SFD Report

Kalpetta
India

Final Report

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SFD Report Kalpetta, India, 2017

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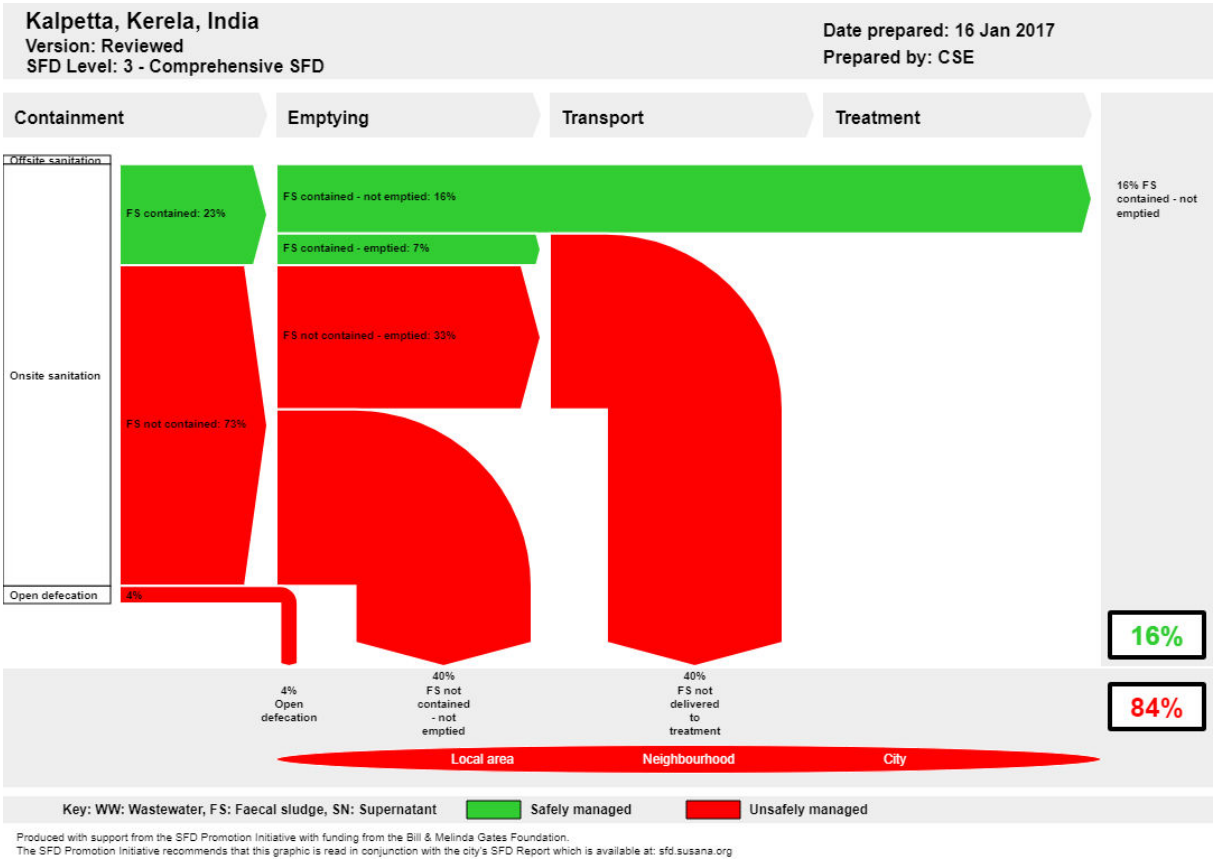
1. The SFD Graphic



Produced with support from the SFD Promotion Initiative with funding from the Bill & Melinda Gates Foundation.
The SFD Promotion Initiative recommends that this graphic is read in conjunction with the city's SFD Report which is available at: sfd.susana.org

2. Diagram information

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3. General city information

Kalpetta is a town and a municipality in the Wayanad district, of Kerala, India. It is the headquarters of Wayanad district as well as the headquarters of Vythiritaluk. It is a bustling town surrounded by dense coffee, tea plantations and hills (KM, 2015).

Apart from being the administrative capital of the district, Kalpetta is also the centre of tourism, as it is currently located within the two districts and due to its proximity to most visited tourist sites (WTO, 2017).

The population of the city, as per the Census of India 2011 is 31,580. The population density of the city is 780 habitants per sq.km. which is low compared to other towns in the state. The area under Municipality of Kalpetta jurisdiction is 40.47sq.km which is divided in 28 municipal wards (KM, 2015).

There are 56 urban poor colonies out of which 28 are notified. These are scattered along the outer periphery of the municipality and comprises of 1,131 households. Approximately, 34% of the area under municipality is tribal (KM, 2016).

During hot weather, the temperature goes up to 29°C and the minimum temperature is 19°C. The average rain fall in the district is 2,322 mm.

4. Service outcomes

Overview on technologies and methods used for different sanitation systems through the sanitation service chain is as follows:

Containment: There is no household connected to functional underground drainage system. Most of the households in the city (60%) are dependent on three chambered septic tanks connected to soak pits. Whereas the rest (36%) are dependent on pit latrines constructed with concrete rings or granite stones with open bottoms. Sizes of containment systems depend on space availability and affordability of the households. The septic tanks are constructed according to the Kerala Municipal Building Rules (KMBR) 1999. About 4% of population defecates in the open. It is mostly practised tribal areas and near riparian of River Moniyangod. There are three public toilets catering tourists, visiting the city, and seven community toilets catering the local residents deprived of individual toilets (KM, 2016).

Figure 1: Two chambered septic tank connected to soak pit of a household

Emptying: The Urban Local Body (ULB) or the local government does not provide emptying services. Hence the entire city is dependent on private emptiers stationed about 100 km away from the town. The emptiers advertise their contact number in local newspapers on alternate days. In order to avail the emptying service, the citizens contact emptiers through phone call. The capacity of the vacuum tanker is typically 5,000 litres and the emptying duration is dependent on the size and type of containment. Emptying fee charged is INR 6,000 – INR 10,000 (90 USD – 150 USD) per containment. Desludging being an expensive affair is not preferred often, especially with the households dependent on pit latrines. It is observed that when pit gets full, it is covered with soil, closed permanently and abandoned. HHs prefer to construct another pit within the premises of the household, which costs less as compared to cost incurred on emptying services. This case is mostly prevalent in hilly areas of the town.

Some places where the lanes are quiet narrow and movement of emptying vehicles is not possible, people opt for manual scavengers for emptying. Usually, two people are hired for the purpose and are paid Rs.10,000 (150 USD).

Emptying operation is carried out at night as this keeps the emptiers away from police and local people who get offended and troubled by the emptying business.

Transportation: There is no household connected to functional underground drainage system. The houses having septic tanks are connected to soak pit and others are dependent on pit latrines. Thus, no wastewater is discharged in drains. Moreover, there is a general practice in the city to construct a separate pit within the premises for the disposal of grey water. As a result, there is no discharge of black or grey water in drains (KM, 2016). Sample household survey revealed that some of the households on the riverside discharge their grey water in the stream called Moniyangod River, which emerges from the hills and flows through the city. Faecal sludge (FS) is collected from different parts of the city, by the privately operated vacuum tankers and disposed at the nearest big drain or open low-lying area outside the city (Private Emptiers, 2016).

End-use/Disposal: There is no treatment facility for septage and FS generated in the city. The FS collected by the vacuum tankers is disposed at open low-lying areas outside the city. Discharging of FS is a huge issue as there is no designated place for disposal of FS. The private emptiers often bribe the local police for allowing discharge of FS at non-confirming spaces (Private Emptiers, 2016). To get rid of carrying FS to another site after emptying, the manual scavengers dig a pit near the emptying site and discharge FS in it. These pits are then covered with mud and soil.

96% of the city is dependent on onsite sanitation systems (OSS), of which 60% are dependent on septic tanks connected to soak pits and around 36% on pits. Public latrines are considered to be connected to septic tanks hence have been incorporated in onsite systems (KM, 2016). Septic tanks are connected to soak pits but still these are considered as ‘not contained’. It is because, despite the supply of drinking water, residents consume groundwater from their open wells in their premises. These wells are about 30 feet deep. Whereas, pits in the hilly area are considered as ‘contained systems’, as the residents in hilly areas are dependent on streams of water from hill tops rather than groundwater.

There is no clear differentiation between the volume of effluent and solid FS generated from septic tanks and pits, hence to reduce the maximum error; it is assumed to be 50% each. Therefore, 49% of FS is assumed to be effluent that is not contained, and includes infiltration of water as well. Rest of the FS is emptied from

tanks whenever full. According to Census 2011, 4% of the population still practices open defecation, which was found true based on field research.

5. Service delivery context

National Urban Sanitation Policy (NUSP) was issued in 2008, by the Ministry of Housing and Urban Affairs (MoHUA, GoI). 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 identifies the constitution of multi-stakeholder task force, known as city sanitation taskforce (CSTF) as one of the principal activities to be taken up to start the city sanitation planning process. CSTF has now been renamed as Swachh Bharat City Level Task Force (SBCLTF) (MoUD, 2014)

The Environment (Protection) Act, 1986 and the Water (Prevention and Control of Pollution) Act, 1974 have provisions relating to sanitation services and environmental regulations. It 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 (MoUD, 2013).

In February 2017, MoHUA issued the National Policy on Faecal Sludge and Septage Management (FSSM). The policy aims to set the context, priorities, and direction for, and to facilitate, nationwide implementation of FSSM services in all ULBs such that safe and sustainable sanitation becomes a reality for all in each and every household, street, town and city in India (MoUD, 2017).

There are various schemes launched by central government to provide basic civic amenities including improvement of urban sanitation. Under Swachh Bharat Mission (SBM). Construction of 22 community toilets is in progress, of which four have already been completed. Kerala Industrial and Technical Consultancy Organisation (KITCO) has recently submitted a Detailed Project Report (DPR) to the State government for laying of sewerage network in the city (including 10 km sewer line, sewage pumping station and sewage treatment plant (KM, 2016).

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 the allocation of roles and responsibilities between state and local agencies, which sometimes result in large gaps in implementation (USAID, 2010).

Key stakeholders	Institutions / Organizations
Public institutions	Minsitry of Housing and Urban Affairs (MoHUA), Kerala Water Authority (KWA), Local Self Government Department (LSGD), Kerala State Pollution Control Board (KSPCB), Town and Country Planning Organisation (TCPO), Urban Poverty Alleviation Department (UPAD), and Kalpetta Municipality (KM), Kerela State Planning Board (KSPB)
NGOs	Suchitwa Mission, Centre for Science and Environment
Private sector	Private emptiers, local masons and manual emptiers

Table 1: Key stakeholders (Source: compiled by CSE, 2016)

KWA is responsible for planning, designing and construction/development of the assets in sewerage and drainage sector, while KM is responsible for operation and maintenance of assets (MoUD, 2013). LSGD is responsible for administrative and financial management of municipalities, the implementation of central and state government's schemes and development programmes. KSPCB is responsible for monitoring and evaluation of STPs. KM is also responsible for septage management in the town.

7. Credibility of data

Two key sources of data are used; Census of India, 2011 and published documents of relevant departments. Most of the data are then updated by KIIs and FGDs. Overall Six KIIs and three FGDs have been conducted with different stakeholders.

There were three major challenges faced during the development of the SFD. Census of India and published/unpublished reports were not able to provide (i) up-to-date on containment (ii) detailed typology of containment and (iii) actual information about FSM services provided in households.

The Census mostly differentiates between systems connected to the user interface, if any, but does not give information about the design of actual containment systems on ground level or

about the disposal of septage and wastewater generated. Therefore, a sample household survey was conducted in each ward of the city to identify and cross-check the data collected from secondary sources.

The objective of the random survey conducted was to obtain a more accurate measure of how excreta are managed through stages of sanitation service chain (from containment to end-use or disposal).

8 Process of SFD development

Data are collected through secondary sources. The city is visited to conduct the surveys, Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) with relevant stakeholders, to fill in the data gap and to cross-check the data collected.

To start with, a relationship between sanitation technologies defined in Census of India and that defined in the project is established. The survey data are quantified and crosschecked with FGDs and KIIs.

The data is fed into the SFD graphic generator to calculate the excreta flow in terms of percentage of the population and also to produce the SFD graphic.

Overall, excreta of 16% population is managed and the rest of the 84% is unsafely discharged into the environment.

9. List of data sources

Below is the list of data sources used for the development of SFD.

- Published reports and books:
  - Census of India 2011, House listing and housing data, Government of India
  - Master Plan of Kalpetta, 2035
  - City Sanitation Plan (final draft)
- KIIs with representatives from
  - Kalpetta Municipality
  - Kerala Water Authority
  - Kerela State Planning Board
  - Public toilet in charge
  - Slum dwellers
  - Private emptiers
- FGDs
  - Kalpetta Municipality staff
  - Slum dwellers
  - Market shopkeepers
- Random sample household survey

Kalpetta, India, 2017

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Abbreviations

BIS	Bureau of Indian Standard
CGWB	Central Ground Water Board
CPHEEO	Central Public Health & Environmental Engineering Organization
CPCB	Central Pollution Control Board
CSE	Centre for Science and Environment
CSP	City Sanitation Plan
CSTF	City Sanitation Task Force
EWS	Economically Weaker Sections
FGD	Focus Group Discussion
FSM	Faecal Sludge Management
GoI	Government of India
IHSDP	Integrated Housing and Slum Development Programme
INR	Indian Rupee (USD = 65.3 INR)
ITC	Industrial Training Centre
ITI	Industrial Training Institute
KII	Key Informant Interview
KINFRA	Kerala Industrial Infrastructure Development Corporation
KITCO	Kerala Industrial and Technical Consultancy Organisation
Km	Kilometre
KMBR	Kerala Municipal Building Rules
KSPCB	Kerala State Pollution Control Board
LPCD	Litres per Capita per Day
MoUD	Ministry of Urban Development
MSL	Mean Sea Level
NH	National Highway
NIUA	National Institute of Urban Affairs
NIC	National Informatics Centre
OD	Open Defecation
OSS	Onsite Sanitation System
PMAY	Pradhan Mantri Awas Yojna
SBCLTF	Swachh Bharat City Level Task Force
SFD	Shit Flow Diagram
SLB	Service Level Benchmarks
SN	Supernatant
Sq.km	Square Kilometer
STP	Sewage Treatment Plant
SWM	Solid Waste Management
UIDSSMT	Urban Infrastructure Development for Small and Medium Towns
ULB	Urban Local Body
USAID	United States Agency for International Department
UWSS	Urban Water Supply and Sanitation
VHSS	Vocational Higher Secondary School
WW	Wastewater

1 City context

Kalpetta is a town and a municipality in the Wayanad district, of Kerala. Kalpetta is the headquarters of Wayanad district. It is a bustling town surrounded by dense coffee, tea plantations and hills. It lies on the Kozhikode-Mysore National Highway (NH) 766, 72 km from Kozhikode (the largest urban area in the state) and 360 km from the state capital Thiruvananthapuram (KM, 2015).

Apart from the administrative capital of the district, Kalpetta is also the centre of tourism activities in Wayanad due to its central location within the district and its proximity to most visited tourist sites. Some of them include Mahathma Gandhi museum, Myladippara trekking center, Pookode lake, Meppadi Garden village, Anantnath Swami temple among others (WTO, 2017).

The population of the city, as per the Census of India 2011 is 31,580. The Municipality of Kalpetta jurisdiction covers an area of 40.47 sq.km which is divided in 28 municipal wards. The population density of the city is 780 habitants per sq.km. which is low compared to other towns in the state. There are 56 slum settlements in the municipality area, out of which 28 are notified. The slums are scattered along the outer periphery of the municipality and comprise of 1,131 households (HHs). The population growth rate of the city is given in Table 1.

Table 1: Population growth rate

Census Year	Population	Growth Rate (%)
1981	19,354	-
1991	24,750	28
2001	29,612	20
2011	31,580	7

Source: Census, 2011

Kalpetta, the only municipal town in the district, lies between 76° 30' & 76° 66' East Longitude and 11°34'12" & 11°38'24" North Latitude. The municipality is surrounded by Kottathara Grama Panchayat towards north, Muttil and Meppadi Grama Panchayats towards East, Vythiri Grama Panchayat towards south west and Pozhuthana and Vengappally Grama Panchayats at its West. Major area of Kalpetta Municipality (KM), except some hilly portions fall within mid land region and the ground level varies from 731 m to 1,371 m (KM, 2015).

The city is also blessed with vested forest area of 511 ha which is around 12.63% of the total geographical area of the city. Red loam is the most common soil in this area. These soils are rich in organic carbon and are acidic; rich in Nitrogen and poor in Phosphorous. The economy of the town mainly depends on agricultural activities (KM, 2015).

Due to the high altitude and presence of surrounding forest area, the district has a pleasant climate. The average rain fall in the district is 2,322 mm and the average wind speed is 3-8 km/h. During hot weather the temperature goes up to 29°C and the minimum temperature is 19°C (KM, 2015).

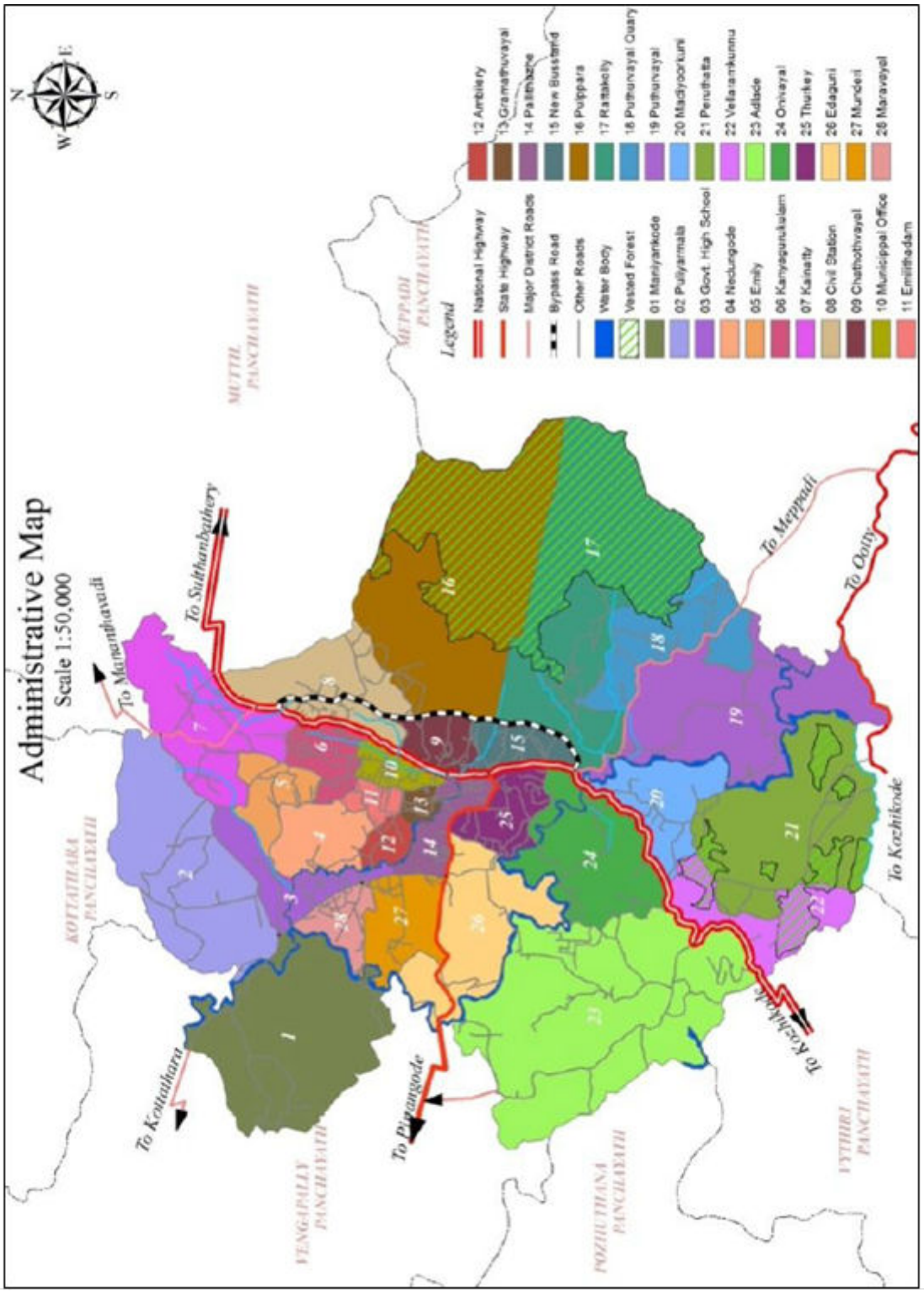

Figure 1: Ward map of Kalpetta city (Source: CSE, 2017)

2 Service outcomes

The analysis is based on data available from published/unpublished reports and sample Household (HH) survey. Data collected from secondary sources are triangulated in the field based study. Data on the containment are available in Census, 2011. Data have been cross-checked and updated by Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs). According to the SFD promotion initiative (PI) definitions of sanitation systems, the types of containments prevalent in the wards are examined through sample HH survey. Data on emptying, transport, treatment and disposal of FS are collected through KIIs with ULB. It is the local governing body of a city responsible for providing basic infrastructures like water supply and sanitation along with health facilities as per standards and norms, to all the citizens. In Kalpetta, the ULB is Kalpetta Municipality.

2.1 Overview

To start with, a relationship between sanitation technologies defined in Census of India and the variables defined in the project is established. Then the population dependent on those systems is represented in terms of percentage of population, as shown in Table 2 below:

Table 2: Sanitation technologies and corresponding percentages of population

S. No.	Sanitation technologies and systems as defined by:		SFD reference variable	Percentage of population
	Census of India	SFD Promotion Initiative		
1	Piped sewer system	User interface discharges directly to a centralized foul/separate sewer.	T1A1C1	10.2
2	Septic tank	Septic tank connected to open drain or storm sewer	T1A2C6	63.2
3	Other Systems	User interface discharges directly to open ground	T1A2C8	1.9
4	Pit latrine with slab	Lined pit with semi-permeable walls and open bottom, no outlet or overflow, general situation	T1A5C10	19.2
5	Pit latrine without slab	Unlined pit no outlet or overflow, general situation	T1A6C10	0.7
6	Night soil disposed into open drain	User interface discharges directly to open drain or storm drain	T1A1C6	0
7	Service latrine	User interface discharges directly to 'don't know where"	T1A1C9	0
8	Public latrine	Septic tank connected to open drain or storm sewer	T1A2C6	1.1
9	Open defecation	Open defecation	T1B11C7 TO C9	3.6

Source: Census of India, 2011

2.1.1 Sanitation facilities

This section presents on existing sanitation facilities in institutions, commercial establishments, residential areas and public places.

Community/public toilets: It is reported that there are three public toilets in the city which have their user interfaces connected to septic tanks, which are further connected to soak pit. The septic tanks do not adhere to the standards prescribed in the Central Public Health and Environmental Engineering Organization (CPHEEO) manual. The septage from these public toilets is emptied every year by the private emptiers and the Faecal Sludge (FS) is disposed of in low-lying areas outside the city. Recently, under Swachh Bharat Mission (SBM), four community toilets have also been constructed and other 18 are under construction. All these community toilets are being constructed for urban poor and have the containment systems same as the public toilets.

School sanitation: There are 17 schools under the jurisdiction of KM. All schools have provided urinals, but there are no female friendly facilities in any of these institutions. Other than schools, there is a govt. college, an Arabic college, four parallel colleges under private ownership, 1 Industrial Training Institute (ITI) and 2 Industrial Training Centres (ITC) (KM, 2015). The toilets in these premises have septic tanks connected to a soak pits.

Commercial areas: The commercial activities are concentrated on both sides of NH 766 passing through the centre of the city. Only 34 hectares (ha.) of land (0.84% of the total area under municipality) is under commercial use (KM, 2015). Each shop in the commercial areas has a toilet with septic tank connected to soak pit. The visitors can either use the public toilets in the area or the toilets inside the shops. Flow of effluent from the containments to open drains is restricted as per Kerala Municipal Building Rules (KMBR). The defaulters are charged a fine of INR 2,500 (38 USD) (KM, 2016).

Industrial areas: Kalpetta houses an industrial park called 'KINFRA-Small industries park', which is located on the Mysore road. It is spread across an area of 20 ha. The types of industries include food processing units, industrial products as well as raw material and furniture. Each industry has toilet facility with a two-chambered septic tank connected to soak pit. The septage from these toilets is emptied by the private emptiers and the waste is disposed of in low-lying area outside the city (KINFRA, 2016).

2.1.2 Containment

The Census of India 2011 reflects 10% of HHs are connected to piped sewer system. However, during the field based study including KII with ULB, it was found that the city does not have any sewer system at present.

Most of the HHs in the city (60%) are dependent on 3 chambered septic tanks connected to soak pits, whereas the rest (36%) are dependent on pit latrines either constructed with concrete rings or granite stones.

The type and size of the containment system prevalent in the city depends on space availability and affordability of the HHs. People living in hilly areas rely on pit latrines with granite stone, as these are cheaper to construct. People residing on plains prefer constructing either septic tank connected to soak pit or pits constructed with concrete rings. The lower income group HHs prefer pit latrines unlike others who prefer septic tanks connected to soak pits due to low cost of construction.

According to the Kerala Municipal Building Rules (KMBR) 1999, it is mandatory to include design of a septic tank connected to a soak pit during approval of layout plan of a house. In

case of not following the norms laid in KMBR, the layout plan will not be approved by the ULB. This is the key reason that almost 60% of HHs have good containment systems (KM, 2016)

Around 4% of the population still practices open defecation. These are mostly practised in the wards occupied by urban poor and the wards in proximity to the River Moniyangod.

Figure 2: A three chambered septic tank connected to soak pit of a HH (Source: Anil/CSE, 2017)

2.1.3 Emptying

Since the ULB does not provide emptying services due to absence of a vacuum tanker, the residents of the city are dependent on private emptiers stationed about 100 km away from the town. The emptiers advertise their contact number in local newspapers on alternate days. In order to avail the emptying service, the citizens contact emptiers through phone call. Emptying operation is done during late at night, as this practice keeps them away from police and local people who may get offended and troubled by the emptying business.

The capacity of the vacuum tanker is typically 5,000 litres. It generally takes about half an hour for emptying one septic tank at a time. Charges for emptying are INR 6,000 – 10,000 (92 USD – 153 USD) per trip (Private Emptiers, 2016).

Emptying being an expensive affair is not preferred often, especially for the HHs dependent on pit latrines. It is observed that when pit gets full, it is covered with soil, closed permanently and abandoned. Generally, another pit is dug within the premises of the HH which costs less as compared to cost incurred for emptying service. This case is mostly prevalent in the hilly areas.

Some places where the lanes are quiet narrow and movement of vacuum tankers is not possible, people opt for manual scavengers for emptying. Usually, two people are hired for the purpose and are paid Rs.10,000 (150 USD) to empty one containment.

2.1.4 Transportation

Most of the HHs dependent on OSS, do not discharge any wastewater in drains. Nevertheless, sample HH survey revealed that some of the HH located on the riverside discharge their grey water in the stream called Moniyangod River, which emerges from the hills and flows through the city.

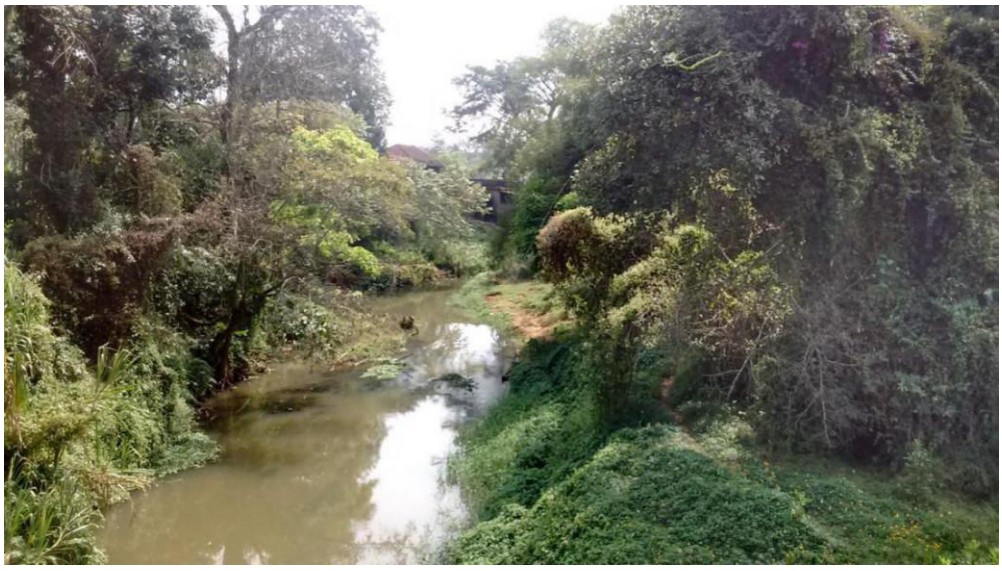

Figure 3: Picture showing a drinking water well and spring water used by residents living in plains and hilly area (Source: Anil/CSE, 2017)

Storm water drains, where ever they exist in city, are clogged due to silt and dumping of solid waste. The length of existing storm water drain managed by PWD and Municipality is 3 km each. A number of hotels and restaurants in town centre have no wastewater treatment facilities and discharge their wastewater to the storm water drains. Storm water drains from the town conveys major portion of the wastewater to the river and pollutes the water bodies. FS collected from different parts of the city is transported by the privately operated vacuum tankers and discharged at the nearest *nullah* or open low-lying area outside the city. These suction machines are usually truck mounted with a capacity of 5,000 litres. A pump of 2 hp is installed on the truck that creates vacuum to suck FS. On an average, each vacuum truck completes 4 – 5 trips per day (Private Emptiers, 2016).

2.1.5 Treatment and disposal

There is no treatment facility for faecal sludge generated in the city. The FS collected by the vacuum tankers is disposed at open low-lying areas outside the city. Discharging of FS is a huge issue as there is no designated place for disposal of FS. The private emptiers often pay bribe to the local police if found dumping FS at non-conforming spaces (Private Emptiers, 2016). To get rid of transporting FS to another site after emptying, the manual scavengers dug a pit near to emptying site and dump FS in it. These pits are then covered with mud and soil.

2.2 SFD Matrix

The SFD matrix is shown in Appendix 7.6 and the final SFD for Kalpetta is presented in appendix 7.3.

2.2.1 SFD matrix explanation

Definition and estimation of different variables (used to make SFD) are explained below in Table 3 and Table 4.

Table 3: Description of variables used for defining containment systems

S. No.	Variables	Description (city context)	Percentage of population
1	T2A2C5	User interface discharging to septic tank connected to soak pit.	60
2	T2A4C10	User interface discharging to lined pit with impermeable walls and open bottom	13
3	T1A5C10	User interface discharging to lined pit with semi-permeable walls and open bottom	16
4	T1B7C10	User interface discharging to pits (all types), never emptied but abandoned when full and covered with soil	7
5	TIB11C7 TO C9	Open defecation	4

Source: CSE, 2016

Table 4: Description of variables used in SFD

System type	Variables	Description (city context)	Percentage of population
Onsite	FS contained	FS from the onsite sanitation technology (T1A5C10 and T1B7C10), in the hilly areas where the population is dependent on natural streams of water and not on groundwater	23
	FS contained – not emptied	FS is not removed from the onsite sanitation technology (T1A5C10 and T1B7C10). In hilly areas, emptying is an expensive affair and thus not preferred. People abandon their pits (T1B7C10), once full and construct new system. The part of the FS from T2A5C10 which is left in the system after emptying also contributes to this parameter	16
	FS contained – emptied	FS is removed from the onsite sanitation technology (T1A5C10) where FS is contained, which is emptied, using either motorized or manual emptying	7
	FS not contained	FS from the onsite sanitation technology (T2A2C5 and T2A4C10) on the plains, where the depth of ground water is low and there is a significant risk of groundwater contamination. Here the population is dependent on ground water	73
	FS not contained – emptied	FS not contained, that is emptied from the onsite sanitation technology (T2A2C5 and T2A4C10), using either motorized or manual method of emptying	33
	FS not delivered to treatment	FS that is dumped in the outskirts of the city and it is either: • Discharged to the environment (to an open drain, to a water body, to open ground); • Is applied to landfill; • Is applied to land (for illegal use without treatment); or • Discharged to 'don't know where'	40
	FS not contained-not emptied	FS from the OSS (T2A2C5 and T2A4C10) which gets infiltrated and the 10% FS which remains in the containment system during the emptying process from the OSS	40
Open defecation	Open defecation	With no user interface, users defecate in water bodies or on open ground or to 'don't know where'	4

Source: (CSE, 2016)

Offsite systems

According to the Census, 10% of the city is dependent on offsite systems, all of which are connected to piped sewer.

However, according to the field observations, Focus Group Discussions (FGDs) conducted with ULB officials and sample HH survey, it was found that there is no household connected to functional underground drainage system.

Onsite sanitation systems

According to the Census, 85% of the city is dependent on OSS. But according to the sample household survey and FGDs, 96% of the city is dependent on OSS, out of which 60% is dependent on septic tanks connected to soak pit and 36% on pit latrines including lined pit with semi permeable walls and open bottom (16%) + lined tank with impermeable walls and open bottom (13%) + pits, never emptied but abandoned when full and covered with soil (7%). Referring to the data from ULB, public latrines in the city are considered to be connected to septic tanks and hence, have been incorporated in onsite systems.

Septic tanks are connected to soak pit but still are 'not contained' as the residents consumes the groundwater from the open wells in their respective premises and the same goes for the pits constructed with concrete rings. Whereas, pits constructed with granite stones and the pits which are usually abandoned when full (regular practice in the hilly areas) have been taken as 'contained', as the people on hilly areas are dependent on natural streams of water rather than groundwater.

Figure 4: Picture showing a drinking water well and spring water used by residents living in plains and hilly area

FS not contained is attributed to 73% of the population who use the systems: septic tank connected to soak pit (60%) and lined tank with impermeable walls and open bottom, no outlet or overflow (13%), both located in areas of high risk of groundwater pollution. These systems are considered as not contained as HHs with these OSS are dependent on ground water available from wells.

FS contained is attributed to 23% of the population who use the systems: lined pit with semi-permeable walls and open bottom, no outlet or overflow (16%) and pits which are never emptied but abandoned when full and covered with soil (7%), both located in areas of low risk of groundwater pollution. These systems are considered as contained as HHs with these OSS are dependent on spring water coming from the hills.

Since there is no clear differentiation between the volume of solid and liquid in the FS not contained systems, 50% is considered as solid FS and 50% is considered as the liquid FS component. It is assumed that 90 % of FS is emptied during the emptying process thereby leaving 10% of FS in the containment system itself.

Out of the 73% FS not contained, 36% is considered as the liquid component (infiltrate) and 37% is the solid FS. Out of the 37% solid FS (not contained), 33% is emptied (90% of 37%) leaving behind 4% FS, which is not emptied. The 36% infiltrate together with the 4% FS which is left behind in the containment system constitute the 40% FS not contained-not emptied.

Based on the above mentioned assumption, 16% of the population's FS is contained-not emptied. This is attributed to 7% of the population dependent on pits which are never emptied but abandoned when full and covered with soil (T1B7C10) + 8% (50% of the 16%, which is FS that remains inside the pits) of the population dependent on lined pit with semi-permeable walls and open bottom, no outlet or overflow (T1A5C10). The graphic shows these system as safely managed due to no risk of ground water pollution in the hilly areas.

Similarly, the FS contained-emptied which is attributed to 7% of the population along with 33% FS not contained-emptied together constitutes 40%, which does not get delivered to the treatment plant and terminates in low lying areas, open ground or water body.

Open defecation
4% of the population still practices open defecation due to non-availability of individual household toilet.

It can be concluded that excreta of 16% of the population are safely managed and that of 84% of the population (40% FS not contained- not emptied + 40% FS not delivered to treatment + 4% open defecation) are unsafely managed.

2.2.2 Risk of groundwater contamination

The SFD assessment includes the risk of groundwater pollution as an important factor in determining whether excreta is contained or not contained.

If the risk of contamination to groundwater is low then FS is considered "contained". The type of onsite sanitation technology in use also has an influence on infiltration of liquid into the groundwater and therefore on the potential risk of groundwater pollution.

Plan for construction of a new house only gets approved by the municipality if it complies with the KMBR 1999, which states that *'No leech pit, soak pit, refuse pit, earth closet or septic tank shall be allowed or made within a distance of 7.5 metres radius from any existing*

well used for supply of water for human consumption or domestic purpose or within 1.20 metres distance from the plot boundaries.'

Although there is a strict adherence to the implementation of the rules, it was decided to characterize all existing sanitation containment systems as having "significant risk" of groundwater pollution, as groundwater table is less than 10 mbgl (CGWB, 2014). But since the HHs in the hilly areas are dependent on natural streams of water rather than on groundwater, the sanitation containments have been considered as posing "low risk" of groundwater pollution.

According to the Census, 63% of the population is dependent on covered/uncovered wells, 30% on piped water supply, 3% on natural springs, 2% on tube well & bore well and the rest on other sources like hand-pumps, ponds, etc.

As per the sample survey, 50% of the respondents are dependent on natural springs, 33% on covered/uncovered wells, 17% on bore wells and 17% also use the piped water supply as a secondary option, which also includes public tap water and households dependent on community based piped water connections. But since the sample size for the survey was very small, the census data are more reliable.

2.2.3 Discussion of certainty/uncertainty levels of associated data

There were three major challenges to develop the SFD. Published/unpublished reports were not able to provide (i) up-to-date data on containment, (ii) detailed typology of containment and (iii) actual information about FSM services provided to households. For this reason, field-based studies were conducted to validate the data provided by secondary sources.

The Census mostly differentiates between systems connected to user interface, if any, but does not give information about the design of actual containment systems on ground level or about the disposal of septage and waste water generated. Therefore, a sample household survey was conducted in each ward of the city to identify and cross-check the data collected from secondary sources.

There is some uncertainty in the data collected through the field survey as well. The data were collected from 9 wards considering 4-5 households per ward. Although a very small sample was considered to represent the whole city, the households surveyed were a good mix of planned and unplanned areas and different socio-economic backgrounds.

The assumption regarding the volume of FS emptied as compared to the FS generated has a high impact on the overall SFD. A reliable method for estimating quantities of FS generated on a citywide scale does not exist, and it is complicated because the containment size and emptying period greatly vary within the city.

The objective of the survey conducted was to obtain a more accurate measure of how excreta are managed through stages of sanitation service chain (from containment to end-use or disposal).

To reduce the uncertainty around the data collected, the draft SFD was prepared based on the analysis done and was shared with the ULB where no objection was raised.

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 Housing and Urban Affairs (MoHUA), formerly known as 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 on-site 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. NUSP identifies the constitution of the multi-stakeholder task force as one of the principal activities to be taken up to start the city sanitation planning process. As per the requirement of CSP, major role is to be played by the members of institutions, organizations, individuals, NGOs, academics, media representatives, local councillors, industry owners, consultants, representatives of private sector, etc. Constitution of Swachh Bharat City Level Task-force (SBCLTF) formerly known as City Sanitation Task-force (CSTF) is facilitated by drawing members from these groups in consensus with citizens who will be constantly supporting the CSP preparation by analysing the strengths and competencies required to overcome the current situation and for better sanitation facilities (MoUD, 2014).

The advisory note on septage management in urban India, issued by MoHUA in 2013, recommends supplementing CSPs with a Septage Management Sub-Plan (SMP) be prepared and implemented by cities. Septage refers here broadly to not only faecal sludge removed from septic tanks but also that removed from pit latrines and similar on-site toilets. This advisory provides references to the 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, 2013). It clearly discusses on techno- managerial and socio-economic aspects of Septage management in India and provides guidelines for ULBs to plan and implement SMPs.

The Environment (Protection) Act, 1986 and the Water (Prevention and Control of Pollution) Act, 1974 have provisions relating to sanitation services and environmental regulations. It 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, 2013).

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. The broad objectives of the act are to eliminate insanitary latrines, prohibit the employment of manual scavengers and the hazardous manual cleaning of sewer and septic tanks, and to maintain a survey of manual scavengers and their rehabilitation (MoSJE, 2014).

In February 2017, MoHUA issued the National Policy on Faecal Sludge and Septage Management (FSSM). The policy aims to set the context, priorities, and direction for, and to facilitate, nationwide implementation of FSSM services in all ULBs such that safe and sustainable sanitation becomes a reality for all in each and every household, street, town and city in India (MoUD, 2017).

The Fourteenth Finance Commission (FC-XIV) was constituted by the President of India under Article 280 of the Constitution on 2 January 2013 to make recommendations for the period 2015-20. Its assignments include distribution of revenue between union and state; devising formula for grant; suggesting method to augment resources for local bodies; and taking care of any matter referred to it (NIUA, 2015).

Model Municipal Building Bye-laws 2016 prepared by Town and Country Planning Organization (TCPO). Building Byelaws 2016 is used to regulate coverage, height, building bulk, and architectural design and construction aspects of buildings so as to achieve orderly development of an area. They are mandatory in nature and serve to protect buildings against fire, earthquake, noise, structural failures and other hazards. It includes chapters on green buildings and sustainability provisions, rainwater harvesting, wastewater (WW) reuse and recycle, installation of solar roof top photo voltaic norms, revised norms for adequate toilet facilities for women and public conveniences in public buildings and mandatory provisions for segregated toilet facilities for visitors in public buildings (TCPO, 2016).

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

According to the Constitution of India, water and sanitation are state subjects. Statutory powers are conferred to the state for making laws on water and sanitation. Some of the policies, laws and regulations are listed below:

The Kerala Water Supply and sewerage Act, 1986
An Act to provide for the establishment of an autonomous authority for the development and regulation of water supply and waste water collection and disposal in the state of Kerala and for matters connected there with.

Draft Health Policy of Kerala, 2013
Its objective is to position good health as the product of development agenda including water supply, nutrition, sanitation, prevention of ecological degradation, respect for citizen's rights and gender sensitivity.

Kerala State Sanitation Strategy (KSSS), 2011
The objectives of the strategy, passed by Government of Kerela (GoK), includes; comprehensive information about the full cycle of sanitation, ensuring the accessibility to sanitation and also to build capacities within ULBs and other line agencies for participatory citywide sanitation. KSSS is a major fillip to guide the municipal authorities to prepare and

operationalize CSP. Strategy emphasizes on promoting proper disposal and treatment of sludge from on-site installations (septic tanks, pit latrines, etc.); It also indicates that ULBs should ensure that all the human wastes are collected safely, confined and disposed of after treatment so as not to cause any hazard to public health or the environment (GoK, 2011).

Draft Kerala State Housing Policy, 2011

Its objectives include following an integrated habitat approach to housing, taking into account issues of spatial planning, including water supply, sanitation and waste disposal. It aims to facilitate all dwelling units with easy accessibility to basic services of sanitation, drinking water, power, waste disposal and social infrastructural facilities and transportation. Its objectives also include slum reconstruction programmes for creating a better environment, which would be based on the basis of audit of slum areas covering health status, education, sanitation, environment, employment status and income generation.

Kerala Municipality Act, 1994

The act governs the structure and management of the notified area councils and municipalities. Provisions for sanitation are listed below.

- A Municipality shall provide and maintain in proper and convenient places a sufficient number of public latrines and shall cause the same to be daily cleansed and kept in proper order.
- The Secretary may, by notice, require the owner or occupier of any building, within the time specified in such notice, to provide a latrine or alter or remove from an unsuitable to a more suitable place any existing latrine in accordance with the directions contained in such notice for the use of the persons employed in or about or occupying such building and to keep it clean and in proper order.
- The Secretary may, by notice require the owner or manager of a market, car stand, cattle shed, poultry, theatre, railway station, dock, wharf or other place of public resort to provide and maintain within the time specified in such notice for the separate use of persons of each sex latrines of such description and number and in such position as may be specified in such notice.

Kerala State Finance Commissions

These are constituted by GoK under clause 1 of Article 243 (I) and (Y) of the Constitution of India read with sections 186 of the Kerala Panchayat Raj Act 1994 and Section 205 of the Kerala Municipalities Act 1994. It aims at studying the financial position of the *panchayats* and the ULBs and to making recommendations to the Governor accordingly.

3.1.3 Institutional roles

The MoHUA 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. CPHEEO, created in 1953, is the technical wing of the MoHUA, which advises the ministry on 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 norm setting 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 ULBs. This transfer has resulted in a variety of implementation models, as well as a lack of clarity in roles and responsibilities of state and local agencies, resulting in large gaps in implementation (USAID, 2010). Management and delivery of urban basic services in Kalpetta is governed by various institutions.

Table 5 presents the institutions responsible for policy making, service provision and regulation of urban services.

Table 5: Roles and responsibilities

Institutions	Roles and responsibilities
Town and Country Planning Department (TCPD)	TCPD is the prime agency for providing technical inputs for the planned development of urban settlements. The TCPD: • Prepares Master Plans for the State's cities and towns • Prepares detailed development plans • Provides guidance to local bodies and development authorities on plan implementation • prepares area development plans for controlled areas • Advises various State level agencies on planning, site selection, and preparation of development schemes
Kerala Water Authority (KWA)	KWA constituted in 1984 is a State level agency, which both owns and operates water supply and sewerage services for the ULB
Local Self Government Department (LSGD), GoK	Overall coordination, management, and administration of the various components, such as urban infrastructure improvement, urban management and implementation assistance. The urban infrastructure component comprises water supply, sewerage and sanitation, solid waste management, urban drainage, roads and transport, and community infrastructure.
Suchitwa Mission	• Providing policy, strategy, planning, implementation and monitoring, IEC campaigns and capacity building support for Solid and Liquid Waste Management • Technical support group for LSGIs in Waste Management sector
Kerala State Pollution Control Board (KSPCB)	Controlling of water and air pollution caused by various sources across the state. It is responsible for monitoring and oversight to ensure compliance with various state and central legislation on pollution.
Urban Poverty Alleviation Department (UPAD), Ministry of Housing and Urban Poverty Alleviation (MoHUPA), GoI	The Kudumbasree Project of the UPAD channels funds of centrally sponsored schemes to the ULBs and monitors fund utilization through its District Mission Coordinator (DMC). Based on the funds available through centrally sponsored schemes and projects approved by the ULB, Kudumbasree transfers the requisite amount to the ULB for utilization in Below Poverty Line (BPL) settlements.
Kalpetta Municipality (KM)	Overall management of the civic services in the city including public sanitation, solid waste management, public health and education.

Source: (CSE, 2017)

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 (ULBs) is in charge of O&M (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 even subsidize operating costs (Planning commission, 2002).

Furthermore, when no separate utility exists, there is no separate allocation of accounts for different activities within a municipality. Some states and cities have non-typical institutional arrangements. For example, in Rajasthan, the sector is more centralized and the state government is also in charge of operation and maintenance while in Mumbai the sector is more decentralized and local government is also in charge of planning and investment (NIUA, 2005).

In Kalpetta, public health, sanitation, conservancy, and solid waste management services are delivered by Health and Sanitation Department of KM. Septage management is also the responsibility of the same department, headed by the health supervisor.

3.1.5 Service standards

1. Service Level Benchmarks (SLB), 2008: Issued by the Ministry of Urban Development in 2008, the SLB seeks to (i) identify a minimum set of standard performance parameters forth 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. The 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, a statutory organization constituted in September 1974 under the Water (Prevention and Control of Pollution) Act, 1974. It specifies the effluent standards from different pathways.
3. Code of Practice for Installation of Septic Tanks, 1985: Issued by BIS, a national standard setting body of India. The code specifies standards and design consideration for installation of septic tanks.
4. Manual on Sewerage & Sewage Treatment, Second Edition, 2013: This manual was developed by CPHEEO. It provides detailed designs and guidelines for various technologies of wastewater management.

3.2 Planning

3.2.1 Service targets

State governments must put in place targets for delivery of essential services provided by the local bodies for four services viz., water supply, sewerage, solid waste management and storm water drains on lines of handbook for SLB by MoHUA. State government must notify or cause all ULBs to notify by the end of a fiscal year the service standards and targets (PAS, 2009-16)

The SBM, one of the flagship programmes of the Government of India, launched on October 2nd 2014 by the MoHUA. SBM-Urban aims to eliminate open defecation (OD) by the year 2019, eradicate manual scavenging, capacity augmentation of ULBs and generate awareness about sanitation and its linkage with public health. The SBM (urban) aims to ensure that no new insanitary toilets are constructed during the mission period and that pit latrine should be converted into sanitary latrines. The target group for construction of household units of toilets thus is (i) 80% of urban households engaging in (OD), remaining 20% of households practising (OD) are assumed to be catered by community toilets due to constraints of space (ii) all households with insanitary latrines (iii) all households with single-pit latrine. Service delivery targets in accordance with SLBs (MoUD, 2014). Table 6 provides an overview of service delivery progress in accordance with SLBs.

Table 6: Service delivery targets in accordance with SLBs

Sanitation service chain	Parameter	National benchmark	Time frame to achieve benchmark
Containment	Coverage of toilets	100%	2019
Transport	Coverage of sewer network services	100%	2031
	Collection efficiency of the sewerage network	100%	2031
Treatment	Adequacy of sewage treatment capacity	100%	2031
	Quality of sewage treatment	100%	2031
End-use/disposal	Reuse and recycling	80%	2031
Other	Cost recovery	100%	2031
	Efficiency of collection of charges	100%	2031
	Redressal of customer complaints	80%	2031

Source: Adapted from (MoUD, 2008), (MoUD, 2010)

Table 7: Service delivery progress in accordance with SBM

Indicator	Benchmark	Status
Coverage of toilets	100	99
Coverage of sewerage network services	100	0
Collection efficiency of waste water network	100	0
Adequacy of waste water treatment capacity	100	0
Quality of waste water treatment	100	0
Extent of reuse and recycling of treated waste water	20	0
Efficiency in redressal of customer complaints	80	0

Source: (KM, 2016)

3.2.2 Investments

The centrally sponsored scheme Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) division of TCPO has been entrusted with the job of appraising of project reports, processing for release of ACA, scrutiny of MOAs, monitoring of projects, examining of QPR, coordination with ministry and state government, collating and providing information/data to the MOHUA, attending to parliament questions, status note to parliamentary standing committees, preparation of annual budget, performance budget, reply to Court cases, PIL, Legal Notices etc. in reference to centrally sponsored UIDSSMT Scheme under the Jawaharlal Nehru Urban Renewal Mission (TCPO, 2011) . A project comprising of laying of water supply pipelines (40 km); construction of a pumping station and provision of house connections, was successfully implemented by the KM at an estimated cost of INR 70 crores (1.07 Million USD) (KM, 2016).

In 2016, Kerala Industrial and Technical Consultation Organisation (KITCO) had submitted a Detailed Project Report (DPR) to the GoK for construction of sewerage system in the city. Under the project, it is proposed to lay 10 km of sewer line, Sewage Pumping Station (SPS) and a Sewage treatment Plant (STP) is to be constructed. The cost associated with the project is INR 50 crores (7.66 Million USD) (KM, 2016).

3.3 Reducing inequity

3.3.1 Current choice of services for the urban poor

There are 56 slum colonies in the Municipal area, out of which, 28 are notified. The slums are scattered along the outer periphery of the town with 1,131 households (11.6% of total population). Most of these people defecate in open and only a few use community toilets. The practice of manual emptying by slum dwellers is still prevalent in the city which is usually carried out by 2-4 people. Sometimes, manual emptiers enter into the containment to empty FS. No safety measure is taken while emptying and thus diseases are common among manual emptiers. Bucket and spade is used to empty the containment (Private Emptiers, 2016).

3.3.2 Plans and measures to reduce inequity

Pradhan Mantri Aawas Yojna (PMAY)/HFA (Urban) project is aimed at urban areas with following components: (I) Slum rehabilitation of slum dwellers with participation of private developers using land as a resource; (II) Promotion of affordable housing for weaker section through credit linked subsidy; (III) Affordable housing in partnership with public and private sectors; and (IV) Subsidy for beneficiary-led individual house construction or enhancement.

All houses built or expanded under the mission should essentially have toilet facility. The mission has the provision of civic infrastructure as per applicable state norms/CPHEEO norms/BIS code/National building code for sewer connection, if existing or has to be made through the convergence of other national or state schemes (MHUPA, 2016).

Under PMAY, a survey of 2,002 beneficiaries has been completed and the state has approved a fund of INR 46.57 crores (7.1 Million USD), details of each component have been provided in Table 8. Each house has a toilet and a containment (septic tank connected to a soak pit) (KM, 2016).

Table 8: Details of the number of beneficiaries under PMAY

Component	New construction	Enhancement of old construction	Total number of beneficiaries
Credit Linked Subsidy Scheme (CLSS)	180	47	227
Affordable Housing in Partnership (AHP)	188	—	188
Beneficiary Led Construction (BLC)	1,031	556	1,587

Source: (LSGD, 2016)

Under SBM, 22 community toilets, with two seats each, are planned to be constructed in the city. The cost associated with the project is INR 98,000 (1,500 USD) per toilet. It is proposed to construct one community toilet per ten families residing in the colony and each toilet will have a septic tank connected to a soak pit. Construction of all these toilets is under progress, out of which four are already completed. These toilets are only being constructed in tribal colonies for the urban poor.

The Integrated Housing & Slum Development Programme (IHSDP) was envisaged and brought into effect in 1993-94. It aims at combining the existing schemes of Valmiki Ambedkar Malin Basti Awas Yojana (VAMBAY) and National Slum Development Programme (NSDP) under the IHSDP scheme for having an integrated approach in improving the conditions of the urban slum dwellers that do not possess adequate shelter and reside in dilapidated conditions. The scheme is applicable to all cities and towns as per 2001 Census except cities/towns covered under Jawaharlal Nehru National Urban Renewal Mission (JnNURM) and administered by MoHUPA. The scheme seeks to enhance public and private investments in housing and infrastructural development in urban areas (MoHUPA, 2007).

Under IHSDP, a project of INR 1.72 crores (0.26 Million USD) was sanctioned to construct 31 new houses and renovate 47 existing houses. Out of the 31 new houses to be constructed, 29 have been completed and the other two are under construction. All the 47 houses to be renovated have been completed. Each house constructed under this scheme has a provision of a toilet with containment (septic tank connected to a soak pit) (KM, 2016).

Another project of INR 68.16 Lakh (0.1 Million USD) was sanctioned under IHSDP to construct roads, drains and footpaths in selected colonies, which has been completed in 2016 (KM, 2016).

Kalpetta Municipality initiated a scheme 'Ente – bhavanam' in 2010. Under this scheme the municipality plans to construct 230 houses for the residents of the city. The cost associated with the project is INR 2 Lakh (3,053 USD) per house. There is a full grant to the beneficiaries belonging to urban poor section and 75-80% subsidy to others. Houses to be constructed under this scheme have a provision of a toilet connected to a septic tank. The effluent from the septic tank, will discharge into a soak pit. Out of the proposed 230 houses, 200 houses have already been constructed and the rest are under construction.

3.4 Outputs

3.4.1 Capacity to meet service needs, demands and targets

KM has sufficient funds to meet the demand of providing basic sanitation services and amenities through the revenue it is generating. However, it is majorly dependent on state and central's schemes fund. It is learnt during the FGD with the officials from KM that there is often delay in the disbursement of fund through state finance department (KM, 2016).

Municipal expenditures in India account for 1.1% of the country's GDP, compared to 6.9% in South Africa and 9.7% in Switzerland. ULBs therefore rely mainly on national or state grants (AFD, 2014) . In the context of Kalpetta, the major source of income (both revenue and capital) is through grants from Finance Commission and the remaining is generated through taxes and user charges. Municipality also received funds for sanitation infrastructure development which came through schemes like SBM, etc.

Shortage of human resource witnessed in the municipality. It is largely relied on staff hired on contractual basis to provide the daily service needs to the public. Also, the staff lacks the basic know-how and technical skills (KM, 2016).

3.4.2 Monitoring and reporting access to services

Data on service levels should be collected, documented and reported to MoHUA according to the format prescribed by SLB framework. Service level Improvement Plans (SLIP) are prepared with yearly targets. It has to be reviewed each year and progress has to be monitored. The planning documents like CDP and CSP have to be reviewed once in 5 years. This gives an opportunity to monitor the progress on service level improvement.

The progress of SBM gets reflected on mission progress dashboard in the SBM-Urban website. Of 4,041+ Municipalities in 650+ districts, 3,802 ULBs are active. 75 million plus cities are being monitored separately.

The sanitary inspector is supposed to inspect the design of septic tanks and their adherence to standards at the time of construction but this is not done most of the times.

3.5 Expansion

In 2016, MoHUA initiated a rapid assessment of 131 flagship cities to estimate the budgetary requirement for implementing Faecal Sludge and Septage Management (FSSM) in selected cities across the country, supported by the National Alliance for Faecal Sludge and Septage Management (NFSSM). The flagship cities include 100 smart cities, 12 cities in Ganga basin and others across India. A declaration was signed – for cities journey beyond Open Defecation Free (ODF) - mainstreaming effective FSSM by key decision makers and NFSSM alliance members.

Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is a mission to provide basic services (e.g. water supply, sewerage, urban transport) to households and build amenities in cities to improve the quality of life for all. The cities are required to submit SLIP documents (includes details on funding of specified projects by ULB) to the state. The state then prepares State Annual Action Plan (SAAP) document compiling all the details given in SLIPs. SAAP will then be forwarded to the MoHUA for sanction of funds. It has been decided to divide the projects into two phases.

Kalpetta is one of the flagship cities and plans to undergo the assessment but since it is not covered under the AMRUT programme, the municipality has to look for other sources of funding like Finance Commission/UIDSSMT/PMAY/other donor agencies etc.

Integrated Low Cost Sanitation (ILCS)

The centrally sponsored scheme of low cost sanitation for liberation of scavengers started from 1980-81 initially through the Ministry of Home Affairs (MoHA) and later on through the Ministry of Welfare. From 1989-90, it came to be operated through the MoUD and later on through Ministry of Urban Employment and Poverty Alleviation (MoUEPA) now titled Ministry of Housing & Urban Poverty Alleviation (MoHUPA). The programme envisages construction of new sanitary latrines in households not having latrines by adopting the low cost leach pit system, with an objective to eliminate dry latrines and manual scavenging. The scheme is being implemented with 63% Housing and Urban Development Corporation Ltd (HUDCO) loan, 32% Government of India subsidy and 5% of contribution of beneficiary (MoHUPA, 2008).

3.5.1 Stimulating demand for services

The following activities may stimulate demand for services:

- Awareness generation on septic tank construction, regular emptying of septic tanks through awareness campaigns
- Awareness campaigns on ill effects of environmental degradation because of disposal of untreated septage into local environment
- Capacity building of ULB staff on septage management
- Skill development for local masons
- Monitoring and regulation of private emptiers

It is recognized that the end objectives and corresponding benefits of SBM cannot be achieved without proper management of faecal sludge and septage across the sanitation service chain. Further, it is well understood that sewerage coverage will not meet the complete sanitation needs in all areas, and a strategy which is a combination of OSS and off-site (decentralised and centralised) must co-exist in all cities and must be given equal attention. However, the current policies are not explicit enough and also do not provide an outcome-focused direction on this issue (MoUD, 2017).

3.5.2 Strengthening service provider roles

SBM majorly provides funds for access to toilets but thereafter lacks funds for treatment and disposal of sewage and FS throughout the service chain. The service delivery of sewage and FS treatment and disposal can be met through converging the two-national flagship programmes SBM and AMRUT. The ULB can take the benefit of the programmes and strengthen the services along the value chain and achieve the goals of both programmes.

4 Stakeholder engagement

4.1 Key informant interviews

The KIIs were conducted with the stakeholders having a role or interest in sanitation and FSM services within the city. The relevant departments were contacted through e-mail, letter, call and fax prior to visit to the concerned departments. The purpose of the SFD study and depth of data required was conveyed through an introductory letter to respective departments. Overall, 6 KIIs were conducted with different stakeholders like government functionaries, emptiers, masons and community representatives (see appendix 7.2). Apart from KIIs, a survey was also conducted, which included interviews with representatives from NGOs, institutions and other commercial establishments. Indeterminate information was available prior to the field based research about the type of containment, emptying service, transportation and disposal of sewage generated by the city. The visit enabled in enhancing data collection through gathering progress details of SBM, published and unpublished reports like CDP, etc. Interview with the private emptiers and other stakeholders provided additional insight into the service delivery context.

4.2 Field observations

In order to get a better picture of variety/typology of onsite sanitation systems, primary surveys were conducted. Sample was carefully chosen to get good spatial representation from each ward of OSS dependence based on Census, 2011. At least 5-6 households were surveyed in each of the selected wards of Kalpetta. It was made sure that respondents from slums are surveyed as well. The surveyor also recorded the field observations related to sanitation. Such surveys, observations and KIIs helped to produce a more credible and accurate SFD, provided with qualitative data and perhaps more precise quantitative data relating to the service delivery. Some of the observations are listed below.

It was observed that few economically weaker section (EWS) households have poorly constructed toilets and some of the houses constructed under the ‘Particularly Vulnerable Tribal Groups’ Scheme for the tribal people were deprived of toilets. Such HHs usually share toilets with others or opt for open defecation, especially those residing near the river. The containment system varies according to the economic status of the society and the physiography of the area. Due to such variations, it was decided on the field to conduct survey in wards with different physiography, land use and economic variation. A visit was done to observe various disposal points in the city. Observation in the city also helped in sample selection as it gave a better understanding of the city context.

Most of the settlement in the city is informal and unplanned. Due to narrowness and congestion of the roads, HHs are dependent on manual emptying service through private emptiers. The manual emptying is usually carried out by 2 - 4 people, depending upon the size of the containment and the degree of solidification of FS in the containment. Spade and bucket is used for emptying OSS.

4.3 Focused group discussion

The FGDs were conducted to complement, validate and challenge data collected during literature review and interviews. In total, three FGD sessions were conducted. FGDs were held with ULB officials, slum dwellers and market shop keepers. The questionnaires for FGDs were prepared in English, but the interviewer asked the questions, translating into the Malayalam language.

The findings from the FGD sessions revealed information that increased the understanding of the sanitation and septage management in Kapetta. FGDs were useful in data triangulation. Primary survey helped in validating secondary data and data provided by different stakeholders. It resulted in actual and true SFD of the city.

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7 Appendix

7.1 Stakeholder identification

Table 9: Stakeholder identification.

S. No.	Stakeholder group	In Kalpetta context
1	City council / Municipal authority / Utility	Kalpetta Municipality
2	Ministry in charge of urban sanitation and sewerage	Kerala Water Authority
3	Ministry in charge of urban solid waste	Kalpetta Municipality
4	Ministries in charge of urban planning finance and economic development	Local Self Government Department, GoK
	Ministries in charge of environmental protection	Directorate of Environment and Climate Change, GoK
	Ministries in charge of health	Directorate of Health Services, GoK
5	Service provider for construction of onsite sanitation technologies	Local masons
6	Service provider for emptying and transport of faecal sludge	Private emptiers
7	Service provider for operation and maintenance of treatment infrastructure	N/A
8	Market participants practicing end-use of faecal sludge end products	N/A
9	Service provider for disposal of faecal sludge (sanitary landfill management)	Private emptiers
10	External agencies associated with FSM services: e.g. NGOs, academic institutions, donors.	Centre for Science and Environment, New Delhi

Source: CSE, 2016

7.2 Tracking of engagement

Table 10: Tracking of engagement.

S. No.	Name of Organisation	Designation	Date of engagement	Purpose of engagement
1	Kalpetta Municipality	Secretary	18/11/2016	Introduction of SFD and permission to conduct FGDs in the offices and municipal wards. Also conducted KII.
2	Kalpetta Municipality	Health Supervisor	18/11/2016	FGD
3	Kalpetta Municipality	Junior Health Inspector		
4	Kalpetta Municipality	Junior Health Inspector		
5	Kalpetta Municipality	Health Supervisor	18/11/2016	KII
6	Kerala Water Authority	Assistant Executive Engineer	19/11/2016	KII
7	KINFRA	Office Staff	19/11/2016	KII
8	Kerala State Planning Board	Town Planner	19/11/2016	KII
9	Private Emptiers	Private Emptiers	19/11/2016	KII
10	Slum dwellers	NA	19/11/2016	FGD
11	Public toilet incharge	Incharge	19/11/2016	KII
12	Market shopkeepers	NA	19/11/2016	FGD

Source: CSE, 2016

7.3 SFD graphic

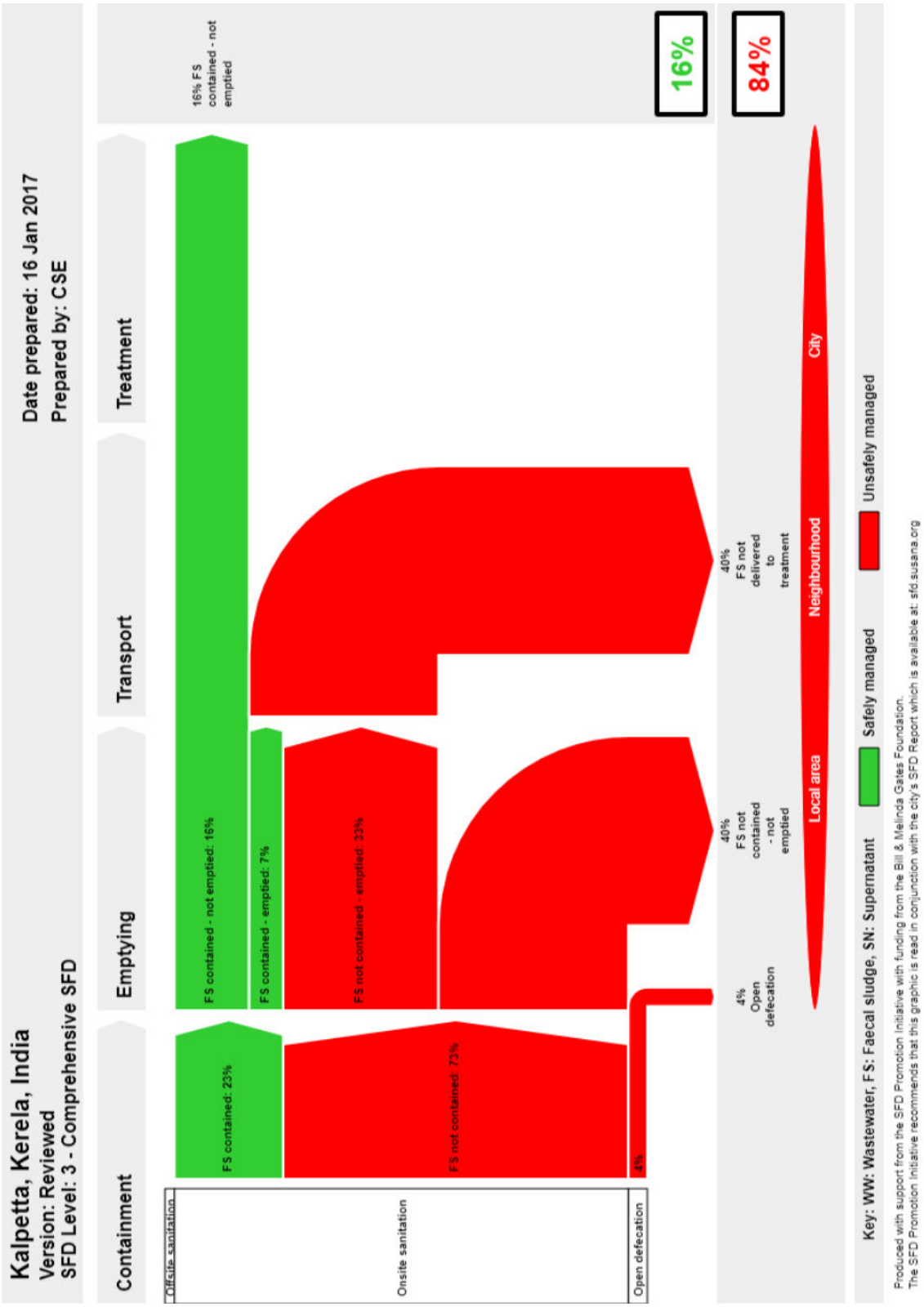

Figure 5: SFD graphic (Source: SFD graphic generator, 2017)

7.4 SFD brief explanation

Table 11: Percentage of the population using each system technology and method

System Type	Containment	Emptying	Transport	Treatment	End-use/ disposal
Onsite	T2A2C5: 60% of the population is dependent on septic tank connected to soak pit. T2A4C10: 13% of the population is dependent on lined pit with impermeable walls and open bottom. T1A5C10: 16% of the population is dependent on lined pit with semi-permeable walls and open bottom. T1B7C10: 7% of the population is dependent on pits (all types), never emptied but abandoned when full and covered with soil.	Since most of the population is getting their systems emptied (except for the 7% population dependent on T1B7C10), it is assumed 90% of population has their onsite technology emptied. Since there is no clear differentiation between % of septage and effluent, it is assumed to be 50% each. FS contained - emptied comes out to be 7% and FS contained-not emptied becomes 16%. FS not contained - emptied comes out to be 33% and FS not contained-not emptied becomes 40%.	FS is transported in vacuum tankers to outskirts of the city for discharging FS at non confirming random places	No treatment facility exists hence no FS is treated; therefore FS not delivered to treatment plant is 40%. But 16% of FS contained – not emptied has been shown as safely managed because of 'low risk' of groundwater pollution.	No use of emptied FS in or outside the city is reported
Open Defecation	4% of population practice open defecation.				

Source: CSE, 2017

7.5 SFD selection grid

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					Not Applicable
Septic tank					T2A2C5 / Low risk of GW pollution					
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					T2A4C10 / Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									Significant risk of GW pollution / T1A5C10
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 / T1B7C10
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 6: SFD selection grid (Source: SFD graphic generator, 2017)

7.6 SFD calculation grid

Table 12: SFD matrix

Kalpetta, Kerela, India, 16 Jan 2017. SFD Level: 3 - Comprehensive SFD
Population: 31580
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 50%

System label	Pop	F3	F4	F5
System description	Proportion of population using this type of system	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
T1A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow	16.0	90.0	0.0	0.0
T1B11 C7 TO C9 Open defecation	4.0			
T1B7C10 Pit (all types), never emptied but abandoned when full and covered with soil, no outlet or overflow	7.0			
T2A2C5 Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	60.0	90.0	0.0	0.0
T2A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	13.0	90.0	0.0	0.0

Source: SFD graphic generator, 2017

7.7 Community/public toilets

Table 13: Details of public toilets

S. No.	Location of the Toilet (Ward Number)	No. of Users per day	No. of functional toilet seats				Operation & maintenance by:	Toilet Connected to (Septic tank/ Pit/ Open Drain)	Septic tank size in feet (L×B×H)	Emptying Frequency (in years)	Septic Tank outlet connected to (OD/ SP)
			Men		Women						
1	New Bus Stand (10)	200	4	2	-	2	ULB	Septic Tank	6×3×6	1	Soak Pit
2	Old Bus Stand (13)	250	7	6	-	3	ULB	Septic Tank	6×3×6	1	Soak Pit
3	Kainatty (4)	100	4	4	-	2	ULB	Septic Tank	5×4×3	4–5yrs old. Not yet emptied.	Soak Pit

Source: KM, 2016