Draft SFD Lite Report

Prayagraj
India

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

Date of production: 17/04/2020

1 The SFD Graphic

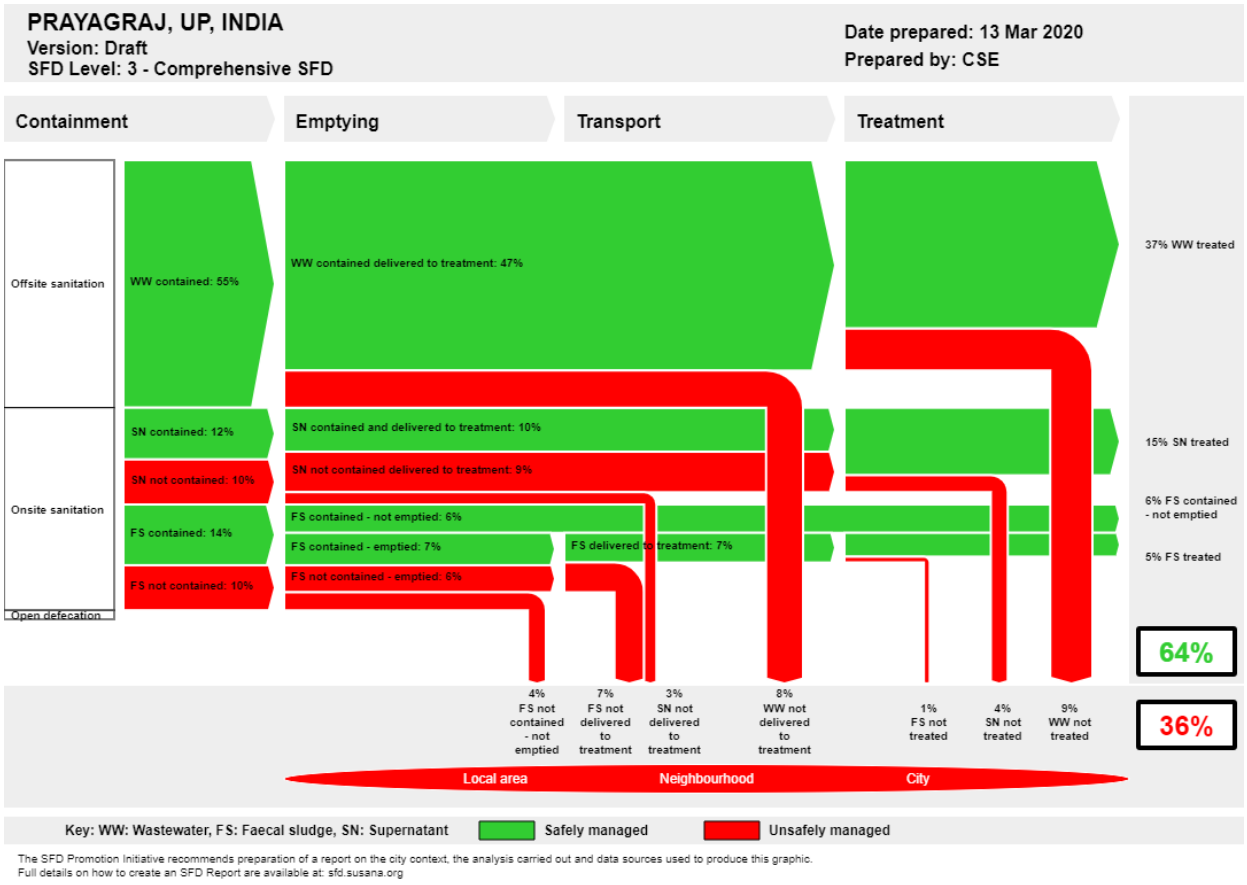

Figure 1: SFD Graphic for Prayagraj

2 SFD Lite information

Produced by:

Centre for Science and Environment (CSE), New Delhi.

Acknowledgement:

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Collaborating partners:

- Prayagraj Nagar Nigam (Municipal Corporation)

Date of production: 17/04/2020.

3 General city information

Prayagraj is coined with the name Prayag mean "place of sacrifice or offering". The city was earlier known as Allahabad, Illahabad. The city is the headquarters of Prayagraj district in Uttar Pradesh. The District is part of Central Ganga Plain and lies between Latitude **24° 47' N** & **25°N** and Longitude **81°19' E** & **82°21'E**.

The city is situated at the confluence of three rivers – Ganga, Yamuna and the invisible Saraswati. The meeting point is known as Triveni (or Sangam) and is very sacred to Hindus World famous Maha Kumbh Mela, Kumbh Mela, Ardh Kumbh Mela and Magh Mela take place at Sangam at an interval of 144 years, 12 years, 6 years and annually, respectively. The area under Sangam is not included under Nagar Nigam jurisdictions and is governed by Prayagraj Fair Authority (PFA).

As per the census 2011, the population of the city was 1142751 and total no. of households (HH) was 195259 and was spread across 142 sq.km, divided into 80 administrative wards. For this study, only area that falls under Nagar Nigam i.e. Municipal boundary is taken into consideration. As per ULB data, the population of the city as of (2018) is 13,12,662 and total no. of households (HH) is 226542 and is spread across 164 sq.km divided into 80 administrative wards. For the purpose of SFD preparation, a population of 13,78,295 has been considered which includes 5% floating population.

The average annual rainfall is 934 mm. Climate is sub humid and is characterized by hot summer and pleasant monsoon and cold season. About 90% of rainfall takes place from June to September. Depth of ground water in pre and post monsoon ranges between 3 – 15 metres below ground level (mbgl) and 1.45 – 13 mbgl respectively.

4 Service outcomes

Table 1: SFD Matrix for Prayagraj (2020)

PRAYAGRAJ, UP, INDIA, 13 Mar 2020. SFD Level: 3 - Comprehensive SFD
Population: 1378295
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 50%

System label	Pop	W4a	W5a	F3	F4	F5	S4d	S5d	S4e	S5e
System description	Proportion of population using this type of system	Proportion of wastewater in sewer system, which is delivered to centralised treatment plants	Proportion of wastewater delivered to centralised treatment plants, which is treated	Proportion of 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 sewer system, which is delivered to treatment plants	Proportion of supernatant in sewer system that is delivered to treatment plants, which is treated	Proportion of supernatant in open drain or storm sewer system, which is delivered to treatment plants	Proportion of supernatant in open drain or storm sewer system that is delivered to treatment plants, which is treated
T1A1C2 Toilet discharges directly to a centralised foul/separate sewer	55.0	85.0	80.0							
T1A2C2 Septic tank connected to a centralised foul/separate sewer	23.0			60.0	50.0	80.0	85.0	80.0		
T1A2C6 Septic tank connected to open drain or storm sewer	13.0			60.0	50.0	80.0			90.0	80.0
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	7.0			60.0	50.0	80.0			90.0	80.0
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	2.0			30.0	50.0	80.0				

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

Containment:

In Prayagraj, 55% of the population is dependent on the offsite sanitation system and 45% of the population depends on onsite sanitation system (OSS). Customarily, the population dependent on OSS have constructed either septic tanks or fully lined tank (with outlets), lined tanks with open bottom. Any kind of lined tanks (with outlet) with baffle wall in between (2-3 chamber) connected to toilets are locally called septic tanks irrespective of whether it adheres to the design specifications prescribed by Bureau of Indian Standards (BIS) or not and Lined tank (with outlet) without baffle wall is considered as fully lined tank. As per Focused Group Discussion (FGD) with masons and with field observation, it was observed that, septic tank was more prominent as compared to fully lined tank. Fully lined tank was observed particularly in areas of Low-Income Group (LIG) or in old areas of Prayagraj. As 55% of the city is connected with sewer network, there are still houses who have connected their septic tank outlet to the sewer system whose percentage after field observation and interviews with relevant stakeholders comes out as 23%. The size of the containments is usually decided on the basis of space availability and affordability of the households. Due to no standardization being followed while constructing the containment system, few households have constructed their containments large in capacity irrespective of their household size.

Septic Tank of a Household

HH being connected to sewer chamber

Figure 2: Containment type in Prayagraj

Under Swacch Bharat Mission (SBM), there have been 8250 Individual Household Latrines (IHHL), Community Toilets (CT) with 450 no of seats and Public Toilets (PT) with 850 no of seats constructed in Prayagraj. Despite being certified ODF++, Prayagraj has still pockets where people lack proper sanitation facilities in form of IHHL or CT/PT and are still practicing open defecation

Emptying:

Emptying frequency varies widely across the city, depending upon the type of Onsite Sanitation Systems. Containments, which have outlet, have an emptying frequency ranging from 6-10 year depend upon the size of the tank, whereas system with open bottom increases to 15-20 years.

ULB owns and operates three vacuum tankers that have a faecal sludge carrying capacity of 5000 litres. The emptying fee per trip charged by the NN for 5000 liters tankers is INR 1000 to 1200. On an average, these tankers cumulatively complete 1-2 trips per day, monsoon being the peak season for emptying. 02 people (1 driver + 1 helper) usually carry out emptying of fecal sludge from containments. On an average, it takes about 1–2 hours for completing one trip depends on the distance covered during the trip.

As per discussion with NN officials, there are 08 private vacuum tankers operating in the city. The faecal sludge carrying capacities of these trucks varies between 4000-5000 litres and the fee charged by them ranges from INR 700 to 1000 per trip. As per KII with private operator, the depth of septic tank differs with pertinence of location. These private desludgers advertise their contact number by distributing business cards or posters on wall. On an average, private vacuum tank, cumulatively complete 1-2 trips per day, monsoon being the peak season for emptying. On an average, it takes about 1–2 hours for completing one

trip depends on the distance covered during the trip. As per KII with the vacuum tanker operators, manual emptying is also prevalent in the city.

Open drain ending at open ground

Choked sewer line

Figure 3: Containments connected to different systems

Transportation:

Wastewater from sewerage network is directly conveyed to Sewage Treatment Plants (STPs). For effective planning, implementation and maintenance, the UPJN has divided the whole city into seven sewerage districts. The transportation efficiency of these sewerage networks is assumed to be 85%.

Some households where containment (septic tank/fully lined tank) are connected to sewerage network, the supernatant is conveyed to the STP. In other households, where the containment (septic tank/fully lined tank) are directly connected to open drains, the supernatant is transported through lined open drains. These small drains eventually converge to form big drains and there are total of 42 big drains (locally called nullahs) in the city. Out of the total 42 big drains, 37 are eventually intercepted by the sewerage network and the rest discharge either into Rivers Ganga/Yamuna or in open areas.

Faecal sludge from the tanks is conveyed through truck/tractor mounted vacuum tankers. There are 05 designated sites notified by the Prayagraj Nagar Nigam for disposal of faecal sludge. The 5 designated sites by the PNN are 25 MLD STP in Kodra, 35 MLD STP in Numayadahi, 50 MLD STP in Rajapur, 43 MLD STP in Salori, and 80 MLD STP in Naini. However, on many occasions private desludgers decant their truck at the low-lying area or in the open drains.

Jetting Machine Cleaning the Sewer Line

Vacuum Tanker involved in emptying process

Figure 4: Emptying and Transportation of Excreta through different system

Treatment and End-use/disposal:

The wastewater from the sewer network and storm water drain (tapped) is treated in the STPs. There are STPs in 7 locations in the city with cumulative sewage treatment capacity of 279.6 MLD. At present 259 MLD (i.e. 188 LPCD) of water is supplied to the town. Wastewater generated is 207 MLD (80% of the water supplied). As per field observation, 258 MLD wastewater is received at the STPs (which includes stormwater as water is tapped from open drains). Treated sewage from the STPs is discharged into Ganga and Yamuna rivers. Untreated wastewater flowing in open drains that are not intercepted by the sewerage network flows into either River Yamuna /Ganga, without treatment or in open drain.

Prayagraj generates approx. 344.6 KLD of faecal sludge. There is no dedicated faecal sludge treatment plant in Prayagraj. STPs have been designated for disposal of faecal sludge. As per the Vacuum emptier logbook of STP on an average 40 KLD of faecal sludge treated per day in the STPs.

Figure 5: Sewage Treatment Plant of Prayagraj at Naini

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.

- Volume of wastewater generated is 80% of water supplied.
- 50% of the contents of tanks and pits is Faecal Sludge
- Floating population is taken as 5% of total population

6 List of data sources

Reports and literature

- District Census Handbook 2011 for Prayagraj (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
- IHHL, SBM data, Prayagraj, U.P (2017-18).
- Service Level Benchmark under 14th Finance Commission - Prayagraj, UP (2018-19)
- Central Ground Water Board, 2008-09. Ground Water Brochure of Allahabad District, U.P. [http://cgwb.gov.in/District_Profile/UP/Allahabad.pdf

Key informant interviews

- KII-1: Ravi Ranjan, Municipal Commissioner, Prayagraj Municipal Corporation
- KII-2: Uttam Kumar Verma, Environment Engineer, Prayagraj Municipal Corporation
- KII-3: Jogeshwar Singh, Urban Planner, Prayagraj Municipal Corporation

- KII-4: Anand Kumar Dubey, Project Engineer, Uttar Pradesh Jal Nigam (State Parastatal Body)
- KII-5: Neeraj Kumar, Assistant Engineer, Uttar Pradesh Jal Nigam (State Parastatal Body)
- KII-6: Vipul Mishra, Adani Water, STP plant operator at Prayagraj (Private Operator)
- KII-7: Madhur Mishra, Adani Water, STP Operator at Prayagraj (Private Operator)
- KII-8: S C Valmiki, General Manager, Jal Kal Vibhag, Prayagraj Municipal Corporation
- KII-9: Vinod Kumar, Junior Engineer, Jal Kal Vibhag, Prayagraj Municipal Corporation

Focus group discussions

- FGD-1: Private Desludgers
- FGD-2: Masons

Field Visits

- Visit to Sewage Treatment Plants
- 50 Households from low income, middle income and high-income category
- Public and Community toilets

Prayagraj, India, 2020

Produced by:

CSE, Sarim

CSE, Nida Ahmed

Editing:

CSE, Dr Suresh Kumar Rohilla

CSE, Rahul Mankotia

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