SFD Report

Alandi
India

Final Report

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SFD Report Alandi, India,2018

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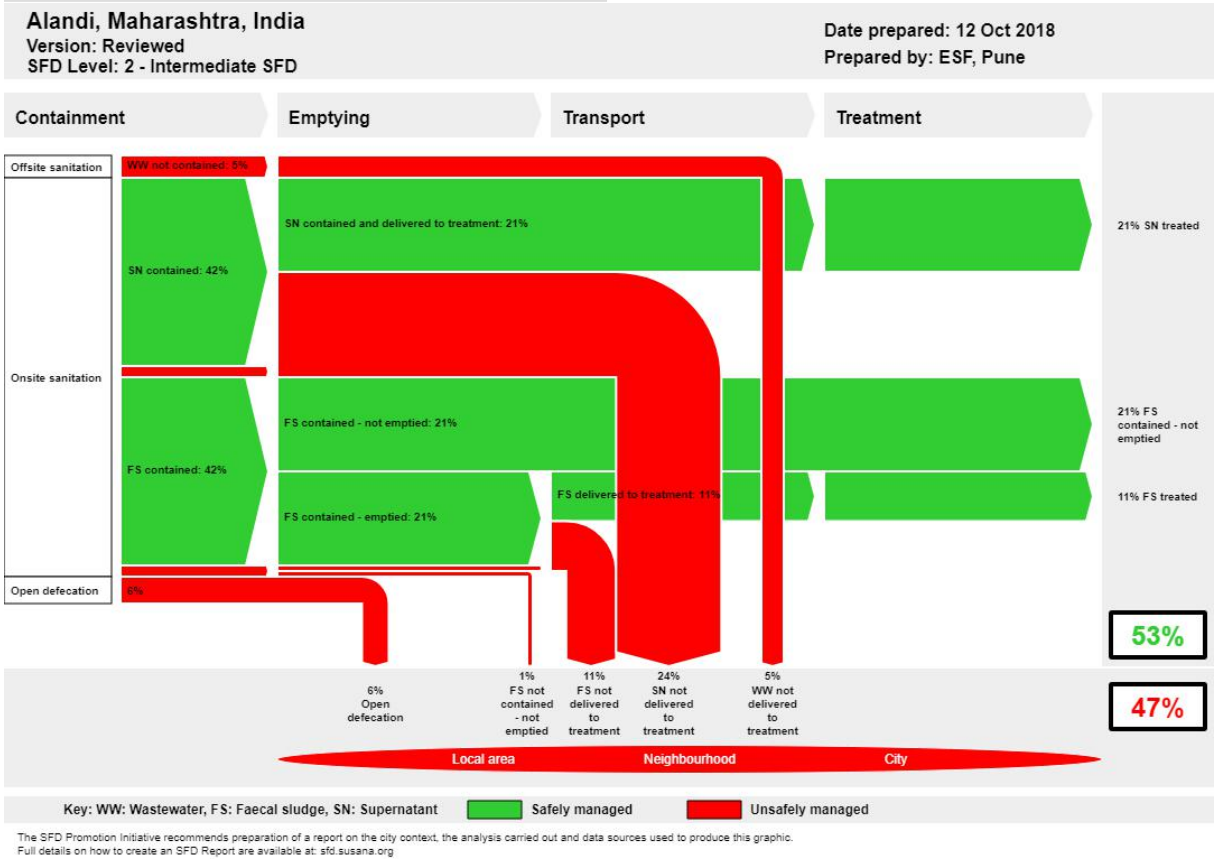
1. The SFD Graphic



The SFD Promotion Initiative recommends preparation of a report on the city context, the analysis carried out and data sources used to produce this graphic.
Full details on how to create an SFD Report are available at: sfd.susana.org

2. Diagram information

SFD Level:

This SFD – Level 2 – is a desk- and field-based SFD report.

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Status:

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3. General city information

Alandi is a pilgrimage town and has a municipal council in Pune district. Alandi is connected to the District Head Quarter Pune and nearby main urban centres through the Pune-Nashik NH-50 and a Major District Road (MDR). It is also connected to the Moshi village on the NH-50 by a road leading to Dehu, another religious town. Chakan, a village also situated on the NH-50, is connected to Alandi by a MDR passing through the town.

The population of town as per Census 2011 is 28,645 persons. The density of city is 4,188 persons per sq.km. which is very high as compared to the state average of 365 persons per sq.km. Slum population is 1,950 persons which constitutes 6.8% of the total population (Planitech, 2017).

Council boundary has been chosen for the current study. It comprises an area of 6.84 sq.km.

4. Service outcomes

Overview on technologies and methods used for different sanitation systems through the sanitation service chain are as follows (Census of India, 2011):

Containment: According to census, Alandi is dependent on onsite sanitation systems, where 89% of households are dependent on septic tanks. The majority of individual household toilets are connected to septic tanks which are generally not adhering to design prescribed by Bureau of Indian standards. The size of the septic tank depends upon the availability of space at the time of construction and number of users, there is no standard size. The effluent from the septic tank flows into closed drains, i.e. sewers, and open drains. FS is collected in the septic tank and connected to the sewer system. Only 5% of septic tanks are connected to open drain.

Around 7% of population depends on public toilets. The public latrines are connected to septic tanks and hence are incorporated in onsite systems.

Only 4.6% population is directly connected to open channels/drains, which corresponds to an offsite sanitation system, but as there is no sewage treatment plant connected to this channels/drains, the raw sewage goes untreated to open land/channel/river.

Figure 1: Wastewater from the closed drainage opening to water body (Source: Mrunal/ESF,2018)

Figure 2: Wastewater mixing to Water body

Emptying: Alandi Municipal Council (AMC) is responsible for septage management. Due to lack of vacuum tankers, AMC has been providing the services through a private contractor. The capacity of the tankers is 3,000 litres each. Citizens have to submit an application form and spend between INR 800-1,200 (USD 11-17) as emptying fees. Septic tanks of public toilets are being emptied twice in a year. On an average, the frequency of emptying septic tanks is 2-5 septic tanks per day.

Transport: Transport of collected septage is made by truck-mounted vacuum tankers to Pimpri Chinchwad Municipal Corporation (PCMC) sewage treatment plant. Supernatant from septic tanks connected to the sewer (underground channels) is also delivered to the PCMC sewage treatment plant.

Treatment: There is a STP to treat septage collected from septic tanks and supernatant that flows from the sewer. Supernatant from toilets and septic tanks connected to open drains is disposed of in the environment untreated.

End-use/ Disposal: 50% of septage is treated and 50% is disposed untreated on agricultural fields. 50% of the supernatant which flows through the sewer gets treated at PCMC sewage treatment plant (AMC, 2018d).

It is tough to determine the actual percentage of effluent (supernatant, SN) and septage generated from tanks, hence to reduce the maximum error, the FS in tanks has been assumed to be 50%. Out of the excreta generated from onsite systems, 44% is FS and 45% is SN. The 45% of SN is composed of: SN contained, transported to treatment and treated (21%) and SN not delivered to treatment which is dumped into the Indrayani river (24%). Moreover, all WW is not delivered to treatment nor treated (5%). The total FS contained is 42%, out of which only 50% is emptied. The FS not emptied (21%) is considered as safely managed. Out of the FS

which is emptied (21%), 50% is delivered to the treatment plant resulting in a total of 11% of FS treated in PCMC treatment plant. The other 50% is dumped unsafely managed in the environment in agricultural fields.

It can be concluded that excreta of 47% of the population are not being managed safely in Alandi and only 53% corresponds to excreta safely managed.

5. Service delivery context

In 2008, the Ministry of Urban Development (MoUD) issued the National Urban Sanitation Policy (NUSP). The policy aims to: raise awareness, promote behaviour change; achieve open defecation free cities; develop citywide sanitation plans; and provide 100% safe confinement, transport, treatment and disposal of human excreta and liquid wastes. The NUSP mandates states to develop State urban sanitation strategies and work with cities to develop City Sanitation Plans (CSPs). Furthermore, it explicitly states that cities and states must issue policies and technical solutions that address onsite sanitation, including the safe confinement of faecal sludge (FS) (USAID, 2010).

The objectives of NUSP are to be realized through CSPs and state sanitation strategies. As of now, there are very few cities which have finalized their CSPs, and those plans are also not implemented. This remains a major drawback in implementation of NUSP.

As per the advisory note on septage management for the urban India, issued by MoUD in 2013, It recommends supplementing CSPs with Septage Management Sub-Plan (SMP). The Septage management strategies and its related work in most of urban cities of Maharashtra is not yet prominent due to lack of knowledge, lack of sufficient funds, topography of the area, unplanned growth of the city and many other socio-political issues.

There are no specific legal provisions relating to septage management, but there are a number of provisions relating to sanitation services and environmental regulations, which major stems from, The Environment (Protection) Act, 1986 and the Water (Prevention and Control of Pollution) Acts. Municipal acts and regulations usually refer to management of solid and liquid wastes but absence of specific rules for septage management (MoUD, 2013). Despite of no specific provisions for septage management, AMC provides emptying services at affordable prices, though they are disposing septage in agricultural fields.

6. Overview of stakeholders

The 74th Constitutional Amendment Act of 1992 reformed the sector by transferring responsibility for domestic, industrial, and commercial water supply and sewerage (WSS) from state agencies, such as Departments of Public Health Engineering and State Water Boards, to Urban Local Bodies (ULBs). This transfer has resulted in a variety of implementation models, as well as lack of clarity in allocation of roles and responsibilities between state and local agencies, which sometimes results in large gaps in implementation (USAID, 2010).

The following stakeholders are responsible for sanitation service delivery in Alandi:

Table1: Key stakeholders (Source: Compiled by ESF, 2018)

Key stakeholders	Institutions/ Organizations
Public Institutions	Alandi Municipal Council (AMC) Maharashtra Jeevan Pradhikaran (MJP) State Pollution Control Board (SPCB)
Private Sector	Private emptiers

AMC is responsible for planning, designing, construction, operation and maintenance of sewerage network.

Public health and sanitation is delivered by AMC through the health department of the council. Septage management is also the responsibility of the same department of AMC.

Private emptiers are also responsible for septage management. They are providing services to AMC as AMC do not have any vehicle.

7. Credibility of data

Data are used from three key sources: Census of India (2011), draft CSP (2014) and CDP (City Development Plan), 2017. Data were cross-checked by individual Household (HH) survey and Key Informant Interviews (KIIs).

Data on containment were available in Census. Data on emptying and transport were collected by KII.

Some of the issues and challenges are listed below:

- Accuracy: Discrepancy observed between Census data and actual ground situation.
- People participation was not cooperative during survey.
- There was a lack of awareness amongst the residents about the sanitation systems which they are using in their house.
- Data available at different time lines.
- Limited data on reuse.

Assumptions followed for preparing the SFD:

- Data provided by Census (2011) are correct.
- Septic tanks and sewer connections on ground are as per septic tanks and sewer connections defined in Census.
- Volume of waste water generated is 80% of water supplied.

8. Process of SFD development

Primary data are collected through individual household surveys. Data were collected from all the wards where 10% of population was surveyed. Data were compared with Census and CSP.

Data were collected through secondary sources. City was visited to conduct KIIs with relevant stakeholders, to fill in the gaps in data and to cross-check the data collected.

To start with, a relationship between sanitation technologies defined in Census of India and the ones defined in project was established.

Data were fed into the Graphic Generator to calculate the excreta flow in terms of percentage of population.

Excreta of 47% of the population of the city are not managed safely, while only 53% of excreta generated are managed safely.

Limitations of SFD:

SFD is dependent on secondary data and true picture of the city may differ.

Data available correspond at different time lines, for example data on containment are from Census of India (2011), and data on emptying and transportation are collected through KIIs conducted in 2018.

9. List of data sources

AMC. 2018d. Interview with Sanitary inspector at Alandi Municipal Council (AMC). September 2018.

Census of India. 2011. House listing and housing data: Households by availability of type of latrine facility. [Online]. Available from: http://www.censusindia.gov.in/DigitalLibrary/TablesSeries2001.aspx

MoUD. 2013. Draft Report: Rapid Baseline Assessment – Solapur City, Capacity Building for Urban Development: Ministry of Urban Development (MOUD), Government of India.

USAID. 2010. A Rapid Assessment of Septage Management in Asia: Policies and Practices in India, Indonesia, Malaysia, the Philippines, Sri Lanka, Thailand, and Vietnam. Bangkok: United States Agency for International Development (USAID).

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Abbreviations

AMC	Alandi Municipal Council
AIILSG	All India Institute of Local Self Government
BIS	Bureau of Indian Standard
CDP	City development plan
CSP	City Sanitation plan
CSE	Centre for Science and Environment
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
FS	Faecal Sludge
GoM	Government of Maharashtra
HH	Household
KII	Key Informant Interview
LPCD	Litres per capita and per day
MLD	Millions of litres per day
MJP	Maharashtra Jeevan Pradhikaran
MPCB	Maharashtra Pollution Control Board
MTPVD	Maharashtra Town Planning and Valuation Department
MHADA	Maharashtra Housing and Area Development Authority
MOUD	Ministry of Urban Development
NIUA	National Institute of Urban Affairs
PHED	Public Health and Engineering Department
PCMC	Pimpri Chinchwad Municipal Corporation
SLB	Service Level Benchmarks
SN	Supernatant
STP	Sewage Treatment Plant
SWM	Solid Waste Management
USAID	United States Agency for International Department
UDD	Urban Development Department
WSSD	Water Supply and Sanitation Department

1 City Profile

1.1 Location

Alandi is a municipal town situated on banks of Indrayani River in Khed taluka in Pune District. The Latitude and Longitude of Alandi are 18°40′37.42″N and 73°53′47.76″E, respectively. The town is approximately 25 km north of Pune. Pune Nasik National highway no. 50 passes by the town. The town is well connected to Pune by Pune Chakan road. The average elevation of the town is 577 metres. The total municipal area of Alandi is 6.84 sq. km. The town is popular as a place of pilgrimage being the resting place (*Sajeev Samadhi*) of the 13th century Saint poet "Sant Dnyaneshwar". The most revered, amongst the scholarly works authored by Sant Dnyaneshwar, is the "***Dnayneshwari***", the commentary on "***Shrimat Bhagavad-Gita***" (Planitech, 2017).

Alandi is an oldest town being adjacent to Pune and Pimpri-Chinchwad region, therefore got importance of trade and market centre. The people of Alandi are mostly engaged in trade and commerce, where a large number of vendors do business in the area adjacent to the main temple complex. It mainly deals with materials used for religious observance such as flowers, garlands, coconuts, kunkum, turmeric powder, etc. These vendors also do good business by selling religious souvenirs, photographs and books (Planitech, 2017).

1.2 Agriculture

Traditionally, groundnut cultivation has been an important activity around Alandi. Most of the production is sent to oil mills in the nearby town of Chakan for processing. Planned commercial shopping centres are developed along the Dehu- Alandi road and Markal road, while unplanned development is observed at Chakan road, Pradakshina Marg and Bhairavnath chowk towards Wadgaon road (Planitech, 2017).

1.3 Population Growth

Table 1 shows the Population growth rate in Alandi. The population of Alandi, as per the Census of India, 2011 is 28,645 which has increased by 5.01% compound annual growth rate from the previous census (17,565 in 2001 Census). The floating population is around 30,000-40,000 (Planitech, 2017).

Table 1: Population growth rate

Census Year	Population	Growth rate (%)
1971	4788	--
1981	7523	57.12
1991	10249	36.24
2001	17565	71.38
2011	28645	63.08

1.4 Ward wise Population

There are 17 wards for AMC and the ward wise population is mentioned in Table 2. Figure 1 shows the ward map of Alandi.

Table 2: Ward Wise Population

Sr. No	Ward No	Population	Nos.of HH
1	1	2,618	667
2	2	1,957	467
3	3	2,165	557
4	4	1,466	333
5	5	925	227
6	6	1,736	484
7	7	1,135	325
8	8	734	166
9	9	2,444	558
10	10	1,179	318
11	11	891	234
12	12	1,406	309
13	13	1,795	460
14	14	2,296	594
15	15	2,413	604
16	16	2,329	618
17	17	1,156	272
		28,645	**7,193**

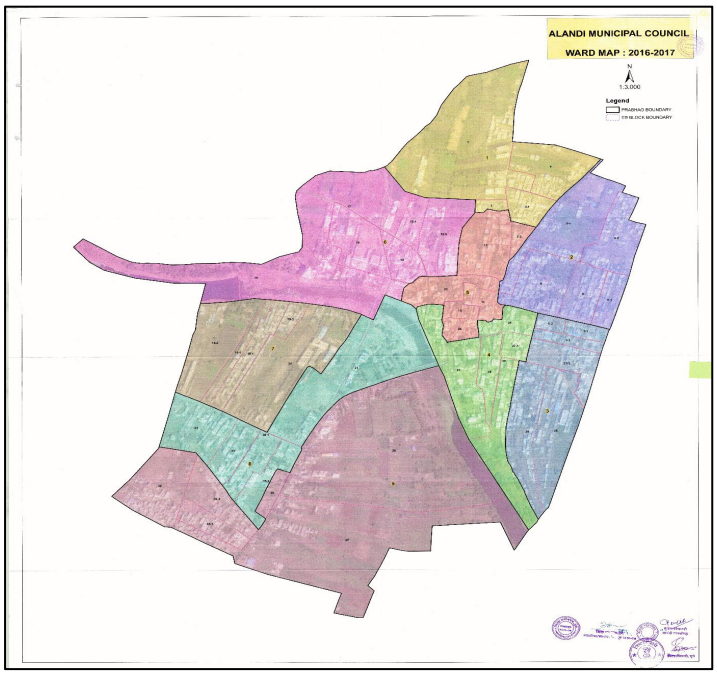

Figure 1: Ward map of Alandi

The area of Alandi Municipal Council is 287.25 Ha. The boundary of the Municipal Council is as per notification issued by government dated 30th September, 2015 (Figure 1).

The population density is 130 persons/Ha. Alandi town has approximately 7% of population residing in 3 major slums pockets. As per information given by Municipal Council Alandi, slums at Wadgaon Road, Chakan Chowk and Kalewadi road are the major slum settlements apart from the small hutments observed in the peripheral areas (Planitech, 2017).

1.5 Climate

Alandi has a tropical climate and comes under moderate rainfall zone. The average temperature in Alandi is 25°C. It has a hot summer and dry weather throughout the year except monsoon season (Planitech, 2017).

The driest month is from December to April, with 0 to 1mm of rainfall. Most of the precipitation falls in June, July and August, averaging 721.7mm. The warmest month of the year is April with an average temperature of 30.5°C. December is the coldest month, with temperatures averaging 20°C. The difference in precipitation between the driest month and the wettest month is 162.56 mm. throughout the year (Planitech, 2017).

2 Service outcomes

Service outcome analysis is based on primary data as well as secondary data. Three sources of data are: Census of India, 2011, Draft City Sanitation Plan (CSP), 2014 and draft City Development Plan (CDP), 2017. The data are cross-checked and updated by individual household (HH) surveys and Key Informant Interviews (KIIs). Data on containment are available in the Census. Data on emptying and treatment are collected by KIIs. Data on emptying, transport, and treatment are cross-checked with Individual HH surveys.

2.1 Overview

2.1.1 Water Supply

There are 3 water storage reservoirs constructed at three different locations. The details of each storage systems are mentioned below.

Table 3: Water Storage Network (source: Alandi Nagar Parishad)

Sr. No	Storage System	Location	Storage Capacity (Cubic meter)	Service Area
1	ESR	Markal Chowk-1	4 lakhs- litres (400.000 litres)	Left bank of river- Gaothan area and residential areas
2	ESR	Markal Chowk-2	4.5 lakhs- litres (450.000 litres)	
3	GSR	Kalewadi	38,000 litres	Right bank of river- kalewadi, Dehu Phata.
			8.88 lakhs –litre (988.000 litres)	

The water supply during normal period varies from 80 to 90 Litres per capita per day (LPCD) (Average of 85 LPCD) and during summer season is 70 LPCD. The rate of water supply for floating population is 20 LPCD. At present, 16.5 *Lakhs* of water (1.65 millions of litres per day, MLD) is supplied and during festival and wari period the water supply is almost doubled i.e. up to 3.5 MLD.

2.1.2 Sanitation Facilities

This section presents existing sanitation facilities apart from household toilets.

Public toilets: In Alandi, around 7% of the population live in the slum areas and most of them rely on public toilets. Alandi is an important pilgrim centre. The census data recorded that 8% of HHs in Alandi rely on public toilets. On an average, 12-15 *lakh* (1,200,000-1,500,000) pilgrims visit Alandi annually. On normal days, about 10,000 to 12,000 pilgrims visit Alandi daily. However, on Thursdays and weekends, this figure goes to as high as 25,000. On the Ekadashi days (twice in a month) about 60,000 to 70,000 people visit Alandi. On the two annual events of Ashadhi and Kartiki Ekadashi, as many as 3 to 5 *lakh* (300,000-500,000) pilgrims visit Alandi (AIILSG, 2014).

The floating population is also dependent on the public level sanitation facilities. The details of the public toilets are listed below. At present, there are 19 public toilets in Alandi, out of

which, 14 toilets are available free of cost for usage and 5 toilets are functioning of pay and use basis. Some toilets are constructed by the private institutions for the tourist and pilgrim usage (AIILSG, 2014).

Table 4: List of Public Toilets in Town (Source: Planitech, 2017)

Sr.No.	Location of Toilet	No. of Seats	No. Of Urinals	Bathroom Units	Total
FREE USE TOILETS					
1	Bhagirathi Nala	16	5	2	23
2	Gopalpura Maruti Mandir	17	10	6	33
3	Padmavati Slum	24	3	4	31
4	Behind D.Y. Patil Hospital	24	3	4	31
5	Near Kate House (Dagdi Bridge)	24	0	4	28
6	Choupal Building	24	3	4	-
7	Janabai Dharmshala (ESR)	2	9	3	14
8	N.P. School No :1 Toilet	10	5	4	19
9	N.P. Scholl No: 3Toilet	20	9	4	33
10	Kelgao Road	17	10	6	33
11	Gund Talim	5	0	1	6
12	Tanaji Nagar	24	9	4	37
13	Dada Maharaj Satarkar	10	0	2	12
14	Ghundre Ali Toilet	16	7	2	25
PAY AND USE					
15	Sulabh Toilet	66			66
16	Maulai Ghat	22			22
17	Chakan Chowk	26			26
18	MIT college constructed, Chakan Chowk	25			25
19	P.M.T. Bus Stop	10			10
	Total	382			505

In addition to these toilets, there are 80 registered *Dharmashalas* (Residence for pilgrims), i.e. mobile toilets, in the town. The estimated numbers of toilet seats available are considered at 200. Also, the AMC installs around 100 mobile toilets (Portable/bio-toilets) during the peak season for the floating population. The majority of these toilets are connected to septic tanks (AIILSG, 2014).

Due to the lack of data on excreta generated from institutions, industrial areas, restaurants and hotels, these establishments have not been taken into consideration for the production of the SFD, whereas excreta generated from public toilets, residential areas, as well as commercial areas, are considered for this study (AIILSG, 2014).

2.1.3 Sanitation technologies & Excreta Contribution

This section presents the range of sanitation technologies/infrastructure, methods, and services designed to support the management of FS and Waste Water (WW) through the sanitation service chain in Alandi. The details on quantitative estimations are presented in the Table 5 below and following sections.

Table 5: Sanitation technologies and contribution of excreta in terms of percentage population

Sr. No	Sanitation technologies and systems as defined by:		SFD reference variables	Percentage of population
	Census of India	SFD promotion initiative		
1	Piped sewer system	User interface discharges directly to open drain or storm sewer	T1A1C6	5%
2	Septic tank	Septic tank is connected to the centralized combined sewer	T1A2C1	77%
3	Septic tank	Septic tank is connected to open drain or storm sewer	T1A2C6	5%
4	Public latrine	Septic tank is connected to the centralised combined sewer	T1A2C1	7%
5	Open defecation	Open defecation	T1B11C7 TO C9	6%

Figure 2 shows the SFD Selection Grid for the city.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B					Significant risk of GW pollution Low risk of GW pollution	T1A1C6				Not Applicable
Septic tank	T1A2C1				Significant risk of GW pollution Low risk of GW pollution	T1A2C6				
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution					
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution					Significant risk of GW pollution Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution Low risk of GW pollution
Unlined pit										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied but abandoned when full and covered with soil										Significant risk of GW pollution Low risk of GW pollution
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										
Toilet failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable						T1B11 C7 TO C9			Not Applicable

Figure 2: SFD Selection Grid

2.2 Sanitation Analysis

2.2.1 Toilets & Disposal system

As per census, there are 7,193 residential properties, out of which 86.2% of the households have individual toilets and the rest rely on Public/Community toilets (CT) or practice open defecation. Percentage of open defecation is as high as 6.1%, mostly observed in slum areas. Nearly 81% households are dependent on onsite sanitation systems. Only 4.6% of households are directly connected to the sewers, which are in reality open drains and hence, considered as system T1A2C6. 7% of the population is dependent on public toilets which are connected to septic tanks (Census of India, 2011). Different types of septic tanks have been observed in town. The tanks are made of concrete rings placed one on another, fully plastered tanks, tanks with only brickwork (not plastered). The effluent from the septic tank flows into closed, underground and open drains. Septic tanks connected to closed underground drains, considered as sewers, were modelled as system T1A2C1 for the purpose of the SFD. It is observed that size, location and design of on-site systems is prerogative of local masons and is majorly dependent on space available. The septic tanks constructed are generally not adhering to design prescribed by the Bureau of Indian Standard (BIS) (AMC, 2018b) but they were modelled as septic tanks in the Graphic Generator because of lack of knowledge of local residents about their sanitation system at individual household level and because that was the closest and best option for the purpose of this SFD report.

Floating population has not been considered in the production of this SFD report.

2.2.2 *Collection for Disposal / Emptying of Septic tanks*

In Alandi, emptying services of septic tanks are managed and regulated by the municipal council. AMC does not own any vacuum tanker but they have appointed a service person for doing this activity (AMC, 2018b). There are two trucks available with a capacity of 3,000 litres each. Citizens are required to contact AMC and have to pay Rs. 800 to Rs.1,200 (USD 11-17) as emptying fees to avail the service. For emptying outside city limits, people are charged INR 8 (USD 0.12) per kilometre. Emptying is done within three days of submitting the application. AMC also empties septic tanks of community toilets twice in a year. On an average, 2-5 septic tanks are emptied in a day (AMC, 2018d).

It was observed that no safety precautions are taken by persons who empty the septic tanks (AMC, 2018e).

2.2.3 *Transportation*

Septage is transported by truck-mounted vacuum tankers to the treatment site i.e. *Pimpri Chinchwad* Sewage Treatment Plant (STP) and also the outskirts of the town. Monthly, around 105 HHs with septic tanks get cleaned. Yearly 2,520 household septic tanks get desludged. Only 49.6% of septic tanks get desludged in the year. The vacuum tankers are parked at a dedicated parking area along with solid waste collection trucks. Sewage is either conveyed through sewer lines or open drains. Nearly 5% of septic tanks are connected to open drains. Rest are closed and underground drainage is present in the town.

Figure 3: Transportation of wastewater through sewer leading to water body (Indrayani River) (Source: Mrunal/ESF, 2018)

2.2.4 *Treatment*

Sewage from open drains is disposed of, untreated, in the Indrayani River through the *Nalla's*. 50% of septage is dumped untreated in agricultural fields and 50% of the septage is treated at the *Pimpri Chinchwad Municipal Corporation* (PCMC) STP (AMC, 2018d). Centralized sewage treatment plant of PCMC has a mechanical process unit with clarifier followed by sequential batch reactor process which finally goes for tertiary treatment by aeration (Figure 4). Separate sludge drying beds are also present at PCMC STP.

Figure 4 Kasarwadi- PCMC STP Plant

2.3 SFD matrix

Table 6: SFD matrix

Alandi, Maharashtra, India, 12 Oct 2018. SFD Level: 2 - Intermediate SFD
Population: 28641
Proportion of tanks: septic tanks: 50%, fully lined tanks: 100%, lined, open bottom tanks: 100%

System label	Pop	W4c	W5c	F3	F4	F5	S4d	S5d	S4e	S5e
System description	Proportion of population using this type of system	Proportion of wastewater in open sewer or storm drain system, which is delivered to treatment plants	Proportion of wastewater delivered to treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in sewer system, which is delivered to treatment plants	Proportion of supernatant in sewer system that is delivered to treatment plants, which is treated	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C6 Toilet discharges directly to open drain or storm sewer	5.0	0.0	0.0							
T1A2C1 Septic tank connected to a centralised combined sewer	84.0			50.0	50.0	100.0	50.0	100.0		
T1A2C6 Septic tank connected to open drain or storm sewer	5.0			50.0	50.0	100.0			0.0	0.0
T1B11 C7 TO C9 Open defecation	6.0									

2.3.1 *SFD matrix explanation*

According to Census of India, 2011, 89% of the population is dependent on onsite sanitation i.e. on septic tanks and 5% of the population are connected directly to a set of open drains/channels. Sewage from open drains is disposed of in the Indrayani River, untreated.

89% of the town is dependent on the septic tanks and no other system is present. The public toilets are also connected to septic tanks, hence are incorporated in onsite systems. FS is contained as the septic tanks are connected to closed underground drains that were considered as the sewer system. Variable S4d is set to 50% and variable S5d is set to 100%. This means that 50% of the SN from the sewer system is delivered to treatment and 100% is treated at the PCMC STP. It was assumed that treatment efficiency is 100% since the STP is not running at full capacity and is able to treat all septage that arrives at the treatment plant. The other 50% of SN is not delivered to treatment and dumped untreated into the Indrayani River before reaching the treatment plant.

Only 5% of septic tanks are connected to the open drains and hence, FS is not contained in these cases. Variable S4e is set to 0% and S5e is set to 0% since SN from septic tanks connected to open drains/channels is disposed of in the Indrayani River, untreated.

Moreover, 50% of the septage from septic tanks is delivered to treatment and 100% is treated at PCMC STP. The other 50% is disposed of in agricultural fields untreated.

2.4 SFD Graphic

The SFD graphic shows that 47% of the excreta is unsafely managed and 53% is safely managed (Figure 4).

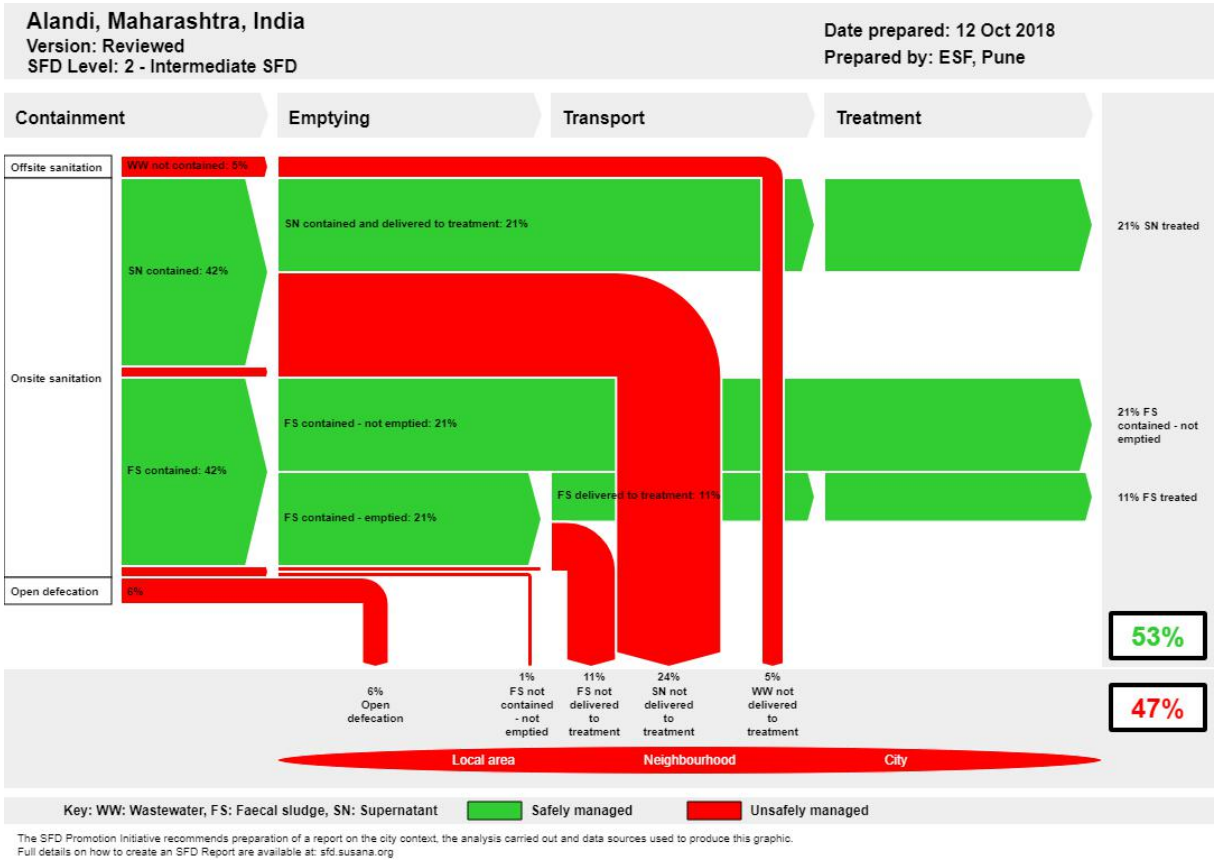

Figure 5: SFD Graphic

It is tough to determine the actual percentage of effluent (supernatant, SN) and septage generated from tanks, hence to reduce the maximum error, it was assumed that FS from tanks is 50%. Out of the excreta generated from onsite systems, 44% is FS and 45% is SN. The 45% of SN is composed of: SN contained, transported to treatment and treated (21%) and SN not delivered to treatment and dumped untreated into the Indrayani River (24%). Moreover, all WW is not delivered to treatment nor treated (5%).

The total FS contained is 42%, out of which only 50% is emptied. The FS not emptied (21%) is considered as safely managed. Out of the FS which is emptied (21%), 50% is delivered to the treatment plant, resulting in a total of 11% of FS treated in PCMC treatment plant. The other 50% is dumped unsafely managed in the environment in agricultural fields.

3 Service delivery context description/analysis

3.1 Policy, legislation and regulation

3.1.1 *Policies, legislations and regulations at national level*

In 2008, the Ministry of Urban Development (MOUD) issued the National Urban Sanitation Policy (NUSP). The policy aims to: raise awareness; promote behaviour change; achieve open defecation free cities; develop citywide sanitation plans; and provide 100% safe confinement, transport, treatment and disposal of human excreta and liquid wastes. The NUSP mandates states to develop state urban sanitation strategies and work with cities to develop City Sanitation Plans (CSPs). NUSP specifically highlights the importance of safe and hygienic facilities with proper disposal and treatment of sludge from on-site installations (septic tanks, pit latrines, etc.) and proper operation and maintenance (O&M) of all sanitary facilities. Furthermore, it explicitly states that cities and states must issue policies and technical solutions that address onsite sanitation, including the safe confinement of faecal sludge (USAID, 2010). The objectives of NUSP are to be realized through CSPs and state sanitation strategies. As of now there are very few cities that, have finalized their CSPs, and those plans that have be developed have not been implemented. This remains a major drawback in the implementation of the NUSP.

The advisory note on septage management in urban India, issued by MOUD in 2013, recommends supplementing CSPs with a Septage Management Sub-Plan (SMP), prepared and implemented by cities. Septage here broadly refers to not only FS removed from septic tanks but also that removed from pit latrines and similar on-site systems. This advisory provides reference to Central Public Health & Environmental Engineering Organisation (CPHEEO) guidelines, Bureau of Indian Standard (BIS) standards, and other resources that users of this advisory may refer, for details while preparing their SMP (MoUD, 2013a). The advisory clearly discusses the techno- managerial and socio- economic aspects of septage management in India and provides guidelines for Urban Local Bodies (ULBs) to plan and implement SMP.

There are no specific legal provisions relating to septage management, but there is a number of provisions relating to sanitation services and environmental regulations. These mostly stem from, The Environment (Protection) Act, 1986 and the Water (Prevention and Control of Pollution) Act, 1974. It also applies to households and cities with regard to disposing wastes into the environment. ULBs/ utilities also have to comply with discharge norms for effluent released from sewage treatment plants and to pay water cess under the Water Cess Act, 1977. The ULB is responsible for ensuring the safe handling and disposal of septage generated within its boundaries, for complying with the Water Act and for meeting all state permit requirements and regulations (CSE, 2010). Municipal acts and regulations usually refer to management of solid and liquid wastes but may not provide detailed rules for septage management (MoUD, 2013a).

The *Prohibition of Employment as Manual Scavengers and their Rehabilitation Act* is enacted in 2013. This act prohibits employment of manual scavengers and insanitary latrines – Laying strong emphasis on rehabilitation of manual scavengers. This act has become instrumental in eradicating manual scavenging in India.

3.1.2 *Policies, legislations and regulations at state level and ULB level*

According to Constitution of India, water and sanitation is a state subject. Statutory powers are conferred to the state for making laws on water and sanitation. There is no specific state sanitation policy for Maharashtra, but the state follows the approach advocated in the NUSP. Maharashtra adopted the guiding principles of NUSP in its Sujal Nirmal Abhiyan (SNA), vision statement for the urban water supply and sanitation sector. SNA prescribes certain measures, mainly addressing community/public latrines, but falls short of addressing the entire FSM chain (PAS, 2013).

In May 2008, water supply and sanitation department (WSSD) of Maharashtra issued a Government Resolution (GR) which has guidelines for constructing toilets. The GR stated that every city should follow standards prescribed by the National Building Code, 2005. The Urban Development Department, GoM, issued a GR encouraging cities to develop plans to recycle and reuse at least 20 percent of waste water generated (PAS, 2013).

Each Municipal council is entitled to make its own by-laws for various aspects of city governance, and Building By-Laws is one of them. The state has provided Model Building By-Laws to guide ULBs to develop their own laws. Model By-Law describes septic tanks as the most common method of collecting faecal matter and also sullage (if no drains are available) and it has to be designed according to Indian Standards code. It also provides the details of septic tank design and construction (PAS, 2013).

Toilets, bathrooms and kitchens are part of a building and are governed by Building By-Laws. The regulatory guidelines and process is well laid out in the Municipal Acts. As per *Maharashtra Municipal Councils, Nagar Panchayats and Industrial Townships Act, 1965*, the Municipal Corporation/Council is responsible for issuing permits for construction of new buildings and/or repairs/renovation of old buildings (PAS, 2013).

According to the Act, a person intending to construct a building should submit a plan with information on drain pipes, privies, water closets, cesspools, etc. along with house plan. The chief officer, after due inspection grants permission for construction. The owner/occupier of a building can be fined if he is causing nuisance by discharging any wastewater, cesspool water etc. into open drains/streets/open plots. The development control rules of many cities mandate that effluent from septic tanks should be properly treated before disposing into open drains or water body (GoM, 1965).

The chief officer is responsible for fixing the timings and planning routes for removal and transportation of septage. The emptier can be fined if improper vehicle is used for emptying, disposing septage in water body or anywhere which causes nuisance. However, the act lacks specifications for vehicles, approval mechanisms of licenses to emptier (GoM, 1965).

3.1.3 *Institutional roles*

The MoUD is the nodal Ministry for policy formulation and guidance for the urban water supply and sewerage sector. The Ministry's responsibilities include broad policy formulation, institutional and legal frameworks, setting standards and norms, monitoring, promotion of new strategies, coordination and support to State Programmes through institutional expertise and finance. The Ministry is also responsible for managing international sources of finance.

The Central Public Health and Environmental Engineering Organization (CPHEEO), created in 1953, is the technical wing of the MoUD, which advises the Ministry in all technical matters and collaborates with the State Agencies about water supply and sanitation activities. CPHEEO plays a critical role in externally funded and special programmes. CPHEEO also plays a central role in setting design standards and norms for urban water supply and sanitation (Planning Commission, 2002).

The 74th Constitutional Amendment Act of 1992 reformed the sector by transferring responsibility for domestic, industrial, and commercial water supply and sewerage (WSS) from state agencies, such as Departments of Public Health Engineering and State Water Boards, to Urban Local Bodies (ULBs). This transfer has resulted in a variety of implementation models, as well as lack of clarity in allocation of roles and responsibilities between state and local agencies, which sometimes leave large gaps in implementation (USAID, 2010).

Management and delivery of urban basic services in Maharashtra is governed by various institutions. The following are the institutions responsible for policy making, service provision and regulation of urban services.

1. Urban Development Department (UDD)
2. Water supply and sanitation Department (WSSD)
3. Maharashtra Jeevan Pradhikaran (MJP)
4. Maharashtra Pollution Control Board (MPCB)
5. Maharashtra Town Planning and Valuation Department (MTPVD)
6. Maharashtra Housing and Area Development Authority (MHADA)
7. Pune Municipal Corporation
8. Alandi Municipal Council (AMC)

The following Table 7 provides roles and responsibilities of various institutions:

Table 7: Institutional roles and responsibilities

Institution	Roles and responsibilities
Urban Development Department (UDD)	Allocation of budget, regular monitoring and functioning of ULBs. Approval of municipal budgets, funding of CSPs and other proposals.
Water supply and sanitation Department (WSSD)	Preparation of state urban sanitation strategies, policy, guidelines, schemes.
Maharashtra Jeevan Pradhikaran (MJP)	Key financing vehicle. Plans and constructs urban Infrastructure. However, it is not involved in management of onsite sanitation systems.
Maharashtra Pollution Control Board (MPCB)	Advises state on pollution related standards and policies. Monitoring of treatment plants. Key regulator for pollution related issues.
Maharashtra Town Planning and Valuation Department (MTPVD)	Development of regional and city development plans.
Maharashtra Housing and Area Development Authority (MHADA)	Implements low cost housing projects, slum improvement projects.
Pune Municipal Corporation (PMC)	Reporting and auditing Municipal Councils under Pune division.
Alandi Municipal Council (AMC)	Planning, designing, implementation, operation and maintenance (O&M) of urban infrastructure. Development control. Overall management of the civic services in the city. Responsible for septage emptying, transportation and disposal.

Several institutions are involved in management of sanitation activities with varying roles. While most of the state level institutions are responsible for policy setting, oversight and monitoring, PMC and AMC are responsible for actual implementation.

3.1.4 *Service provision*

Institutional arrangements for water supply and sanitation in Indian cities vary greatly. Typically, a state-level agency is in charge of planning and investment, while the local government (Urban Local Bodies) is in charge of operation and maintenance (NIUA, 2005). Some of the larger cities have developed municipal water and sanitation utilities that are legally and financially separated from the local government. However, these utilities remain weak in terms of financial capacity. In spite of decentralization, ULBs remain dependent on capital subsidies from state governments. Tariffs are also set by state governments, which often subsidise operating costs (Planning Commission, 2002a).

Public health and sanitation services are delivered by AMC through the health department of the Council. Septage management is also the responsibility of the same department of AMC. The department is headed by medical officer of health and is supported by one Sanitary Inspectors and subordinate staff consisting of 2 drivers and 15 sanitary workers (AMC, 2018).

3.1.5 *Service standards*

1. Service Level Benchmarks (SLB), 2008: Issued by the Ministry of Urban Development in 2008, It seeks to (i) identify a minimum set of standard performance parameters for the water and sanitation sector that are commonly understood and used by all stakeholders across the country; (ii) define a common minimum framework for monitoring and reporting on these indicators and (iii) set out guidelines on how to operationalize this framework in a phased manner. SLB refers to improving service through better provision and delivery. It evaluates the performance of ULBs in providing urban services.
2. General Standards for Discharge of Environmental Pollutants Part-A: Effluents-The Environment (Protection) Rules, 1986 (Schedule VI): Issued by Central Pollution Control Board (CPCB), a statutory organisation constituted in September, 1974 under the Water (Prevention and Control of Pollution) Act, 1974.
3. Manual on Sewerage & Sewage Treatment, Second Edition, 2013: This manual has been developed by Central Public Health and Environmental Engineering Organization (CPHEEO). It provides detailed design and guidelines for various technologies of wastewater management.
4. Code of Practice for Installation of Septic Tanks, 1985: Issued by Bureau of Indian standards. It is a national standard setting body of India. The code specifies standards and design consideration for installation of septic tanks.

4 Stakeholder Engagement

a) Household survey and Community consultation:

To know the actual sanitation situation of the city with respect to toilets and sewerage management, a Household survey has been done on sample basis. 10% population i.e. 742 HHs are covered in all the wards (17 wards). It reveals that almost all the houses are using the Treated/Filtered water. The families have to spend on average Rs.6,000 to 8,000 (USD 84 - 112) per year for the potable water. 68% of families are said that the water supplied to them is insufficient. By considering this, it has been noted that due to heavy contamination of water people are using fully functioning water treatment plant and bringing potable water from that plant. Out of 742 HHs, only 3.5% are using community toilets and rest of HHs i.e. 96.5% are having individual toilets.

Figure 6: Household survey

Figure 7: Water sample collection

The water samples are taken from three different places. It was found that the *E-coli* is present and water needs to be treated since it is not suitable for the potable purpose.

4.1 Key informant interviews

The relevant departments were contacted through e-mail, letter, call. The purpose of the SFD study and depth of data required was conveyed through introductory letter to respective departments. Overall, 6 KIIs were conducted with different stakeholders like government functionaries, private emptiers etc. Limited documents were available on web, hence the visit to city also helped in collecting data, including unpublished reports. The KIIs and data collected helped in understanding the existing situation and upcoming development plans in the sanitation sector. Due to limitation of desk-based study, all the key stakeholders engaged in sanitation services could not be interviewed in person. Also the individual household survey gave the verification of the data.

Single Interviews were conducted with the following persons:

- Mr. Sameer Bhumkar, CO, AMC
- Mrs.Shital Jadhav, health officer, AMC
- Mr. Vilas S, AMC
- Mr. Anup Gaikwad, Engineer, AMC
- Mr. Mahesh Rupanwar, Sanitary inspector, AMC
- Mr. Nanikar,Private Desluding contractor

The SFD is based on the data collected through HH surveys and reports given by AMC. Validation and update of the information were done through the KIIs.

5 Acknowledgements

This SFD is dedicated to citizen of Alandi. We would like to take this opportunity to thank Mr. Sameer Bhumkar, Chief Officer, AMC, Mr. Anup Gaikwad, Engineer, Water supply and drainage department, AMC, Mrs. Shital Jadav, Engineer, Health Department AMC for their support during our visits to Alandi and also for providing the reports regarding for our references. A special thanks to Dr. Dayanand Panse, Director Ecosan Services Foundation for his guidance at every step of assessment and reporting.

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7 Appendix

7.1 Stakeholder identification

Table 8: Stakeholder identification

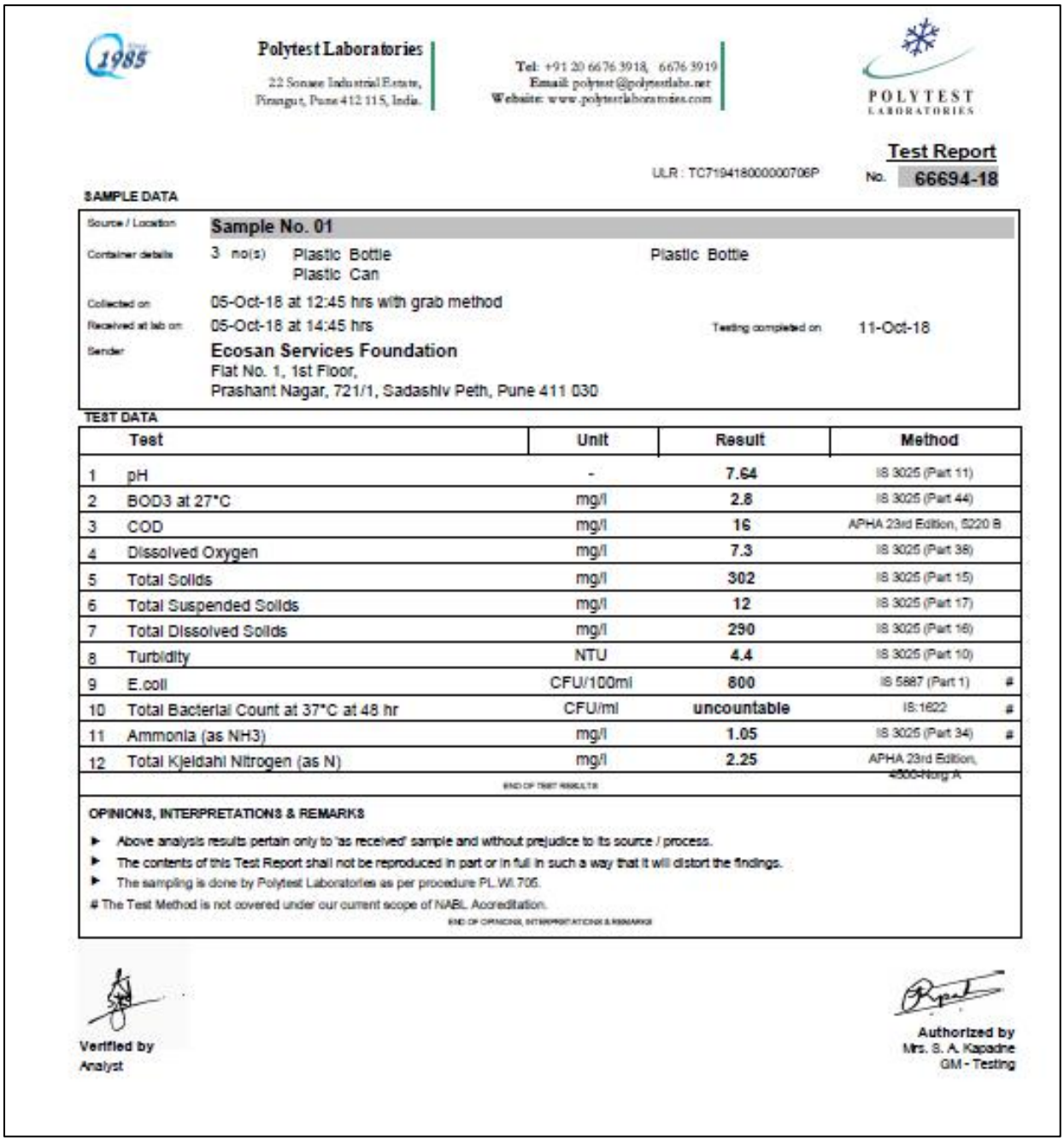
No.	Stakeholder group	In Alandi context
1	City council / Municipal authority / Utility	Alandi Municipal Council
2	Ministry in charge of urban sanitation and sewerage	Urban Development Department, GoM
3	Ministry in charge of urban solid waste	Urban Development Department, GoM
4	Ministries in charge of urban planning finance and economic development.	Urban Development Department, GoM
	Ministries in charge of environmental protection/	Directorate of Environment, GoM
	Ministries in charge of health	Public Health Department, GoM
5	Service provider for construction of onsite sanitation technologies	Local masons
6	Service provider for emptying and transport of faecal sludge	Alandi Municipal Council
7	Service provider for operation and maintenance of treatment infrastructure	NA
8	Market participants practising end-use of faecal sludge end products	NA
9	Service provider for disposal of faecal sludge	Alandi Municipal Council
10	External agencies associated with FSM services:	Private emptiers

7.2 Tracking of engagement

Table 9: Tracking of engagement

Name of organisation	Name of the contact person	Designation	Date of engagement	Purpose of engagement
Alandi Municipal Council	Mr. Sameer Bhumkar	Chief officer	17.07.18 & 28.09.18	Data collection KII
Alandi Municipal Council	Mrs.Shital Jadhav	Health officer	23.07.18	KII
Alandi Municipal Council	Mr. Anup Gaikwad	Deputy Engineer (Water and sewerage)	14.09.18	KII & Data collection
Alandi Municipal Council	Mr. Mahesh Rupanwar	Sanitary inspector	5.10.18	KII
Alandi Municipal Council	Mr. Vikas S	Sanitary worker	28.09.18	KII
No name	Mr. Nanikar	Private emptier	5.10.18	KII & data collection

7.3 Water samples report:



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Website: www.polyestlaboratories.com

POLYTEST LABORATORIES

Test Report

ULR : TC719418000000706P

No. **66694-18**

SAMPLE DATA

Source / Location	**Sample No. 01**
Container details	3 no(s) Plastic Bottle, Plastic Bottle, Plastic Can
Collected on	05-Oct-18 at 12:45 hrs with grab method
Received at lab on	05-Oct-18 at 14:45 hrs
Testing completed on	11-Oct-18
Sender	**Ecosan Services Foundation** Flat No. 1, 1st Floor, Prashant Nagar, 721/1, Sadashiv Peth, Pune 411 030

TEST DATA

	Test	Unit	Result	Method	
1	pH	-	7.64	IS 3025 (Part 11)	
2	BOD3 at 27°C	mg/l	2.8	IS 3025 (Part 44)	
3	COD	mg/l	16	APHA 23rd Edition, 5220 B	
4	Dissolved Oxygen	mg/l	7.3	IS 3025 (Part 38)	
5	Total Solids	mg/l	302	IS 3025 (Part 15)	
6	Total Suspended Solids	mg/l	12	IS 3025 (Part 17)	
7	Total Dissolved Solids	mg/l	290	IS 3025 (Part 16)	
8	Turbidity	NTU	4.4	IS 3025 (Part 10)	
9	E.coli	CFU/100ml	800	IS 5887 (Part 1)	#
10	Total Bacterial Count at 37°C at 48 hr	CFU/ml	uncountable	IS:1622	#
11	Ammonia (as NH3)	mg/l	1.05	IS 3025 (Part 34)	#
12	Total Kjeldahl Nitrogen (as N)	mg/l	2.25	APHA 23rd Edition, 4500-Norg A	

END OF TEST RESULTS

OPINIONS, INTERPRETATIONS & REMARKS

- Above analysis results pertain only to 'as received' sample and without prejudice to its source / process.
- The contents of this Test Report shall not be reproduced in part or in full in such a way that it will distort the findings.
- The sampling is done by Polytest Laboratories as per procedure PL.WI.706.

The Test Method is not covered under our current scope of NABL Accreditation.

END OF OPINIONS, INTERPRETATIONS & REMARKS

Verified by
Analyst

Authorized by
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POLYTEST LABORATORIES

Test Report

ULR : TC719418000000707P

No. **66695-18**

SAMPLE DATA

Source / Location	**Sample No. 02**		
Container details	3 no(s) Plastic Bottle Plastic Can	Plastic Bottle	
Collected on	05-Oct-18 at 11:45 hrs with grab method		
Received at lab on	05-Oct-18 at 14:45 hrs	Testing completed on	11-Oct-18
Sender	**Ecosan Services Foundation** Flat No. 1, 1st Floor, Prashant Nagar, 721/1, Sadashiv Peth, Pune 411 030		

TEST DATA

	Test	Unit	Result	Method	
1	pH	-	**7.77**	IS 3025 (Part 11)	
2	BOD3 at 27°C	mg/l	**3.8**	IS 3025 (Part 44)	
3	COD	mg/l	**20**	APHA 23rd Edition, 5220 B	
4	Dissolved Oxygen	mg/l	**7.8**	IS 3025 (Part 38)	
5	Total Solids	mg/l	**336**	IS 3025 (Part 15)	
6	Total Suspended Solids	mg/l	**16**	IS 3025 (Part 17)	
7	Total Dissolved Solids	mg/l	**320**	IS 3025 (Part 16)	
8	Turbidity	NTU	**6.6**	IS 3025 (Part 10)	
9	E.coli	CFU/100ml	**uncountable**	IS 5887 (Part 1)	#
10	Total Bacterial Count at 37°C at 48 hr	CFU/ml	**uncountable**	IS:1622	#
11	Ammonia (as NH3)	mg/l	**1.27**	IS 3025 (Part 34)	#
12	Total Kjeldahl Nitrogen (as N)	mg/l	**2.81**	APHA 23rd Edition, 4500-Norg A	

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POLYTEST LABORATORIES

Test Report

ULR : TC710418000000708P

No. 66696-18

SAMPLE DATA

Source / Location	**Sample No. 03**
Container details	3 no(s) Plastic Bottle Plastic Can Plastic Bottle
Collected on	05-Oct-18 at 13:50 hrs with grab method
Received at lab on	05-Oct-18 at 14:45 hrs
Testing completed on	11-Oct-18
Sender	**Ecosan Services Foundation** Flat No. 1, 1st Floor, Prashant Nagar, 721/1, Sadashiv Peth, Pune 411 030

TEST DATA

	Test	Unit	Result	Method	
1	pH	-	7.52	IS 3025 (Part 11)	
2	BOD3 at 27°C	mg/l	3.2	IS 3025 (Part 44)	
3	COD	mg/l	16	APHA 23rd Edition, 5220 B	
4	Dissolved Oxygen	mg/l	8.2	IS 3025 (Part 38)	
5	Total Solids	mg/l	322	IS 3025 (Part 15)	
6	Total Suspended Solids	mg/l	12	IS 3025 (Part 17)	
7	Total Dissolved Solids	mg/l	310	IS 3025 (Part 16)	
8	Turbidity	NTU	5.3	IS 3025 (Part 10)	
9	E.coli	CFU/100ml	uncountable	IS 5887 (Part 1)	#
10	Total Bacterial Count at 37°C at 48 hr	CFU/ml	uncountable	IS:1622	#
11	Ammonia (as NH3)	mg/l	0.68	IS 3025 (Part 34)	#
12	Total Kjeldahl Nitrogen (as N)	mg/l	1.69	APHA 23rd Edition, 4500-Norg A	

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The Test Method is not covered under our current scope of NABL Accreditation.

END OF OPINIONS, INTERPRETATIONS & REMARKS

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Analyst

Authorized by
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GM - Testing