SFD Report

Ramnagar
India

Final Report

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SFD Report Ramnagar, India, 2017

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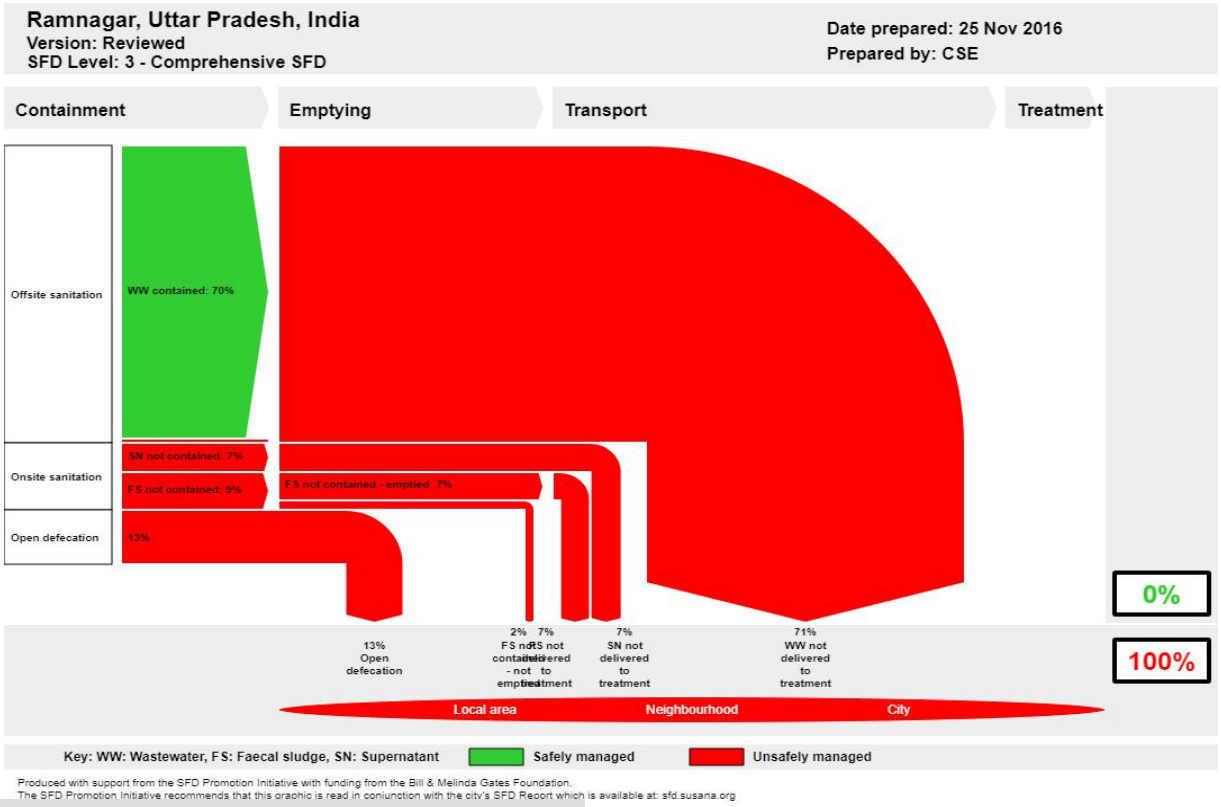
1. The SFD Graphic



2. Diagram information

SFD Level:

Comprehensive.

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3. General city information

Ramnagar city is situated on the banks of the Ganga River in the state of Uttar Pradesh, India. The city lies in the Indo-Gangetic plain. Ramnagar is 28 km away from Varanasi, the district headquarters, and is connected via road and by a temporary pontoon bridge. From a historical point of view, Ramnagar gets its name from Ramnagar fort, which was constructed in the 18th century. It is located on the eastern bank of Ganga River opposite to Varanasi (NPP, 2016).

The population of the city, as per the Census of India, 2011 is 49,132. The Municipality of Ramnagar named as 'Nagar Palika Parishad - Ramnagar' (RNPP) is divided into 25 wards. The population density of the city is 13,572 persons per sq.km, which is considerably high when compared to the density of Uttar Pradesh, i.e. 828 persons per sq.km. The slum population is 1,958, representing 3.98% of the total population (Census, 2011). The temperature rises maximum to 43.8°C during peak summer season and drops down to a minimum of 3.44°C during the winter season. Ramnagar city lies in a moderate to high rainfall region with an average yearly rainfall of about 635.4 mm (GeoHack, 2017). The administrative area of the city is 4 sq.km, chosen for current study.

4. Service outcomes

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

Containment: The existing sewer network covers about 70% of the households. The rest of the city (16%) is either dependent on 2/3 chambered septic tanks or pit latrines, the size of which depends on space availability and affordability of households. Due to no standardization being followed while constructing the containment system, few households have constructed septic tanks large in capacity irrespective of household size to decrease the emptying frequency. Rest of the 13% of population defecates in open. Open defecation is mostly practised in the wards without sewer network and the wards in proximity to banks of Ganga. There are seven public toilets catering tourists visiting the city. As there is no designated community toilet available for urban poor, public toilets are often used by them as well (NPP, 2016).

Emptying: The emptying frequency of the septic tank is more than 5 years due to oversized septic tanks, irrespective of household size. Since only 16% of the population depends on on-site sanitation facilities, Nagar Palika Parishad (NPP) of Ramnagar owns only a single tractor mounted vacuum tanker of 3,000 litres capacity. During emptying operation, the tanker runs on a 5 HP motor for suction. Emptying service is carried out by one driver and two sanitary workers under the supervision of a sanitary supervisor. Emptying fees to avail the service is INR 1,000 (15 USD) per trip. NPP also caters to applications from households which are located up to 10 km distance outside the NPP boundary. The NPP seldom receives applications requesting for emptying OSS. In past 2 years, only 5-6 containment systems have been emptied due to low demand for the service (NPP, 2016). Most of the settlement in the city is informal and unplanned. Due to narrowness and congestion of the roads, households are dependent on manual emptying service.

Figure 1: Vacuum tanker is used for unclogging sewers (Source: Bhavik/CSE, 2016)

Transportation: Sewage of 70% households is conveyed through sewer network, though the sewer line is dilapidated in few wards. NPP owns a tractor mounted vacuum tanker. Jetting and unclogging of the sewers in different wards of the city is done daily using vacuum tankers. Sewage is conveyed via sewerage network to a Sewage Pumping Station (SPS) from where it is distributed to farmers for irrigation during crop sowing season (GPCU, 2016). Rest of the days, sewage conveyed through trunk sewer is bypassed from SPS and discharged into four big nullahs.

End-use/Disposal: There is no treatment facility available for sewage and FS generated in the city. Sewage and FS generated in the city is eventually discharged into Ganga River. Sewage is also used for irrigation during the beginning of crop sowing period which is two to three months in a year. Rest of the days, sewage is bypassed from the SPS and flows into nullahs. The four places where the big nullahs meet the Ganga River have been identified as Jamdari Tola, Yadav Basti, Malaiya and Balua Ghat; all situated at downtown of city called as old Ramnagar.

Figure 2: Sewage is distributed through channels for irrigation (Source: Shantanu/CSE, 2016)

According to the Census of India 2011, 71% of the city is dependent on offsite systems, of which, population connected to sewer line is 70% and user interface directly discharging in open drain or open ground is only 1%. 16% of the city is dependent on onsite sanitation systems (OSS), out of which 15% are dependent on septic tanks and around 1% on pits. According to survey and key informant interviews (KII) conducted in 2016, public latrines are connected to sewers and septic tanks, hence have been incorporated in offsite as well as onsite systems. Septic tanks are not contained as they are connected to open drains and since the groundwater level is low, 5 to 6 mbgl (CGWB, 2014), the pits are also not contained.

There is no clear differentiation between the volume of effluent and solid FS generated from septic tanks, hence to reduce the maximum error, it's assumed to be 50% each. Therefore, 7% of FS is assumed to be effluent/supernatant that goes

into open drains and rest of FS is emptied from tanks whenever full. Some FS is always left in the tanks and is assumed to be 1%. Even FS from pits is considered not-contained and is calculated as 1% which includes infiltration of FS into the ground as well.

According to Census 2011, 13% of the population still practices open defecation, which was also cross-checked 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) formerly known as Ministry of Urban Development. 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 state to develop state urban sanitation strategies and work with cities to develop City Sanitation Plans (CSPs).

NUSP identifies the constitution of the 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), 98 individual households' toilets have been approved but no toilet has been constructed yet. The UP Jal Nigam has proposed to National Mission for Clean Ganga (NMCG): laying of 80 km sewer line, installation of a 13 MLD Sewage Treatment Plant (STP) and interception of drains for the city to abate pollution in the Ganga River (NPP, 2016).

The municipality did a rapid assessment of FSM in city to calculate the funds required for the same. It was estimated that INR 123 million (1.8 million USD) is required for implementation of effective FS and septage management including operation and maintenance for five years (MoUD, 2016).

6. Overview of stakeholders

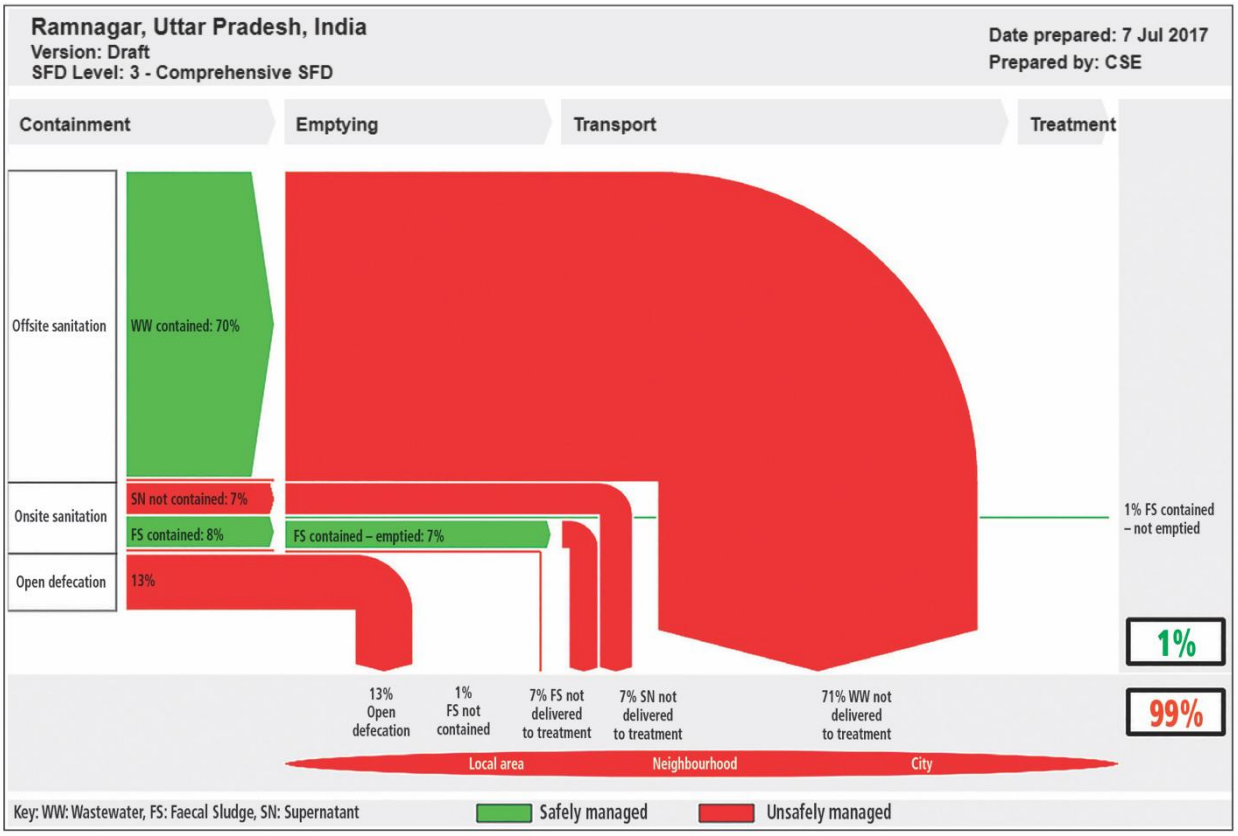
The 74th Constitutional Amendment Act of 1992 reformed the sector by transferring responsibility for domestic, industrial, and commercial water supply and sewerage (WSS) from state agencies, such as Departments of Public Health Engineering and State Water Boards, to Urban Local Bodies (ULBs). This transfer 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), National Ganga Council, Ganga Pollution Control Unit, UP Jal Nigam (UPJN), Urban Development Department (UDD), Nagar Palika Parishad-Ramnagar (RNPP), District Urban Development Authority (DUDA) Uttar Pradesh Pollution Control Board, Varanasi, Uttar Pradesh (UPPCB), State Programme Management Group (SPMG)
NGOs	Centre for Science and Environment
Private sector	Manual emptiers, local masons

Table 1: Key stakeholders (Source: Compiled by CSE, 2017)

UPJN is responsible for planning, designing and construction/development of the assets in sewerage and drainage sector, while RNPP is responsible for operation and maintenance of assets (MoUD, 2013). UDD is responsible for administrative and financial management of municipalities, implementation of development programmes. UPPCB is responsible for monitoring and evaluation of STPs. DUDA is responsible for the implementation of central and state government's schemes. RNPP is responsible for septage management. SPMG coordinates and oversee the implementation of projects sanctioned by Government of India under National Ganga Council (NGC). SBCLTF is a multi-stakeholder platform comprising representatives from different sectors of society, including agencies directly responsible for sanitation, agencies indirectly involved or impacted, eminent persons, practitioners, NGOs and sanitary workers.

7. Description of context-adapted SFD



8. Context-adapted SFD graphic

As mentioned in section 5, 16% of the population is dependent on onsite sanitation systems. Out of 16% of the population, 15% of the population is dependent on septic tanks connected to open drain or storm sewer. 1% of the population, dependent on lined pit with semi-permeable walls and open bottom, is attributed to be FS not contained.

The only difference suggested in the context-adapted SFD is at containment stage for correctly designed septic tanks, though connected to open drains, the 'FS not contained' changes from 9% to 1%, 'FS contained' changes from 0% to 8% and 'SN not contained' remains 7% when compared to SFD generated through graphic generator.

With an earlier assumption of 50% of the proportion of the content of the septic tank is solid FS, generated and collected inside the septic tanks. Rest of the 50% of the content is supernatant, which attributes to 8% of the population that flows through open drains. According to SBCLTF the solid FS collected in the septic tank should be considered contained as it is neither polluting the ground water nor the solid excreta are overflowing in the open drain.

Hence 8% of FS is considered contained (represented green in colour). 7% FS contained is emptied and remaining 1% FS remains in the tank which is contained and never emptied. Nevertheless the supernatant generated from septic tank connected to open drain is not contained and hence considered to be unsafely managed (represented red in colour).

Overall excreta of 99% population are not managed safely according to the context adapted SFD.

9. Process of SFD development

Data are collected through secondary sources. The city is visited to conduct the surveys, FGDs and 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 cross-checked with FGDs and KIIs.

The data are fed into the SFD graphic generator to calculate the excreta flow in terms of percentage of the population and also produce the SFD graphic. It can be concluded that excreta of the whole population are discharged untreated into environment.

The SFD graphic of Ramnagar city, developed using graphic generator is not able to capture the correctly designed fully functional septic tanks as a contained system, as based on feedback from SBCLTF. Hence, a context-adapted city specific SFD graphic is manually corrected to convey the substantial picture of the excreta management in the city.

10. 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. Overall four KIIs and three FGDs have been conducted with different stakeholders.

There were three major challenges to develop the SFD. Census and 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 and published/unpublished reports mostly differentiate 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 the secondary sources.

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).

11. 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
  - Census of India 2011, District Handbook – Varanasi
  - Groundwater Year Book, Central Groundwater Board, 2014
- KIIs with representatives from
  - RNPP
  - CPCB – Varanasi
  - Sewage pumping station
  - Wards
- FGDs
  - RNPP staff
  - Private emptiers
  - SBCLTF members
- Sample household survey

Ramnagar, India, 2017

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This Executive Summary and the SFD Report are available from: www.sfd.susana.org

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Abbreviations

AMRUT	Atal Mission for Rejuvenation and Urban Transformation
BIS	Bureau of Indian Standard
CAPEX	Capital Expenditure
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health & Environmental Engineering Organization
CSE	Centre for Science and Environment
CSP	City Sanitation Plan
CSTF	City Sanitation Task Force
CT	Community Toilet
DUDA	District Urban Development Authority
E	East
EWS	Economically Weaker Sections
FGD	Focus Group Discussion
FS	Faecal Sludge
FSC	Farm Science Centre
FSM	Faecal Sludge Management
FSSM	Faecal Sludge and Septage Management
GoI	Government of India
GoUP	Government of Uttar Pradesh
INR	Indian National Rupee
KII	Key Informant Interview
LPCD	Litres per Capita per Day
MIS	Management Information System
MLD	Million Litres per Day
MoHUA	Ministry of Housing and Urban Affairs (formerly known as MoUD)
MoUD	Ministry of Urban Development
MoWRRD&GR	Ministry of Water Resources, River Development and Ganga Rejuvenation
MSL	Mean Sea Level
N	North
NBC	National Building Code
NFSSM	National Faecal Sludge and Septage Management Alliance
NGC	National Ganga Council
NIC	National Informatics Centre
NITI	National Institution for Transforming India (formerly Known as Planning Commission)
NIUA	National Institute of Urban Affairs
NUSP	National Urban Sanitation Policy
OD	Open defecation
OPEX	Operation Expenditure
OSS	Onsite Sanitation System
PMAY	Pradhan Mantri Awas Yojna
PPE	Personal Protective Equipment
PT	Public Toilet

RNPP	Nagar Palika Parishad – Ramnagar
SBCLTF	Swachh Bharat City Level Task Force
SBM	Swachh Bharat Mission
SFD	Shit Flow Diagram
SLB	Service Level Benchmarks
SMP	Septage Management Sub-Plan
SN	Supernatant
SPS	Sewage Pumping Station
Sq.km	Square kilometer
STP	Sewage Treatment Plant
SWM	Solid Waste Management
UDD	Urban Development Department
ULB	Urban Local Body
UPJN	Uttar Pradesh Jal Nigam
UPPCB	Uttar Pradesh Pollution Control Board
UPSIDC	Uttar Pradesh State Industrial Development Corporation
USAID	United States Agency for International Department
USD	United States Dollar (1 USD = 66.5 INR)
WSS	Water Supply and Sewerage
WW	Waste Water

1 City context

Ramnagar city is situated on the banks of the River Ganga in the state of Uttar Pradesh, India. The city lies in the Indo-Gangetic plain. Ramnagar is 28 km away from Varanasi, the district headquarters, and is connected via road and by a temporary pontoon bridge.

The population of the city, as per the Census of India, 2011 is 49,132. The Municipality of Ramnagar named as 'Nagar Palika Parishad – Ramnagar' (RNPP) is divided into 25 wards. The population density of the city is 13,572 persons per sq.km, which is considerably high when compared to that of Uttar Pradesh state, i.e. 828 persons per sq.km. The slum population is 1958, representing 3.98% of the total population (Census, 2011). The population growth rate of the city is given in Table 1. The area under Nagar Palika Parishad (NPP) of Ramnagar jurisdiction is 4 sq.km (NPP, 2016) . Municipal boundary has been chosen for the current study.

Table 1: Population growth rate

Census year	Population	Growth rate (%)
1991	30116	—
2001	40619	35
2011	49132	21

Source: (Census, 2011)

From a historical point of view, Ramnagar gets its name from Ramnagar fort, which was constructed in the 18th century. It is located near the Ganga River on its eastern bank, opposite to Varanasi (NPP, 2016) . Agro and sub-agro climatic zones of Ramnagar city fall under the eastern plain zone of Uttar Pradesh. The climate is dry sub-humid to moist sub-humid. Over 70% of the land is cultivated and more than 80% of the cultivated area is irrigated. Soil type is sandy, sandy loam, clay loam, sodic / saline soil (FSC, 2017).

The city stretches for about 1.35 km along the Ganga River and has highly fertile alluvial soil. The city is located at 25°16'48''N latitudes and 83°1'48''E longitudes with an average altitude of 64m above Mean Sea Level (MSL). The temperature rises maximum up to 43.8°C during peak summer season and drops down to minimum of 3.44°C during the winter season. Ramnagar city lies in a moderate to high rainfall region with an average yearly rainfall of about 635.4mm (GeoHack, 2017).

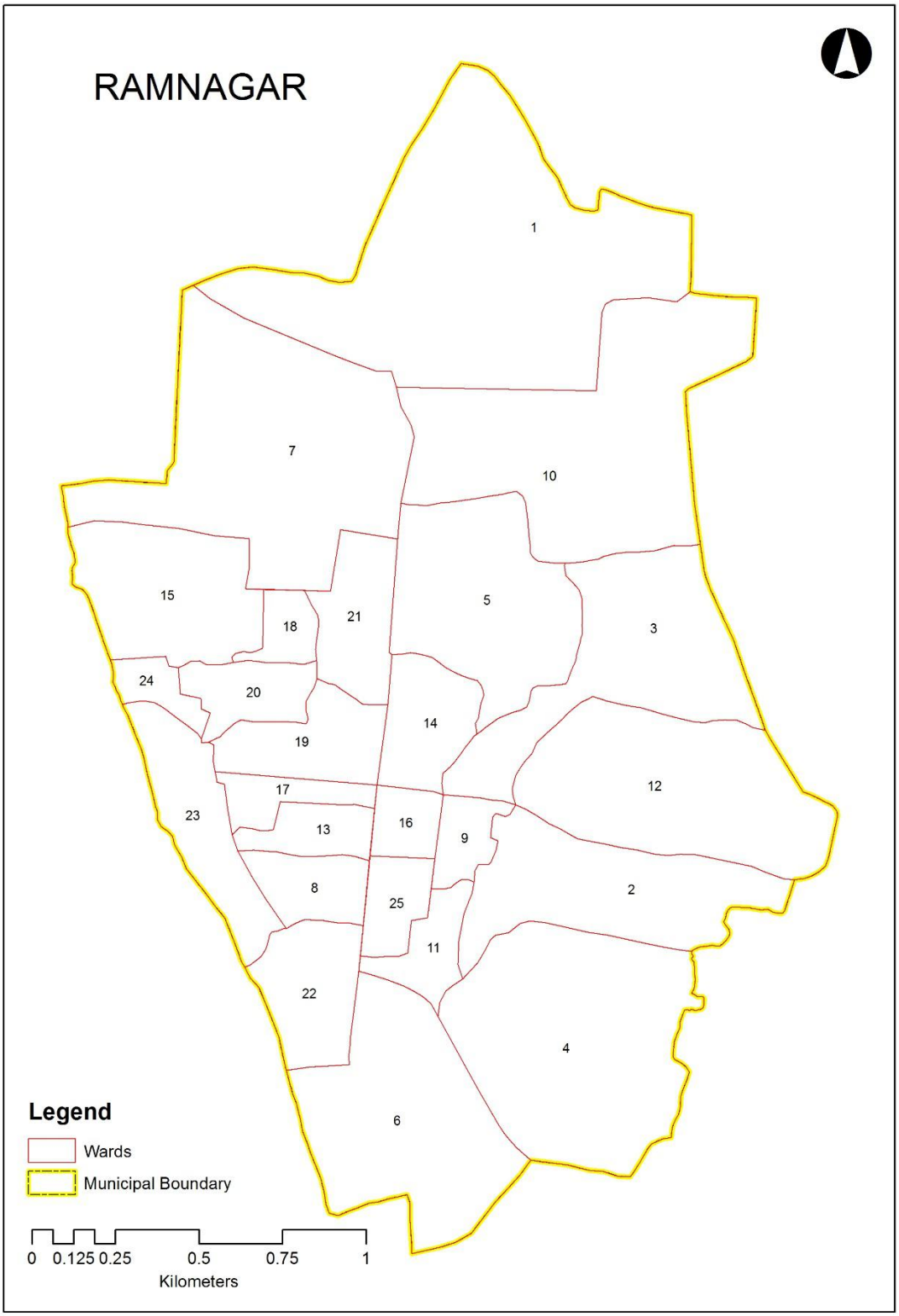

Figure 1: Ward map of Ramnagar city (CSE, 2016)

2 Service outcomes

Analysis is based on data available from Census of India, 2011 and sample household survey. Data collected from secondary sources are triangulated in 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 household survey (for details refer table 2). Data on emptying, transport, treatment and disposal of FS are collected through KIIs with ULB, private emptiers and parastatal body. However most of the data are qualitative.

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: Ward map of Ramnagar city (CSE, 2016)

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.	T1A1C2	69.6
2	Septic tank	Septic tank connected to open drain or storm sewer	T1A2C6	13.6
3	Other Systems	User interface discharges directly to open ground	T1A2C8	1.3
4	Pit latrine with slab	Lined pit with semi-permeable walls and open bottom, no outlet or overflow, general situation	T1A5C10	0.6
5	Pit latrine without slab	Unlined pit no outlet or overflow, general situation	T1A6C10	0.2
6	Night soil disposed into open drain	User interface discharges directly to open drain or storm drain	T1A1C6	0.7
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	1.3
9	Open defecation	Open defecation	T1B11C7 TO C9	12.8

Source: (Census of India, 2011)

2.1.1 Sanitation facilities

This section presents on existing sanitation facilities in institutions, commercial establishments, slums and facilities for tourists.

Community/public toilets: There are seven public toilets available in the city with no designated community toilets for urban poor in the city. Public toilets are used by urban poor as well. Four out of seven public toilets are connected to sewer and the rest have toilets connected to septic tanks. The size and design of septic tanks of the public toilets do not

meet the design standards as stipulated in the CPHEEO manual on sewerage and sewage treatment systems. The septage is emptied from the public toilets in every 3-5 years by the Ramnagar NPP and the collected septage is indiscriminately disposed at any low-lying areas in the city.

School sanitation: There are a total of 20 schools in the municipal area, out which 14 are privately owned and the rest are government aided. Some of the schools lack the basic facilities such as drinking water and sanitation (MoUD, 2015).

Commercial areas: Commercial areas comprise of shops, markets etc., where business activities take place. Though the commercial/market places are owned by the royal family of Ramnagar, the public toilets in the area are operated and maintained by the RNPP. Public toilets are either connected to the sewer system or septic tanks (NPP, 2016).

Industrial areas: Ramnagar industrial area is developed by the Uttar Pradesh State Industrial Development Corporation (UPSIDC). It is located on NH2 and is 15 km. from Varanasi. There are 3 industrial areas in Ramnagar i.e. Ramnagar I, Ramnagar II and Karkhiyaon. Different types of industries operating in the industrial area are chemicals, plastics, agro, and cattle feed industry. The drainage system in the industrial area was designed decades ago and is largely choked. It is poorly maintained; most of the drains are open and these areas often face flooding situation during monsoons. The industrial network does not have a Common Effluent Treatment Plant (CETP). Therefore, the effluents generated by the industries flows through open drains and discharged into river without treatment resulting in water pollution (MoUD, 2015). The municipal area does not include the industrial areas within the administrative boundary.

Although the city witnesses a significant footfall in the fort during festivals but lack of data on excreta generated from institutions and commercial areas, it has not been taken into consideration for production of SFD.

2.1.2 Containment

According to Census of India, 2011, city has coverage of 70% households connected to sewerage network which was found to be in line with the field based study including KII with ULB. Households in the wards having sewer network are connected to chamber/sewer-hole right next to their house. All these chambers are interconnected through underground pipes. The branch sewer with several chambers is connected to trunk sewer. It was observed during the survey that, choking of the sewer network is a common phenomenon, which leads to overflow and spillage of sewage from the chambers.

The rest of the city is either dependent on 2/3 chambered septic tanks or pit latrines. The size and type of containment depends upon space availability and affordability of households. Generally, septic tanks are not adhering to design prescribed by the BIS. Few households have constructed septic tanks large in capacity irrespective of household size. A minor proportion of households have their toilet which discharges directly into open drains without any containment. A significant population defecates in open. OD is mostly practised in the wards, in close proximity to Ganga River, due to non-availability of toilets.

Figure 2: Containment systems in Ramnagar (Source: Bhavik/CSE, 2016)

2.1.3 Emptying

The emptying frequency of the septic tank is more than 5 years. Households dependent on OSS have constructed oversized septic tank, irrespective of household size. Emptying service is managed and regulated by the NPP. The capacity of vacuum tanker is 3,000 litres. During emptying operation the tanker runs on a 5 HP motor for suction. Emptying service is carried out by one driver and two sanitary workers under the supervision of sanitary supervisor.

Resident has to submit an application letter requesting to NPP for the service. Emptying fees to avail the service is INR 1,000 (15 USD) per trip. NPP also caters to applications from households which are located up to 10 km distance outside the NPP boundary. The NPP seldom receives applications requesting for emptying service. In past 2 years only 5-6 containments have been emptied due to low demand for the ULB run service and prevalence of manual emptying (NPP, 2016).

Most of the settlement in the city is informal and unplanned. Due to narrow and congested roads, households 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 density of FS in the containment. Spade and bucket is used for emptying OSS. The emptying fee ranges from 4,000 – 5,000 INR (60-75 USD) (Manual Emptiers, 2016).

Predominantly, NPP is employing the vacuum tanker for jetting and unclogging of sewers. The sanitary workers do not use any personal protective equipment (PPE) like gloves, boots and mask during emptying of OSS and cleaning of sewers (NPP, 2016).

Figure 3: Vacuum tanker is used for unclogging sewer manholes (Source: Bhavik/CSE, 2016)

2.1.4 Transportation

Sewage of 70% of households is conveyed through sewer network, though the sewers are dilapidated in few wards. The waste collected during unclogging of sewers, is discharged into low-lying areas in the city. Sewage is conveyed to an SPS, from where it is distributed to farmers for irrigation during crop sowing season (GPCU, 2016). Rest of the days, sewage carried through trunk sewer is discharged into four big nullahs. NPP owns a tractor-mounted vacuum tanker. NPP owned vacuum tanker and manual emptiers discharge septage into sewers/open drains or any low-lying open grounds in & around the city (Manual Emptiers, 2016). Vacuum tanker usually covers a distance of 2-3 km per trip.

Figure 4: RNPP vacuum tanker used for emptying septic tanks/pits (Source: Shantanu/CSE, 2016)

Sewage Pumping Station

Conduit carrying sewage for irrigation

Mixing tank of sewage and tubewell water

Wastewater to agricultural fields

Figure 5: Sewage pumping station and associated distribution network (Source: Shantanu /CSE, 2016)

2.1.5 Treatment and disposal/end use

There is no treatment facility available for sewage and FS generated in the city. WW from the sewers and open drains flows into four big nullahs of the city and eventually disposed into Ganga River. Sewage generated in the city is also used for irrigation purpose. Sewage is majorly used for irrigation during beginning of crop sowing period which is two to three months in a year. For irrigation, the sewage is diluted with groundwater from a tube well in a ratio of 50-50 at SPS. Diluted sewage is then supplied to several farmer's field at a tipping charge of INR 30 per h. Rest of the days, sewage flows into nullahs. The four places where the big nullahs meet the Ganga River have been identified as Jamdari Tola, Yadav Basti, Balua Ghat and Bandha Road situated at the downtown called as old Ramnagar.

Figure 6: Discharge sites of sewage and septage (Source: Bhavik/CSE, 2016)

2.2 SFD matrix

The SFD matrix is shown in Appendix 7.7 and the final SFD for Ramnagar 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	T1A1C2	User interface discharging to separate sewer	70
2	T1A1C6	User interface discharging directly to open drain	1
3	T1A2C5	User interface discharging to septic tank connected to open drain or storm sewer.	14

4	T1A2C8	User interface discharging to septic tank connected to open ground.	1
5	T2A5C10	User interface discharging to lined pit with semi-permeable walls and open bottom	1
6	T1B11C7	Open defecation	13

Source: (CSE, 2016)

Table 4: Description of variables used in SFD

System type	Variables	Description (city context)	Percentage of population
Offsite	WW contained	WW from the offsite systems where the user interface discharges directly to a separate sewer.	70
	WW not contained	WW from the offsite systems where the user interface discharges directly to open drain.	1
Onsite	SN not contained	Supernatant from the onsite sanitation technology (T1A2C5 and T1A2C8) flows through open drains.	7
	SN not delivered to treatment	Supernatant from the onsite sanitation technology (T1A2C5 and T1A2C8) that is conveyed in the open drains is either discharged into the Ganga River or is applied to land for irrigation	7
	FS not contained	FS from the OSS is not contained either due to significant risk of groundwater contamination or due to connection of septic tank to open drain.	9
	FS not contained – emptied	FS (not contained) is emptied, using either motorized or manual emptying equipment.	7
	FS not delivered to treatment	FS that is dumped in the city and is either discharged into the Ganga River or is applied to land for irrigation	7
	FS not contained not emptied	FS not contained not emptied from OSS (T1A2C5, T2A5C10 and T1A1C6) remains in the system and cannot be emptied. This includes the infiltrate as well.	2
Open defecation	Open defecation	With no user interface, users defecate in water bodies or on open ground, consequently the excreta are not contained.	13

Source: (CSE, 2016)

Offsite systems

According to the Census, 71% of the city is dependent on offsite systems, of which, population connected to sewer line is 70% and user interface discharging directly into open drain or open ground is only 1%. Therefore, WW contained and not contained were estimated to be 70% and 1% respectively. Since there is no treatment facility for sewage and septage, total WW not delivered to treatment adds up to 71%.

Onsite sanitation systems

16% of the city is dependent on onsite sanitation systems (OSS), out of which 15% are dependent on septic tanks and around 1% on pits. Septic tanks are not contained as they are connected to open drains. FS from pits is also considered not contained as the infiltrate pollutes the ground water.

There is no clear differentiation between the volume of effluent and solid FS generated from septic tanks, hence to reduce the maximum error, it's assumed to be 50% each. Therefore, supernatant that goes into open drains is assumed to be 7% and FS (not contained) is

estimated to be around 9%. It is also assumed that 90% of the population (dependent on onsite systems) gets their system emptied when full. Hence around 6.75% of FS (not contained) is emptied & 2.25% FS (not contained) remains in the tank which includes the infiltrate from the pits as well.

Open Defecation
13% of the population still practices open defecation.

It can be concluded that excreta of the whole population discharged in the Ganga River are untreated and therefore, unsafely managed. The Appendix 7.4 summarizes the percentage of the population using each sanitation technology and method along the service chain.

2.2.2 Risk of groundwater contamination

Uttar Pradesh is covered with rich fertile soil and underlain by a large thickness of alluvium making it one of the richest ground water repositories of the world. The groundwater depth ranges from 5.67 (post monsoon) to 6.57 (pre-monsoon) mbgl (CGWB, 2014).

The SFD assessment includes the risk of groundwater pollution as an important factor in determining whether excreta are 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.

Based on the survey with households and KIIs in Ramnagar, 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. The NPP supplies drinking water to the residents through deep tube-wells, ground water being the most common source of water (NPP, 2016). According to the Census, 85% of the population is dependent on piped water supply through municipal borewells and 4% on private well, tube well or bore well and 8% on hand pumps. Sample survey revealed 80% of the respondents are dependent on piped water supply, which also includes public tap water and households dependent on community-based piped water connections. 10% of the respondents were depended on bore well and tube wells and 10% on submersible pump.

2.2.3 Discussion of certainty/uncertainty levels of associated data

There were three major challenges to develop the SFD. Published and unpublished reports were not able to provide completely (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 and triangulation of data provided by secondary sources.

The Census mostly differentiate 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 WW 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.

CSE’s representatives have conducted the KIIs, FGDs and sample surveys.

The assumption regarding the volume of FS emptied as compared to FS generated has a high impact on the overall SFD. A reliable method for estimating quantities of FS generated on a citywide scale do not yet exist, and it is complicated because the containment size and emptying period greatly vary. The volume of FS emptied is not clear because RNPP empties sewage from sewers, septage from government & private institutions and commercial establishment. Since there is no clear differentiation between the volume of effluent/supernatant and septage generated from septic tanks and lined tanks, hence it is assumed to be 50% each. Based on the survey, it is assumed that respondents getting their OSS emptied within 10 years are using their systems with emptying and respondents getting their OSS emptied after 10 years are using their system without emptying. In the matrix, it is assumed that 90% of the population get their containment systems emptied when full.

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 and presented to the SBCLTF, based on their feedback a context-adapted SFD was prepared.

2.3 Context-adapted SFD

According to the SBCLTF, SFD generated by graphic generator is not sufficiently visualizing the actual situation at containment stage of sanitation chain. According to the stakeholders the properly designed septic tanks, which are regularly emptied, should be considered contained even if the supernatant is discharged into open drains. Hence, a context-adapted city specific SFD graphic is manually corrected to convey the true picture of the excreta management in the city.

Please refer Appendix 7.5 for the context-adapted SFD graphic. There is no major change done in the graphic. The only difference suggested in this context is at containment stage, i.e. for correctly designed septic tanks. Out of 16% of the population, dependent on onsite sanitation system, 15% of the population is dependent on septic tanks connected to open drain or storm sewer. 1% of the population, dependent on lined pit with semi-permeable walls and open bottom, is attributed to be FS not contained.

The only difference suggested in the context-adapted SFD is at containment stage for correctly designed septic tanks, though connected to open drains, The ‘FS not contained’ changes from 9% to 1%, ‘FS contained’ changes from 0% to 8% and ‘SN not contained’ remains 7% when compared to SFD generated through graphic generator.

With an earlier assumption of 50% of the proportion of the content of the septic tank is solid FS, rest of the 50% is assumed to be supernatant, which attributes to 8% of the population, that flows through open drains. According to SBCLTF the solid FS collected in the septic tank (attributed to 8% population) should be considered contained as it is neither polluting the ground water nor the solid excreta are overflowing in the open drain. Hence 8% of FS is considered contained (represented green in colour). 7% FS contained is emptied and rest 1% FS remains in the tank which is contained and never emptied. Nevertheless, the supernatant generated from septic tank connected to open drain is not contained and hence considered to be unsafely managed (represented red in colour).

Overall, excreta of 99% population are not managed safely according to the context-adapted SFD. The graphic is well received by the stakeholders group and city's authority has agreed that the context-adapted SFD graphic is representing much closer picture to the ground conditions.

3 Service delivery context description

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 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 (FS) (USAID, 2010) . The objectives of NUSP are to be realized through CSPs and state sanitation strategies. NUSP identifies the constitution of 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 to improve 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), 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), and other resources that users of this advisory may refer, for details while preparing their SMP (MoUD, 2013). 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.

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 Uttar Pradesh Water Supply and Sewerage Act, 1975:
An act to facilitate the establishment of corporation, authorities and organizations for the development and regulation of water supply and sewerage services, related matters. According to this act the corporation has powers to fine the owner of the improper/damaged septic tank.

The Uttar Pradesh Urban Sanitation Policy, 2010:
In 2010, the Director of Local Authorities, Uttar Pradesh issued the Uttar Pradesh Urban Sanitation Policy (UPUSP). The policy is inspired from the NUSP. The UPUSP mandates the

cities to establish City Sanitation Task Force (CSTF) and to elevate the consciousness about sanitation in municipal agencies, government agencies and most importantly, amongst the people of the city. UPUSP 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. As of now there are very few cities that have finalized their CSPs; and it remains a major drawback in the implementation of the UPUSP.

Draft Faecal Sludge and Septage Management Guidelines 2016
The draft guidelines provide step by step approach for preparation of plan for septage management and financial resource mobilization, along with a focus on existing situation across sanitation service chain and sources of revenue. The guidelines stress upon Uttar Pradesh Municipal Corporation Act, 1959, Chapter IX: Corporation taxation, Section 173(d), where Conservancy tax can be levied on all the properties by the corporation where city undertakes the collection, removal and disposal of excreta and polluted matter from privies, urinals and cesspools.

Uttar Pradesh Municipal Building Bye-Laws, 2008: Issued by Housing Department, Government of Uttar Pradesh. The codes specify standards and design consideration for installation of toilets and septic tank.

The Uttar Pradesh Finance Commission is a committee pertaining to the state of Uttar Pradesh, established with a purpose of reviewing the financial implementations of the state. The main purpose of this committee is to formulate implementation of financial policies pertaining to the state of Uttar Pradesh. The Finance Commission is set up under the Article 243 Sec I of the Indian Constitution, which orders that the Governor of the state would, at the end of every fifth year establish a Finance Commission for the purpose of reviewing, within the introduction of the 73rd Amendment of the Constitution Act, 1992 (BMoI, 2016).

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. The Central Public Health and Environmental Engineering Organisation (CPHEEO), created in 1953, is the technical wing of the MoHUA, 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 norm setting for urban water supply and sanitation (Planning Commision, 2002).

National Council for Rejuvenation, Protection and Management of River Ganga referred as National Ganga Council formerly known as National Ganga River Basin Authority (NGRBA) is the implementation wing of National Mission for Clean Ganga (NMCG), which was constituted under the provisions of the Environment (Protection) Act (EPA), 1986. The council aims at ensuring effective abatement of pollution and rejuvenation of the River Ganga by adopting a river basin approach to promote inter-sectoral co-ordination for comprehensive

planning and management, maintenance of minimum ecological flows in the river Ganga with the aim of ensuring water quality and environmentally sustainable development (NMCG, 2011).

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 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 Ramnagar is governed by various institutions. The following are the institutions responsible for policy making, service provision and regulation of urban services:

Table 5: Roles and responsibilities

Institutions	Roles and responsibilities
Urban Development Department (UDD)	Policy formulation, preparation of municipal bye-laws, monitoring and evaluation of programmes, supervision of municipal administration, coordination with related state government departments, liaison with the central government and external funding agencies, administrative and financial management of municipalities, implementation of development programmes.
Nagar Palika Parishad – Ramnagar (RNPP)	Water supply and sewerage, public health, sanitation, conservancy and solid waste management, urban poverty alleviation by providing infrastructure, provision and maintenance of urban amenities and facilities such as parks, gardens, playgrounds, provision and maintenance of the lighting in the public streets, corporation markets, public buildings. Registration of births and deaths, O&M of burial grounds, cremation grounds, etc. The ULB has a vital role in design, develop, plan and implement ULB level FSSM strategy, set up and ensure operation of systems for 100% safe and sustainable collection, transport, treatment and disposal of FS & septage, monitor and evaluate FSSM strategy and implementation plan and Implement Municipal Bye-laws.
Uttar Pradesh Jal Nigam (UPJN)	Carry out the functions of – • Preparation, execution, and promotion of ULB and state level plans of water supply and sewerage schemes • Establishment of standards for water supply and sewerage in the state
District Urban Development Authority (DUDA)	Its functions are to– • Execute various government schemes for urban development and employment generation • Create urban infrastructure, including water supply • Undertake tasks related to urban infrastructure to generate local employment • Construct community toilets and link it to sewer lines etc. • Lay sewerage network according to plan made by Jal Nigam • Regulate and help ULBs set up systems to ensure financial sustainability in provision of sanitation services
State Programme Management Group (SPMG)	It is implementing arm of NMCG in the state. Coordinate and oversee the implementation of projects sanctioned by Government of India under National Ganga Council (NGC). Take all such action and to enter all such actions as may appear necessary or incidental for the achievements of the objectives of the NGC.
Uttar Pradesh Pollution Control Board (UPPCB)	Regulation, licensing for environmental check etc. Monitor the compliance of the standards regarding ground water, ambient air, leachate quality and the compost quality including incineration standards as specified under Schedule II, III & IV of 'The Water (Prevention and Control of Pollution) Act 1974'.

Source: (CSE, 2016)

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 largest cities have created 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 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 Ramnagar, public health, sanitation, conservancy, and solid waste management services are delivered by Health and Sanitation Department of RNPP. Septage management is also the responsibility of the same department, headed by the Sanitary Officer.

3.1.5 Service standards

1. Service Level Benchmarks (SLB), 2008: Issued by the Ministry of Urban Development in 2008, the SLB seek 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. The SLB refers to improving service through better provision and delivery. It evaluates the performance of urban services provided by different ULBs throughout the country.
2. General Standards for Discharge of Environmental Pollutants – 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. General standards are notified with respect to parameters for safe discharge of effluent to inland surface water/public sewers/land for irrigation/ marine coastal areas.
3. Manual on Sewerage & Sewage Treatment, Second Edition, 2013: This manual was developed by Central Public Health and Environmental Engineering Organization (CPHEEO). It provides detailed designs and guidelines for various technologies of WW management.
4. Code of Practice for Installation of Septic Tanks, 1985: Issued by, Bureau of Indian Standards. The code specifies standards and design consideration for installation of septic tanks.

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 Swachh Bharat Mission (SBM), one of the flagship programmes of the government of India, launched on October 2nd 2014 by the Ministry of Urban Development. SBM-Urban aims to eliminate open defecation, eradicate manual scavenging, capacity augmentation of ULBs and generate awareness about sanitation and its linkage with public health during the mission period till 2019. The SBM (urban) aims to ensure that no new insanitary toilets are constructed during the mission period and that pit latrines 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 open defecation, remaining 20% of households practising open defecation 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 latrines (MoUD, 2014). Table 6 provides an overview of service delivery progress in accordance with SBM.

Table 6: Service delivery targets in accordance with SLBs

Sanitation service chain	Parameter	National benchmark	Timeframe 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	20%	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

SBM Head	Mission Target (Till 02.10.2019)	Target Till March 2017	Achievement		Online Application Status		
			Till March 2017	For 2016-17 (April 2016 to till date)	Received	Verified	Approved
Individual Household Toilets (IHHT)	935	767	440	2	1671	385	98
Community Toilets (CT)	2	2	0	0	0	0	0
Public toilets (PT)	4	2	0	0	0	0	0

Source: (NPP, 2016)

According to rapid assessment of FSM in the city done by NPP, they would need three additional emptying trucks, which will improve the emptying service. Each vehicle is expected to complete 2 trips per day with an average distance of round trip being 10 km. Along with the emptying trucks, the NPP would also need to install one or more FSTPs in the municipal area, which are expected to treat 26 m^3/day of septage initially and 29 m^3/day after a period of 5 years (MOUD, 2016). Sewer is being laid in the remaining OSS dependent wards of the city. House sewer connection is provided based on the rate list, (see Appendix 7.8) (NPP, 2016).

3.2.2 Investments

An investment of INR 210.58 crores (31.7 Million USD) was proposed for the project "Sewerage Works in Ram Nagar & Peri-Urban Area, Varanasi" (UPJN, 2015b). The project includes laying of 80 km sewerage network and construction of 13 MLD Sewage Treatment Plant (STP). Also, it was proposed to intercept four drains and divert to a proposed 13 MLD STP at Kodopur, Ramnagar, under the project "Interception, Diversion and Treatment Works in Ramnagar, Varanasi" at an estimated cost of INR 95.13 crores (14.3 Million USD) including ten-year O&M cost (UPJN, 2015a). Table 8 provides the status of funds released by central government under SBM programme to the ULB, for construction of toilets in city.

Table 8: Status of fund released in accordance with SBM

SBM head	Fund released from Mission Directorate to ULB				Fund released from ULB to applicant/contractors					
	GoI		State		GoI		State		ULB/Other	
	Units	INR (Lakh)	Units	INR (Lakh)	Units	INR (Lakh)	Units	INR (Lakh)	Units	INR (Lakh)
IHHT	11	0.22	0	0	0	0	0	0	0	0
CT	0	0	0	0	0	0	0	0	0	0
PT	0	0	0	0	0	0	0	0	0	0

Source: (NPP, 2016)

As per the rapid assessment of FSM in city done by RNPP, the budgetary provision required for capital expenditure for FSM is around INR 760 lakh (1.143 million USD). Whereas, the operation and maintenance (O&M) cost associated with the emptying services and treatment operations is estimated to be INR 471 lakh (0.708 million USD) for 5 years (MoUD, 2016). Further details of CAPEX and OPEX have been provided in the Table 9.

Table 9: Status of CAPEX & OPEX for FSSM.

S. No.	Component	CAPEX INR (Lakh)	OPEX INR (Lakh)	Total INR (Lakh)
1	FS management	492.35	463.17	955.52
2	Liquid waste management	267.04	7081	274,085
3	FSSM Total	759.39	470.98	1,230.37

Source: (MoUD, 2016)

3.3 Reducing inequity

3.3.1 Current choice of services for the urban poor

There are 9 slum settlements within the RNPP limits (NPP, 2016). According to Census of India, 2011, the slum population is 1958, which is 3.98% of the total population. Most of the people defecate in open and only a few use community toilets. RNPP provides emptying services to the slum households (NPP, 2016) . The practice of manual emptying is still prevalent in the city. The manual emptying 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 sanitary workers. Bucket and spade is used to empty the containment (Manual Emptiers, 2016).

3.3.2 Plans and measures to reduce inequity

Pradhan Mantri Aawas Yojna (PMAY), Housing for All (Urban) project is aimed for 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 & private sectors; and (iv) Subsidy for beneficiary-led individual house construction or enhancement.

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

Under PMAY, 2525 application forms have been filled but no progress is reported thereafter (NPP, 2016). Also, 1,671 forms for construction of toilets were filled under SBM, of which 98 have been approved.

3.4 Outputs

3.4.1 Capacity to meet service needs, demands and targets

NPP has insufficient fund to meet the demand of providing basic sanitation services and amenities through the revenue it is generating. NPP is majorly dependent on state and central schemes for funding. It is learnt during the focus group discussion with the NPP that there is often delay in the disbursement of funds through state finance department (NPP, 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 Ramnagar, 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. NPP also received funds for sanitation infrastructure development which came through SBM.

Shortage of human resource can be witnessed in the NPP. 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 (NPP, 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.

Progress of toilet coverage 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. Under SBM, no toilets have been constructed yet in the city.

Ramnagar is yet to digitize the billing of emptying services, but maintains a register of the data on number of tanks emptied. These data can be used to quantify septage emptied but it would not be valid due to lack of data on manual emptying. At present, the municipality is not using the available data for monitoring the emptying services.

The officials of RNPP occasionally carry out site inspections to check the quality of emptying services. 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 time (NPP, 2016).

3.5 Expansion

In 2016, MoHUA initiated 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 FS and septage management by key decision makers and NFSSM alliance members. Ramnagar is one of the flagship city and has undergone the assessment but since it is not covered under the AMRUT programme, the NPP has to look for other sources of funding like NMCG/ donor agencies etc.

National Mission for Clean Ganga, develop such infrastructure or make such infrastructure functional, as the case may be, for collection, storage, transportation and disposal of sewage in the territorial area of the local authority through its *Namami Gange* programme- an integrated Ganga conservation programme (NMCG, 2011). Under this mission, 118 towns have been identified as priority towns for the interventions near main stem of Ganga. Ramnagar city is one of the cities listed in 118 urban habitations.

Nirmal Dhara is proposed under *Namami Gange* Programme – an initiative ensuring sustainable municipal sewage management which plans for (NMCG, 2011):-

- Project prioritization in coordination with MoHUA
- Incentive for states to take up projects on Ganga Main-stem by providing an additional share of central grants for sewerage infrastructure.
- Uniform standards for both MoHUA scheme and Namami Gange programme, 10 years mandatory O&M by the same service provider at par with NGRBA programme and Public-Private Partnership (PPP), Mandatory reuse of treated water.
- Expanding coverage of sewerage infrastructure in 118 urban habitations on banks of Ganga- estimated cost by MoWRRD&GR is INR 51000 crores (7.6 Billion USD).

3.5.1 Stimulating demand for services

It is recognized that the end objectives and corresponding benefits of SBM and NMCG cannot be achieved without proper management of FS 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).

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 and plumbers
- Monitoring and regulation of private emptiers

3.5.2 Strengthening service provider roles

Funding is estimated for septage management initiatives under rapid assessment for FSSM supported by the MoHUA, GoI through National Alliance for Faecal Sludge and Septage Management (NFSSM). These funds can be used to buy vacuum tankers, building treatment facility, etc. RNPP has to make use of these funds to strengthen the services. At present, there are no detailed plans for strengthening service delivery.

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 NMCG. 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, and call to visit the concerned departments. The purpose of the SFD study and depth of data required was conveyed through an introductory letter to respective departments. Overall, 4 KIIs were conducted with different stakeholders like government functionaries, emptiers, masons and community representatives (see Appendix 7.2). Apart from KIIs, surveys were 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 system, 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 Ramnagar. 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, provides 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. The toilet is generally constructed for the females in the house, males and children practice open defecation. The households situated near the banks of Ganga practice open defecation. Majorly, households in dense and core areas of the city are found to be using toilets. The containment system varies according to the economic standard of the society. Due to such variation of containment system in the city, it was decided on the field to conduct a survey with OSS dependent wards of the municipal area. Various disposal points of sewage and septage in the city were also identified during the visit. 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, households 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 density of FS in the containment. Often spade and bucket are 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, four FGDs were conducted. FGDs were held with administration wing of NPP, private emptiers, community representatives and local masons. The questionnaires for FGDs were prepared in English, but the interviewer asked the questions, translating into the Hindi language.

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

Stakeholders were identified and the task force was formulated and notified under the mandate by NUSP (refer appendix 7.8 for more details). An FGD was conducted with the SBCLTF's members and the draft SFD was presented and analysed. SBCLTF's members validated the collected data and the final SFD graphic (SBCLTF, 2017).

5 Acknowledgement

This report was compiled as part of the SFD promotion initiative project funded by the Bill and Melinda Gates foundation (BMGF). We would like to thank Mr Gowalal, Executive Officer, NPP and Mr Sanjay Pal, Sanitary Inspector, NPP for providing information for this assessment. Special thanks to Dr Suresh Kumar Rohilla, Programme Director, CSE, for his supervision and guidance at every step of the assessment and report writing.

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7 Appendix

7.1 Stakeholder identification

Table 10: Stakeholder identification

S. No.	Stakeholder group	In Ramnagar context
1	City council / Municipal authority / Utility	Nagar Palika Parishad, Ramnagar
2	Ministry in charge of urban sanitation and sewerage	Urban Development Department, GoUP
3	Ministry in charge of urban solid waste	Urban Development Department, GoUP
4	Ministries in charge of urban planning finance and economic development	Urban Development Department, GoUP
	Ministries in charge of environmental protection	Environment Department, GoUP
	Ministries in charge of health	Department of Medical Health and Family Welfare, GoUP
5	Service provider for construction of onsite sanitation technologies	Local masons
6	Service provider for emptying and transport of FS	Nagar Palika Parishad, Ramnagar
7	Service provider for operation and maintenance of treatment infrastructure	N/A
8	Market participants practising end-use of FS end products	N/A
9	Service provider for disposal of FS (sanitary landfill management)	Nagar Palika Parishad, Ramnagar
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 11: Tracking of engagement

S. No.	Name of Organisation	Designation	Date of engagement	Purpose of engagement
1	RNPP	Executive Officer	17/10/2016	Introduction of SFD and permission to conduct FGDs in the offices and municipal wards.
2	RNPP	Sanitary Officer	17/10/2016	FGD
3	RNPP	Pump Operator		
4	RNPP	Tax Inspector		
5	RNPP	Junior Engineer (Civil)		
6	Ganga Pollution Control Unit	Pump Operator, Sewage Pumping Station	18/10/2016	KII
7	RNPP	Representative of Ward – 12	19/10/2016	KII
8	RNPP	Representative of Ward – 6	19/10/2016	KII
9	Private	Emptiers/Manual Scavengers	19/10/2016	FGD
10	Central Pollution Control Board, Varanasi	Chief Environmental Officer	21/10/2016	KII
11	SBCLTF	16 members of SBCLTF	17/03/2017	FGD

Source: (CSE, 2016)

7.3 SFD Graphic

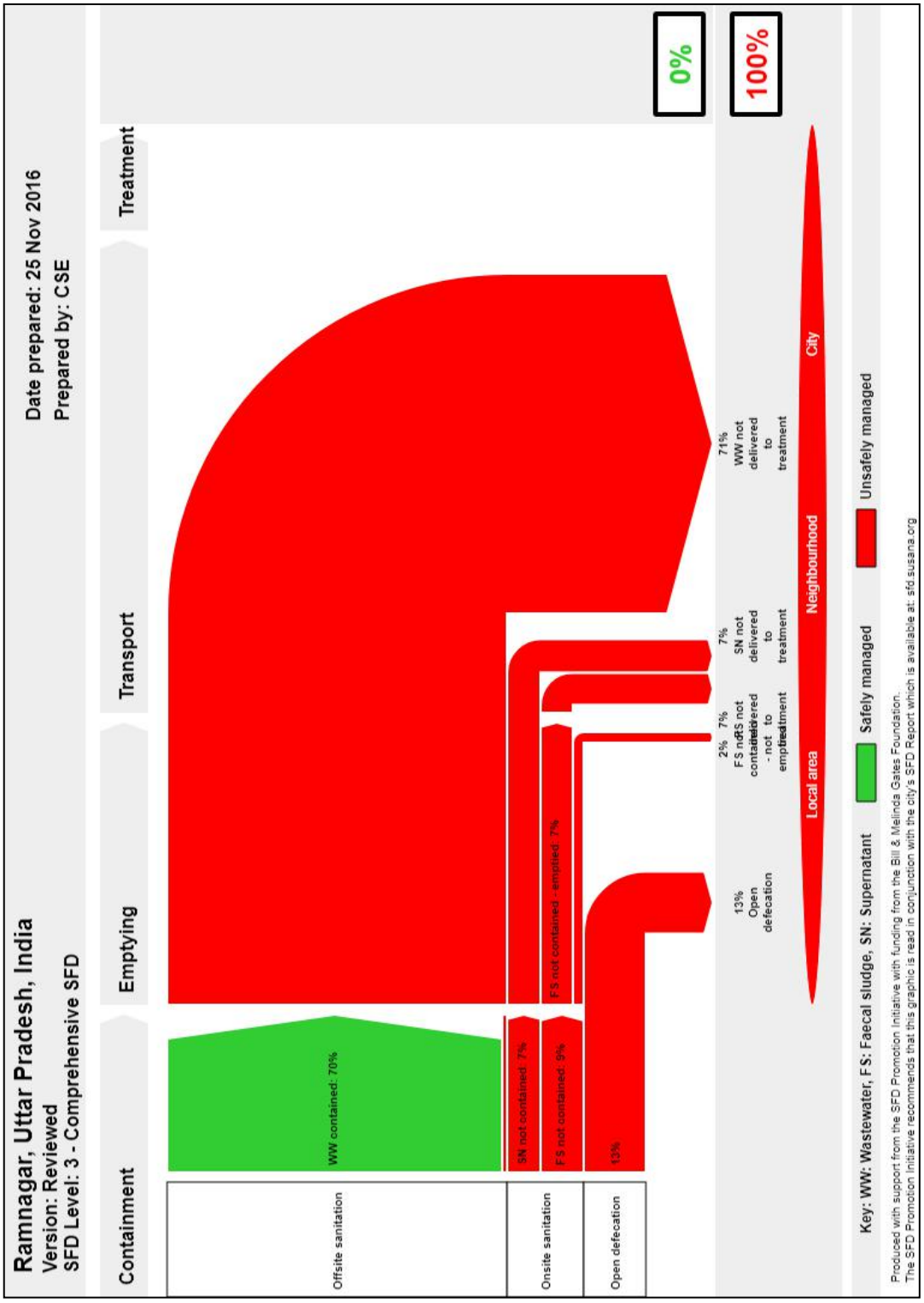


Figure 7: SFD graphic (Source: SFD graphic generator)

7.4 SFD brief explanation

Table 12: Percentage of the population using each system technology and method

System Type	Containment	Emptying	Transport	Treatment and end-use
Offsite	T1A1C2: 70% of the population is connected to centralized sewer; hence WW contained is 70%. T1A1C6: 1% of the population is discharging their excreta directly to open drain.	Not applicable.	WW not delivered to treatment plant is 71%.	There is no treatment of WW in the city. WW is either discharged into Ganga River or is used in agriculture without treatment
Onsite	T1A2C6: 14% of population is dependent on septic tank connected to open drain. T1A2C8: 1% of population is dependent on septic tank connected to open ground. T2A5C10: 1% of population is dependent on lined pit with semi-permeable walls and open bottom.	Since there is no clear differentiation between % of septage and supernatant, it is assumed to be 50% each. SN is assumed to be 7%. Since most of the population is getting their systems emptied, it is assumed 90% of population has their onsite technology emptied. Therefore, FS not contained - emptied comes out to be 7% and FS not contained-not emptied becomes 2%.	No treatment facility exists hence no FS is transported to treatment plant therefore FS not delivered to treatment plant is 7%.	No treatment facility exists hence FS treated is 0%.
Open defecation	13% population still defecate in open			

Source: (CSE, 2016)

7.5 Context-adapted SFD Graphic

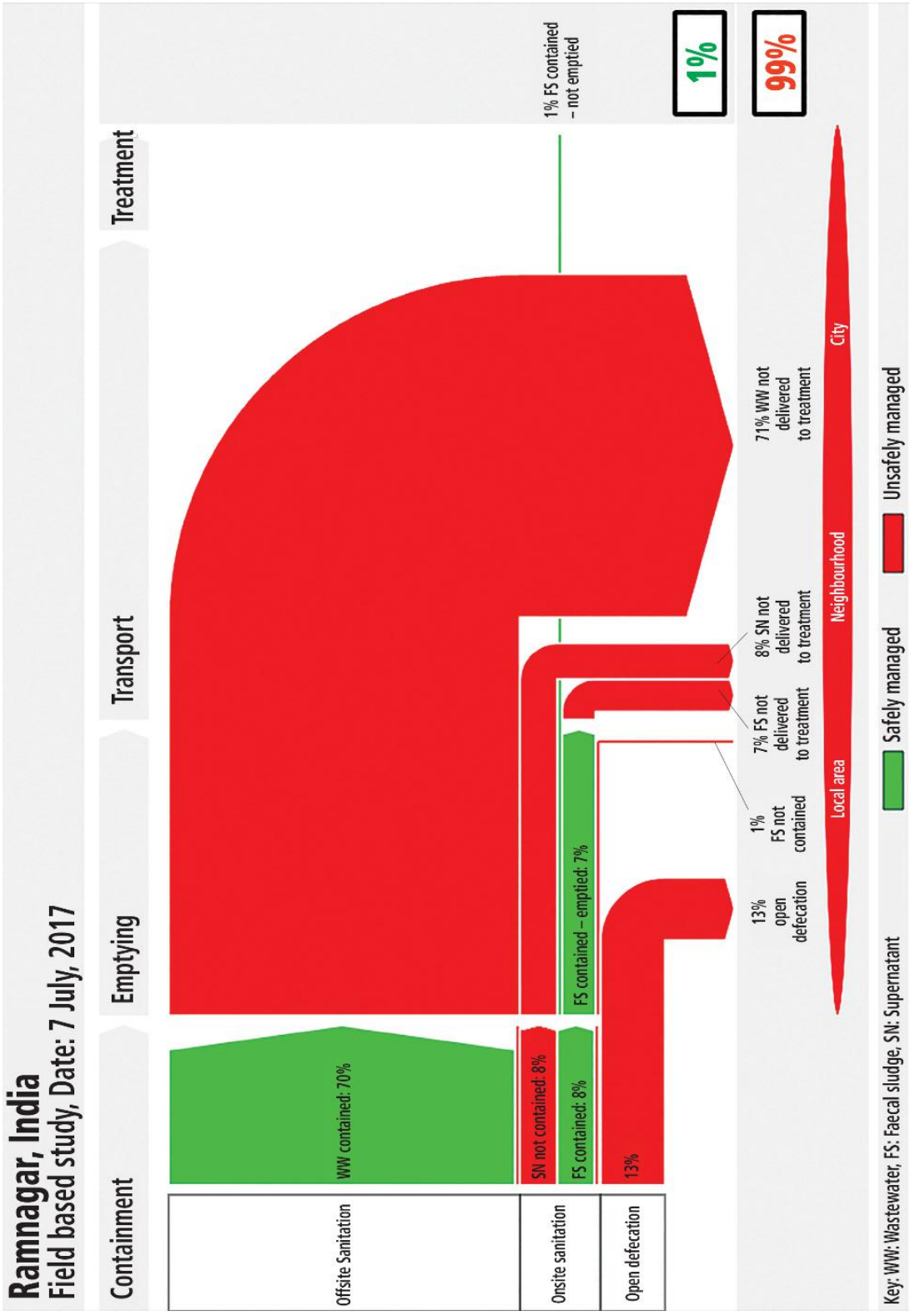


Figure 8: Context-adapted SFD graphic (source: CSE)

7.6 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		T1A1C2			Significant risk of GW pollution Low risk of GW pollution	T1A1C6				Not Applicable
Septic tank					Significant risk of GW pollution Low risk of GW pollution	T1A2C6		T1A2C8		
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									T2A5C10 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										
User interface 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 9: SFD selection grid (Source: SFD graphic generator, 2016)

7.7 SFD calculation grid

Table 13: SFD matrix

Ramnagar, India, 25 Nov 2016. Field based study
Population: 49132
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 50%

System label	Pop	W4a	W5a	W4c	W5c	F3	F4	F5	S4e	S5e
System description	Proportion of population using this type of system	Proportion of wastewater in sewer system, which is delivered to centralised treatment plants	Proportion of wastewater delivered to centralised treatment plants, which is treated	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 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
T1A1C2 User interface discharges directly to a centralised foul/separate sewer	70.0	0.0	0.0							
T1A1C6 User interface discharges directly to open drain or storm sewer	1.0			0.0	0.0					
T1A2C6 Septic tank connected to open drain or storm sewer	14.0					90.0	0.0	0.0	0.0	0.0
T1A2C8 Septic tank connected to open ground	1.0					90.0	0.0	0.0		
T2A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	1.0					0.0	0.0	0.0		
T1B11 C7 TO C9 Open defecation	13.0									

Source: (SFD graphic generator)

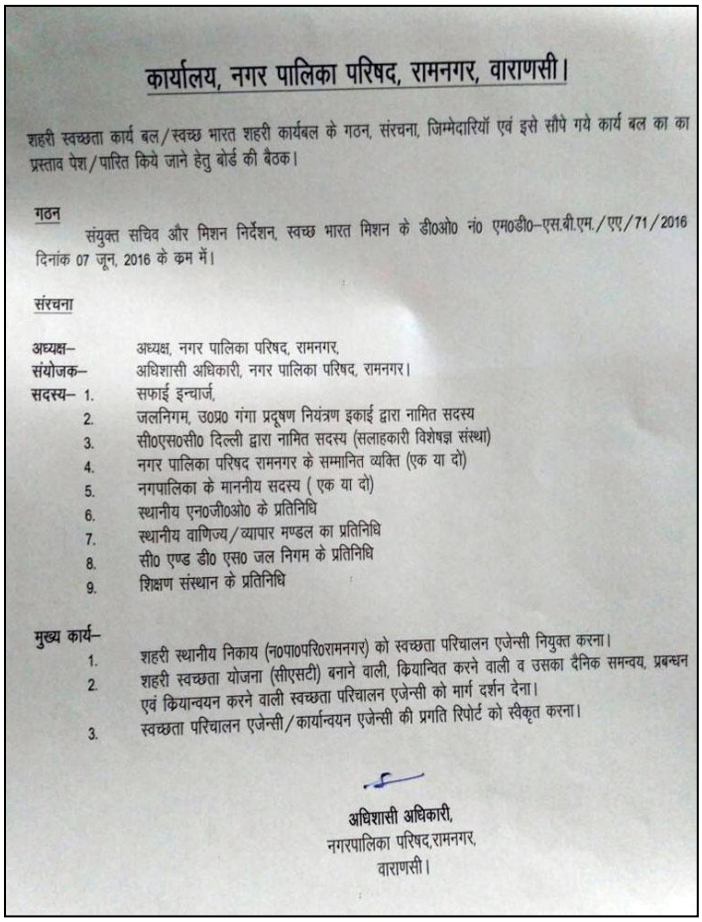
7.8 Community/public toilets

Table 14: Details of community/public toilets

S. No.	Location of the Toilet	No. of Users per day	No. of functional toilet seats				Toilet Connected to	Septic tank size in feet (L×B×H)	Emptying Frequency (in years)
			Men		Women				
			Urinals	Seats	Urinals	Seats			
1	Behind Golaghat Power House	20	2	3	-	2	Sewer	-	-
2	Ramnagar Chowk	100	4	3	-	3	Sewer	-	-
3	Rampur	50	-	-	-	4	Sewer	-	-
4	Near Veterinary Hospital	25	-	3	-	2	Septic Tank	10×5×10	Not Yet
5	Near Rampur Temple	10	-	2	-	3	Septic Tank	10×5×10	3
6	Near Animal Welfare Inter College	50	3	5	-	5	Septic Tank	15×10×10	5
7	Hathykhana	15	-	3	-	3	Sewer	-	-

Source: (NPP, 2016)

7.9 Swachh Bharat City Level Task Force – Ramnagar



कार्यालय, नगर पालिका परिषद, रामनगर, वाराणसी।

शहरी स्वच्छता कार्य बल/स्वच्छ भारत शहरी कार्यबल के गठन, संरचना, जिम्मेदारियों एवं इसे सौपे गये कार्य बल का का प्रस्ताव पेश/पारित किये जाने हेतु बोर्ड की बैठक।

गठन

संयुक्त सचिव और मिशन निर्देशन, स्वच्छ भारत मिशन के डी0ओ0 नं0 एम0डी0–एस.बी.एम./एए/71/2016 दिनांक 07 जून, 2016 के कम में।

संरचना

अध्यक्ष– अध्यक्ष, नगर पालिका परिषद, रामनगर,
संयोजक– अधिशासी अधिकारी, नगर पालिका परिषद, रामनगर।
सदस्य– 1. सफाई इन्चार्ज,
2. जलनिगम, उ0प्र0 गंगा प्रदूषण नियंत्रण इकाई द्वारा नामित सदस्य
3. सी0एस0सी0 दिल्ली द्वारा नामित सदस्य (सलाहकारी विशेषज्ञ संस्था)
4. नगर पालिका परिषद रामनगर के सम्मानित व्यक्ति (एक या दो)
5. नगपालिका के माननीय सदस्य (एक या दो)
6. स्थानीय एन0जी0ओ0 के प्रतिनिधि
7. स्थानीय वाणिज्य/व्यापार मण्डल का प्रतिनिधि
8. सी0 एण्ड डी0 एस0 जल निगम के प्रतिनिधि
9. शिक्षण संस्थान के प्रतिनिधि

मुख्य कार्य–
1. शहरी स्थानीय निकाय (न0पा0परि0रामनगर) को स्वच्छता परिचालन एजेन्सी नियुक्त करना।
2. शहरी स्वच्छता योजना (सीएसटी) बनाने वाली, कियान्वित करने वाली व उसका दैनिक समन्वय, प्रबन्धन एवं कियान्वयन करने वाली स्वच्छता परिचालन एजेन्सी को मार्ग दर्शन देना।
3. स्वच्छता परिचालन एजेन्सी/कार्यान्वयन एजेन्सी की प्रगति रिपोर्ट को स्वीकृत करना।

अधिशासी अधिकारी,
नगरपालिका परिषद,रामनगर,
वाराणसी।

Figure 10: Notification for a meeting of SBCLTF isued by RNPP (Source: NPP, 2016)

Table 15: List of SBCLTF members of Ramnagar city

Members of Ramnagar-SBCLTF		
Chairman	Mayor	
Convener	Executive Officer	
Members	1	Sanitary In-charge
	2	Nominee from Ganga Pollution Control Unit, Jal Nigam
	3	Advisor from Centre for Science and Environment
	4	Senior officials from Municipal Council (one/two)
	5	Members of Council (one/two)
	6	Representatives from local NGO
	7	Representative from local market association
	8	Representatives from construction and design services, Jal Nigam
	9	Representatives from educational institutions

Source: (NPP, 2016)

Figure 11: SBCLTF meeting held in Ramnagar (CSE, 2016)

7.10 Photographs captured during field visit

Figure 12: Pic: 1 Chlorine mixing tank; Pic: 2 & 3 KII with Pump operator & sanitary worker/manual emptiers (Source: Bhavik/CSE, 2016)

7.11 Rate list of services by RNPP

नगर पालिका परिषद्, रामनगर, वाराणसी

द्वारा लिये जाने वाले विभिन्न शुल्क दर तालिका

क्र0	शुल्क का विवरण	शुल्क दर
1	सूचनाधिकार	10.00
2	अभिलेख मुआयना	05.00
3	नकल फीस असेसमेन्ट रजिस्टर (साधारण)	25.00
4	नकल फीस असेसमेन्ट रजिस्टर (अर्जेन्ट)	50.00
5	नकल फीस जन्म व मृत्यु (साधारण)	10.00
6	नकल फीस जन्म व मृत्यु (अर्जेन्ट)	20.00
7	जन्म पंजीकरण विलम्ब शुल्क	50.00
8	मृत्यु पंजीकरण विलम्ब शुल्क	25.00
9	नामान्तरण विलम्ब शुल्क	100.00
10	पानी के टैंकर का शुल्क विवाह, धार्मिक कार्य व्यवितगत	200.00
11	त्रयोदशाह कार्य	निःशुल्क
12	मकान मरम्मत आदि कार्य	500.00
13	जलमूल्य घरेलू कनेक्शन वार्षिक	120.00
14	जलमूल्य व्यावसायिक (प्लाट आदि सम्बन्धी) वार्षिक	240.00
15	रोड कटिंग चार्ज-पत्थर चौका प्रति चौका	53.00
16	रोड कटिंग चार्ज-इण्टर लाकिंग प्रति वर्गमीटर	264.00
17	रोड कटिंग चार्ज-पिच रोड प्रति वर्गमीटर	80.00
18	रोड कटिंग चार्ज-सी.सी. रोड प्रति वर्गमीटर	364.00
19	रोड कटिंग चार्ज-ईट खड़ंजा प्रति वर्गमीटर	38.50
20	जल कनेक्शन फीस मजदूरी व सामान के कुलयोग पर	12 पै. प्रति रूपया
21	अन्य कार्यो का सुपरवीजन चार्ज	02.00
22	कनेक्शन फीस	02.00
23	कनेक्शन सुपरवीजन फीस	02.00
24	टेस्टिंग फीस	03.00
25	वाटर सप्लाई नं0 2	02.00
26	फिटिंग चार्ज प्रति फुट	04.00
27	मीट, मछली, मुर्गा लाइसेन्स	200.00
28	विवाह/आयोजन स्थल	1000.00
29	फार्म शुल्क अतिरिक्त	2.00

7.12 Household survey questionnaire

CENTRE FOR SCIENCE AND ENVIRONMENT, NEW DELHI
Focus Group Discussion (FGD)
QUESTIONNAIRE

Date: ___/ ___ / ___, **Area Name:** _____, **Ward:**_____,

Co-ordinates:_____, **No. of Participants (4-10)** _____

Group Profile
No. of Male: No. of Female:

Respondents	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Gender										
Age										
Marital Status ((U/M)										
Household size										
Social category (G, OBC, SC, ST										
House Structure (P,K, SP)										
Latrine facility (IT, ST, CT, PT, ODF)										
IT: Individual Toilet, ST: Shared toilet, CT: Community Toilet, PT: Public Toilet, ODF: Open Defecation										
Who constructed toilet (SF, Govt.,Pvt.,NGO)										

Respondents	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Does the current state of toilet cause trouble (Y/N)? State reasons??										
Do all females use toilet (Y/N)?										
Do all males use toilet (Y/N)?										
Do all children use toilet (Y/N)?										
Types of toilet (ISP, Western)										
ISP: Indian Squatter Pan										
Kind of flushing (PF/CF)										
PF: Pour Flush, CF: Cistern Flush										
User interface connected to(S,ST,PL,OD, OG,LIC/O,LSC/ O)?										
S: Sewer, ST: Septic Tank, PL: Pit Latrine, OD: Open Drain, OG: Open Ground, LIC/O: Lined tank impermeable/Semipermeable walls with closed/open bottom,										
Details of the tank										
Circular/rectangular/Square (C/R/S)										
Length: Breadth: Depth										
Comment:										

2

Figure 13: Household questionnaire used during random survey (Source: CSE, 2016)

FS emptiers questionnaire

CENTRE FOR SCIENCE AND ENVIRONMENT, NEW DELHI
Septic tank Cleaner Survey

Date: ...../Nov/2016 Time: ..... Place: .....

1. Owner name & Mob. No. .....
2. De-sludging process (Manual/Mechanical/Semi M.M) .....
3. Reasons for adopting the process.....
4. Type of vehicle used for transportation (Tractor/Truck/trolley/others)

   .....
5. Price of vehicle.....
6. Type of ownership (Own vehicle /hire from others) .....
7. Number of vehicles (total in your area). . .....
8. Capacity of vehicles .....
9. Typical age of Vehicles .....
10. Vehicle Assembling point.....
11. Vehicle Details.

New or second hand	
Mileage	
Durability of vehicle (Max.)	
Capacity of pump (in HP)	
Location of pump on vehicle	
Tank maintenance details (if any rupture etc.)	
Tank durability (max.)	

12. Typical No of trips per day .....
13. Average distance per trip.....
14. Area of responsibility.....
15. Fees charge/trip.....
16. Time taken for desludging activity.....
17. Where is sludge dumped .....
18. Where should be disposal site to be located? .....
19. Official dumping site for city.....
20. Reuse for sludge .....
21. Total Quantity of faecal sludge received per day per trip (Approx.).....
22. Septic tank location (top place used for any activity or unused).....
    .....
23. Septic Tanks details (Capacity, dimension, materials used for construction, Inlet and outlet baffle etc.....
24. Areas having highest demand for sludge clearing .....
25. Frequency of desludging per household.....
26. Fees Charges /Trip (Competitors) .....
27. NO. Of private Operators in your area .....
28. Are you maintaining any register/produce any bill for payment? .....
29. Is the current practice suitable for the you (Suggest any changes)

    .....
30. Major issue running in the business

    .....
31. Safety Measures if any during desludging process .....
32. Marketing Strategy.....
33. Why you are doing this work?

    .....

Figure 14: Survey questionnaire used during emptiers interview (Source: CSE/2016)