SFD Lite Report

Bithoor

India

This SFD Lite Report was prepared by
Centre for Science and Environment

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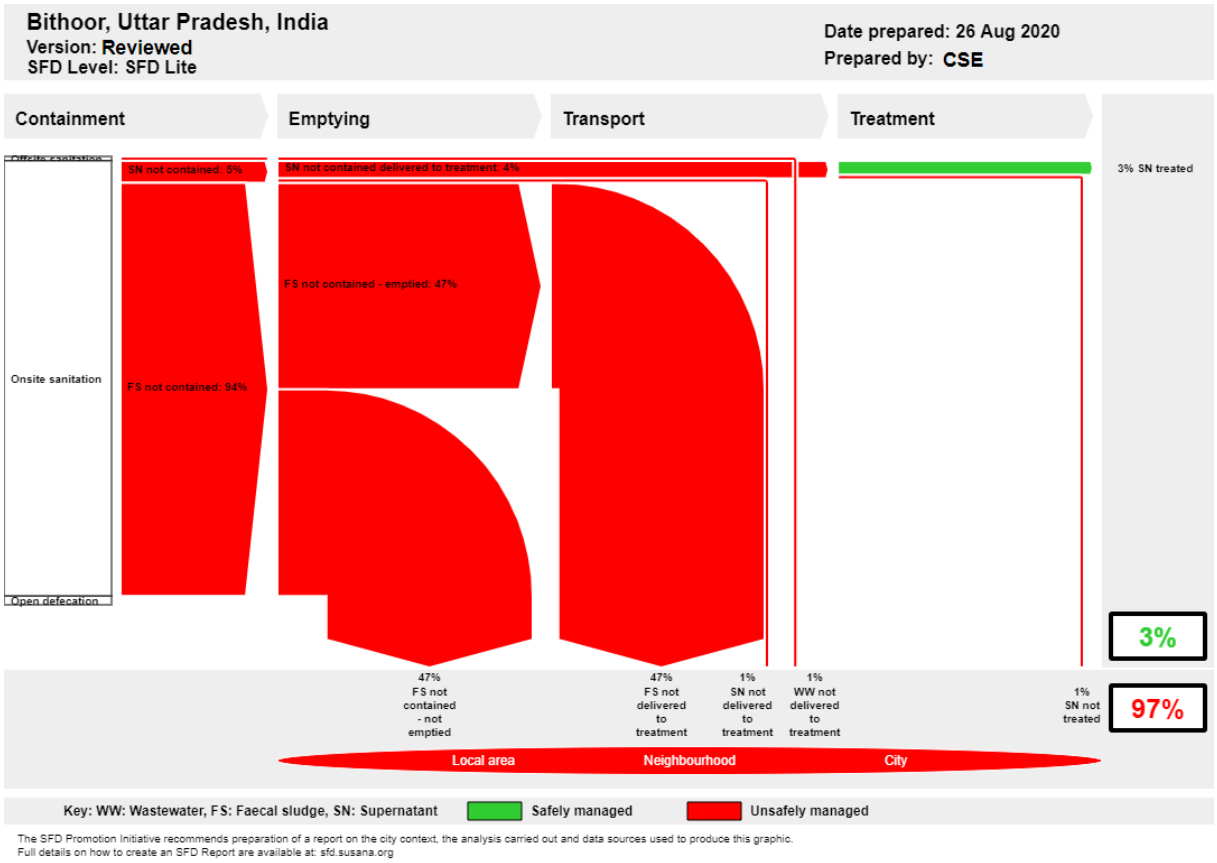
1 The SFD Graphic



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

2 SFD Lite information

Produced by:

- Centre for Science and Environment, New Delhi
- This report was compiled as part of the SFD Promotion Initiative project funded by Bill and Melinda Gates Foundation (BMGF). We would like to thank Mr Vinay Kumar Shukla, Executive officer, Mr Shivam Singh, Computer Operator, Mr Prashant Yadav, Computer Operator and Mr. Anil, Sanitation Supervisor, Nagar Panchayat Bithoor for providing all the required secondary data and cooperating for Key Informant Interviews (KIIs) & Focussed Group Discussions(FGDs).
- This report would not have been possible without constant support of Mr Brajesh Maurya, Assistant Engineer, UPJN who helped in providing relevant data for STPs in Bithoor.

Collaborating partners:

- Nagar Panchayat, Bithoor, Uttar Pradesh

Date of production: 17/09/2020

3 General city information

Bithoor or Bithur is a town in Kanpur Nagar District, 23.4 kilometres by road north of the centre of Kanpur city, in Uttar Pradesh, India. Bithoor is situated on the right bank of the Ganga, and is a centre of Hindu pilgrimage. According to Hindu mythology, Bithoor is the birthplace of Lord Ram's sons Luv and Kush. Bithoor is also the centre for Revolt of 1857 as Nana Sahib, a popular freedom fighter who was based there. The city is enlisted as a municipality of Kanpur metropolitan area.

As per Census 2011, Bithoor has a population of 11,300 residing in 1,974 households. The population of the city as per *Swachh Survekshan* (Country wide annual ranking mechanism for cities with respect to sanitation) conducted in 2019 is 13,742 corresponding to 2,198 households.[1] This population is used for preparation of SFD. The urban local body governing the town is Bithoor Nagar Panchayat (BNP). BNP has an administrative area of 8.58 sq.km which is divided into 10 wards. The density of the city is 1601 people per sq.km which is high in comparison to state density of 828 people per sq.km.[2]

The geographical coordinates of Bithoor are 26.6127°North and 80.2719°East. The topography of Bithoor is majorly plain.The average rainfall is 837 mm. Temperature rises to 46°C and drops to 6°C. The soil type is clayey and sandy with occasional gravel and boulder. Table 1 shows the population growth in Bithoor in past two decades.

Census Year	Population	Growth Rate (%)	Source
2001	9,647	-	Census 2001
2011	11,300	18	Census 2011
2019	13,742	13	BNP

Table 1: Population Growth rate Bithoor (Source: BNP, 2020, Census, 2011)

4 Service outcomes

Bithoor, Uttar Pradesh, India, 26 Aug 2020. SFD Level: SFD Lite
Population: 13742
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 100%

System label	Pop	F3	F4	F5	S4e	S5e
System description	Proportion of population using this type of system	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	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
T1A1C7 Toilet discharges directly to water body	1.0					
T1A2C6 Septic tank connected to open drain or storm sewer	4.0	50.0	0.0	0.0	80.0	80.0
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	6.0	50.0	0.0	0.0	80.0	80.0
T2A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	2.0	50.0	0.0	0.0		
T2A5C10 Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	87.0	50.0	0.0	0.0		

Table 2: SFD Matrix for Bithoor

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

[1] KII with Executive Officer, Bithoor
[2] District Census Handbook 2011 for Bithoor (Houses and household amenities and assets table HH-08: percentage of households by availability of the type of Latrine Facility; http://censusindia.gov.in/DigitalLibrary/MFTableSeries.aspx

4.1 Offsite Systems

There is no sewerage network in the city within the administrative boundary of Bithoor however, there are households which are directly discharging into water body. In the sample household survey, it was found that in ward number 8,the few of the households have connected their toilets discharging directly to a pond .[3] It was concluded that such households correspond to 1% population of Bithoor.

There are 6 Constructed Wetlands based Sewage Treatment Plants with a total treatment capacity of 1.3 MLD commissioned in December, 2019 with the total funding of 8.12 crores from National Mission for Clean Ganga (NMCG) and they receive the wastewater generated from households which ultimately flows in 7 main open drains[4]. Earlier, the wastewater from the open drains was directly flowing into river Ganga. It is also evident from field observation that the effectiveness of treatment of wastewater in STPs is reduced due to indiscriminate dumping of solid waste and presence of cowdung from various dairies at different locations of the city into the open drains (field observation). However, it is estimated that 80% of Supernatant (S4e) is delivered to the STP on the basis that the open drains are not fully lined which may result in leakages along the route of the drains.

At present, the STPs receives a combined flow of 0.65 MLD[5]. As, the STPs are newly commissioned seasonal variations that are observed in the inflow water like in monsoon is yet to be monitored. The test results conducted by third party laboratory on request of UP Jal Nigam revealed that the discharge standards, prescribed by Central Pollution Control Board (CPCB), are met by the plant but, on field observation revealed that presence of cowdung and other inert matter in the wastewater is resulting in choking of wetlands, which hampens the treatment efficiency of STPs. Hence, the supernatant treated at the STP is considered 80% (S4e).

4.2 On-site Sanitation Systems

Figure 1: Overflowing lined pit

Containment: Based on sample household survey, KIIs and FGDs with relevant stakeholders it is estimated that 99% population is dependent on the On-site Sanitation Systems (OSS).[6,7,8] The most prevalent OSS in Bithoor is Lined pit with semi permeable walls and open bottom, no outlet and no overflow (T2A5C10), 87%). Fully lined tank (FLT) connected to open drains (T1A3C6, 6%) and Septic tanks connected to open drains (T1A2C6, 4%) are the other two prevalent systems after the aforementioned system and lastly Lined pit with impermeable walls and open bottom with no outlet and no overflow (T2A4C10, 2%).

[3] Sample household survey, 2020
[4] KII with Executive Officer, BNP and AE, UPJN,
[5] Swachh Sarvekshan data given by BNP
[6] Field Obsevations.
[7] KIIs with Executive Officer and household surveys
[8] FGDs with sanitation workers

Figure 3: Fully lined tank connected to open drain

Figure 2: Under construction 2 chambered septic tank

According to the Executive Officer and Computer Operator, 967 Individual Household Latrines (IHHL) have been provided to households having no toilets or access to community toilets in the vicinity or to households with insanitary toilets as of August 2020, under Swachh Bharat Mission (SBM). FLTs in Bithoor are either square or rectangular in shape whereas septic tanks are mostly 2 chambered tanks. Most of the containment systems constructed even under SBM are Lined pits with semi permeable walls and open bottom, no outlet and no overflow. This is due to the local belief that lined pits with honeycomb structure is better than conventional septic tank as lined pits do not result in supernatant flowing out of system.

Figure 4: Ocassionally used Public toilet constucted under Namami Gange

Community Toilets/Public Toilets: There are 7 community toilets and 4 public toilets in Bithoor which have STOD[9] as their containment system. The average size of septic tanks in community toilet is 8 x 4 x 6 m .The average size of septic tanks in public toilet is 6 x 3 x 6 m. As majority of the CT/PTs have been recently constructed under SBM and hence have not yet reached at stage where emptying is required which would be further stretched due to low number of people actually using these facilities and every household in the city having its own functional toilet.

Emptying: The city is dependent on private desludging service provider for emptying faecal sludge (FS). However,BNP has recently procured one vacuum tanker which is not yet operational[10]. City has narrow and congested roads, however, manual scavenging was not observed during field observation and KII with households.Hence. its effect is not considered while generating the graphic due to insufficient data. There is only 1 private operator with 1 vacuum tankers plying in the city[11]. The vacuum tanker are equipped with a motorised pump, storage tank of 3000 litres capacity and a 250 ft long hose pipe to access containment systems in narrow roads and congested areas.

[9] Field observations from visits to different Community & Public Toilet, 2020
[10] KII with Executive Officer and Computer Operator, Bithoor Nagar Panchayat
[11] KII with private desludging operators

Desludging is usually carried out by 2 people (1 Driver + 1 Helpers) and a fee of INR 1200 – 1500 (15-20 USD) per trip is charged. The variation in fees depends upon the size of the containment system and the extent of solidification of sludge at the bottom. The private operator who provides desludging services in Bithoor operates from Pankhi, which is around 15 kilometres from the city. Emptying of containments in Bithoor is done on demand basis and on an average he completes 1 trip per 4 months[12]. Advertisements of emptiers could be seen on electric poles, wall paintings, etc.

The frequency of emptying varies from 15 to 20 years or more as the majority of the containment systems in the city is lined pits with semi permeable walls. Hence, it was observed that households that are taking too long to get their containments emptied are rather using their systems without emptying hence it was assumed that the population using their systems with emptying (F3) is taken as 50%.

Figure 5: ULB owned vacuum tanker

Figure 6: Bhunni drain

Transportation: The emptied faecal sludge is transported using a tractor mounted vacuum tanker. These vehicles cover a distance of 3-5 km per trip on an average[13] after desludging from the households and they decant the emptied FS in the nearby agricultural fields. In the KII with the private emptier it was revealed that time taken for emptying and discharge of FS is 1-2 hours on an average. None of the FS getting emptied is delivered to the treatment facility. However, the supernatant from the septic tanks and fully lined tanks flows in the open drains which gets treated at the Constructed Wetlands. As the length of drains is short but the open drains are not properly lined, it is assumed that 80% of the supernatant flowing in open drains reaches the treatment facility (S4e).

Figure 7: Constructed wetlands at Bhunni Drain

Treatment/Disposal: BNPP has no designated site for the disposal of FS[14]. Therefore in the absence of such provision the private emptiers discharge the faecal sludge in nearby agricultural fields[15]. Usually local farmers allow them to discharge the FS on their farm lands, which is later used by farmers as a soil fertiliser. Sometimes farmers tip them on discharging FS regularly in times of need. Since there is no proper treatment of emptied FS, F5 is also

[13] KII with private emptying operators
[14] KII with Executive Officer, BNP
[15] Field observation, 2020

considered to be zero.However, there are 6 Constructed Wetlands based STPs in Bithoor which treat the wastewater flowing in 7 main open drains and which ultimately discharges into river Ganga.

5 Data and assumptions

Census 2011 was considered as the baseline and the data for all the stages of sanitation chain were updated based on the data collected from field through KII, FGDs, observations, secondary data collected from relevant stakeholders. Following assumptions were made for developing the SFD for Bithoor.

- 80% of water supplied is wastewater generated
- 50% of the contents of septic tanks and fully lined tanks is Faecal sludge
- 80% of the wastewater in the open drain reaches STP and 20% accounts for leakages
- Treatment efficiency of the STPs is taken as 80%

6 Context adapted SFD Graphic

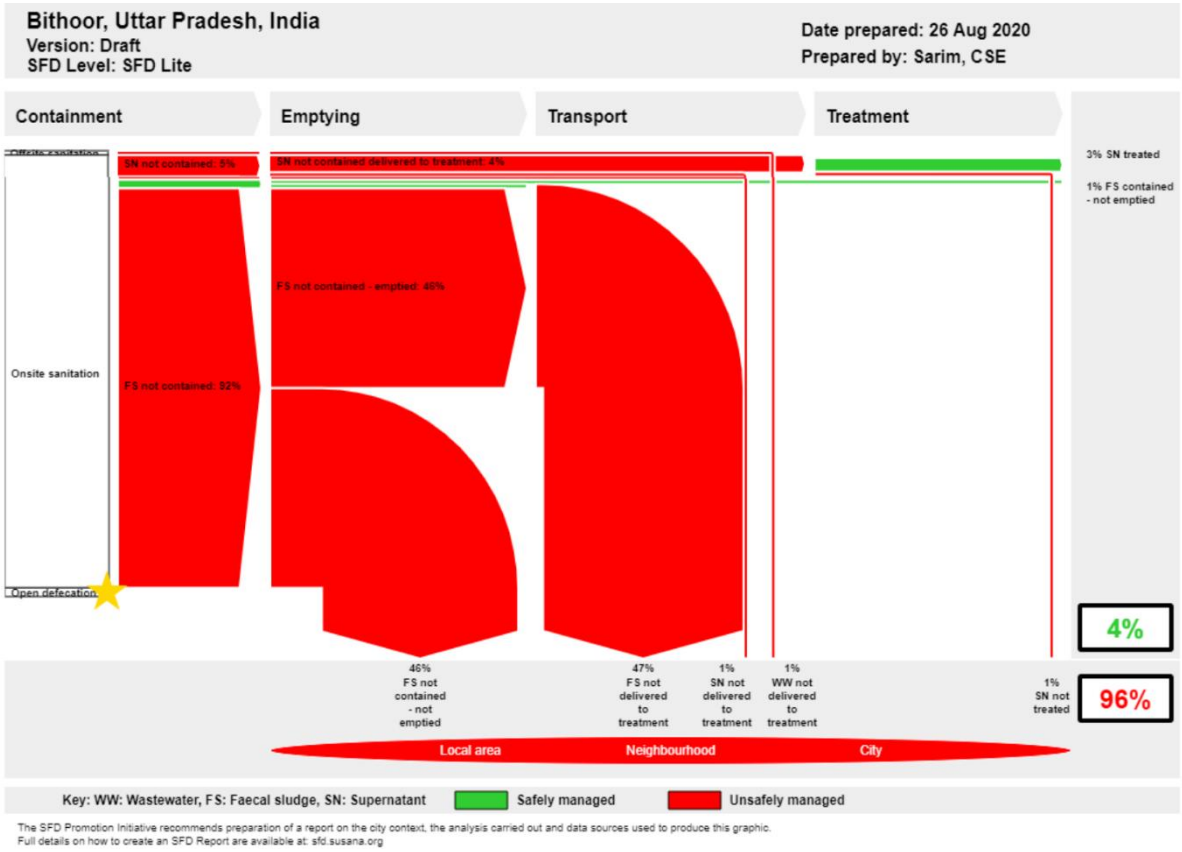


Figure 8: Context adapted SFD for Bithoor

The only difference suggested in the context adapted SFD is at containment stage. The Faecal Sludge portion of correctly designed septic tanks is considered as safely managed, even though connected to open drains. The supernatant is considered as unsafely managed.

7 List of data sources

Reports and literature

- District Census Handbook 2011 for Bithoor (Houses and household amenities and assets table HH-08: percentage of households by availability of the type of Latrine Facility http://censusindia.gov.in/DigitalLibrary/MFTableSeries.aspx
- District Census Handbook 2011 (Population Census Abstract Data Table (India & State/UTs-Town/Village/WardLevel) http://censusindia.gov.in/2011census/population_enumeration.html
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Key Informant Interviews (KII)

- Executive Officer, BNP
- Assistant Engineer, UPJal Nigam, Kanpur
- Computer Operator, BNP

Focus Group Discussions (FGD)

- Masons
- Ward members

Field Visits

- Public and Community toilets
- Nullah tapping locations
- Sewage Treatment Plants
- Random household survey

Bithoor, India, 2020

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