SFD Report

Buxar
India

Final Report

This SFD Report –Comprehensive level - was prepared by Centre for Science and Environment.

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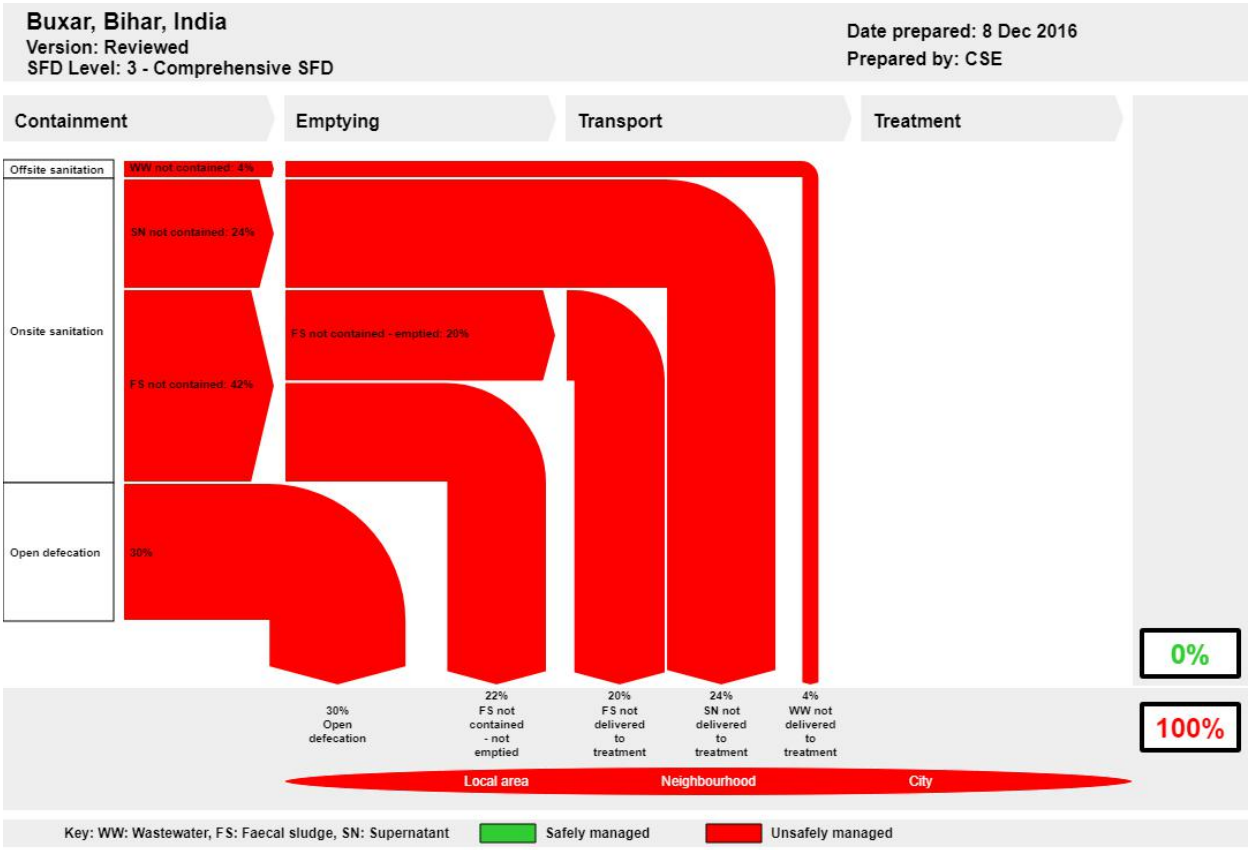
SFD Report Buxar, India, 2017

Produced by:
Suresh Kumar Rohilla, CSE
Bhitush Luthra, CSE
Shantanu Kumar Padhi, CSE
Amrita Bhatnagar, CSE

This Executive Summary and SFD Report are available from:

www.sfd.susana.org

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

SFD Level:

Level of this SFD report: Comprehensive.

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09/05/2017

3. General city information

Buxar city is situated on the banks of River Ganga in the state of Bihar, India. The city lies at the centre of Indo Gangetic plains. The city is the district headquarters of Buxar district, Bihar and is located 117.7 km from Patna, the state capital. Historically, the city is famous for the battle of Buxar (BUDA, 2010).

The population of the city, as per the Census of India, 2011 is 102,861, while slum population is 10,161 (9.87% of total population) (Census of India, 2011) . The urban local body governing in Buxar is the Buxar Municipal Council (BMC). BMC administrative boundary covers 6.71sq.km which is divided into 34 electoral wards. The population density of the city is 15,330 persons per sq.km which is relatively high in comparison to state density of 1,021 persons per sq. km (Census, 2011).

The temperature rises maximum to 45°C during peak summer season and drops down to a minimum of 4°C during the winter season. Buxar city lies in a moderate to high rainfall region with an average yearly rainfall of 792mm (BUDA, 2010) . Buxar lies in agro-climatic zone IIIB (southern west) and the soil type is alluvial which is highly fertile (KVK, 2017).

4. Service outcomes

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

Containment: The city is majorly dependent on Onsite Sanitation Systems (OSS): 24% of the population depends on septic tanks connected to open drains, 24% of the population depends on fully lined tanks connected to open drains, 18% population depends on lined pit with semi permeable walls and open bottom, with no outlet, 4% population depends on user interface discharging directly into open drains, while 30% population defecates in open (BMC, 2016).

Emptying: Emptying frequency of OSS in the city is more than 5 years, due to oversized construction of OSS irrespective of the household size. The mechanical emptying service is facilitated by BMC only, restricted to area of jurisdiction. Emptying is done using a vacuum tanker of 3,500 litres capacity and performed by 2 people (1 driver + 1 helper). Emptying services are done without personal protective equipment (PPE). Emptying service charge is INR 1,300/trip (USD 19.5/trip) (BMC, 2016a) . It is reported that BMC receives only one to two service request per month. Due to inaccessible narrow lanes majority of households are dependent on manual emptying. In case of pit latrines with slab, sometimes the containment system is closed upon filling up of the system using sand and stone.

Figure 1: Tractor mounted vacuum tanker (Source: Amrita/CSE, 2016)

Transportation: OSS connected to open drains let out supernatant/effluent directly into the drains while the faecal sludge is emptied out using tractor mounted vacuum tankers. Vacuum tankers carry faecal sludge 4-5 km away from the city and discharge at open fields. Wastewater from user interface disposing directly to drains is carried directly to the river Ganga through a water canal (BMC, 2016a).

Treatment and end-use/discharge: There is no treatment facility available for FS generated in the city. Emptied FS from OSS is discharged into open drains/farms and supernatant/effluent from OSS is conveyed through open drains into Sone canal which eventually reaches River Ganga at Ramrekha Ghat (BMC, 2016a).

According to the Census of India 2011, 4.9% of the city is dependent on the piped sewer system, while 69.1% population is dependent on septic tanks, 1.6% on other systems, 1.8% population depends on pit latrine and 0.8% on service latrines. 21.8% population in the city practices open defecation.

During the field based research, it was observed that there is no sewerage network existing in the city and the equivalent population is dependent on OSS. Septic tank connected to open drain is attributed to 24% of the population, fully lined tanks connected to open drains is attributed to 24% of the population lined pit with semi permeable walls and open bottom with no outlet serves 18% of the population. The public latrines are connected to septic tanks and hence are incorporated in onsite systems. The lined pit with open bottom are considered to be not contained as the FS infiltrates and pollute ground water due to high water table. 4% population depends on user interface which discharges directly in open drains, while 30% population practices open defecation.

5. Service delivery context

National Urban Sanitation Policy (NUSP) was issued in 2008, by the Ministry of Urban Development (MoUD, 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. Urban Local Bodies (ULB-local municipal government)/ 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).

Key Stakeholders	Institutions / organizations
Public Institutions	Ministry of Housing and Urban Affairs (MoHUA), Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWRRD& GR) Ganga Pollution Control Unit., Buxar Municipal Council (BMC), *Nagar Vikaas Vibhaag*, Bihar Urban Infrastructure Development Corporation (BUIDCo), Support Programme for Urban Reforms (SPUR), Bihar state pollution control board (BSPCB), Bihar Urban Development Authority (BUDA)
NGOs	Centre for Science and Environment (CSE), Sulabh International Social Service organization (SISSO),
Private Sector	Local masons
Development partners & donor	Department for International Development (DFID)-Sector Wide Approach to Strengthen Health (SWASTH)

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

In February 2017, MoUD 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 the central government to provide basic civic amenities including improvement of urban sanitation. Under Swachh Bharat Mission (SBM), 261 individual households' toilets have been constructed, while 803 are under construction. Under the Support Programme for Urban Rejuvenation (SPUR) an initiative of Government of Bihar, a sewer network of 9.5 km with 3 pumping stations and a 13 MLD Sewage Treatment Plant (STP) has been proposed (BUDA, 2010).

The municipal council did a rapid assessment of FSM to calculate the funds required for the same. It was estimated that INR 5120.19 lakh (7.7 million USD) is required for implementation of effective faecal sludge and septage management including operation and maintenance for five years (MoUD, 2016).

6. Overview of stakeholders

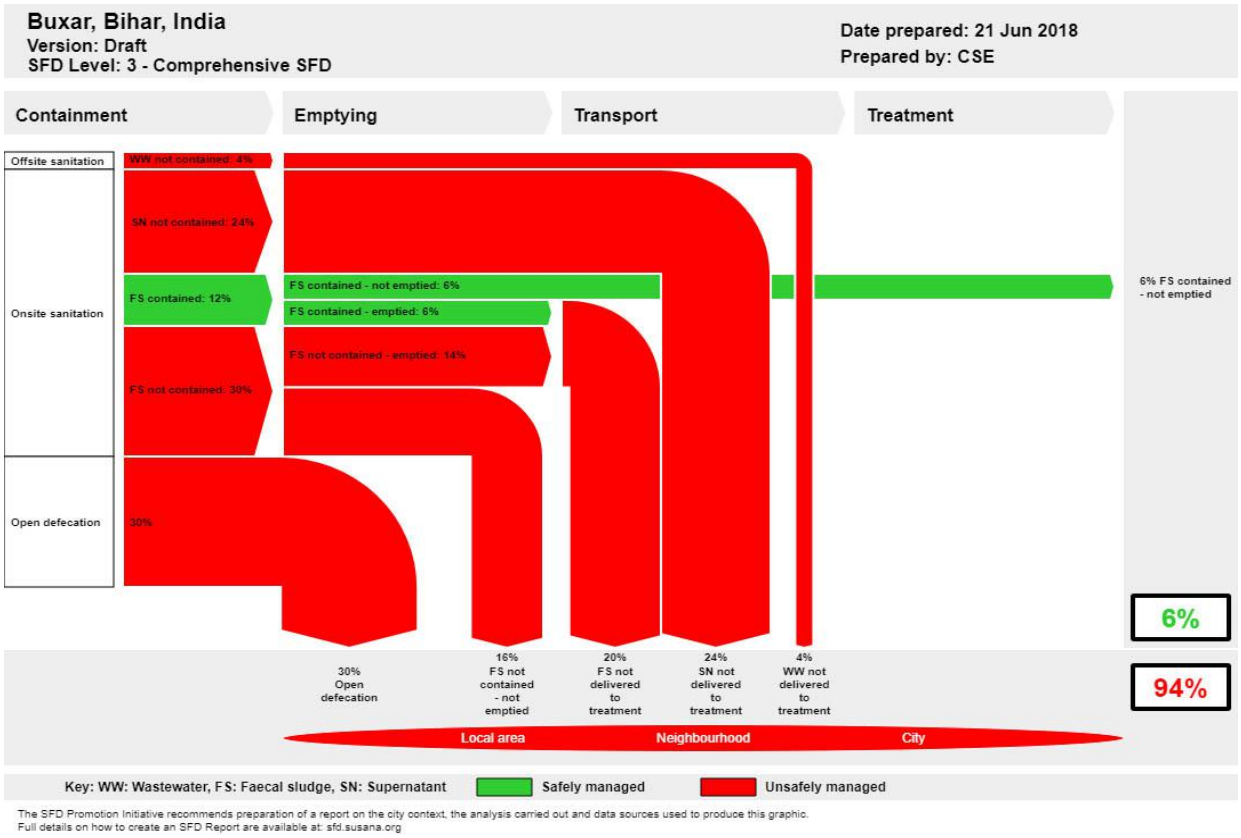
The 74th Constitutional Amendment Act of 1992 reformed the sector by transferring responsibility for domestic, industrial, and commercial water supply and sewerage (WSS) from state agencies, such as Departments of Public Health Engineering and State Water Boards, to Urban Local Bodies (ULBs). This transfer 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).

Table 1 summarizes the stakeholders responsible for sanitation service delivery in Buxar. Public Health and Engineering Department, Bihar is responsible for ensuring access to safe water; supply of drinking water and development of sanitation facilities; constant monitoring of quality of drinking water supply; sanitation; reforming water supply and sanitation sector.

Reform Support Unit (RSU) implements the projects supported by DFID-SWASTH in the state of Bihar. Urban Development & Housing Department, GoB is at the state level and performs implementation of schemes supported by the centre and state government respectively, such as the National Clean Ganga Mission, SBM and 7 Nischay Mission. Water & Sanitation Department, Buxar Nagar Nigam has 2 sanitary inspectors who inspect the toilet and sanitation work which are being carried out in the city. SPMG coordinates and oversees 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 4, the city is majorly dependent on OSS: 48% population depends on septic tanks and fully lined tanks connected to open drains, 18% population depends on lined pit with semi permeable walls and open bottom, with no outlet, 4% population depends on user interface discharging directly into open drains, while 30% population defecates in open.

The only difference suggested in the context-adapted SFD is at containment stage for correctly designed septic tanks, though connected to open drains.

With an earlier assumption of 50% of the proportion of the content of the septic tank and fully lined tank is solid FS, generated and collected inside the septic tank and fully lined tanks. Rest of the 50% of the content is supernatant, which attributes to 24% (12% +12%) 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, 12% of FS in septic tanks is considered contained (represented green in colour). 6% FS contained is emptied and remaining 6% 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). The 'FS not contained' changes from 42% to 30%, 'FS contained' changes from 0% to 12% and 'SN not contained' remains 24% when compared to SFD generated through graphic generator.

Figure 2: FGD at Ramrekha Ghat, Buxar (Source: Anil/CSE, 2017)

Overall excreta of 94% 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 those defined in the project are established. The secondary data are quantified and cross-checked with FGDs and KIIs.

The data are then fed into the online SFD graphic generator to calculate the excreta flow in terms of percentage of the population and to produce SFD graphic (refer section 1) of the executive summary. It can be concluded that excreta of 98% of the city's population are discharged into local environment without any treatment.

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

10. Credibility of data

Three key sources of data are used; (i) Census of India, 2011 as base data to feed into SFD graphic generator for population (ii) *Saat Nischay Yojna* (a state government scheme to provide basic infrastructure at the household level) data (iii) random households survey based on socio economic condition of each wards, where 5-6 respondents were recorded. The survey was done to understand the proportion of population dependence on different types of sanitation systems. Published documents of relevant departments, KII and FGD are further used for data triangulation. Overall, 2 KII and 4 FGDs have been conducted with different stakeholders.

On ground, there is no sewer network which gets further validated by the Detailed Project Report for proposed sewer network and Sewage Treatment Plant (STP).

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 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 waste water generated. Therefore, random 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 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
  - Groundwater Year Book, Central Groundwater Board, 2015
- KIIs with representatives from
  - Mason
- FGDs with
  - BMC Staff
  - FGD with households
  - SBCLTF
- Random household survey

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Abbreviations

AMRUT	Atal Mission For Rejuvenation & Urban Transformation
BIS	Bureau Of Indian Standard
BMC	Buxar Municipal Council
BUDA	Bihar Urban Development Authority
CAA	Constitution Amendment Act
CAPEX	Capital Expenditure
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health & Environmental Engineering Organisation
CSE	Centre For Science And Environment
CSP	City Sanitation Plan
CSTF	City Sanitation Task Force
DFID	Department For International Development
DPR	Detailed Project Report
EWS	Economically Weaker Sections
FGD	Focus Group Discussion
FS	Faecal Sludge
FSM	Faecal Sludge Management
FSSM	Faecal Sludge And Septage Management
GoB	Government Of Bihar
GoI	Government Of India
HFA	Housing For All
INR	Indian Rupee
KII	Key Informant Interview
lpcd	Litres Per Capita Per Day
mbgl	Metres Below Ground Level
MHUPA	Ministry Of Housing And Urban Poverty Alleviation
MLD	Million Litres Per Day
MoHUA	Ministry of Housing and Urban Affairs
MoUD	Ministry Of Urban Development
NBC	National Building Code
NFSSM	National Faecal Sludge And Septage Management Alliance
NGC	National Ganga Council
NGRBA	National Ganga River Basin Authority
NIC	National Informatics Centre
NIUA	National Institute Of Urban Affairs
NMCG	National Mission For Clean Ganga
OD	Open Defecation
ODF	Open Defecation Free
OPEX	Operational Expenditure
OSS	Onsite Sanitation Systems
PHED	Public Health And Engineering Department

PPE	Personal Protective Equipment's
SBCLTF	Swachh Bharat City Level Task Force
SBM	Swachh Bharat Mission
SFD	Shit Flow Diagram
SLB	Service Level Benchmarks
SLIP	Service Level Improvement Plan
SMP	Septage Management Plan
SN	Supernatant
SPUR	Support Programme For Urban Rejuvenation
sq. km	Square kilometer
STP	Sewage Treatment Plant
SWASTH	Sector Wide Approach To Strengthen Health
ULB	Urban Local Body
USAID	United States Agency For International Development
USD	United States Dollar (1 Usd = 66.5 INR)
WW	Waste Water

1 City context

Buxar is a mythological and historically significant city in the Indian state of Bihar. Buxar city is located on the banks of River Ganga. The city is situated in the western most region of Bihar state, bounded by Balia and Gazipur districts of Uttar Pradesh state (BUDA, 2010). The city lies in the middle Gangetic region. The city is district headquarters for Buxar District, Bihar, India. The city is located 117.7 km from state capital Patna. The population of the city is 102,861 as per Census of India, 2011. The municipal area is 6.71sq.km (UD & HD, 2015). The gross density of the city is 15,330 persons per sq.km which is considerably high in comparison to state density of 1,102 persons per sq.km (Census, 2011). Slum population in the city is 10,161 which is 9.87% of the total population (Census of India, 2011). Municipal boundary has been chosen for the current study. Buxar Municipal Council (BMC) is divided into 34 wards. The population growth rate of the city is given in the Table 1:

Table 1: Decadal growth rate of population of Buxar

Census Year	Population	Decadal Growth (%)
1961	23,068	28%
1971	31,691	37%
1981	42,952	36%
1991	55,753	30%
2001	83,168	49%
2011	102,861	24%

Source: Census, 2014

Buxar is located at 25°33′38″N 83°58′50″E (UD & HD, 2015). The city has an average elevation of 65m above mean sea level (UD & HD, 2015). The area is rich in ground water resource and fertile alluvial soil suitable for wheat and paddy cultivation. The water table in town is quite shallow due to proximity to banks of Ganga River. The pre-monsoon depth of ground water measured for May, 2014 generally varies from 6-8 metres below ground level (mbgl) and the post monsoon water level measured for November 2014 generally varies from 0-2 mbgl (CGWB, 2015). Buxar city is divided into two halves by Sone canal, which further gets connected to River Ganga.

Buxar witnesses moderate climate, during summers the temperature rises to 45°C, while in winters the temperature dips to 4°C. The town receives an average annual rainfall of 792 mm, approximately 85% of annual rainfall is due to southwest monsoon (which is active from June to September (BUDA, 2010).

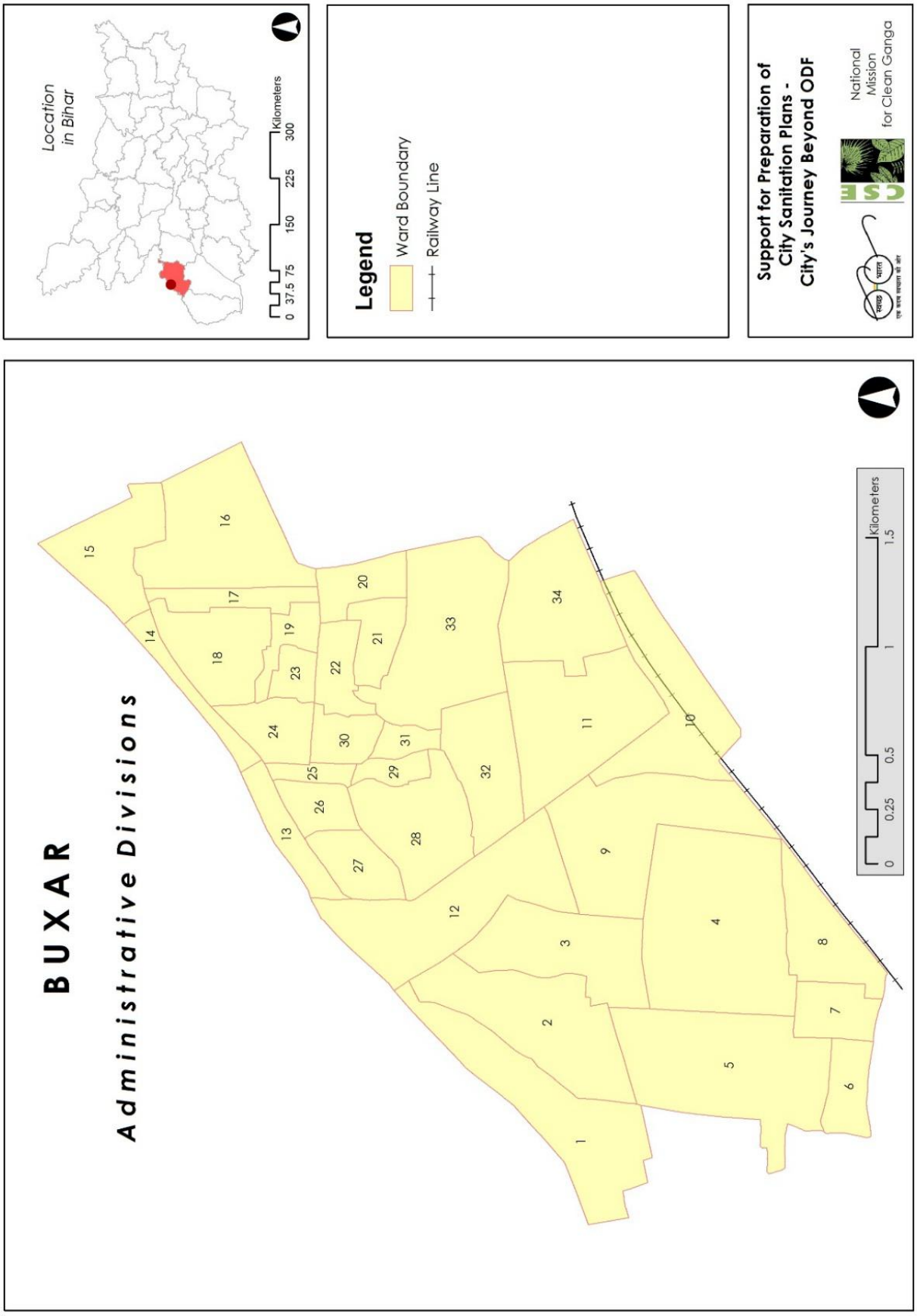

Figure 1: Ward map of Buxar city (Source: CSE, 2017)

2 Service outcomes

The analysis is based on random household surveys and secondary sources of data. The key sources of data used are Census of India, 2011 (Census of India provides information on size, distribution and socio-economic, demographic and other characteristics of the country's population), *Saat NischayYojna, 2017* (A scheme by the state government of Bihar, this has been explained in detail in section 3.5.) and the field surveys conducted in the city. Census considers 8 types of sanitation systems. 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, definitions of sanitation systems, the types of containments prevalent in the wards are examined through a household (HH) survey (Table 2). Data on emptying, transport, treatment and disposal of FS are collected through KIIs with Urban Local Body (ULB is the local governing body in 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 Buxar, the ULB is called Buxar Municipal Council), 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 the 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.	T1A1C2	4.9
2	Septic tank	Septic tank connected to open drain or storm sewer	T1A2C6	67.5
3	Other Systems	User interface discharges directly to open ground	T1A2C8	1.6
4	Pit latrine with slab	Lined pit with semi-permeable walls and open bottom, no outlet or overflow, general situation	T1A5C10	1.4
5	Pit latrine without slab	Unlined pit no outlet or overflow, general situation	T1A6C10	0.4
6	Night soil disposed into open drain	User interface discharges directly to open drain or storm drain	T1A1C6	0.3
7	Service latrine	User interface discharges directly to ‘don’t know where"	T1A1C9	0.5
8	Public latrine	Septic tank connected to open drain or storm sewer	T1A2C6	1.6
9	Open defecation	Open defecation	T1B11C7 TO C9	21.8

Source: Census, 2011

2.1.1 Sanitation facilities

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

Community & public toilets: There are a total of 4 toilets with 8 (4-seats and 4-urinals) units for men and 4 seats for women (SISSO, 2016). Upon the visit to a public toilet at Ramrekha ghat, it was observed that the toilet is connected to septic tank which is 4.57 m in length, 2.4 m in width and 3 m is depth, with supernatant being discharged directly through the outlet of septic tank into Sone canal which meets River Ganga approximately 200 meters away.

Commercial areas: Commercial areas comprise of shops, markets etc., where business activities take place. Toilets in commercial areas are connected to septic tanks. Septic tanks of public toilets are connected to open drain. These public toilets are operated and maintained by BMC.

Due to lack of data on excreta generated from institutions, industrial areas, restaurants and hotels, these establishments have not been taken into consideration for production of SFD. The excreta from public toilets and residential areas have been considered for this study.

2.1.2 Containment system

According to Census 2011, 4.9% population is connected to piped sewer system. As per field survey, there is no sewerage network, which further gets verified by DPR on sewerage network (The sewerage network has not been implemented as the grant under SPUR has finished) and treatment plant proposed under SPUR. As per census the dependence on OSS is 73.2% and population practising open defecation is 21.9%. However, the data used for SFD preparation are based on data triangulation from various sources as explained above and in detail in section 2 (service outcomes).

As per field based survey, it was observed that two types of OSS are prevalent in the city, namely: 1. Septic tank, 2. Pit latrine with the slab.

1. Septic tank: Septic tanks are connected to open drains and serve 24% of the population. Septic tanks are constructed with 2-3 chambers. As the size of septic tank depends upon space availability and affordability of households. For preparation of SFD we have considered these tanks to be septic tank only, although, they are oversized tanks but they are rectangular in size with having baffle walls in it. 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 (BMC, 2016a)

2. Fully lined tanks: Generally, septic tanks constructed in the city do not exactly adhere to standards prescribed by Bureau of Indian Standards (BIS). Hence, it is assumed that 24% of the population is dependent on fully lined tanks. Construction of oversized tanks is a general practice which is believed to help reducing the emptying frequency from 1-2 years as prescribed by Indian standards and Central Public Health and Environmental Engineering Organisation (CPHEEO) manual to emptying of tanks for more than 5 years.

3. Pit latrine with a slab is a system of lined pit with semi permeable walls and open bottom, which serves 18% of the population. Pit latrine in Buxar is a rudimentary twin pit system, where pits are connected with each other through a pipe. The pit system is mostly observed in the vicinity of the river bank, where there is either inadequate space to construct septic tanks or the households cannot afford construction of septic tank. Despite the ongoing Open Defecation Free (ODF) drive for all cities in India, *Saat Nischay Yojna* data reports 30% population practising open defecation.

Figure 2: Vent pipe connected to septic tank (Source: Anil/CSE, 2016)

Figure 3: Newly constructed septic tank (Source: Amrita/CSE, 2016)

2.1.3 Emptying

Onsite sanitation systems in the city are emptied by service provided by BMC using ULB owned tractor mounted with tanker. The BMC owns 1 tractor mounted with a tanker. An application form is to be submitted at the ULB to the *Kajpalak* (sanitary supervisor). After approval from sanitary inspector, the application is forwarded to the *Safai Karamchari* (sanitary worker) to whom the requisite amount is submitted and a receipt is procured, only then the service is provided (BMC, 2016a). The ULB reported that generally they receives only 1-2 applications in a month. During emptying procedure, no safety equipment is used and around 1 litre of kerosene is poured into the OSS to suppress odour. Generally, the frequency of emptying of tanks is more than 5 years and for pits, its less than 5 years due to high groundwater table (BMC, 2016a). Cost of emptying service is INR 1,300/trip (USD 19.5/trip). Emptying service by the ULB is only limited to municipal boundary. The issue of inaccessible and narrow access routes has hints at the practice of manual emptying of containments. In case of pit latrines with slab, few households have reported that they prefer the containment system to close upon filling up of the system using sand and stone.

2.1.4 Transportation

Transportation of faecal sludge is done using tractor-mounted vacuum tanker as shown in Figure 4. The capacity of the tanker is 3,500 litres. A generator run motor is used for suction installed in between the tractor and tanker having a head capacity of 5 HP. The vacuum tankers cover up to 7 km for collection and discharge of faecal sludge (BMC, 2016). Supernatant from OSS and grey water is conveyed to River Ganga, via open drains.

Figure 4: BMC run vacuum tanker (Source: Anil/CSE, 2016)

2.1.5 Treatment and disposal/end use

There is no faecal sludge and supernatant/effluent treatment plant facility available in the city. Septage collected by BMC run vacuum tanker is discharged at various points within the city and its outskirts. Septage discharge points within the city are low lying land as depicted in the figure and its outskirts as depicted in Figure 6. Sewage and faecal sludge are indiscriminately discharged into the *Sone* canal which is eventually conveyed to River Ganga. Figure 7 & Figure 8 depicts the condition of water from *Sone* canal meeting River.

Figure 5: Quality of water entering River Ganga (Source: Anil/CSE 2016)

Figure 6: Discharge point of septage (Source: Amrita/CSE, 2016)

Figure 7: Discharged faecal sludge on open fields in Buxar (Source: Anil/CSE, 2016)

Figure 8: *Ramrekha ghat* (where *Sone* canal meets River Ganga) (Source: Anil/CSE, 2016)

2.2 SFD graphic

The SFD matrix is shown in Appendix 7.6 and the SFD generated from SFD graphic generator for Buxar is presented in Figure 12, Appendix 7.3.

2.2.1 SFD matrix explanation

According to Census 2011, 5% of the population of Buxar city is connected to piped sewer system which in principle is user interface discharging directly to open/covered drains, 73% population is connected to OSS, while 22% population practices open defecation.

According to Census 2011, *Saat Nischay Yojna* data and focus group discussions, it was estimated that around 66% of the city is dependent on OSS, while user interface directly discharging in open drain is 4%. Remaining population, estimating up to 30% defecates in the open (as per field visit, open defecation was observed mostly along the bank of River Ganga). Open defecation majorly attributed to slum settlements who do not have adequate sanitation facilities.

Table 3: Description of variables used for defining containment systems

S. No.	Variables	Description (city context)	Percentage of population
1	T1A1C6	User interface discharges directly to open drain or storm sewer	4
2	T1A2C6	Septic tank connected to open drain or storm sewer	24
3	T1A3C6	Fully lined tanks connected to open drain or storm sewer	24
4	T2A5C10	User interface discharging to lined pit with semi-permeable walls and open bottom	18
5	T1B11C7 TO C9	Open defecation	30

Source: SFD Promotion Initiative Manual

Table 4: Description of variables used in SFD

System type	Variables	Description (city context)	Percentage of population
Offsite Sanitation	WW not contained	Wastewater from user interfaces connected directly to open drains	4
	WW not delivered to treatment	Wastewater from user interfaces connected directly to open drains and not treated	4
Onsite Sanitation	SN not contained	Untreated supernatant from OSS (T1A2C6) being directly discharged in open drains	24
	SN not delivered to treatment	Supernatant from OSS (T1A2C6 and T1A3C6) connected to open drains which do not get treated and discharges to the environment (to an open drain, to a water body, to open ground)	24
	FS not contained	Faecal sludge from OSS (T1A2C6, T1A3C6 and T2A5C10) where either there is significant risk of groundwater contamination or OSS discharges liquid component to open drain	42
	FS not contained – emptied	Faecal sludge emptied from OSS (T1A2C6, T1A3C6 and T2A5C10)where FS is not containedand is emptied using themotorized emptying equipment.(Assumption made that 90% faecal sludge is emptied from a given containment system)	30
	FS not delivered to treatment	Faecal Sludge emptied from OSS is discharged on open sights in the city and surrounding villages, which directly pollutes the environment.	30
	FS not contained-not emptied	FS from the OSS (T2A5C10) which gets infiltrated and the 10% FS which remains in the containment system during the emptying process from the OSS (T1A2C6, T2A5C10)	12
Open defecation	Open defecation	With no user interface, users defecate in water bodies or on open ground or to 'don't know where'; consequently, the excreta are NOT contained.	30

Source: CSE, 2017

Offsite sanitation

Population with user interface discharging WW directly into open drains (T1A1C6) attributes to 4%. WW which is directly discharged from this population is not treated and ultimately leads to River Ganga, through main drains.

Onsite Sanitation

66% of the city is dependent on onsite sanitation systems (OSS), out of which 24% are dependent on septic tanks, 24% are dependent on fully lined tanks and around 18% on pits. Fully lined 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. FS in the septic tank is considered to be contained explained at length in the section 2.3 context-adapted SFD.

There is no clear differentiation between the volume of effluent/supernatant 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 24% which is attributed to septic tanks and fully lined tanks connected to open drains (T1A2C6). FS not contained is 42% which is attributed to 12% from septic tanks, 12% from fully lined tanks and 18% from pits. It is also assumed that 50% of the population dependent on tanks and 90% on pits gets their system emptied when full while 50% (tanks) and 10% (pits) population does not get emptied. Therefore, 20% 'FS not contained and emptied' is attributed to 6% FS each from septic tanks and fully lined tanks; and 8% FS from pits which are emptied. 22% 'FS not contained and not emptied' is attributed to 6% FS each from septic tanks and fully lined tanks and 10% FS from pits, which remains at the bottom of the OSS. FS not contained and not emptied from pits consists of 9% infiltrate due to semi permeable walls which eventually pollutes ground water.

Open defecation

In Buxar city, open defecation (T1B11C7 TO C9) attributes to 30% population, which can be attributed to settlements along the river bank.

It can be concluded that excreta of the whole population are discharged in the environment and is untreated, therefore, it is unsafely managed. 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

Buxar district is rich in ground water resource. The district is a part of the lower Ganga sub-basin of the upper Ganga basin. Physiography of the district is alluvial plain with high fertility (CGWB, 2015).

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 the infiltration of liquid into the groundwater and therefore on the potential risk of groundwater pollution.

Based on the random household survey and KIIs in Buxar, 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, 2015). According to the random survey, it

was observed that population dependent on pit system with open bottom contribute to ground water contamination. According to the Census, 74.4% of the population is dependent on hand pumps and 12.5% on well, tube well or bore well. Random household survey revealed 85% of the respondents were depended on hand pump and 15% were dependent on bore wells.

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 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 triangulate data provided by secondary sources.

The Census 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, random household survey was conducted in each ward of the city to identify and cross-check the data collected from the Census, 2011.

Three key sources of data are used; (i) Census of India, 2011 as base data to feed into SFD graphic generator for population (ii) *Saat Nischay Yojna* data and (iii) random households survey based on socio economic condition of each ward, where 5-6 respondents were recorded. The survey was done to understand proportion of population dependence on different types of sanitation systems. Published documents of relevant departments, KII and FGD are further used for data triangulation. Overall, two KIIs and five FGDs have been conducted with different stakeholders.

The assumption regarding the volume of FS emptied as compared to FS generated has 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. Since there is no clear differentiation between volume of effluent/supernatant and septage generated from septic tanks and lined tanks, hence it's 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 gets 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 based on the analysis done and was presented to the SBCLTF's members and 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 66% of the population, dependent on onsite sanitation system, 48% of the population is dependent on septic tanks connected to open drain or storm sewer. 18% of the population, dependent on lined pit with semi-permeable walls and open bottom, is attributed to be FS not contained.

With an earlier assumption of 50% of the proportion of the content of the septic tank and fully lined tanks are solid FS, rest of the 50% is assumed to be supernatant, which attributes to 24% of the population, that flows through open drains. According to SBCLTF the solid FS collected in the septic tank (attributed to 12% population) should be considered contained as it is neither polluting the ground water nor the solid excreta are overflowing in the open drain, only supernatant is carried through open drains. Hence 12% of FS is considered contained (represented green in colour). 6% FS contained is emptied and rest 6% 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).

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 42% to 30%, ‘FS contained’ changes from 0% to 12% and ‘SN not contained’ remains 24% when compared to SFD generated through graphic generator.

Overall, excreta of 94% 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 (formerly known as Ministry of Urban Development (MoUD)) issued the National Urban Sanitation Policy (NUSP). The policy aims to: raise awareness; promote behavior 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 the multi-stakeholder task force as one the principal activities to be taken up to start the city sanitation planning process. As per the requirement of CSP, a 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 analyzing 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 MoUD in 2013, recommends supplementing CSPs with a Septage Management Sub-Plan (SMP), prepared and implemented by cities. Septage here broadly refers to not only FS removed from septic tanks but also that removed from pit latrines and similar on-site systems. This advisory provides reference to Central Public Health & Environmental Engineering Organization (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 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 discharge 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, MoUD 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 bye-laws 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:

Draft Urban Sanitation Strategy, 2010

The state has prepared a Draft Urban Sanitation strategy which construes upon the overall framework of NUSP. The objective of the strategy is to encourage cities to prevent open defecation, provide potable water in adequate quantity & safely manage WW thereby prioritizing sanitation and developing individual action plans suited to local conditions. The strategy aims at motivating the ULB for planning, execution and operation and maintenance of all works related to water supply, sewerage, solid waste management and sanitation works; henceforth promoting a healthy competition amongst the ULB by awarding the best performing ULB. The strategy's regards to Water management promotes ULB to ensure effective discharge of WW from all toilets by aiming for 100% sewerage system with treatment of sludge before discharge. The state intends to consolidate all plans under the CSP.

Bihar Municipal Act, 2007

The Bihar Municipal Act frames the responsibilities (including sanitation) of the ULBs in the state of Bihar. The Bihar municipal Act, 2007 and section – 81 (2)(w) of the Bihar Urban Planning and Development Act, 2012, the Government of Bihar notified the Bihar Building Bye Laws 2014, which is enforced to all the municipal areas of the state.

Bihar Building Bye-Laws, 2014

The Bihar Building bye-laws highlight the specifications to be followed by the passing of building plans and during construction of septic tanks only. The document refers to volume 1, chapter 5 of the National Building Codes (UD & HD, 2014). As per the bye-laws, the building plan will only be approved if the plan includes a septic tank in the design. If anyone is found to have approved building plan in deviation of building bye-laws shall be liable to be prosecuted and shall be liable to pay fine of Rupees fifty thousand or sentence to imprisonment for a period which may extend to one year or both (UDD, 2007).

The 5th State Finance Commission of Bihar is a committee pertaining to the state of Bihar, established with a purpose of reviewing the financial implementations of the state. It is constituted by the State Government under clause (1) of Article 243-1 and clause (1) of Article 243-Y of the Constitution of India, along with the provisions of the Bihar Panchayat Raj Amendment Act, 2011 (SFCB, 2014).

3.1.3 Institutional roles

The MoUD is the nodal ministry for policy formulation and guidance for the urban water supply and sewerage sector. The ministry's responsibilities include broad policy formulation, institutional and legal frameworks, setting standards and norms, monitoring, promotion of new strategies, coordination and support to state programmes through institutional expertise and finance. The ministry is also responsible for managing international sources of finance. The Central Public Health and Environmental Engineering Organization (CPHEEO), created in 1953, is the technical wing of the MoUD, which advises the ministry 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).

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-ordinationfor 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 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 Buxar is governed by various institutions. Table 5 summarizes the institutions responsible for policy making, service provision and regulation of urban services:

Table 5: Roles and responsibilities

Institution	Roles and responsibilities
Public health and Engineering Department (PHED), Bihar	Ensuring access to safe water supply, development of sanitation facilities; monitoring of quality of drinking water supply; ensuring participation of communities in schemes involving drinking water supply and sanitation; reforming water supply and sanitation sector.
Urban Development & Housing Department, Bihar (UDHD)	Implementation of schemes supported by the centre and state government respectively, such as the National Ganga Mission, Atal Mission for Rejuvenation Urban Transformation (AMRUT), Swachh Bharat Mission (SBM), and *Saat Nischay Yojna*
Bihar State Pollution Control Board	Regulatory measures for domestic and industrial, licensing for environmental check etc. Monitor the compliance standards regarding ground water, ambient air, leachate quality and the compost quality including incineration standards as specified in Schedule II, III & IV of 'The Water (Prevention and Control of Pollution) Act 1974'.
Bihar Urban Infrastructure Development Corporation Ltd	Incorporated in 2009, BUIDCO is mandated to execute and accelerate urban infrastructure projects in the State of Bihar. It acts as an apex body for planning and co-ordination of development activities in the state.
Reform Support Unit (RSU)	Execution of projects related to water and sanitation supported by DFID-SWASTH in the state of Bihar.
Water Resource Department, Government of Bihar	Administrative control of all four command area development agencies viz *Sone, Kosi, Gandak* and *Kiul-Badua-Chandan* has been brought under Water Resources Department to provide the optimum benefit of the major and medium irrigation projects to the beneficiaries. Development of drainage systems falls under its 10 multidimensional functions.
Buxar Municipal Council	Overall management of the civic services in the city. Public sanitation, solid waste management, public health and education
State Programme Management Group (SPMG)	State Programme Management Group (SPMG) - It is an implementing arm of NMCG in the state. Coordinate and oversee the implementation of projects sanctioned by Government of India under NGRBA. Takes all such action and to enter all such actions as may appear necessary or incidental for the achievements of the objectives of the NGRBA.

Source: Compiled by CSE, 2017

3.1.4 Service provisions

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 operation and maintenance (NIUA, 2005). Some of the larger cities have developed municipal water and sanitation utilities that are legally and financially separated from the local government. However, these utilities remain weak in terms of financial capacity. In spite of decentralization, ULBs remain dependent on capital subsidies from state governments. Tariffs are also set by state governments, which often even subsidize operating costs (Planning Commission, 2002).

In Buxar, sanitation facilities from the Urban local body (ULB) is focused on the provisions of public toilets, community toilets, the provisions of toilets under the SBM (Urban) and *Saat Nischay Yojna*. The ULB is solely responsible for the emptying of containment systems. Sanitary inspector is responsible for daily inspection of solid waste management. At present, there are 4 sanitary staff and 80 sanitary workers on temporary basis (BMC, 2016).

3.1.5 Service standards

1. Service Level Benchmarks (SLB), 2008: Issued by the Ministry of Urban Development in 2008, which seeks to:

(i) Identify a minimum set of standard performance parameters for the water and sanitation sector that are commonly understood and used by all stakeholders across the country.

(ii) Define a common minimum framework for monitoring and reporting on these indicators.

(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 -The Environment (Protection) Rules, 1986 (Schedule VI): Issued by Central Pollution Control Board (CPCB), a statutory organization 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 to inland surface water/public sewers/land for irrigation/ marine coastal areas.

3. Code of Practice for Installation of Septic Tanks, 1985: Issued by Bureau of Indian standards. It is a national standard setting body of India. The code specifies standards and design consideration for installation of septic tanks.

4. Manual on Sewerage and Sewage Treatment, Second Edition, 2013: This manual has been developed by CPHEEO. It provides detailed design and guidelines for various technologies of WW management.

3.2 Planning

3.2.1 Service targets

A CSP has been prepared under Support Programme for Urban Reforms (SPUR). This plan includes the provision of city wide sewer networks measuring 9.5 Km with a total of 3 pumping stations and a sewage treatment plant of 13 MLD. Swachh Bharat Mission (SBM), a national mission aims to eliminate open defecation by 2019. The provision of individual toilets to households is the main component of SBM, this mission is complimented by the *Saat Nischay Yojna's*- "*Har Ghar Shauchalaya*" (Toilet in each house) of Government of Bihar. Under the combined scheme a total of 1264 applications have been received, of which 803 toilets are under construction, and a total of 261 toilets have already been constructed (BMC, 2016a). BMC in alliance with UDD aims to provide 4 community toilets, of which 2 have been constructed. 6 more toilets have been proposed under the SBM scheme. Table 6 highlights the service level benchmarks for sewerage system in Buxar as per the CSP, Buxar:

Table 6: Service level benchmarks for sewerage system (MoHUA)

Parameters/Components	Service Level	Benchmarks	Gap
Coverage of Sewerage system	0	100%	100%
Collection efficiency of sewerage network	0	100%	100%
Adequacy of sewage treatment capacity	0	100%	100%
Quality of wastewater treatment	0	100%	100%
Access to toilet	78%	100%	22%
Extent of reuse and recycle of treated WW	0	20%	20%
Efficiency in redressal of customer	NA	80%	80%

Source: SPUR, 2015

The construction of sewerage work has not been started as the CSP document has not been endorsed yet by constituted municipal body which would pave way for the work to being under the plan. According to rapid assessment of FSM in the city done by BMC, they would need to buy nine additional emptying trucks, which will improve the emptying services provided by them. Each vehicle is expected to complete 2 trips per day with an average length of round trip being 10 km. Along with the emptying trucks, the BMC also aims to install one or more FSTPs in the municipal area, which are expected to have a combined capacity to treat 86 m^3/day initially and 95 m^3/day after a period of 5 years (MoUD, 2016).
The city has prepared Service Level Improvement Plan (SLIP) under a nationwide mission known as Atal Mission for Rural and Urban Rejuvenation (AMRUT). The target of this scheme is to upgrade the infrastructure of the cities. Buxar city being an AMRUT city has prepared SLIP only for Park and street light improvement and water supply.

3.2.2 Investments

At present, the city is an AMRUT city among 500 selected cities and towns, but funding for improvement in sanitation services is received from Finance Commission, SBM, and Support Programme for Urban Reforms in Bihar and Housing for All. The detailed project report for sewerage network and treatment plant proposed under SPUR, an investment of INR 64. 1 Crores (USD 9.6 million) (BUDA, 2010) was proposed. SPUR is a state initiative supported/funded by the Department for International Development (DFID). An overall situation of investments for improvement of the sanitation condition in the city has been presented in Table 7:

Table 7: Investment in Buxar city

Particulars	Investment (INR)	Funding agency	Status	Remarks
Sewerage network & STP, 2010	6.41Billion (9.6 million USD)	SPUR- DFID	Proposed	Not sanctioned
2 Community toilet complexes, 2016	0.2 Million (0.03 million USD)	SPUR- DFID	Proposed	Not sanctioned
Individual household toilets (IHHT), 2015	22 Million (0.3 million USD)	SBM	In progress	For building of individual toilets
Housing for all, 2015	22 Million (0.3 million USD)	Housing For All mission, Ministry of housing and urban poverty alleviation	In progress	A sum of 2 lacs per family (Husband, wife & unmarried child under the EWS section of the community) shall be provided which contains a component dedicated to toilet construction
4 community toilets, 2016	1.8 Million (0.27 million USD)	*Nagar Vikaas Vibhaag* and BMC	In progress	-
6 public toilets, 2016	72 Million (1 million USD)	SBM	Proposed	-

Source: Compiled by CSE, 2017

As per the rapid assessment of FSM in city done by BMC, the budgetary provision required for capital expenditure for FSM is around INR 5,120.19 lakh (7.699 million USD). Whereas, the operation and maintenance (O&M) cost associated with the emptying services and treatment operations is estimated to be INR 1982 lakh (2.9 million USD) for 5 years (MoUD, 2016). Further details of CAPEX and OPEX have been provided in Table 8.

Table 8: Estimate of CAPEX & OPEX for FSSM

S. No.	COMPONENT	CAPEX (INR lakhs)	OPEX (INR lakhs)	Total (INR lakhs)
1	Faecal sludge management	1661.41**(2.4 million USD)**	1508.74 (2.2 million USD)	3170.14 (4.6 million USD)
2	Liquid waste management	3458.78 (5.2 million USD)	473.35 (0.7 million USD)	3932.13 (5.9 million USD)
3	FSSM Total	5120.19 (7.6 million USD)	1982.09 (2.9 million USD)	7102.28 (10.5 million USD)

Source: Rapid assessment tool for Buxar, MoUD, 2016

3.3 Reducing inequity

3.3.1 Current choice of services for the urban poor

There are 14 slums (CSP, Buxar, 2015) in the city with a total population of 10,161. Most slum dwellers practice open defecation or depend on public toilets, as currently, only 2 community toilets are present in the city. Community toilets charge INR 2/usage (USD 0.03/usage) for urinals and INR 5/usage (USD 0.075/usage) for lavatory (SISSO, 2016).

BMC is responsible for the construction of toilets and provision of emptying services in the city.

3.3.2 Plans and measures to reduce inequity

Pradhan Mantri Aawas Yojna (PMAY), Housing for All (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 & 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 the 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 the convergence of other national or state schemes (MHUPA, 2016).

At present Housing for All Mission, under the Ministry of Housing and Urban Poverty Alleviation, is the only scheme in the city which provides construction of houses (including toilets). Under the scheme, a total of 111 applications have been approved for construction, and a fund of 2 lakh rupees (0.2 million USD) per family (husband, wife & unmarried child under the EWS section of the community) has been sanctioned to the beneficiaries.

Figure 10: Under construction community toilet at *Ramrekha Ghat* (Source: Amrita/CSE, 2016)

Figure 9: Septic tank of community toilet under construction at *Ramrekha Ghat* (Source: Amrita/CSE, 2016)

3.4 Outputs

3.4.1 Capacity to meet service needs, demands and targets

BMC has insufficient fund to meet the demand of providing basic sanitation services and amenities through the revenue it is generating. BMC is majorly dependent on state and central schemes for funding. It is learnt during the focus group discussion with the BMC that there is often delay in the disbursement of fund through state finance department (BMC, 2016).

ULBs have insufficient financial resources. 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). The majority of funds for capital works of infrastructure come from different central and state government schemes and external lending from bilateral agencies. At present BMC has no guidelines that would cite the regulated emptying and disposal of faecal sludge. The DPR proposed for sewerage network and STP does not cite any guidelines on septage management instead it aims at 100% sewerage network connections for the city.

Shortage of human resource can be witnessed in the BMC. It largely relies 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 (BMC, 2016).

3.4.2 Monitoring and reporting access to services

The service level benchmarks (SLBs) advisories are released from the MoUD regularly. SLB is one of conditions for allocation of performance based grants to ULBs through Finance Commission. Data on service levels should be collected, documented and reported to MoUD according to the format prescribed by SLB framework. The target for the fiscal year has to be revised yearly by ULB. Under AMRUT, SLIPs 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 (MoUD, 2008).

The 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 (BMC, 2016a).

BMC is yet to digitize the billing of emptying services but maintains a register of the data on number of tanks emptied on weekly or monthly basis. These data can be used to quantify septage emptied. At present, the municipality is not using the available data for monitoring the emptying services. The officials of BMC 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 (BMC, 2016a).

3.5 Expansion

AMRUT, 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 (includes details on funding of specified projects by ULB) to the state. The state then prepares State Annual Action Plan (SAAP) compiling all the details given in SLIPs. SAAP IS then forwarded to the MoUD for approval and sanction of funds. Upon the initiation of the mission, states were mandated to prepare SAAP documents, but as per the current amendments in the guidelines of the mission, states have been mandated to prepare action plan for remaining mission period.

In 2016, MoUD initiated a rapid assessment to estimate the budget requirement for apprehending Faecal Sludge and Septage Management (FSSM) in 131 cities across the country, supported by the National Alliance for Faecal Sludge and Septage Management (NFSSM). The states also need to include funding requirements in State Annual Action Plans (SAAP), produced by Atal Mission for Rejuvenation and Urban Transformation (AMRUT) programme. The flagship cities include 100 smart cities, 12 cities in Ganga basin cities and others across India. A declaration was signed – for cities journey beyond Open Defecation Free - mainstreaming effective faecal sludge and septage management by key decision makers and NFSSM alliance members.

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 MoUD.
- The incentivefor states to take up projects on Ganga Main-stem by providing an additional share of central grants for sewerage infrastructure.
- Uniform standards for both MoUD 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 MoUD is INR 51,000 Crores (7.67 Billion USD), Buxar city is one of the cities listed in 118 urban habitations.

Buxar is an AMRUT city, but works proposed under the city's SLIP doesn't cover sanitation related infrastructure provisions, therefore BMC has to look for other sources for funding of infrastructure through NMCG, and other donor agencies.

Saat Nischay Yojna, 2016

In 2016, Chief Minister of Bihar launched a *Saat Nischay Yojna (CM's Seven Resolves),* a campaign which delves towards holistic development of the state on 7 main issues. Two of the seven issues focused on sanitation service: 1. Coverage of access to toilets to improve sanitation facilities and be open defecation free. The scheme provides an outlay of INR 28,700 crore (USD 4.315 billion) to construct 1.72 lakh crore (1.72 billion) toilets in the state. 2. Provision of lined drains to the households and roads with an outlay of INR 78,000 crore (USD 11.73 billion). Under this scheme the state government has created its baseline data by means of collection of data of toilet interface facility, type of toilet, containment at site, availability or water and other subheads as per the 7 main issues.

3.5.1 Stimulating demand for services

It is recognized that the end objectives and corresponding benefits of SBM & NMCG 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 (decentralized and centralized) 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 can stimulate demand for services:

- Awareness generation on septic tank construction, regular desludging 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 for ULB staff on septage management
- Skill development of local masons and plumbers
- Monitoring and regulation of private emptiers

3.5.2 Strengthening service provider roles

Currently, only BMC is providing emptying service in the city. Funding is estimated for septage management initiatives under rapid assessment for FSSM supported by the MoUD, GoI through National Alliance for Faecal Sludge and Septage Management (NFSSM). These funds, once sanctioned can be used to buy vacuum tankers, building treatment facility, etc. BMC 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 faecal sludge throughout the service chain. The service delivery of sewage and faecal sludge treatment and disposal can be meet 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 KII was 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 a 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. 2 KIIs were conducted with-local mason and public toilet caretaker (refer appendix 7.2). The visit enabled in enhancing data collection through gathering progress details of SBM, published and unpublished reports like DPR, maps, etc. Interview with the vacuum tank operator and other stakeholders provided additional insight into the service delivery context.

4.2 Field observations

In order to understand the variety/typology of onsite sanitation system random 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 randomly surveyed in each of the wards of Buxar. Respondents from slums were given prioritization. The survey also recorded the field observations related to sanitation. Such surveys, observations and KII 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. Slums have very less or no sanitation facilities. It was observed that slums along the river bank have designated areas for women and men to defecate in open. Observation in the city also helped in sample selection as it gave a better understanding of the city context.

It was observed that septic tanks are connected to open drains. It was understood from KII with mason that the toilets being built with pit latrine with the slabs actually the twin pit system prescribed under the in SBM guidelines (MoUD, 2014) however these systems are being built incorrectly, as described in Figure 11, while Figure 12 described the design prescribed by SBM guidelines

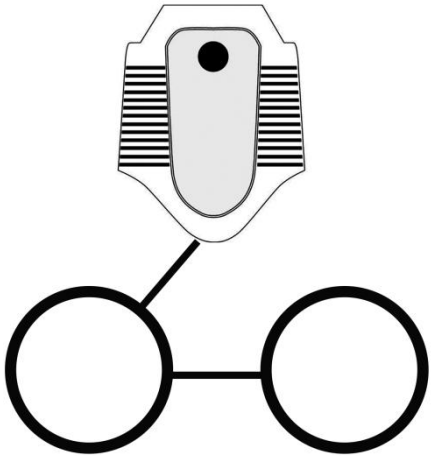

Figure 11: Twin pits in Buxar (Source: Amrita/CSE, 2016)

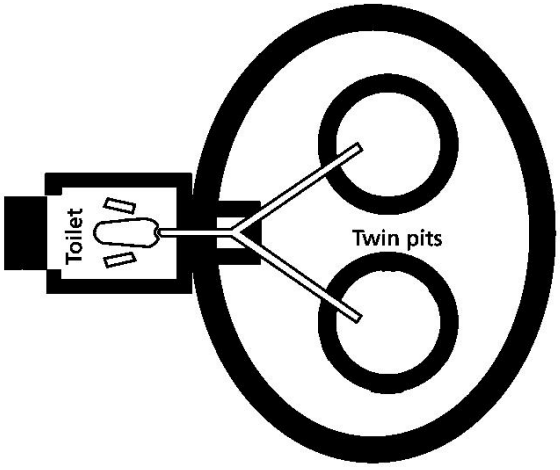

Figure 12: Twin pit system prescribed by SBM guidelines, 2014

In most of the cases the emptying was not done frequently while in some cases, due to lack of knowledge on emptying period, the tanks were emptied more frequently than recommended period by BIS. The range of emptying period observed during field based survey is listed in Table 9.

Table 9: Emptying frequency of OSS in Buxar

Containment Type	Emptying period
Septic tank connected to open drain or storm sewer	7-15 Years
Fully lined tanks connected to open drain	7- 15 Years
Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	Less than 5 Years

Source: Compiled by CSE

4.3 Focus group discussions

Four FGDs were conducted with slum dwellers, BMC administration and sanitary workers to complement, validate and challenge data collected during literature review and interviews. One fact which emerged from focus group discussion was the lack of knowledge and awareness about the ill-effect on the environment and human health due to the uncouth discharge of untreated FS and WW.

The findings from the FGD sessions revealed information that increased the understanding of the sanitation and septage management in Buxar. FGDs were useful in data triangulation. Random 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 taskforce was formulated and notified under the mandate by NUSP (refer appendix 7.10 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). This report would have been incomplete without the full cooperation of Buxar Municipal Council employees: Mr Anil Kumar Singh, Executive Officer, Mr Anil Kumar, City Manager, Mr Narsingh Chaubey, Sanitation Inspector, Mr Amit Gautam, Junior Engineer, and Mr Ashutosh Kumar. Special thanks to Dr Suresh Kumar Rohilla, Programme Director, CSE, for his supervision and guidance at every step of the assessment.

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7 Appendix

7.1 Stakeholder identification

Table 10: Stakeholder identification

S.L No.	Stakeholder group	In context of Buxar
1.	City Council/ Municipal authority/Utility	Buxar Municipal Council
2.	Ministry in charge of urban sanitation and sewerage	UD & HD Ministry, Government of Bihar
3.	Ministry in charge of urban solid waste	UD & HD Ministry, Government of Bihar
4.	Ministries in charge of urban planning finance and economic development	UD & HD Ministry, Government of Bihar
5.	Ministries in charge of environment protection	Forest department, Government of Bihar
6.	Ministries in charge of health	Health department, Government of Bihar
7.	Service provider for construction of onsite sanitation technologies	Buxar Municipal Council
8.	Service provider for emptying and transport of faecal sludge	Buxar Municipal Council
9.	Market participants practicing end-use of faecal sludge end products	N/A
10.	Service provider for discharge of faecal sludge (sanitary landfill management)	N/A
11.	External agencies associated with FSM services: e.g.: NGOs, academic institutions, donors	Centre for Science and Environment

Source: CSE, 2016

7.2 Tracking of engagement

Table 11: Tracking of engagement

S.No	Name of Organization	Designation	Date of Engagement	Purpose of engagement
1	BMC	Executive officer	04-10-2016	• Introduction of SFD and permission to conduct FGDs in the municipal wards • Data collection • FGD with administrative staff of BMC
2	BMC	City manager		
3	BMC	Sanitation workers		FGD with sanitary wing to understand the sanitary condition and analyse the level of knowledge of septage and faecal sludge
4	BMC	Multi-specialty Assistant	05-10-2016	
5	BMC	Vacuum tank driver		
6	BMC	Vacuum tank helper		
7	BMC	Sanitary inspector		
8	BMC	Public toilet caretaker		KII
9	BMC	Local mason		KII
10	BMC	SBCLTF	18-03-2017	FGD
11	Slum dwellers		05-10-2016	FGD

Source: CSE, 2017

7.3 SFD graphic

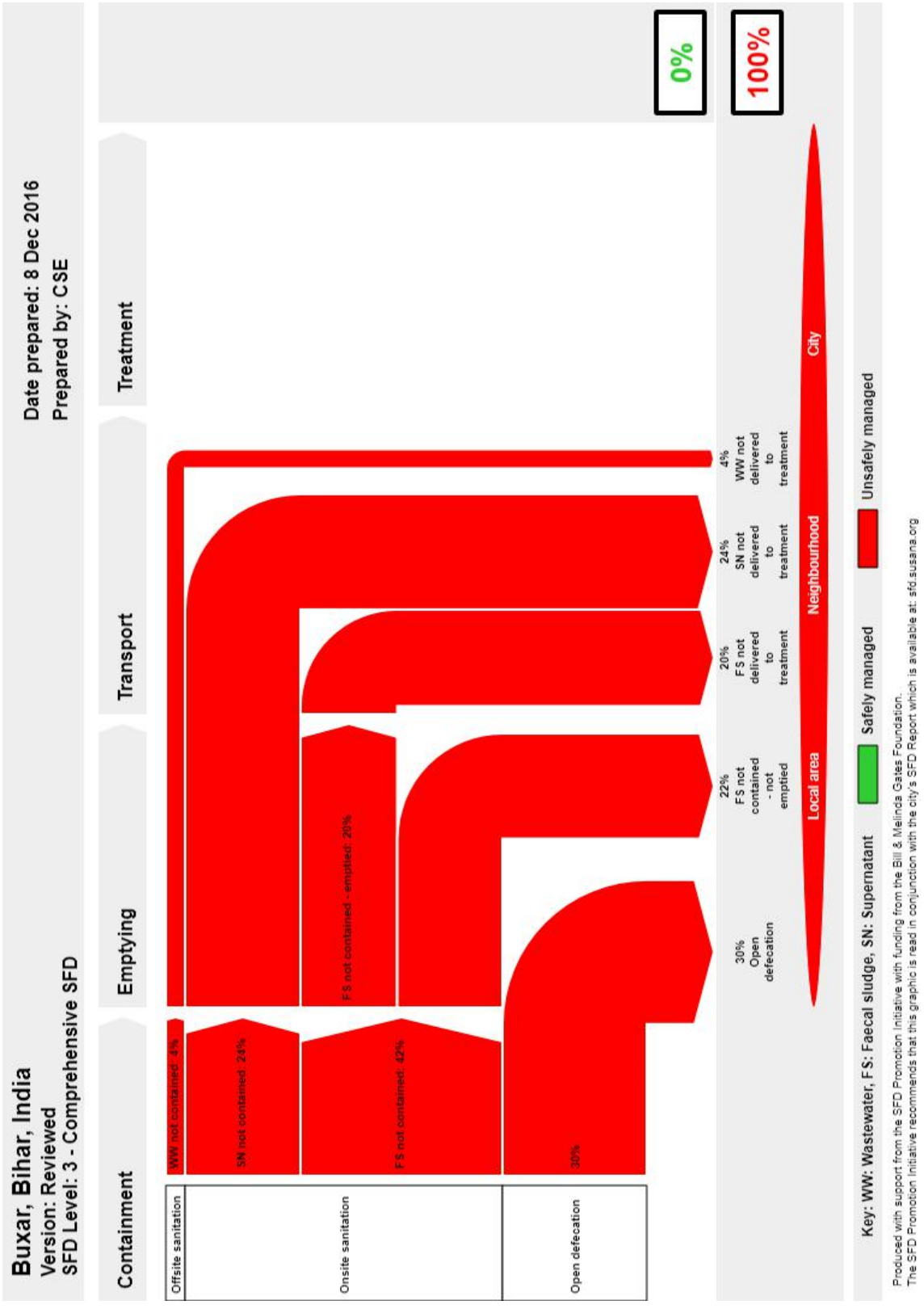


Figure 13: SFD graphic (Source: SFD graphic generator)

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/ discharge
Offsite	T1A1C6: 4% of user interface is connected to open drains	Not applicable.	Transported through open drains	There's no treatment of WW in the city. Total WW disposed untreated in local area comes out to be 4%.
Onsite	T1A2C6 and T1A3C6: 48% of population is dependent on septic tanks and fully lined tanks connected to open drain. T2A5C10: 18% of population is dependent on lined pit with semi-permeable walls and open bottom.	Since most of the population is getting their systems emptied, it is assumed 50% of population has their onsite technology emptied (in case of septic and fully lined tanks) and 90% in case of population connected to pits. • 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 24% which is attributed to septic tanks and fully lined tanks connected to open drains (T1A2C6 & T1A3C6). • FS not contained is 42% which is attributed to 12% from septic tanks and 12% from fully lined tanks and 18% from pits. It is also assumed that 50% (tanks) and 90% (pits) of the population gets their system emptied when full while 22% population does not get emptied. • Therefore, 20% FS not contained and emptied is attributed to 12% FS from septic tanks and fully lined tanks; and 8% FS from pits which is emptied. 22% FS not contained and not emptied is attributed to 12% FS from septic tanks and fully lined tanks and 10% FS from pits. • FS not contained and not emptied from pits consists of 9% infiltrate due to semi permeable walls which may eventually pollute ground water	No treatment facility exists hence no FS is transported to treatment plant.	No treatment facility exists hence no FS is treated; therefore FS treated is 0%. All the FS emptied ends up in local area.
Open defecation	30% of population practice open defecation.	Not applicable.	Not applicable	Not applicable

Source: CSE, 2016

7.5 Context-adapted SFD

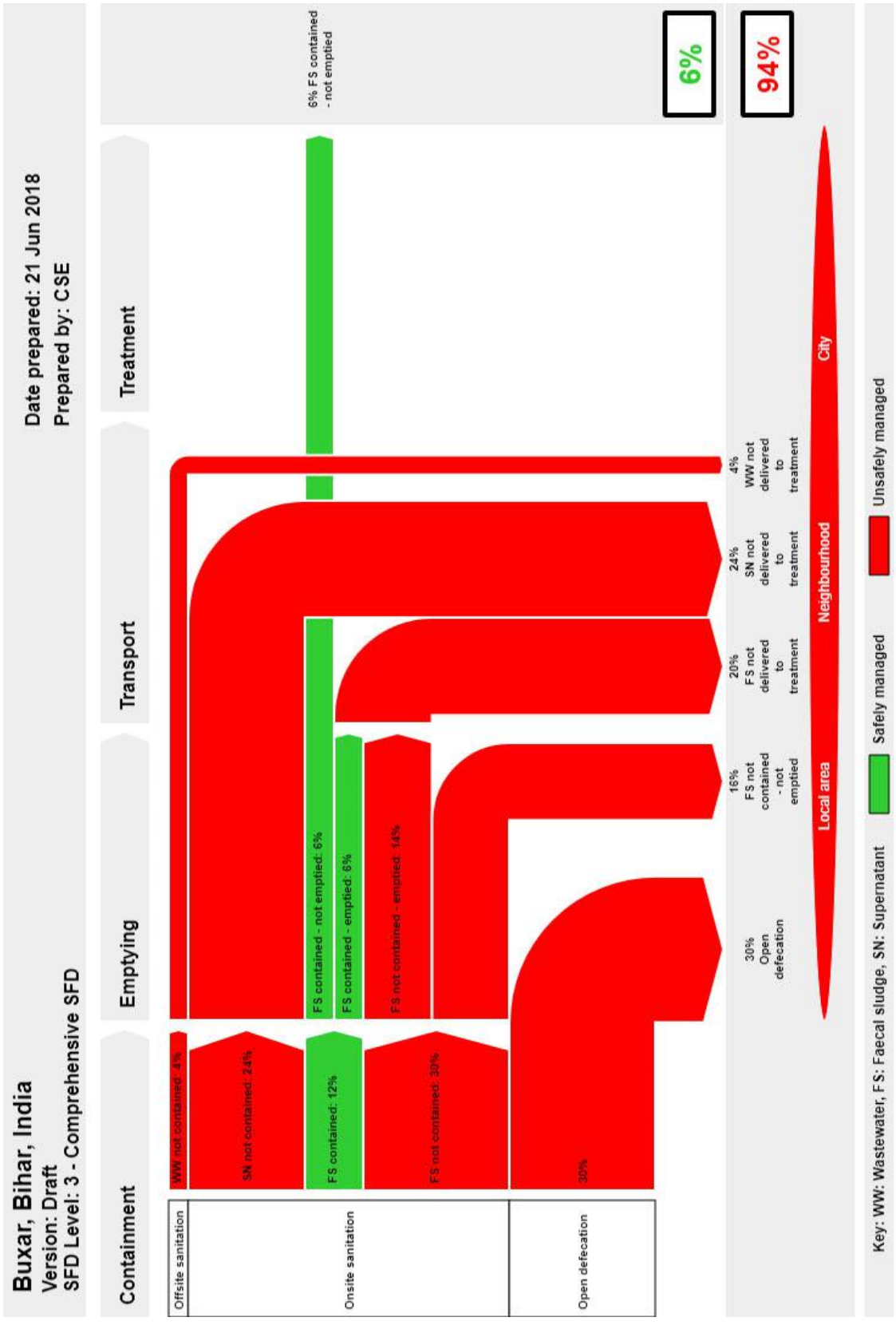


Figure 14: Context adapted SFD (Source: CSE)

7.6 SFD matrix

Table 13: SFD matrix

Buxar, Bihar, India, 8 Dec 2016. SFD Level: 3 - Comprehensive SFD
Population: 102861
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 50%

System label	Pop	W4c	W5c	F3	F4	F5	S4e	S5e
System description	Proportion of population using this type of system	Proportion of wastewater in open sewer or storm drain system, which is delivered to treatment plants	Proportion of wastewater delivered to treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C6 Toilet discharges directly to open drain or storm sewer	4.0	0.0	0.0					
T1A2C6 Septic tank connected to open drain or storm sewer	24.0			50.0	0.0	0.0	0.0	0.0
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	24.0			50.0	0.0	0.0	0.0	0.0
T1B11 C7 TO C9 Open defecation	30.0							
T2A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	18.0			90.0	0.0	0.0		

Source: SFD graphic generator

7.7 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	T1A1C6				Not Applicable
Septic tank					Significant risk of GW pollution Low risk of GW pollution	T1A2C6				
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution	T1A3C6				
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										
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 15: SFD selection grid (Source: SFD graphic generator)

7.8 Community/public toilets

Table 14: Details of community and public toilets

S. No.	Location	Total Seats
1	Ramrekha ghat	5
2	Station road	5
3	Sati road	3
4	Guest house	10

Source: BUDA, 2010

7.9 Photographs from field visit

Figure 18: FGD with slum dwellers (Source: Anil/CSE, 2016)

Figure 16: FS discharging spot (Source: Amrita/CSE, 2016)

Figure 15: KII with sanitary inspector (Source: Amrita/CSE, 2016)

Figure 17: Containment system of community toilet at *Ramrekha ghat* in progress (Source: Amrita/CSE, 2016)

7.10 Maps of Buxar

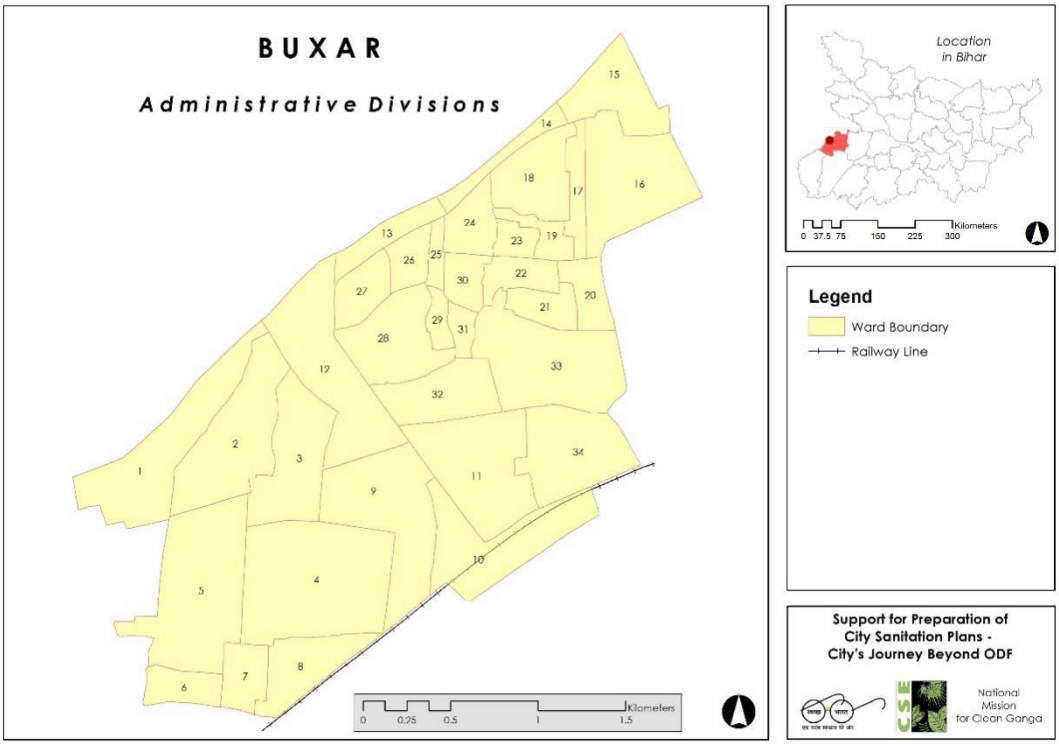


Figure 19: Administrative division of Buxar (Source: CSE, 2017)

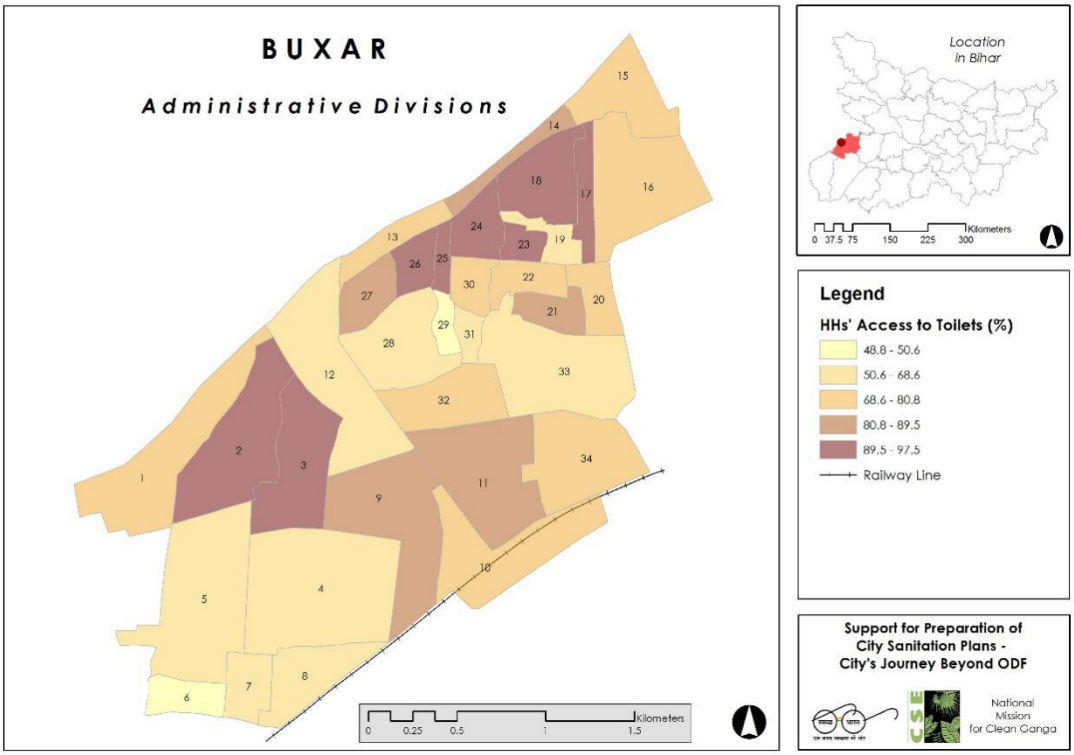


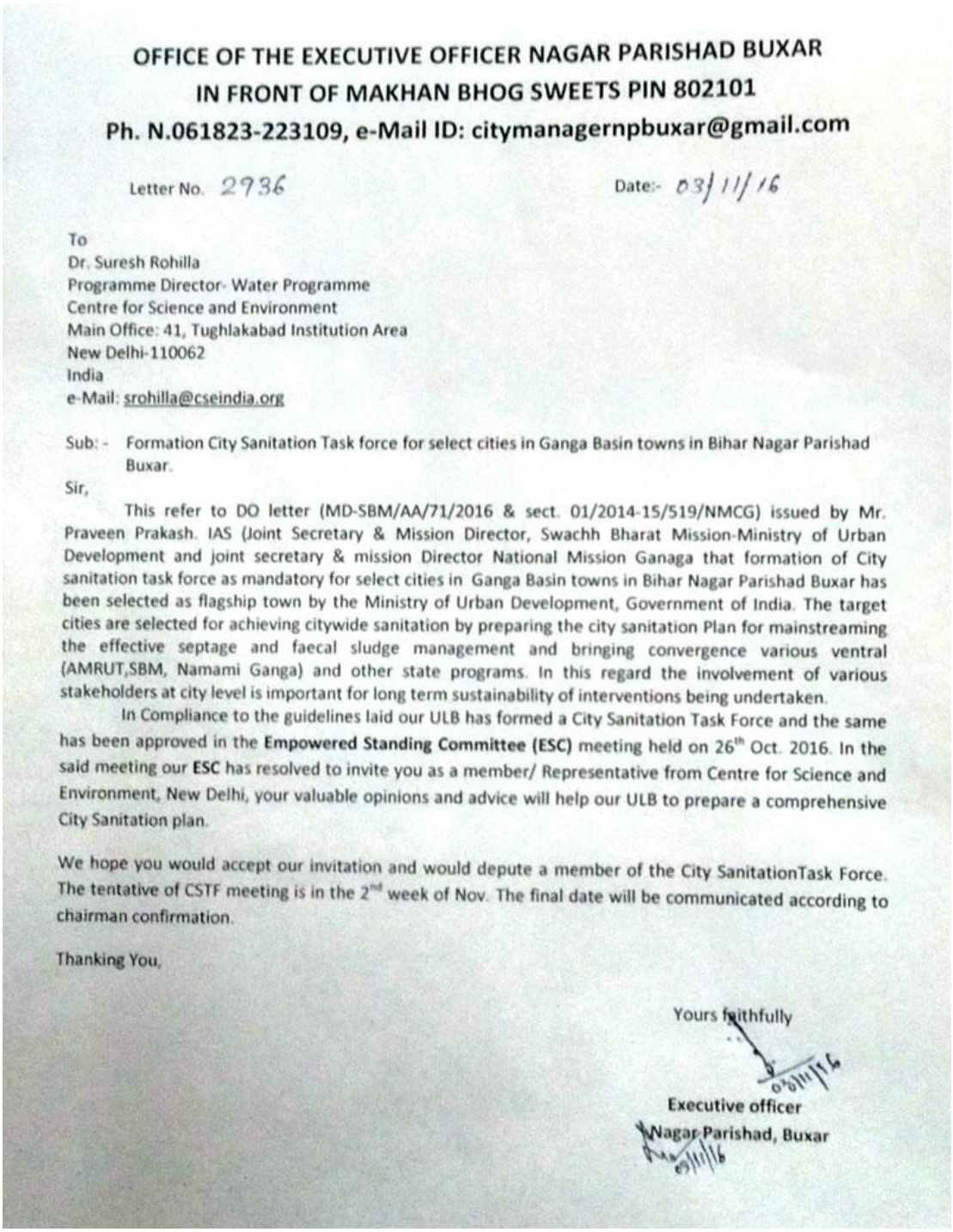
Figure 20: Toilet coverage in Buxar (Source: CSE, 2017)

7.11 Swachh Bharat City Level Task Force of Buxar

Table 15: List of SBCLTF of Buxar Municipal Council

1	Shakuntla Devi	Chairman	Buxar Municipal Council
2	Anil Kumar	Executive officer	Buxar Municipal Council
3	Iftekar Ahmed	Vice-Chairman	Buxar Municipal Council
4	Mohammad Aqubal	Executive Engineer	Public Health and Engineering Department
5	Ramsevak Ram	Ward Councillor – 20	Buxar Municipal Council
6	M R Haider	Executive Engineer	District Urban Development Agency
7	Arvind Kumar Singh	Ward Councilor	Buxar Municipal Council
8	Satyadev Prasad	Member	SBCLTF, Buxar Municipal Council
9	A N Singh	Civil Surgeon	Buxar Municipal Council
10	Shravan Kumar Tiwari	Red-Cross Society Representative	
11	Naveen Kumar	Deputy Programme Manager	Centre for Science and Environment
12	Anil Kumar Singh	City Manager	Buxar Municipal Council
13	Dheeraj Kumar	Senior Reporter	Hindustan
14	AshwaniChaube	Member of Parliament	-
15	Santosh Kumar Nirala	Minister SC/ST	-
16	Ajit Kumar Chaudhary	Former Minister	-
17	Executive Engineer	District Urban Development Agency	Buxar
18	City Manager	Buxar Municipal Council	-
19	Gagay Rai	Health Department Representative	-
20	C M Singh		Rotary Organisation
21	Arvind Singh	Representative	M B College, Buxar

Figure 21: SBCLTF meeting under process in Buxar (Source: Naveen/CSE,2017)



OFFICE OF THE EXECUTIVE OFFICER NAGAR PARISHAD BUXAR
IN FRONT OF MAKHAN BHOG SWEETS PIN 802101
Ph. N.061823-223109, e-Mail ID: citymanagernpbuxar@gmail.com

Letter No. 2936 Date:- 03/11/16

To
Dr. Suresh Rohilla
Programme Director- Water Programme
Centre for Science and Environment
Main Office: 41, Tughlakabad Institution Area
New Delhi-110062
India
e-Mail: srohilla@cseindia.org

Sub: - Formation City Sanitation Task force for select cities in Ganga Basin towns in Bihar Nagar Parishad Buxar.

Sir,

This refer to DO letter (MD-SBM/AA/71/2016 & sect. 01/2014-15/519/NMCG) issued by Mr. Praveen Prakash. IAS (Joint Secretary & Mission Director, Swachh Bharat Mission-Ministry of Urban Development and joint secretary & mission Director National Mission Ganaga that formation of City sanitation task force as mandatory for select cities in Ganga Basin towns in Bihar Nagar Parishad Buxar has been selected as flagship town by the Ministry of Urban Development, Government of India. The target cities are selected for achieving citywide sanitation by preparing the city sanitation Plan for mainstreaming the effective septage and faecal sludge management and bringing convergence various ventral (AMRUT,SBM, Namami Ganga) and other state programs. In this regard the involvement of various stakeholders at city level is important for long term sustainability of interventions being undertaken.

In Compliance to the guidelines laid our ULB has formed a City Sanitation Task Force and the same has been approved in the **Empowered Standing Committee (ESC)** meeting held on 26th Oct. 2016. In the said meeting our **ESC** has resolved to invite you as a member/ Representative from Centre for Science and Environment, New Delhi, your valuable opinions and advice will help our ULB to prepare a comprehensive City Sanitation plan.

We hope you would accept our invitation and would depute a member of the City SanitationTask Force. The tentative of CSTF meeting is in the 2nd week of Nov. The final date will be communicated according to chairman confirmation.

Thanking You,

Yours faithfully

03/11/16

Executive officer
Nagar Parishad, Buxar

03/11/16

Figure 22: SBCLTF meeting notification (Source: Naveen/CSE,2017)

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

7.13 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 24: Survey questionnaire used during emptiers interview (Source: CSE/2016)