SFD Lite Report

Nehtaur
India

This SFD Lite Report was prepared by
Ar. Mohd Aamir

Date of production/ last update: 07/07/2021

1 The SFD Graphic

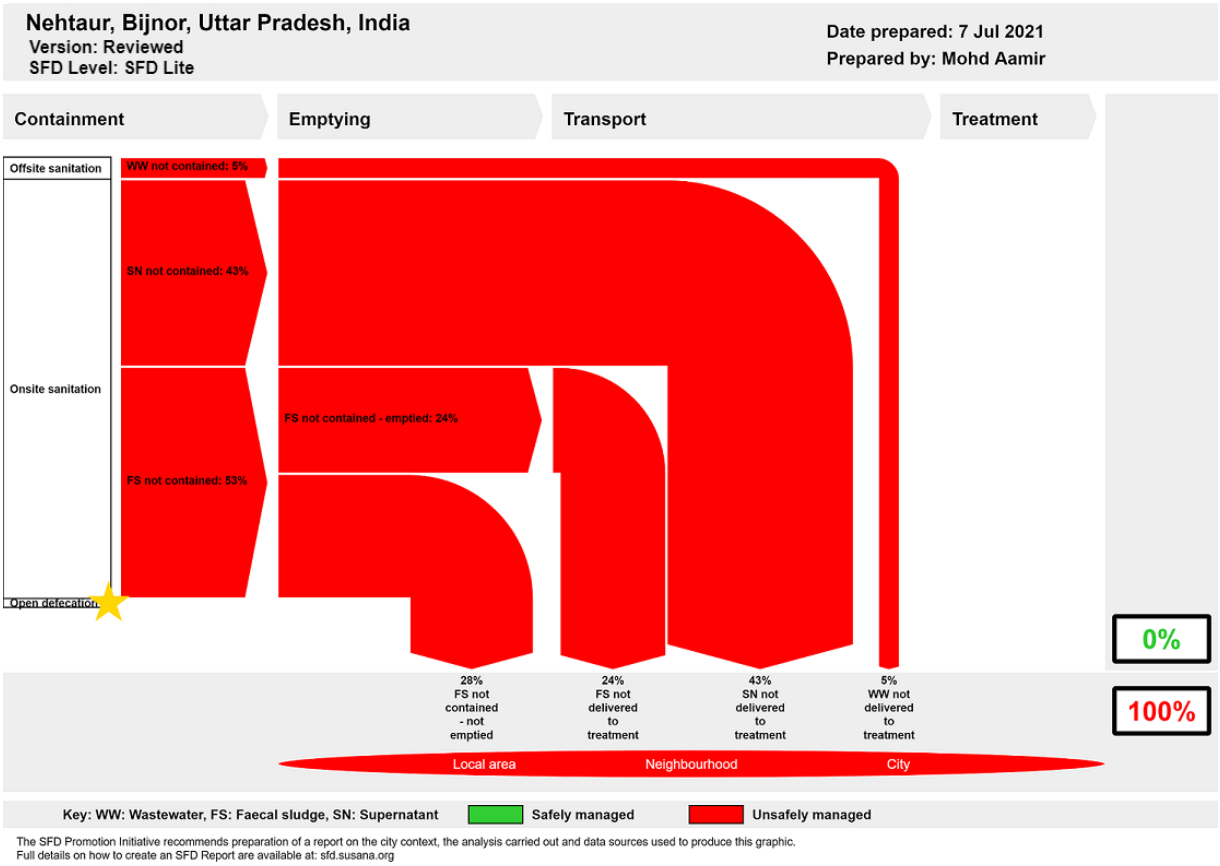

Figure 1: SFD Graphic for Nehtaur (Aamir/CSE/2021).

2 SFD Lite information

Produced by:

- Mohd Aamir (Student-JMI, New Delhi).
- This report has been made as part of Blended Online and Residential Training Programme on preparation of Shit Flow Diagram (SFD) conducted by Centre for Science and Environment (CSE) from 02/04/2021 to 27/05/2021 and compiled as part of SFD Promotion Initiative (SFD-PI) project (Phase 3) funded by Bill and Melinda Gates Foundation (BMGF). Further the report has been funded by CSE and Compiled by Mohd Aamir.
- We would like to thank Mr Subhash Kumar, Executive Officer, Mr Ghanshyam, Head Clerk and Mr Vinod, for supporting and providing the data required and cooperating for Key Informant Interviews (KIIs) & Focussed Group Discussions (FGDs).
- This report would not have been possible without constant support of Mr Shahzeb, Computer Operator, Prashant and Govind who helped in conducting sample surveys and FGDs in field.

Collaborating partners:

- Nehtaur Nagar Palika Parishad, Nehtaur (NNPP), Centre for science and environment, New Delhi

Date of production: 07/07/2021

3 General city information

Nehtaur is a small town in Bijnor District, Uttar Pradesh and is located 26 km to East of Bijnor city, District Headquarters (Figure 2). According to Census 2011, Nehtaur had a population of 47,834 residing in 7,438 households (HHs). The population of the city as per Swachh Survekshan (country wide annual ranking mechanism for cities with respect to sanitation) conducted in 2019 was 57,868 corresponding to 9,700 HHs.[1] this population is used for the preparation of the SFD graphic. The urban local body governing the town is Nehtaur Nagar Palika Parishad (NNPP) or Nehtaur Municipal Council. NNPP has an administrative area of 2.89 km^2 which is divided into 25 wards. The density of the city is 20,023 people per km^2 which is very high in comparison to the state density of 828 people per km^2.

The geographical coordinates of Nehtaur are 29°19'30" North and 78°22'45" East. The topography of Nehtaur area is majorly plain. It is elevated 288 metres above sea level. The average precipitation is 176.3 mm. The temperature rises to 45°C and drops to 6°C. The soil type is clayey and sandy with occasional gravel and boulder and average water table is 5 to 10 metres below ground level. Table 1 shows the population growth in Nehtaur in the past three decades.

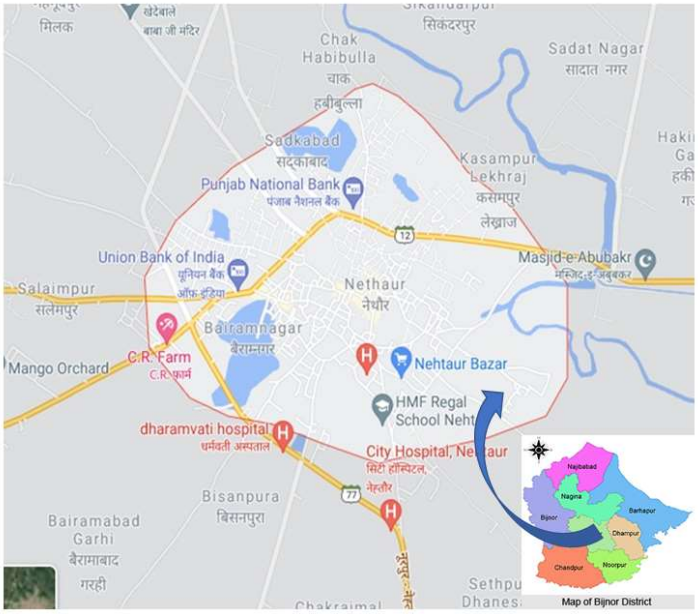

Figure 2: Nehtaur Map (Google Map/2021).

Table 1: Population growth rate of Nehtaur City.

Year	Population	Growth Rate (%)	Source
1991	34,753	-	Census 1991
2001	44,301	27.47	Census 2001
2011	47,834	7.97	Census 2011
2020	57,868	20.97	Swachh Survekshan, 2019

[1] KII with Head Clerk (NNPP).

4 Service outcomes

Nehtaur, Bijnor, Uttar Pradesh, India, 7 Jul 2021. SFD Level: SFD Lite
Population: 57868
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 100%

Containment								
System type	Population	WW transport	WW treatment	FS emptying	FS transport	FS treatment	SN transport	SN treatment
	Pop	W4c	W5c	F3	F4	F5	S4e	S5e
System label and description	Proportion of population using this type of system (p)	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	5.0	0.0	0.0					
T1A2C6 Septic tank connected to open drain or storm sewer	30.0			50.0	0.0	0.0	0.0	0.0
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	55.0			50.0	0.0	0.0	0.0	0.0
T1A4C8 Lined tank with impermeable walls and open bottom, connected to open ground	4.0			30.0	0.0	0.0		
T2A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	4.0			30.0	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	2.0			30.0	0.0	0.0		

Table 2: SFD Matrix for Nehtaur (Aamir/CSE/2021).

The outcome of the SFD graphic shows that all of the excreta flow (100%) is classified as 'Unsafely Managed' (Figure 1). The unsafely managed excreta originates from wastewater not delivered to treatment (5%), Faecal Sludge (FS) – not contained, emptied but not delivered to the treatment (24%). FS not contained – not emptied (28%) and 43% of Supernatant (SN) not delivered to treatment.

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

4.1 Offsite Sanitation systems

As per city officials of Nehtaur Nagar Palika Parishad, the city does not have any sewer network. In the sample household survey, it was found that in few wards (1, 2, 3 and 10) the households have connected their toilets directly to open drains. Based on FGDs, KIIs and sample HH survey, it was concluded that such households correspond to 5% of the population of Nehtaur (Figure 3 and Figure 4). The open drains in the city end up in low lying areas.[2] Water supply is 124 litres per capita per day (lpcd) which is being supplied to residents by NNPP and the gap of 11 lpcd in water demand (135 lpcd) is met by submersible and hand pumps.[3] Hand pumps and submersible pumps are installed secretly in households which is not accounted by NNPP.

[2] KII with senior Clerk NNPP and FGD with drain cleaners and sanitation workers
[3] KII with Engineer Jal Kal NNPP

Figure 3: Toilet connected to open drain (Aamir/CSE/2021).

Figure 4: Waste water flowing into open drain. (Aamir/CSE/2021).

4.2 On-site Sanitation systems

Containment: Based on KIIs and FGDs with relevant stakeholders and sample HH survey, it was concluded that 95% of the population of the city is dependent on Onsite Sanitation Systems (OSS). The two most prevalent OSS in Nehtaur are Fully Lined Tanks (FLTs) connected to open drain (T1A3C6, 55%) and Septic Tanks (STs) connected to open drains (T1A2C6, 30%).[4,5,6] These type of containment systems are present universally all over the city as also observed during the field survey (Figure 5, Figure 6 and Figure 7).

Figure 5: A Fully lined tank under construction. (Aamir/CSE/2021).

Figure 6: A fully lined tank connected to open drain. (Aamir/CSE/2021).

Figure 7: A Septic tank under construction (Aamir/CSE/2021).

The difference between FLTs and STs is that FLTs are either square or rectangular in shape whereas septic tanks are 2-3 chambered tanks. Most of the septic tanks, observed in the sample HH survey, do not adhere to the standards prescribed by BIS Code (IS: 2470 (Part 1) - 1985. According to the Head clerk NNPP, 511 individual household tanks have been constructed till 7 July 2021 under SBM to HHs which had no toilets or having insanitary toilets or no containments. The size of the tanks is generally decided by the factors like space availability and economic status of the HH. The average size of the containment

[4] FGD with Manual emptiers.
[5] FGDs with sanitation workers.
[6] HH sample survey and licensed government masons.

system, as observed on ground and discussed with FGDs, varies from 1 cubic metre to 6 cubic metres.[7,8,] The minimum and maximum depth of the tanks is ranging from 1 to 2.5 metres.[9] The third and fourth containment type, which spread across the city, are lined tanks with impermeable walls and open bottom connected to open ground (T1A4C8, 4%) and lined tanks with impermeable walls and open bottom with no outlet or overflow located all over the city with significant risk of groundwater pollution (T2A4C10, 4%) and the last containment which was commonly seen in low income settlements were lined pits with semi-permeable walls and open bottom, no outlet or overflow (T2A5C10, 2%)[10]. These containments were the upgraded versions of the containments which were earlier unlined pits[11].

As per the data received from NNPP, there are six Community toilets (CTs) and one Public Toilet (PT) in the city (Figure 8) which are maintained by NNPP.[12] As the city is celebrating open defecation free status, CTs are not being used much, as there is hardly any HH with no toilet now. PTs are generally used for urination. The containments of PT and CTs have a capacity of around 6 cubic metres and are maximum 2 metre deep.[13]

Figure 8: A Community toilet with a septic tank connected to open drain. (Aamir/CSE/2021).

Figure 9: Supernatant flowing into open drain from a septic tank. (Aamir/CSE/2021).

Emptying: The city is dependent on desludging operators who do operate mechanically or manually for emptying the Faecal Sludge (FS) from OSSs (Figure 10 and Figure 11). There is one NNPP-owned desludging vehicle[14] and six private desludging operators in the city who provide emptying services through mechanical means.[15] Manual emptying is done In wards which are having congested roads and are inaccessible to mechanically operated desludging vehicles.[16]

[7] Field observations during sample HHs survey.
[8] FGDs with manual and mechanical emptiers..
[9] FGDs with mason.
[10] Field observations in sample HH survey
[11] FGDs with local masons and manual emptiers.
[12] KII with senior clerk NNPP.
[13] FGD with sanitation workers.
[14] FGD with Head clerk, NNPP.
[15] FGD with private operators.
[16] FGD with manual operators.

Figure 10: Emptying being done by mechanical means (Aamir/CSE/2021).

Figure 11: Emptying of a fully lined tank by desludger (Aamir/CSE/2021).

The mechanical desludging is usually carried out by 3 people (1 Driver + 2 Helpers) and a fee of INR 1,500 – 3,000 (20-40 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. Most of private emptiers operate from Chandpur and one from Dhampur, which are nearly 26 and 12 kilometres respectively from the city. Emptying in Nehtaur is done on demand and, on an average, 1.5 trips are done per day in the city.[17] Advertisements of emptiers can be seen on electric poles, wall paintings, etc.(Figure 12).

Figure 12: Advertisements by private emptiers (Aamir/CSE/2021).

Figure 13: FGDs with NNPP Officials (Aamir/CSE/2021).

The manual emptiers do not do any formal advertisement but run their services strictly on word of mouth basis to avoid any legal issues. For emptying a tank of 6 cubic metre capacity, a group of 3 to 5 manual emptiers is required. An emptying fee of around 2,000 to 3,000 INR (27-40 USD) is charged by the manual emptying group in this case[18].

[17] FGD with private emptiers and HH sample survey
[18] FGD with manual emptiers.

Most of the people get their tanks emptied, but not in a scheduled manner. The frequency of emptying varies from 5 to 7 years. Hence, it was assumed that HHs with an average of emptying frequency of seven years are taking too long to get their tanks emptied are rather using their systems without emptying and hence, the population using their systems with emptying (variable F3) is estimated to be 50% for FLTs and STs and 30% for lined pits with semi-permeable walls and open bottom and lined tanks with impermeable walls and open bottom.

Transport: NNPP owns one vacuum emptying tanker which has 4,000 L capacity and a tractor is used for pulling the tanker (Figure 14). Fees charged by NNPP for desludging are 1,500 rupees (20 USD)[19].

There are six private desludging operators in the city having tractor-mounted vacuum tankers (Figure 15). The vacuum tankers are equipped with a motorized pump, storage tank of 4,000L capacity and a 60.96 m long hose pipe to access containment systems in narrow roads and congested areas. If the containment system is not approachable, even with a 60.96 m hose pipe, they reject those sites.[20] In such a case, HHs have to depend on manual emptiers, who generally use jerry cans stacked on a hand cart for emptying faecal sludge.[21] Since there is no functional treatment system in the city, waste water; FS and SN do not get delivered to any treatment facility. Therefore, variables W4C, F4 and S4e shows 0% delivered in the SFD matrix.

Figure 14: NNPP Desludger tanker (Aamir/CSE/2021).

Figure 15: Private desludger vehicle (Aamir/CSE/2021).

Treatment/ Disposal: NNPP has no designated site for discharge of FS. The mechanical emptiers usually discharge FS in open fields or low lying areas near highways. Manual emptiers generally work at night or early morning and dispose the FS in nearby open Nallah or at an empty plot. The supernatant from T1A2C6 and T1A3C6 flows in open drains which finally end in open fields or low lying areas (Figure 16 and Figure 17). As there is no treatment facility in the town, variables W5c, F5 and S5e are considered 0% in SFD matrix.

[19] KII with senior Clerk NNPP.
[20] FGD with private emptiers.
[21] FGD with manual emptiers.

Figure 16: Disposal of FS on open land (Aamir/CSE/2021).

Figure 17: Disposal of FS on open land (Aamir/CSE/2021).

5 Data and assumptions

Population was considered from Swachh Survekshan 2019 and data for all the stages of sanitation chain were updated based on the data collected from field through KIIs, FGDs, HH surveys, observations and secondary data collected from relevant stakeholders. Following assumptions were made for developing the SFD graphic for Nehtaur.

- 80% of water supplied is wastewater generated.
- As per the guidance given in the Frequently Asked Questions (FAQs) in the Sustainable Sanitation Alliance (SuSanA) website, it is assumed that 50% of the contents of spetic tanks and fully lined tanks is FS and 100% of the contents of lined tanks with impermeable walls and open bottom and pits with semi-permeable walls and open bottom is faecal sludge.
- HHs getting their systems emptied in less than 7 years are considered to be using their system with emptying and those who are taking more than 7 years are considered as not emptying their systems.

6 Context-Adapted SFD Graphic

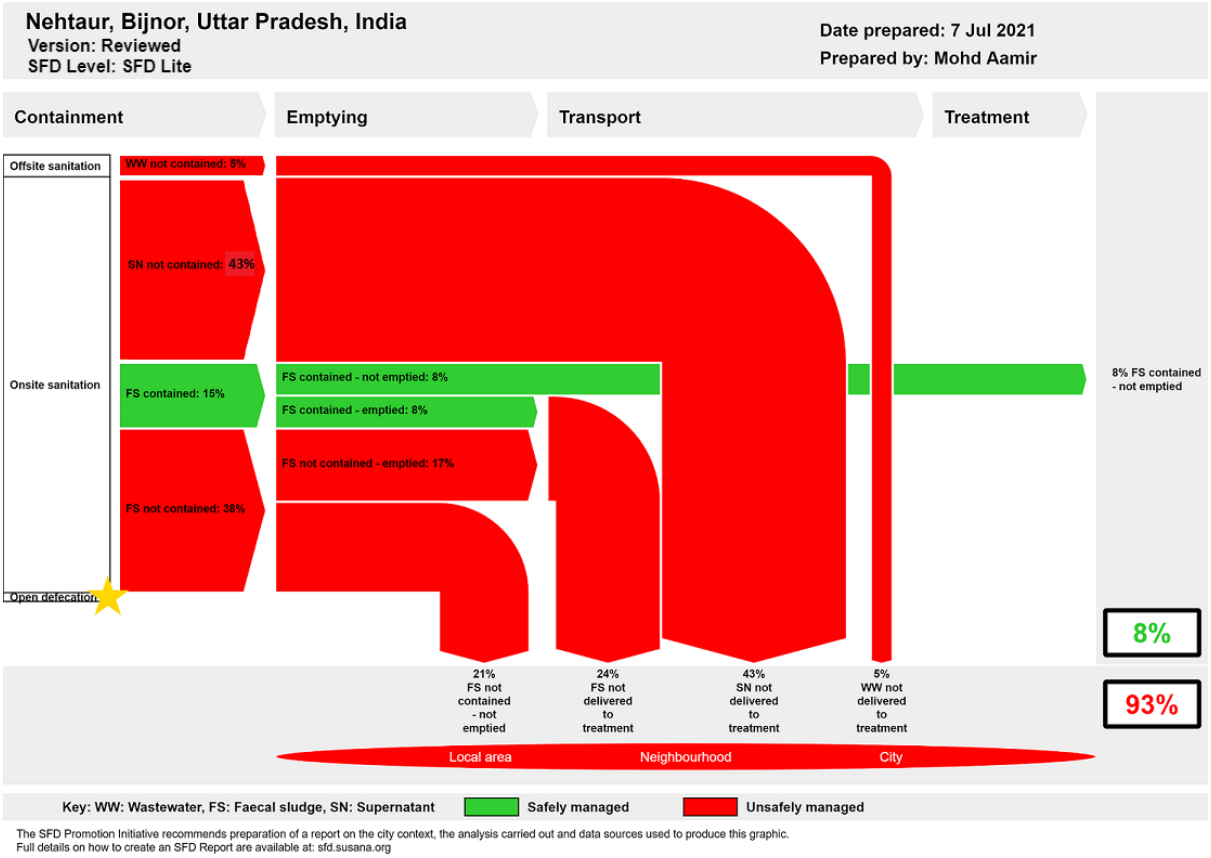

Figure 18: Context-adapted SFD Graphic for Nehtaur (Aamir/CSE/2021).

The only difference suggested in the context-adapted SFD Graphic is at containment stage for correctly designed septic tanks and therefore, septic tanks are assumed to be connected to centralised sewer, though connected to open drains. The solid FS collected in the septic tank is considered to be contained and hence, 15% of FS is contained (represented green in colour at containment stage). Followed by this, 8% of FS contained is emptied; remaining 8% FS remains in the tank which is contained and never emptied. Overall, according to the context-adapted SFD graphic, excreta of 93% of the population are not managed safely while for 8% of the population is managed safely.

Note: Since SFD does not work in decimal, half of fifteen percent of FS contained is divided into eight percent of FS contained – emptied and eight percent of FS contained – not emptied, leading to 101 percent as population divided into 93 and 8.

7 List of data sources

Reports and literature

- District Census Handbook 2011 (Population Census Abstract Data Table (India & State/UTs-Town/Village/Ward Level) http://censusindia.gov.in/2011census/population_enumeration.html
- Ground Water Brochure Bijnor District, U.P. (2014).
- Swachh Survekshan 2019, Ministry of Housing and Urban Development MoUD. 2014.
- Guidelines for Swachh Bharat Mission.: Ministry of Urban Development. Government of India.
- CPHEEO Guidelines, Septage Management in Urban India. Ministry of Urban Development, Government of India.

Key Informant Interviews (KIIs)

- Senior Clerk, NNPP.
- Junior Engineer Civil, Jalkal, NNPP.
- Executive Officer, NNPP.

Focus Group Discussions (FGDs)

- Masons
- Private desludging operators.
- Manual emptiers.
- Sanitation workers, NNPP.

Field Visits

- Public and community toilets.
- Open drains outfall.
- Residential areas.
- Faecal sludge discharge sites.

Nehtaur, India, 2021

Produced by:

Mohd Aamir (Student JMI-New Delhi)

Editing:

CSE, Dhruv Pasricha

CSE, Harsh yadava

CSE, Sachin Sahani

This SFD Lite Report is available from:

www.sfd.susana.org

SFD Promotion Initiative