrangement

- a. Arrangement of toilets
 - Individual
 - Shared
 - Community toilets/ Public toilets
 - No Facility
 - Others (If others mention which)

(If, Arrangement of toilets isn't No Facility)

b. Currently is toilet functional?

- Yes
- No

(If, Arrangement of toilets is Shared)

- c. If shared toilets are used, how many households share the toilet facility?
(Numerical value)

(Arrangement of toilets isn't No Facility and Currently is toilet functional? is Yes)

6. Toilet type

- a. Type of toilet and connected to
 - Flush toilets with sewer network
 - Flush toilets connected to septic tank
 - Flush toilets connected to soak pits
 - Pit latrines – one pit
 - Pit latrines – twin pits
 - Others(specify)
- b. When was the toilet built?
 - ----- years ago

(If, what is your toilet connected to? Is Flush toilets with Septic Tank)

- c. How many chambers does the containment unit have?

- ----- chambers
- Don't know

(If, what is your toilet connected to? Are flush toilets connected to septic tank)

d. What is the septic tank connected to?

- Soak pit
- Open drains
- Open ground
- Water body
- Don't know

(If, do you want to participate in the interview? Is Yes, Arrangement of toilets is Individual or shared)

7. Toilet Construction Cost

a. Who paid the cost for toilet construction?

- Paid by household
- Household + Government scheme (name the scheme)
- Full funding through government Scheme (name the scheme)
- Household + Grant from NGO/CBO (name the NGO/CBO)
- Full funding through Grants (name the NGO/CBO)
- Others (Specify)

(If, do you want to participate in the interview? Is Yes, Arrangement of toilets is Individual or shared and type of toilet connected to is one of flush toilet to septic tank)

8. Onsite Sanitation: - Construction of Septic tank

a. Do you know if the septic tank were built according to the specification?

- Yes (if yes, who decided the specification)
- No
- Don't know

b. Why was septic tank opted?

- Budget
- Strata

- Suggested by Contractor
- Aspiration
- Others (specify)

c. What is the volume of septic tank?

- -----cu m or liters
- Don't know

d. What are the dimensions of septic tank?

- Length (for septic tank)
- Width (for septic tank)
- Depth
- Don't know

(If, do you want to participate in the interview? Is Yes, Arrangement of toilets is Individual or shared and type of toilet connected to is flush toilet to soak pit, Pit latrine- one pit, Pit latrine-twin Pit)

9. Onsite Sanitation: - Construction of Soak pit

a. Do you know if the soak pit were built according to the specification?

- Yes (if yes, who decided the specification)
- No
- Don't know

b. Why was soak pit opted?

- Budget
- Strata
- Suggested by Contractor
- Aspiration
- Others (specify)

c. What is the volume of soak pit?

- -----cu m or liters
- Don't know

d. What are the dimensions of soak pit?

- Depth
- Diameter (for pits)
- Don't know

(If, do you want to participate in the interview? Is Yes, Arrangement of toilets is Individual or shared and type of toilet connected to is one of flush toilet to septic tank)

10. Maintenance of Septic tank

a. Was the septic tank ever full?

- Yes
- No

b. When was the last time you emptied the septic tank? (If the tank was not emptied select N.A)

- ----- years/months ago
- Not applicable

(If When was the last time you emptied the septic tank isn't Not applicable)

c. How often do you empty the septic tank?

- -----years

(If When was the last time you emptied the septic tank isn't Not applicable)

d. How did you know that the septic tank needs to be emptied?

- Due to foul smell
- Flooding of septic tank
- Others (specify)

(If When was the last time you emptied the septic tank isn't Not applicable)

e. Are emptying services are affordable to you?

- Yes
- No

(If do you consider the emptying services affordable to you? is No)

f. How much you can pay for emptying service? (Range)

(If When was the last time you emptied the septic tank isn't Not applicable)

g. Do you schedule the emptying service in advance?

- Yes
- No

h. Are you willing to opt for desludging services in future?

- Yes
- No

(If, Was the septic tank ever full is Yes and When was the last time you emptied the septic tank is Not applicable)

i. If not emptied, what did you do when the containment unit is full?

- Opened for overflow
- Sealed and abandoned
- Use of bio culture
- Others (specify)

(If, Was the septic tank ever full is Yes and When was the last time you emptied the septic tank is Not applicable)

j. Why didn't you empty it instead?

- Not affordable
- Unavailability of service provider in the village
- Others (specify)

(If, do you want to participate in the interview? Is Yes, Arrangement of toilets is Individual or shared and type of toilet connected to is one of flush toilet to soak pit)

11. Maintenance of Soak pit

a. Was the soak pit ever full?

- Yes
- No

b. When was the last time you emptied the soak pit? (If the tank was not emptied select N.A)

- ----- years/months ago
- Not applicable

(If When was the last time you emptied the soak pit isn't Not applicable)

c. How often do you empty the soak pit?

- -----years

(If When was the last time you emptied the soak pit isn't Not applicable)

d. How did you know that the soak pit needs to be emptied?

- Due to foul smell
- Flooding of septic tank
- Others (specify)

(If When was the last time you emptied the soak pit isn't Not applicable)

e. Are emptying services are affordable to you?

- Yes
- No

(If do you consider the emptying services affordable to you? is No)

f. How much you can pay for emptying service? (Range)

(If When was the last time you emptied the soak pit isn't Not applicable)

g. Do you schedule the emptying service in advance?

- Yes
- No

h. Are you willing to opt for desludging services in future?

- Yes
- No

(If, Was the soak pit ever full is Yes and When was the last time you emptied the soak pit is Not applicable)

i. If not emptied, what did you do when the containment unit is full?

- Opened for overflow
- Sealed and abandoned
- Use of bio culture
- Others (specify)

(If, Was the soak pit ever full is Yes and When was the last time you emptied the soak pit is Not applicable)

j. Why didn't you empty it instead?

- Not affordable
- Unavailability of service provider in the village
- Others (specify)

(If, do you want to participate in the interview? Is Yes and what is your toilet connected to is one of soak pit or septic tank and if when was the last time you emptied the septic tank/soak pit isn't Not Applicable)

12. Onsite Sanitation – Emptying services

a. Who empty your septic tank?

- Formal Provider (desludging operators)
- Informal provider (manual scavenger)
- Government (Gram Panchayat/Panchayat Samiti/ULB)
- Others (specify)

b. How did you get the contact details of the service provider?

- Through Gram Panchayat
- Through Friends or Neighbors
- Through News Paper
- Wall Posters or paintings
- Others

c. Contact Details of service provider (Name and contact number)

d. How much did it cost to empty the tank?

-----INR

e. How did you pay for desludging service?

- Self-Funded
- Included in Tax
- Paid through Grant (NGO/CBO) (name the organisation)
- Paid through Government subsidies (name the subsidy)
- Others (specify)

f. What tools were used to empty the septic tank/soak pit?

- Vacuum truck

- Trailer mounted suction machine
- VacuTug
- Gulper (manually operated pumps)
- Hand tools
- Small motorized pump
- Others (specify)

g. Is your household satisfied with the pit emptying service?

- Yes
- No

h. Did you experience any problems with the pit emptying services that was hired?

- No
- Provider did not arrive when scheduled
- Others

i. Access to road

- Accessible by Vacuum trucks (width of road more than 3m)
- Accessible by VacuTug (width of road less than 3m)
- Unavailability of proper road (pukka road)

(If, do you want to participate in the interview? Is Yes and Type of toilet and connected to is one of flush toilet soak pit or septic tank and if when was the last time you emptied the septic tank/soak pit isn't Not Applicable)

13. Conveyance

a. When the septic tank was emptied, do you know where the waste was disposed? (If yes, where)

- Yes (name the point of disposal)
- No

14. Other Information

a. Do you pay sanitary tax?

- Yes (if yes, how much)
- No
- Others

b. Main source of water?

- Surface water
- Tube well or Borewell
- Piped water connection

- Others

c. Is water from the main source available throughout the year?

- Yes
- No

d. Water treatment at household level?

- Boiling
- Adding disinfectant (e.g., chlorine)
- Filters
- Alum treatment
- Others

e. Has the HH experienced water born disease?

- Yes
- No

(If, Has the village experienced water born disease? Is Yes)

f. How frequent do you experience these diseases?

- Only in monsoon season
- Throughout the year
- Others

g. Are any IEC activities conduct in the village?

- Yes (write the frequency, IEC activities per year)
- No

15. Equity Tool

a. What type of fuel does your household mainly use for cooking?

- LPG
- Others (If others mention which)

16. Observation Assessment (Photos)

a. Toilet

b. Containment Unit (location)

c. Road

d. Drains

7.4 Annexure 4: Gram Panchayat Data

Sr. No.	Gram Panchayat	Village	Demographic Information				Water Supply			Sanitation System												
			No of village under each panchyat		Ground water level ft.	Population 2011	Number of households 2011	Water Supply- LPCD			% of HH having access to toilets	% of people having access to toilets but not using it	In absence of toilets where do people defecate?	% of population using commnity toilets	Type of Containment unit			Where is outlet of septic tank connected to				
			2011	2021				Source of Water (well, tubewell, rivers, tap water)	per day water supplied to households (lpcd)	% HH with tap water connection					(Toilets used by more than one households)	single pit (%)	twin pit (%)	septic tank (%)	Drains (nalas) (% of households)	Soak pit (% of households)	Sewer (% of households)	Others (Name) (% of households)
1	Awasari Group	Bedshinge	2	2	250	759	183	Well	400	Don't Know	100	5	Farmland	0	50	0	50	0	90	0	Open ground	10
2		Awasari			250	2011	496	Well	400	20	100	5	Farmland	3	50	0	50	0	90	0	Open ground	10
3	Bijwadi	Gagargaon	5	3	200	709	152	Well	500	90	99	1	Farmland	0	5	20	75	0	80	0	Open ground	20
4		Rajwadi			200	508	104	Well	400	90	90	1	Farmland	0	25	10	65	0	25	0	Open ground	75
5		Vangali			150	1251	265	Well	500	85	90	10	Farmland	0	20	20	60	0	15	0	Open ground	85
6	Galandwadi No.1	Galand Wadi 1	2	2	80	1873	370	Well	200	81	95	0	Farmland	5	30	0	70	70	30	0	N.A.	0
7		Narutwadi			80	1331	224	Tubewell	200	Don't Know	97	0	Farmland	0	5	0	95	95	5	0	N.A.	0
8	Galandwadi No.2	Galandwadi No. 2	1	1	99	2299	470	Well	500	30	100	10	Farmland	0	50	0	50	85	15	0	N.A.	0
9	Kalthan No.2	Kalthan No.2	1	1	100	1188	256	Well	500	80	100	10	Farmland	0	15	0	85	10	90	0	N.A.	0
10	Malwadi	Malwadi	1	1	100	4263	848	Well	200	80	100	10	Farmland	5	20	10	70	70	30	0	N.A.	0
11	Sardewadi	Sardewadi	1	1	150	3187	604	Well	500	80	100	10	Farmland	2	20	10	70	10	90	0	N.A.	0
12	Tarangwadi	Tarangwadi	1	1	350	2557	513	Well	0	30	90	2	Farmland	0	15	0	85	0	85	0	Open ground	15
13	Wadapuri	Gokhali	2	1	150	1608	373	Well	500	85	95	10	Farmland	0	25	0	75	80	20	0	N.A.	0
14		Vadapuri			1	150	4401	919	Pond	325	40	99	0	Farmland	0	80	0	20	1	99	0	N.A.
15	Pandharwadi	Pandharwadi	1	1	125	1198	235	Well	320	70	100	0	Farmland	5	10	0	90	0	100	0	N.A.	0
16	Zhagadewadi	Zhagadewadi	1	1	250	1193	231	Well	600	90	95	0	Farmland	0	70	0	30	80	15	0	Open ground	5

Containment Unit					Desludging Services												Road Accessibility		
Average size of Pit (ft)		Average size of septic tank (ft)			Septic tank desludging frequency		Are there any desludging operators in village? (mechanised, non-mechanised desludging and N.A if not applicable)	Type of desludging operator (Registered /Non Registered)		Does the GP own any desludging vehicle	Type of desludging vehicles.	if not, where you get the desludging vehicles	Where is the waste disposed		Desludging Tariff	How is desludging done in case of narrow lanes/ areas not accessible to desludging vehicles	Width of Road		% of village not accessible by roads
Depth	Diameter	Length	Width	Depth	min (years)	max (years)		Registered	Non-Registered				Deep Row Entrenchment	Land Application			min (m)	max (m)	%
6	3	8	5	8	15	25	N.A.	N.A.	N.A.	N.A.	N.A.	Municipal Council	No	No	6000	Roads are accessible	3	5	0
8	3	7	5	7	15	25	N.A.	N.A.	N.A.	N.A.	N.A.	Municipal Council	No	No	6000	Roads are accessible	3	5	0
4	3	7	4	5	5	7	N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	Yes	7000	N.A.	3	5	0
7	3	7	4	6	12	15	N.A.	N.A.	N.A.	N.A.	N.A.	Municipal Council	No	Yes	5000	N.A.	4	5	0
7	3	7	4	6	10	12	N.A.	N.A.	N.A.	N.A.	N.A.	Municipal Council	No	No	Don't Know	N.A.	3	5	0
9	3	10	8	8	Don't Know		N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	No	Don't Know	N.A.	2	4	2
9	4	11	9	7	Don't Know		N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	No	Don't Know	N.A.	2	4	2
4	3	5	4	7	5	10	N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	Yes	5000	N.A.	3	4	0
7	4	5	7	5	10	20	N.A.	N.A.	N.A.	N.A.	N.A.	Municipal Council	No	Yes	4000	N.A.	3	6	10
7	3	5	7	5	5	15	N.A.	N.A.	N.A.	N.A.	N.A.	Municipal Council	No	Yes	4000	Roads are accessible	2	3	0
7	3	5	7	6	10	15	N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	Yes	5000	Roads are accessible	3	6	0
5	4	7	4	10	15	20	N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	No	Don't Know	N.A.	4	5	0
5	3	7	3	5	Don't Know		N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	No	8000	N.A.	3	4	0
10	3	10	7	9	10	15	N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	No	Don't Know	N.A.	3	4	0
5	3	8	5	5	15	25	N.A.	N.A.	N.A.	N.A.	N.A.	Municipal Council	No	No	5000	Are not desludged	3	4	0
6	3	10	6	9	Don't Know		N.A.	N.A.	N.A.	N.A.	N.A.	Don't Know	No	No	Don't Know	N.A.	3	4	0

Land Availability				Reuse Opportunities			Land use			Tariff			Financial Schemes
Is government land available inside the village	Is government land available in outskirts of village	Major Occupation of the village (To analyse the reuse opportunity)		Are people aware of FSS use for agriculture purpose	Are people using treated FSS collected from pits and septic tanks for agriculture?	In future will people be willing to use FS for agriculture ?	% of agricultural land	What is the main message of FSSM conveyed through IEC	Name the scheme under which IEC activities are conducted	Does GP collect any of the following taxes.			Does the village receive funds for development of sanitation facilities under any government schemes
If yes, how much	if yes, how much	1st Occupation	% of people involved in that occupation		Yes/No	Yes/No		(e.g need of desludging, frequency of desludging, how to contact for desludging services)		Property tax (Rs.)	Sanitation (Rs.)	Water	If yes name the mission
Yes	no	Farming	95	No	No	No	70	N.A.	N.A.		No		No
Yes	no	Farming	95	No	No	No	75	N.A.	N.A.		No		No
No	no	Farming	100	No	No	Yes	95	N.A.	N.A.	200	No	720	No
2 hecter	no	Farming	100	No	No	Yes	100	N.A.	N.A.	400	No	300	No
No	no	Farming	95	No	No	Yes	100	N.A.	N.A.	100	No	400	No
0.7 hecter	no	Farming	85	No	No	Yes	80	N.A.	N.A.		No	360 per household	Gram Vikas Yojana
No	no	Farming	95	No	No	Yes	90	N.A.	N.A.		No		Gram Vikas Yojana
6 acres	no	Farming	75	Yes	Yes	Yes	100	N.A.	N.A.	500 per household	No	500 per household	No
Yes	no	Farming	90	No	Yes	Yes	90	N.A.	N.A.	10-20 Rs per sq ft	No	500 per household	Gram Vikas Yojana, Nirmal Bharat Abhiyan
Yes	yes	Farming	90	Yes	Yes	Yes	90	N.A.	N.A.	1-2 Rs per sq ft	No		Gram Vikas Yojana
Yes	no	Farming	80	No	No	Yes	90	N.A.	N.A.	10-20 Rs per sq ft	No	500 per household	Gram Vikas Yojana
22 acres	no	Farming	90	No	No	No	60	N.A.	N.A.	400	No	100	No
16 acres	no	Daily Wage Employee	90	No	No	Yes	80	N.A.	N.A.		No		No
16 acres	no	Farming	75	No	No	Yes	65	N.A.	N.A.		No	280 per household	No
No	no	Farming	50	No	No	No	90	N.A.	N.A.		No		No
42 acres	no	Farming	90	No	No	Yes	85	N.A.	N.A.		No		No

7.5 Annexure 5: Indapur Urban Data

SR NO	GENERAL DATA	2011	2021	Units		Sanitation Facilities	2011	2021	units	
1	Population	25515 (Census)	29000 (SLB)			1	% of population having access to toilets		100	%
2	No of households	5228	7064 (SLB)				% of population having access to toilets but not using it		0	%
3	Water supply to households per day			LPCD		2	Type of Toilets			
	% of households having tap water supply		100	%			Pour/Flush Toilets		100	%
4	Number of Slums		2				VIP Latrine			
	Percentage of Population residing in slums		8.4	%			Pit Latrine			%
5	Major occupation of the Town	Farming, services, business					Others			%
6	% of town connected with drains		60	%		3	Type of contamination unit			
7	% of town connected with soak pits		40	%			Septic Tank		100	%
8	Where is the water from drains disposed?	Water body or river					Single Pit			%
9	Where is the water from sewer disposed?	NA					Twin Pit			%
10	Is ULB planning to connect the town with sewer/open drains in future? (if yes, mention when)	No. They already have closed drains					Others			
11	Are IEC Activities to promote desludging / FSSM management, practiced for the town	Yes. Once in a year		yes/no		4	Availability of Community Toilets			
	Type of IEC Activities adopted	Flexes, wall paintings					Community Toilets (6 toilets slums)		13	yes/no
	Number of IEC activities conducted	Once in a year		per year			Public Toilets		1	yes/no
	Did IEC helped in increasing the desludging demand.	No		yes/no			% of population using community toilets		8.4	%
12	If water and sanitation taxes are collected from the households, mention the average amount per household.					5	Where is outlet of Septic tank Connected to			
	Frequency of tax collection?	Yearly					Drains (Nalas)		60	%
	Sanitation tax		100/toilet	Rs			Soak Pits		40	%
	Water tax		Water	Rs			sewers			%
	How regularly do the households pay the taxes? (% of households that regularly pays taxes)		80	%			Open ground			%
							Others			
						6	Average dimensions of septic tank			
							Length		2.1	m
							Breadth		1.5	m
							Height		2.1	m

Sr No	Desludging Services	value	unit	SR no	FSTP data	value	unit
1	Frequency of desludging (Demand)			1	Who operates the FSTP?	Municipal Council	
	min	10	years	2	Total Capacity of FSTP	10	KLD
	max	15	years	3	FSTP is currently operational at	100	%
2	Cost of desludging			4	Total volume of sludge received/day	Demand desludging	3000 lit
	min	2000	Rs	5	number of desludging vehicles trip/day	Demand desludging	1
	max	2500	Rs	6	Sludge Characteristics		
3	How is desludging carries out?				pH		
	Mechanised desludging	7000	2		BoD		
	Non-Mechanised Desludging				CoD		
	Sewers				TSS		
4	Number of desludging operators		2	7	Maintanance of Log book	Digital Log Book	
	Registered		2		FSTP		yes
	Non-Registered				Desludging operator	Log book	yes
	Informal Operator (using hand tools)			8	Does sludge from any nearby villages comes to FSTP? (If yes, Write the name of nearby villages the sludge is collected from and also mention volume) Through council vehicle		
5	Number of Desludging vehicles		2		Initially council use to send their vehicle to villages on demand basis but currently they don't do this practise as its not economical for council and also for disposal the treatment capacity is not enough. As per councils		
	ULB owner		2		Reuse of treated sludge and wastewater? (mention where the byproducts are used and for what) Agriculture		
	Private				Yes. After treatment, byproducts of FSTP are used by farmers		
6	Capacities of desludging vehicle			9	Issues faced in operation due to underutilisation of the facilities?		
a	Vaccum suction tractor		3000 lit		Demand desludging make plant not functional - Plant is currently dried and not functional		
b	Vaccum truck		4000 lit	10	How is the operation and maintanance cost of the plant recovered? Also mention the O&M cost per month?		
c					Cost/month :-	Approx. 10,000/- per	
7	Where are desludging trucks emptied				mode of recovery	% of O&M cost	
	FSTP	100	%	a	Sanitation tax, desludging charges and selling of compost 5 Rs./kg	100	
	Drains/nalas		%	b			
	Sewers		%				
	Other						
8	% of town not connected by proper road network	0	%				
	Width of road						
	Min	3	m				
	Max	6	m				
9	How is desludging done in case of narrow lanes.	Pipes of suction trucks are long to get access to septic tanks in narrow lanes					

7.6 Annexure 6: Key Informant Interview

Project Name	Investigation for Urban Rural FSSM Linkages in Maharashtra' under the title 'Urban Rural Linkages in Service Delivery/ addressing challenges with Peri Urban Areas
Meeting Objective	KII with Panchayat Samiti official for rural data collection
Attendee	Mr. Solapuri – Panchayat Samiti Official Ms. Radhika Boargaonkar – Ecosan Services Foundation, Pune Mr. Prajwal More - Ecosan Services Foundation, Pune
Date of meeting	16/02/2022 and 28/02/2022
Date of report	01/03/2022
Reference No.	AIILSG06-KII01

Item	Record of discussion
1.	<p>Discussion – 16/02/2022</p> <p>Mr. Solapuri – Panchayat Samiti Official Ms. Radhika Boargaonkar, Project Manager, ESF Mr. Prajwal More, Project Associate, ESF</p> <p>Ms. Radhika explained the entire project with aim and objective and benefit of the project to rural as well as urban areas.</p> <p>Mr. Solapuri, Panchayat Samiti Official gave the information and contact details of all the gram sevaks of the selected villages under the project. He personally called all the gram sevaks and told them to cooperate with our team.</p> <p>Mr. Solapuri mentioned that in rural Indapur, toilets are connected 20% to soak pits and 80% to septic tank. He provided the list of GPs having shared toilet in villages which is shared between 2 to 3 households and maintained by them only.</p> <p>Maximum number of toilets in rural areas are constructed under SBM. Toilet connected to septic tanks are more in densely populated area of the village whereas toilets connected to soak pits can be found more in scattered area.</p> <p>Use of toilet in rural areas were less before SBM as villagers were not aware of using toilets. After SBM started, construction and usage of individual toilet increased so due to less usage of toilet in villages desludging activity was not practiced till date.</p> <p>Gram panchayat doesn't have any suction vehicle neither they have any private desludging operators.</p>

2.

Discussion – 28/02/2022

Mr. Solapuri – Block Coordinator, Panchayat Samiti, Indapur

Ms. Radhika Boargaonkar, Project Manager, ESF

Mr. Prajwal More, Project Associate, ESF

Gram panchayat doesn't have any suction vehicle neither they have any private desludging operators. They also mentioned that one gram panchayat name Anthurne received one trailer mounted suction truck from District Planning and Development Council, Zilla Parishad for pilot project in rural areas.

In rural area, oversized septic tanks have been constructed by households so that desludging is not required very often.

Tap water connections are provided in few villages under village water supply schemes of government. Water ATMs connected to RO plants are provided in almost all the villages.



Project Name	Investigation for Urban Rural FSSM Linkages in Maharashtra' under the title 'Urban Rural Linkages in Service Delivery/ addressing challenges with Peri Urban Areas
Meeting Objective	KII with FSTP plant incharge and operator of desludging vehicle.
Attendee	Lohire – Assistant Health Inceptor, IMC Kunal Chauhan – Desludging operator Radhika Boargaonkar – Ecosan Services Foundation, Pune Prajwal More - Ecosan Services Foundation, Pune
Date of meeting	28/02/2022
Date of report	01/03/2022
Reference No.	AIILSG06-KII02

Item	Record of discussion
1.	<p>Discussion</p> <p>Mr. Lohire – Assistant Health Inceptor, IMC Mr. Kunal Chauhan – Desludging truck operator Ms. Radhika Boargaonkar – Ecosan Services Foundation, Pune Mr. Prajwal More - Ecosan Services Foundation, Pune</p> <p>During discussion with FSTP incharge he shared that from the past one month only one truck load is emptied at FSTP as Indapur practice demand desludging.</p> <p>Mr. Lohire also mentioned about the log book they maintained at FSTP site and also by desludging operators.</p> <p>Byproduct from FSTP is been reused for gardening and selling to farmers at 5 Rs./1kg bag. Organic waste from solid waste plant is mixed with dried sludge and using it as a compost by farmers.</p> <p>Mr. Kunal, desludging vehicle operator of Indapur council mentioned that PPE kits are provided to them and every six month they use new PPE during emptying process. He also mentioned that no training has been given to the operator as of now. They are using PPE and doing emptying process by self-learning only.</p> <p>Indapur municipal council has 2 desludging vehicles, one is trailer mounted suction machine having 3000 lit. capacity and one is suction truck having 4000 lit. capacity.</p> <p>Background</p>
2.	<p>FSTP of Indapur is having 10 KLD capacity situated at outside of the town near solid waste treatment plant. It is a natural treatment process with sludge drying beds for solid liquid separation and drying of sludge whereas liquid after separation flows to anaerobic baffled tanks and constructed wetland for treatment.</p>



Project Name	Investigation for Urban Rural FSSM Linkages in Maharashtra' under the title 'Urban Rural Linkages in Service Delivery/ addressing challenges with Peri Urban Areas
Meeting Objective	KII with Swachh Bharat Mission Officer, Indapur Municipal Council
Attendee	Mr. Barge – SBM officer, Indapur Municipal Council MS. Radhika Boargaonkar – Ecosan Services Foundation, Pune Ms. Prajwal More - Ecosan Services Foundation, Pune
Date of meeting	28/02/2022
Date of report	01/03/2022
Reference No.	AIILSG06-KII03

Item	Record of discussion
1.	<p>Discussion</p> <p>Mr. Barge – SBM officer, Indapur Municipal Council Ms. Radhika Boargaonkar – Ecosan Services Foundation, Pune Mr. Prajwal More - Ecosan Services Foundation, Pune</p> <p>During discussion Mr. Barge he shared that Indapur urban has 100% access to toilet and tap water supply. In Indapur there are 13 community toilets out of which 6 toilets are in slum areas, 1 public toilet maintained by municipal council.</p> <p>Toilets in Indapur are connected to septic tanks where 60% septic tanks are connected to underground drainage and 40% are connected to soak pits. Construction of toilets are as per Indian standards whereas design of septic tanks is not as per standards and constructed oversized.</p> <p>He also mentioned that desludging of septic tanks in Indapur is demand based and as septic tanks are constructed oversized, desludging happens once in a month.</p> <p>Household has to contact municipal council for desludging of septic tank against which council charge Rs. 2000 to 2500 per trip from household.</p> <p>Council has 2 suction vehicles; one is trailer mounted suction machine having 3000 lit. capacity and one is suction truck having 4000 lit. capacity.</p> <p>Digital Log book at FSTP is maintained by operator who is appointed by council itself. He also mentioned that operation and maintenance cost of FSTP is recovered from the sanitation tax collected from each household which is 100 Rs. /Toilet seat, through desludging cost which they charge from households and also from selling the compost 5 Rs. /1 kg bag. He also mentioned that recently they got Mahacity compost brand credit. Farmers buy this compost and use it in their farms whereas the treated wastewater from FSTP is been reused for gardening in the FSTP premises.</p> <p>Monthly monitoring of effluent and influents characteristics takes place and municipal council has given contract to private lab of Pune.</p> <p>During discussion with Mr. Barge he also mentioned that as Indapur is having 100% underground drainage, they had proposed to UDD which might get sanctioned within 2 months, 2 STPs having capacity 3 and 4 MLD at the end point of the drain.</p>

He also mentioned that currently that wastewater from town is getting disposed off into river without treatment and few farmers use that untreated water for farming.

Mr. Barge shared that entire water supply to Indapur town is from provided Ujjani dam where water is been treated through water treatment plant and then provided to Indapur town.

Municipal council charge property tax as per the type of property, residential properties has been charged 350 Rs./ households whereas commercial properties are being charged 450 Rs./property. Large Commercial properties is been charged Rs. 900/ property for example colleges large hotels etc.

Main occupation of Indapur population is farming and service, few populations had businesses as well.



Underground drainage in Indapur Town

Project Name	Investigation for Urban Rural FSSM Linkages in Maharashtra' under the title 'Urban Rural Linkages in Service Delivery/ addressing challenges with Peri Urban Areas
Meeting Objective	KII with gram sevaks of villages, Indapur
Attendee	Ms. Lodhe – Gram Sevak, Sardewadi Mr. Atole – Gram Sevak, Malwadi No. 1 Mr. Bhalerao – Gram Sevak, Kaltan No. 2 MS. Radhika Boargaonkar – Ecosan Services Foundation, Pune Ms. Prajwal More - Ecosan Services Foundation, Pune
Date of meeting	28/02/2022
Date of report	01/03/2022
Reference No.	AIILSG06-KII04

Item	Record of discussion
1.	<p>Discussion</p> <p>Ms. Lodhe – Gram Sevak, Sardewadi Mr. Atole – Gram Sevak, Malwadi No. 1 Mr. Bhalerao – Gram Sevak, Kaltan No. 2 MS. Radhika Boargaonkar – Ecosan Services Foundation, Pune Ms. Prajwal More - Ecosan Services Foundation, Pune</p> <p>During discussion with gram sevaks, they mentioned that in villages 75% toilets are pour flush toilets connected to septic tanks whereas 35% toilets connected to soak pits. Further these toilets are constructed mostly under SBM as per standards but the construction of containment units are not as per SBM standards. So, the desludging of tanks is not being practiced in villages also villagers started using exiting toilets after SBM came into practice and they have been forced to use toilets and avoid open defecation in villages.</p> <p>The households below poverty level mostly are using precast toilets connected to pits as they can't afford to construct septic tanks and bear cost of desludging.</p> <p>All the households in villages are having access to toilets under SBM or before that also but 5% villagers still don't use the facilities and defecate in open farms.</p> <p>Some villages have underground drains and septic tanks are connected to these drains.</p> <p>Water atm are installed in 60% villages in Indapur district which are connected to RO filters having capacity 500 lit/hrs. Villagers are charged INR 5 per 20 L of tank for the purchase of RO water.</p> <p>Major occupation in villages is farming and few populations belongs to daily wages work. Many villages are having tap water connection under Payjal yojana of government. People living in farms are having their separate wells or borewells or tube wells whereas households living in gaathan or hamlets are having gram panchayat tap water connection. Gram panchayat don't have any desludging vehicle if the tanks are full, they either contact manual scavengers from Indapur town or previously council use to provide desludging service but now they stopped giving service to rural.</p>

Out of 16 villages 5 villages were having shared toilets which are shared between 2 to 3 families used and maintained by them. Few villages are conducting IEC activities in village regarding FSSM and Solid waste management in village.

Under “Mazhi Vasundhara Scheme” gram panchayat is strengthening females of villages to make village clean and make various items from waste so from waste to wealth scheme these females will earn for their survival and create livelihood in the village.

Self Help Groups are carrying vermicomposting activity in villages under the same scheme as well.



7.7 Annexure 7: Desludging Tariff Calculation

	Expenditure	Values	Units	Total Cost
1	Maintanance of vehicle		INR	5000
2	Salary (20%)		INR	5000
	Driver	15000	INR	
	Helper	10000	INR	
3	Disel charges		INR	4230
	Average of vehicle	5	Km/L	
	Cost of Diesel	94	INR	
	Average distance (two ways) for town	5	Km	
	Number of trips per month	45		
4	Operation and Maintanance of FSTP		INR	4000
5	Cost of Safety Equipments		INR	2000
			INR	20230
6	Others			2023
	Total Monthly cost		INR	22253
	O&Mcost per Trip		INR	495
	Base price (O&M cost + 20% Margin)			593

7.8 Annexure 8: List of FSTP: Maharashtra

Sr. No.	Name of ULB	FSTP Size Approved by GR No. SMM-2019/C.R.124/UD-34 for FSTP Project (in KLD)	Revised Size Approved of FSTP Project (Based on Principle of Scheduled Desludging upto year 2030) in KLD
1	2	3	4
1	Akole (NP)	5	25
2	Deolali Pravara (M CI)	10	36
3	Jamkhed (M CI)	10	11
4	Karjat (NP)	3	19
5	Kopargaon (M CI)	-	57
6	Newasa (NP)	5	25
7	Parner (NP)	3	15
8	Pathardi (M CI)	10	41
9	Rahuri (M CI)	10	41
10	Sangamner (M CI)	15	76
11	Shevgaon (M CI)	5	46
12	Shrigonda (M CI)	10	40
13	Akot (M CI)	20	96
14	Balapur (M CI)	-	30
15	Barshi Taklii	5	18
16	Murtijapur	10	42
17	Patur (M CI)	5	16
18	Telhara (M CI)	5	25
19	Achalpur (M CI)	20	102
20	Anjangaon (M CI)	15	54
21	Bhatakuli (NP)	-	9
22	Chandur Railway (M CI)	5	22
23	Chandurbazar (M CI)	5	19
24	Chikhaldara (M CI)	3	8
25	Daryapur Banosa (M CI)	10	45
26	Dattapur Dhamangaon (M CI)	5	27
27	Dharni (NP)	5	19
28	Morshi (M CI)	10	44
29	Nandgaon Khandeshwar (NP)	3	17
30	Shendurjana (M CI)	5	24
31	Teosa NP	3	18
32	Warud (M CI)	10	50
33	Kannad (M CI)	10	42
34	Khuldabad (M CI)	-	11
35	Paithan (M CI)	10	43
36	Phulambri (NP)	5	9
37	Soigaon (NP)	3	11
38	Ambejogai (M CI)	15	73
39	Ashti (NP)	3	13
40	Dharur (M CI)	5	22
41	Georai (M CI)	10	36

42	Kaij (NP)	10	39
43	Manjlegaon (M CI)	10	42
44	Patoda (NP)	3	12
45	Shirur (NP)	3	15
46	Wadavani (NP)	5	23
47	Bhandara (M CI)	20	104
48	Lakhandur (NP)	3	16
49	Lakhani (NP)	3	15
50	Mohadi (NP)	3	12
51	Pauni (M CI)	5	27
52	Sakoli (NP)	5	34
53	Tumsar (M CI)	10	53
54	Buldana (M CI)	15	76
55	Chikhli (M CI)	15	69
56	Deulgaon Raja (M CI)	10	41
57	Jalgaon (Jamod) (M CI)	10	35
58	Khamgaon (M CI)	-	78
59	Lonar (M CI)	5	22
60	Malkapur (M CI)	15	63
61	Mehkar (M CI)	10	45
62	Motala (NP)	3	12
63	Nandura (M CI)	10	46
64	Sangrapur (NP)	3	6
65	Sindkhed Raja (M CI)	15	29
66	Bhadravati (M CI)	15	73
67	Brahmapuri (M CI)	10	61
68	Chimur Municipal Council	10	31
69	Gadchandur(MC)	10	28
70	Gond Pipari (NP)	3	11
71	Jivati (NP)	3	10
72	Korpana (NP)	3	8
73	Mul (M CI)	-	25
74	Nagbhid (M CI)	10	33
75	Pombhurna (NP)	3	10
76	Rajura (M CI)	-	26
77	Saoli (NP)	3	13
78	Sindewahi	3	17
79	Warora (M CI)	10	50
80	Dondaicha-Warwade	10	47
81	Sakri (NP)	5	22
82	Shindkheda(NP)	-	24
83	Aheri (NP)	3	21
84	Armori (NP)	5	30
85	Bhamaragad (NP)	3	10
86	Chamorsi (NP)	5	23
87	Desaiganj (M CI)	10	40
88	Dhanora (NP)	3	11
89	Etapalli (NP)	3	4
90	Korchi (NP)	3	6

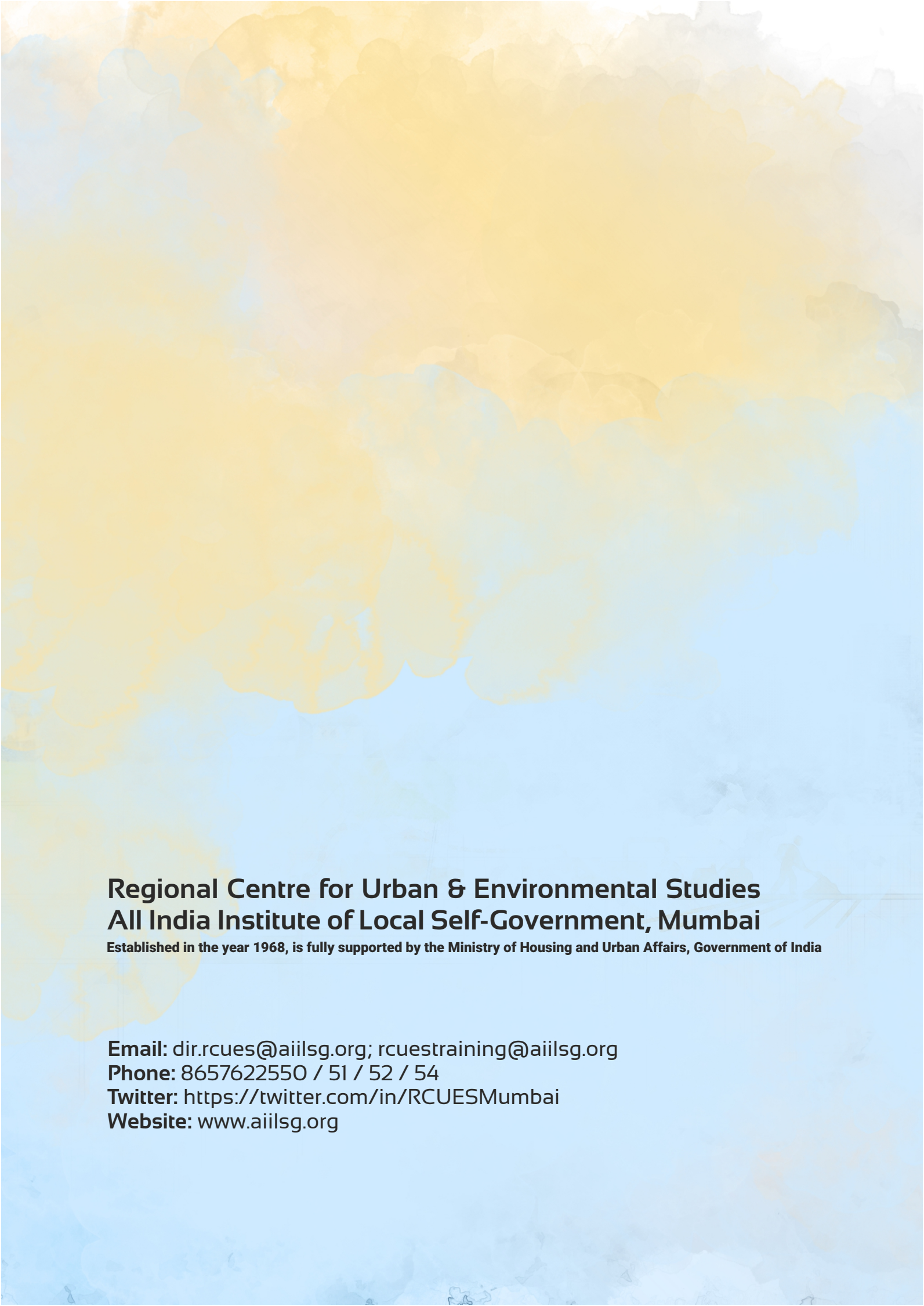
91	Kurkheda (NP)	3	11
92	Mulchera (NP)	3	5
93	Sironcha (NP)	3	16
94	Amgaon	-	28
95	Arjuni (NP)	3	14
96	Deori	3	16
97	Goregaon (NP)	3	12
98	Sadak Arjuni (NP)	3	10
99	Salekasa (NP)	3	11
100	Tirora (M CI)	10	33
101	Aundha (NP)	3	16
102	Basmath (M CI)	15	55
103	Kalamnuri (M CI)	5	24
104	Sengaon	3	6
105	Bhadgaon (M CI)	10	39
106	Bhusawal (M CI)	20	165
107	Bodwad	5	24
108	Chopda (M CI)	15	85
109	Dharangaon (M CI)	10	36
110	Erandol (M CI)	10	34
111	Faizpur (M CI)	10	29
112	Muktainagar	-	32
113	Parola (M CI)	10	35
114	Raver (M CI)	10	27
115	Savda (M CI)	5	20
116	Shendurni	-	20
117	Varangaon (NP)	10	40
118	Yawal (M CI)	10	41
119	Ambad (M CI)	10	33
120	Badnapur NP	3	18
121	Bhokardan (M CI)	5	24
122	Ghansawangi NP	3	9
123	Jafrabad NP	5	20
124	Mantha NP	5	26
125	Ajara	-	13
126	Chandgad	-	10
127	Gadhinglaj (M CI)	10	38
128	Hatkangale	-	9
129	Hupari	-	27
130	Kagal (M CI)	-	39
131	Kurundvad (M CI)	-	21
132	Malkapur (M CI)	3	8
133	Panhala (M CI)	-	3
134	Shirol	-	22
135	Vadgaon Kasba (M CI)	-	24
136	Ahmadpur (M CI)	10	42
137	Ausa (M CI)	10	36
138	Chakur (NP)	5	18
139	Devani(NP)	3	11

140	Jalkot (NP)	3	13
141	Nilanga (M CI)	10	37
142	Renapur	3	13
143	Shirur Anantpal	3	6
144	Udgir (M CI)	20	90
145	Bhiwapur (NP)	3	17
146	Butibori	-	36
147	Hingana (NP)	-	9
148	Kalameshwar (M CI)	5	41
149	Kamptee (M CI)	20	93
150	Kanhan-Pipri (MC)	-	25
151	Khapa (M CI)	3	15
152	Kuhi (NP)	3	12
153	Mahadula	-	23
154	Mohpa (M CI)	3	11
155	Mouda	-	13
156	Mowad (M CI)	3	11
157	Narkhed (M CI)	5	25
158	Parseoni	3	19
159	Ramtek (M CI)	5	25
160	Savner (M CI)	10	45
161	Umred (M CI)	-	55
162	Wadi (MC)	-	55
163	WANADONGRI	-	51
164	Ardhapur(M CI)	-	23
165	Bhokar	10	44
166	Biloli (M CI)	3	14
167	Dharmabad (M CI)	10	37
168	Hadgaon (M CI)	10	34
169	Himayatnagar (NP)	5	24
170	Kandhar (M CI)	5	24
171	Kinwat (M CI)	10	37
172	Kundalwadi (M CI)	3	16
173	Loha (M CI)	5	24
174	Mahur (M CI)	3	15
175	Mudkhed (M CI)	-	15
176	Mukhed (M CI)	10	35
177	Naigaon (NP)	5	22
178	Peth Umri (M CI)	3	15
179	Dhadgaon Wadfalya (NP)	3	13
180	Nawapur (M CI)	10	30
181	Shahade (M CI)	15	59
182	Talode (M CI)	10	33
183	Bhagur (M CI)	-	5
184	Chandwad (MC)	10	35
185	Deola NP	3	13
186	Dindori NP	5	30
187	Igatpuri (M CI)	10	31
188	Kalwan NP	5	26

189	Manmad (M CI)	20	76
190	Nandgaon (M CI)	5	23
191	Niphad NP	5	8
192	Peth NP	3	8
193	Satana (M CI)	10	42
194	Surgana NP	3	7
195	Yevla (M CI)	15	53
196	Bhum (M CI)	5	25
197	Kalamb (M CI)	10	34
198	Lohara B. (NP)	3	12
199	Murum (M CI)	5	23
200	Naldurg (M CI)	5	21
201	Paranda (M CI)	5	23
202	Tuljapur (M CI)	10	37
203	Umarga (M CI)	10	46
204	Vashi (NP)	10	28
205	Dahanu (M CI)	15	62
206	Jawhar (M CI)	3	15
207	Mokhada	3	10
208	Palghar (M CI)	15	121
209	Talasari	3	9
210	Vikramgad	3	11
211	Wada	-	18
212	Gangakhed (M CI)	10	45
213	Jintur (M CI)	10	43
214	Manwath (M CI)	10	35
215	Palam (NP)	3	16
216	Parbhani (M CI)	20	267
217	Pathri (M CI)	10	41
218	Purna (M CI)	10	37
219	Sailu (M CI)	10	46
220	Sonpeth (M CI)	5	19
221	Alandi (M CI)	-	30
222	Bhor (M CI)	5	21
223	CHAKAN	-	62
224	Indapur (M CI)	10	36
225	Jejuri	-	17
226	Junnar (M CI)	10	36
227	Vadgaon Maval	-	19
228	Alibag (M CI)	5	29
229	Karjat (M CI)	10	34
230	Khalapur(NP)	3	14
231	Khopoli (M CI)	15	86
232	Mahad (M CI)	10	46
233	Mangaon (NP)	5	31
234	Matheran (M CI)	3	7
235	Mhasala (NP)	3	14
236	Murud Janjira (M CI)	3	13
237	Pen (M CI)	10	55

238	Poladpur(NP)	3	9
239	Shrivardhan (M CI)	5	24
240	Tala (NP)	3	7
241	Uran (M CI)	-	38
242	Chiplun (M CI)	15	61
243	Dapoli Camp (NP)	5	20
244	Devrukh	3	17
245	Guhagar	3	13
246	Khed (M CI)	5	27
247	Lanja MC	3	23
248	Mandangad (NP)	3	8
249	Rajapur (M CI)	3	14
250	Ratnagiri (M CI)	20	100
251	Ashta (M CI)	10	39
252	Jath	15	46
253	Kadegaon	3	16
254	Kavathemahakal	5	20
255	Khanapur	3	11
256	Palus	10	36
257	Shirala	5	19
258	Vita (M CI)	10	48
259	Dahiwadi	3	19
260	Khandala	3	11
261	Koregaon	5	29
262	Lonand	5	23
263	Medha	3	7
264	Mhaswad (M CI)	5	29
265	Patan	3	24
266	Rahimatpur (M CI)	5	18
267	Waduj	5	14
268	Devgad - Jamsande	3	22
269	Kankavli (NP)	5	27
270	Kasai - Dodamarg (NP)	3	8
271	Kudal	5	22
272	Malwan (M CI)	5	25
273	Sawantwadi (M CI)	5	34
274	Vengurla (M CI)	3	10
275	Wabhave - Vaibhavwadi	3	5
276	Akkalkot (M CI)	10	35
277	Dudhani (M CI)	3	10
278	Karmala (M CI)	5	21
279	Madha	3	14
280	Maindargi (M CI)	3	7
281	Malshiras	5	22
282	Mangalvedhe (M CI)	5	17
283	Mohol Nagar Parishad	10	41
284	Sangole (M CI)	10	45
285	Murbad (NP)	-	21
286	Shahapur (NP)	3	16

287	Ashti (NP)	3	13
288	Deoli (M CI)	5	25
289	Karanja (NP)	3	15
290	Pulgaon (M CI)	10	31
291	Samudrapur (NP)	3	10
292	Selu (NP)	3	17
293	Sindi (M CI)	3	17
294	Karanja (M CI)	15	81
295	Malegaon Zahangir (NP)	-	20
296	Mangrulpir (M CI)	10	42
297	Manora (NP)	3	12
298	Risod (M CI)	10	37
299	Arni(M CI)	10	35
300	Babhulgaon (NP)	3	9
301	Dhanki	-	6
302	Digras (M CI)	10	45
303	Ghatanji (M CI)	5	24
304	Kalamb (NP)	5	21
305	Mahagaon (NP)	3	10
306	Maregaon (NP)	3	6
307	Ner (M CI)	5	26
308	Pandharkaoda (M CI)	10	35
309	Pusad (M CI)	15	78
310	Ralegaon (NP)	5	20
311	Umarkhed (M CI)	10	58
312	Wani (M CI)	15	70
313	Zari (NP)	3	4



**Regional Centre for Urban & Environmental Studies
All India Institute of Local Self-Government, Mumbai**

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