



# Draft SFD Lite Report

## Agra India

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

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# 1 The SFD Graphic

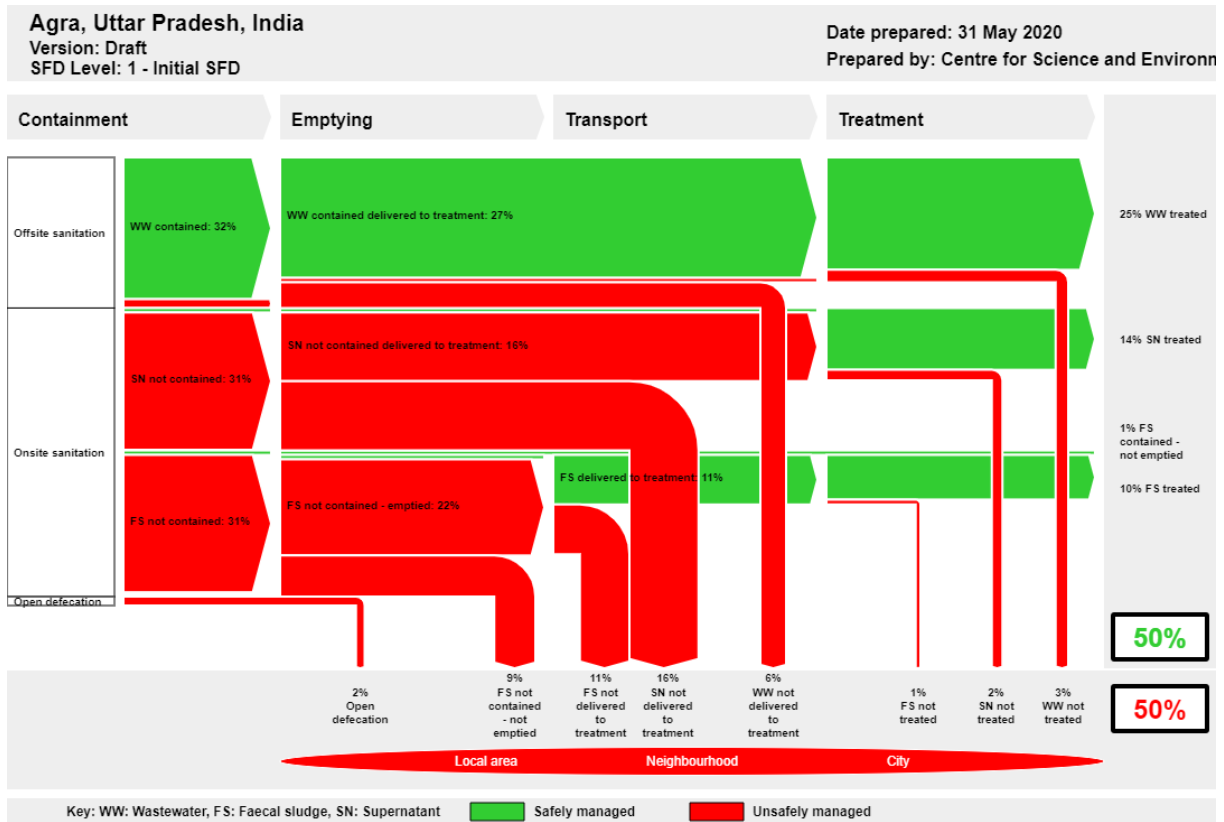


Figure 1: SFD Graphic for Agra

## 2 SFD Lite information

Produced by: Centre for Science and Environment (CSE), New Delhi

### Acknowledgement:

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### Collaborating partners:

- Agra Municipal Corporation

Date of production: 02/04/2020

### 3 General city information

Agra, the city of Taj Mahal, is the 3rd most populous city in Uttar Pradesh and is the administrative headquarters of the Agra district. The city is a major tourist hub with number of monuments like Agra Fort and Fatehpur Seekri Fort, other than the Taj Mahal, which have been listed as the UNESCO World Heritage sites. The highest density is in the old city areas, where the settlements started flourishing from the Mughal period like Lohamandi, Shahganj and the density is lowest in colonial Agra. 40% of the population depends largely on agriculture and remaining earn their livelihood in the leather, footwear business and iron foundries.

The Urban Local Body (ULB) governing the city is Agra Municipal Corporation (AMC). As per Census of India 2011, Agra has a population of 1,585,704. The city population taken for the study (2020) is projected and taken as 1,968,000. Municipal boundary with an area of ~141 sq km (100 wards) has been chosen for the current study. The floating population for the city is 3 lakhs. Population considered for the SFD is 22,68,000. Refer Table 1 for growth rate pattern in Agra city.

Table 1: Population growth rate

Census year	Population (Lakhs)	Growth rate (%)
1971	5.91	-
1981	7.81	32.15
1991	9.78	25.22
2001	12.75	30.37
2011	15.85	23.5

Source: Census (2011, 2001, 1991, 1981, 1971)

The climate of Agra city is extreme and tropical. During summer season the maximum temperature rises to 47 °C and drops down to minimum of 3°C during winter season. The city receives moderate to high rainfall with an average yearly rainfall of about 686 mm. The strata consist of mainly sandy soil. The sub soil water level is generally 6 to 8 m below ground level.

### 4 Service outcomes

Table 2: SFD Matrix for Agra (2020)

Agra, Uttar Pradesh, India, 31 May 2020. SFD Level: 1 - Initial SFD Population: 2268000 Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 100%												
System label	Pop	W4a	W5a	W4c	W5c	F3	F4	F5	S4d	S5d	S4e	S5e
<b>System description</b>	Proportion of population using this type of system	Proportion of wastewater in sewer system, which is delivered to centralised treatment plants	Proportion of wastewater delivered to centralised treatment plants, which is treated	Proportion of wastewater in open sewer or storm drain system, which is delivered to treatment plants	Proportion of wastewater delivered to treatment plants, which is treated	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated	Proportion of supernatant in 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
<b>T1A1C2</b> Toilet discharges directly to a centralised foul/separate sewer	32.0	85.0	90.0									
<b>T1A1C6</b> Toilet discharges directly to open drain or storm sewer	2.0			50.0	90.0							
<b>T1A2C2</b> Septic tank connected to a centralised foul/separate sewer	1.0					70.0	50.0	90.0	85.0	0.0		
<b>T1A2C6</b> Septic tank connected to open drain or storm sewer	30.0					70.0	50.0	90.0			50.0	90.0
<b>T1A3C2</b> Fully lined tank (sealed) connected to a centralised foul/separate sewer	1.0					70.0	50.0	90.0	85.0	0.0		
<b>T1A3C6</b> Fully lined tank (sealed) connected to an open drain or storm sewer	32.0					70.0	50.0	90.0			50.0	90.0
<b>T1B11 C7 TO C9</b> Open defecation	2.0											

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

### 4.1 Offsite Systems

At present, there are 8 sewer zones, of these most of the zones are fully covered with sewer network whereas some the work is in progress in Western and Eastern Zones. During field visit, it has been observed that the sewer trunk lines frequently choke and require jetting machines for overcoming this. There are also leakages reported in the network.

34% of total population of the city are dependent upon offsite sanitation systems. As per data from Up Jal Nigam and AMC, a total of 96422 households are connected to sewer network from which 43012 are old connections and 53410 are new connections made till 2020. During KII with UP Jal Nigam officials it was found that for ~20% of the new connection the outlet of septic tank / fully lined tank is connected to sewer network; such systems have been considered as onsite sanitation system in this SFD.

It was observed that many households have toilets with no containment system and discharge FS directly into open drains. Based on household surveys, FGD with masons and KII with with AMC officials such systems are estimated to be 2%.

### 4.2 On-site Sanitation Systems

*Containment:* 64% of city's population is dependent on On-Site Sanitation System (OSS). This includes four types of containment systems i.e. septic tanks (ST) connected to open drain, ST connected to sewer, fully lined tanks (FLT) connected to open drain and FLT connected to sewer.

As per FGD with masons, the size of the containments is usually decided on the basis of space availability and affordability of the households and do not adhere to the size prescribed by Bureau of Indian Standards (BIS). STs and rectangular FLT with outlets connected to open drains and sewers are constructed in the city with a good depth. Old FLT are box type tanks without baffle walls having their outlets connected to open drain and sewer.

Due to lack of space and to make task easy, prefabricated cemented cylindrical tanks are also now commonly used as containments, having outlets connected to open drain. These are considered as circular fully lined tanks. The size of such tanks is 4-6 feet diameter and ~15 feet depth.

Agra has made a significant progress from 2011 in reducing the proportion of people dependent on open defecation by constructing community toilets and supporting households in individual toilet construction. But during household survey and FGD with residents, it was observed that a significant number of households still practice open defecation (OD) due to lack of awareness or individual toilets in their homes. General open defecation hotspots are agriculture fields, railway tracks, open drains, open grounds and on the banks of Yamuna river.



Figure 2: Toilets directly connected to open drain & people practicing open defecation in Yamuna River

*Open defecation:* Even though the city has been declared ODF, 2% of population still defecates in open ground which is found near agricultural fields, bank of Yamuna River and near drains.

*Emptying:* Emptying service is provided by both Government & Private vacuum tanker operators. There are 7 govt. and around 25 private operators present in the city to provide emptying service. Out of 25 private operators, 11 are registered to AMC.

To avail the service from government, residents have to submit an application to the sanitary department. Government emptiers use truck mounted vacuum tankers with capacity 5000 – 6000 L. Average of two trips are made by government desludgers. Emptying fee charged is INR 1000 (13.2 USD) per trip.

Private emptiers use tractor mounted vacuum tankers. Three people are for one vacuum tanker. Capacity of vacuum tankers is 5000- 6000 liters. Time taken to empty one tank is 10-20 minutes. Around 1 - 2 trips are made by private desludger in a day. The govt. desludgers make around 2 to 3 trips a week. Fee charges varies from INR 800 to 1200 per trip. No personal protective equipment is used while emptying. Average frequency of desludging a tank is 3-4 years, however, it was observed that it varies basis on the size of the tanks.



**Figure 3: Cleaning of choked sewer by government emptier**

*Transportation:* Faecal Sludge (FS) collected by government desludgers is discharged into the designated disposal points. During FGD with private emptiers it was found that a lot of tankers also discharge FS into the agricultural fields after taking consent from farmers or discreetly in open drains.

It is estimated that around 85% of the wastewater in the sewerage network reaches STP and rest of it gets leaked from the system and discharges into open drain. There are some containment systems with outlet connected to sewerage network.

The Supernatant from such containment systems of 2% of population dependent upon onsite sanitation system is also transported through the sewerage network. The Supernatant from other onsite sanitation systems flows into the small and large drains flowing in the city. Most of this supernatant ends up into the Yamuna river untreated while some amount gets tapped and treated in the STP. There are total of 90 open drains and of which 29 are tapped.



Figure 4: Storm water drain directly discharging into Yamuna river



Figure 5 Designated disposal point by Agra Municipal Corporation

*Treatment and disposal:* There are 9 Sewage Treatment Plants (STPs) in Agra with an installed capacity of 220.5 MLD. The wastewater generated in the city is ~272 MLD. However total wastewater reaching the STPs is 145 MLD. But this is not sufficient to treat all the waste water (WW) generated in the city. Thus, there is proposal of setting up 3 new centralized STPs with total capacity of 166 MLD and 10 decentralized STPs with total capacity of 11.6 MLD. Based on the STPs visit, treatment efficiency of STPs is taken as 90%.

The wastewater reaching the STPs is getting treated and the treated sludge is given to farmers. The treated WW is discharged into river Yamuna or any other water body in the vicinity.

During FGD with private desludgers it was found that some desludgers discharge faecal sludge untreated into the environment either in open drains or agricultural fields. The city generates ~806 KLD of faecal sludge and treats around 140 KLD of faecal sludge through discharging the faecal sludge in the designated points in the sewerage network which leads to an STP.



Figure 6: Treated wastewater discharging from an STP

## 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.

- 50% of the contents in septic tanks and fully lined tanks is FS.
- 80% of the water supplied is wastewater.

## 6 List of data sources

### Reports and literature

- District Census Handbook 2011 for Agra (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/Ward Level) [http://censusindia.gov.in/2011census/population\\_enumeration.html](http://censusindia.gov.in/2011census/population_enumeration.html)
- IHHL, SBM data, Jhansi, U.P (2018-2019).
- Service Level Benchmarking under 14<sup>th</sup> Finance Commission (2018) - Agra
- Service Level Improvement Plan (SLIP) report on sewerage and septage management, 2015
- SFD Promotion Initiative Report 2015, Agra
- Assessment of Excreta Management: SFD factsheets for 66 cities in Uttar Pradesh (2018).
- Agra Master Plan- 2021

### Key Informant Interviews (KII)

- KII- 1; Mr Mr Vijay Kumar, Addl. Municipal Commissioner, Agra Municipal Corporation (AMC)
- KII- 2; Mr K. K. Pandey, SBM Project Manager, Agra Municipal Corporation
- KII- 3; Mr Rajeev Rathi, Environment Engineer, Agra Municipal Corporation
- KII- 4; Mr D. R. Sisodiya, Zonal Sanitary Officer, Agra Municipal Corporation
- KII- 5; Mr B. K. Garg, Project Manager, YPCU, Agra
- KII- 6; Ms Anuja Deewedi, Assistant Engineer, Uttar Pradesh Jal Nigam
- KII- 7; Mr Anwar Khwaza, Jal Sansthan, Agra Municipal Corporation

### Focus Group Discussions (FGD)

- FGD-1; Private desludgers
- FGD-2; Govt. desludgers engaged by AMC
- FGD-3; STP operators
- FGD-4; Masons

### Field Visits

- Visit to approximately 50 households from Low- Income, Middle-Income and High-income groups.
- Visit to faecal sludge discharge point and sewage treatment plants.
- Visit to community and public toilets in the city.

#### SFD Promotion Initiative



Agra, India, 2020

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