Draft SFD Lite Report

Indore

India

This SFD Lite Report was prepared by
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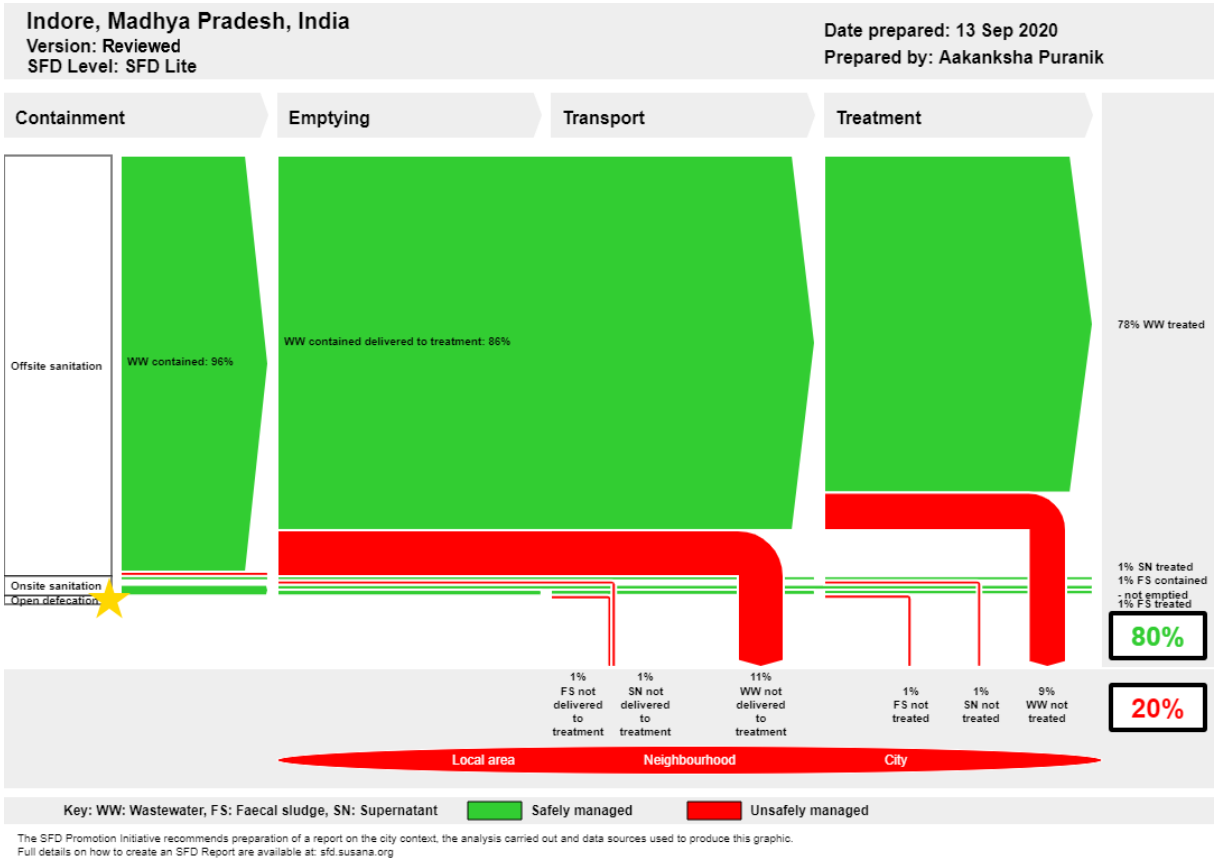
1 The SFD Graphic



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:

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- 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. Sunil Kumar Gupta, Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC); Mr. Mandeep Singh Tuteja, Desludging Operator; Ms. Mamta Verma, Plant in-charge STP - Enviro Control Associates; Mr. Ritesh Rangari, Engineer, DRA Consultants; Mr. Raj Joshi, Supervisor, Desludging Complaint Registration, IMC for providing all the required secondary data and cooperating for Key Informant Interviews (KIIs) & Focussed Group Discussions (FGDs).

Collaborating partners:

- Centre for Science & Environment, New Delhi, India
- Indore Municipal Corporation, Indore, Madhya Pradesh

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3 General city information

Indore, one of the fastest-growing cities of India, is the largest city of Madhya Pradesh, in terms of its population, with 841 people per sq. km.[1] One of the 100 Indian cities selected under the Smart City Mission (urban renewal and retrofitting program by the Government of India to make cities sustainable and friendly for its citizens). Indore is also the financial capital and education hub of Central India. It is famous for its street food delicacies. It is located at the centre of Indore District, situated on fertile Malwa Plateau at 22.7196° N, 75.8577°E. The city has 69 wards (old IMC limit) and is administered by Indore Municipal Corporation (IMC) for the provision of civic facilities. Indore has been declared as the cleanest city of India four times in a row under *Swacch Survekshan* (countrywide annual ranking mechanism for cities with respect to sanitation) 2017-2020.

According to census 2011, the population of the city was 1964086 and the total number of households was 462075, spread across an area of 134 sq. km. In 2014, Government of Madhya Pradesh merged the 29 villages into IMC limits, thus increasing the jurisdiction of IMC over 280 sq. km and 85 wards with a population of 3003400[2]. The old municipal boundary and current population is used for the preparation of SFD.

Table 1: Population Growth Rate Indore City

Census Year	Population	Growth Rate (%)	Source
2001	1474968		Census, 2001
2011	1964086	2.5	Census, 2011
2020 (estimated)	2686250	2.7	IMC, 2020

The estimated floating population of the city is around 300000-500000[3]. However, taking into consideration the COVID Pandemic situation while the study was being conducted, the floating population has not been considered.

The pattern of sewerage catchment of Indore is a typical river-based system. Kanh, a tributary of river Kshipra passes through the densely populated areas of the city from South to North. Major tributaries meander from western and eastern direction towards the river. The terrain is mostly flat and the maximum elevation difference is about 20m from upstream to downstream ground levels in the system[4]

The water supplied in the city is predominantly through various sources, majorly surface water. Narmada River is the major source of water supply (540 MLD) in the city. The other two being Yashwant Sagar Dam (45 MLD) and Bilawali Tank (9 MLD). The total water supply in the city is 323 MLD with per capita water supply of 97.67 LPCD[5]

The predominant rocks in the region are Deccan traps. These basaltic aquifers get recharged by the rainfall and depth to groundwater level varies from 8-20 mbgl[6]. The city has black cotton soil varying in depth from place to place. Indore enjoys a composite climate, with monsoon from mid-June to

1 District Census Handbook 2011 for Indore
2 Indore Municipal Corporation. (2020). *Detailed Project Report Indore Sewerage System Volume 1*
3 Ministry of Urban Development. (2017). Swachh Bharat Newsletter May 2017. http://sbkosh.gov.in/
4 Indore Municipal Corporation. (2017). *Detailed Project Report Indore Sewerage System Volume 1*
5 AMRUT SLIP of city
6 Central Ground water Board Ministry of Water Resources (2013) http://cgwb.gov.in/District_Profile/MP/indore.pdf

September, post monsoon in October-November, winters from December to February and summer period from March to June[7]

4 Service outcomes

Indore, Madhya Pradesh, India, 13 Sep 2020. SFD Level: SFD Lite
Population: 2686250
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 50%

System label	Pop	W4a	W5a	W4c	W5c	F3	F4	F5	S4d	S5d
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 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
T1A1C2 Toilet discharges directly to a centralised foul/separate sewer	96.0	90.0	90.0							
T1A1C6 Toilet discharges directly to open drain or storm sewer	1.0			0.0	0.0					
T1A2C2 Septic tank connected to a centralised foul/separate sewer	1.0					90.0	90.0	90.0	90.0	90.0
T1A2C5 Septic tank connected to soak pit	2.0					90.0	90.0	90.0		

Table 2: SFD Matrix for Indore

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

4.1 Offsite Systems

The sewerage network has been laid all over the city within the administrative boundary of Indore by various governing agencies with total 1664.38 km[8] of sewerage network. At present, DRA Consultants Ltd. Nagpur, is responsible for providing sewerage system. 96% (T1A1C2) of the city's population is found to be connected to the centralised piped sewer system based on sample household survey, KIIs and FGDs with relevant stakeholders[9,10,11]

During the sample household survey, it was found that in a slum area, Kabootar Khana, which is approximately 1% (T1A1C6) of the city population, the households have their toilets connected directly to the open drains[12]. As observed, the slum is illegal and lacks basic sanitation facilities. However, this slum area is considered for rehabilitation programmes in the near future[13]. Many households in the slum area do not have an individual toilet and depend on the community toilet, which is in a dilapidated condition[14]. With two separate toilets for male and female section, only one for each is functioning. As there is no water supply in the toilet, the community members have to carry their own bucket of water. The drains carrying wastewater from the community toilet is directly overflowing into the Saraswati River that flows right next to the slum[15]

[7] District Census Handbook 2011 for Indore
[8] Indore Municipal Corporation. (2020). Detailed Project Report Indore Sewerage System Volume 1: Main DPR
[9] KII with desludging operator
[10] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
[11] Field observations, 2020
[12] Field observations, 2020
[13] KII with city official
[14] Field observations, 2020
[15] Field observations, 2020

Figure 1: Open drains carrying wastewater in Kabutar Khana

Figure 2: Open drains leading to Saraswati River at Kabutar Khana

Indore has three STPs with varying capacities of 78 MLD, 12 MLD and 245 MLD, located at Kabitkhedi, Indore[16]

Table 3: Details of STPs of Indore City

STP	Commissioned year	Location	Technology	Run by	Existing capacity in MLD	Inflow (average) in MLD
12 MLD STP	2006	Kabitkhedi	Up flow Anaerobic Sludge Blanket (UASB)	Aqua Gases	12	12
78 MLD STP	2006	Kabitkhedi	Up flow Anaerobic Sludge Blanket (UASB)	Aqua Gases	78	78
235 MLD STP	2016	Kabitkhedi	Sequential Batch Reactor (SBR)	Enviro Control Associates Pvt Ltd	245	245
Total					**335**	**335**

As per the current scenario, ~90% of the wastewater is reaching to the STPs (W4a, S4d) considering the blockages and leakages from old defunct sewer lines which finds its way to either storm water drains and river[17]. The total wastewater generation in the city is 235 MLD of total water supply which complies with total treatment capacity of 335 MLD[18,19]. However, the lab report from the STP revealed that the discharge standards, prescribed by Central Pollution Control Board are met by only one of the STP of 245 MLD capacity[20]. Hence, the wastewater and supernatant treated at the STPs is considered 90% (W5a & S5d). The other two STPs of 78 MLD & 12 MLD are proposed for rehabilitation plans to match the required treated water quality for safe disposal at the Kahn and Saraswat River[21,22,23]. To cater to the growing population, five more STPs have already been constructed, which are not operational as of now[24].

[16] Indore Municipal Corporation. (2020). Detailed Project Report Indore Sewerage System Volume 1: Main DPR
[17] Field Observations, 2020
[18] KII with STP in-charge
[19] Indore Municipal Corporation. (2020). *Detailed Project Report Indore Sewerage System Volume 1: Main DPR*
[20] Indore Municipal Corporation. (2020). *Detailed Project Report Indore Sewerage System Volume 1: Main DPR*
[21] Indore Municipal Corporation. (2020). *Detailed Project Report Indore Sewerage System Volume 1: Main DPR*
[22] KII with STP in-charge
[23] KII with STP supervisor
[24] KII with STP supervisor

Figure 3: STP of 78 MLD capacity with UASB technology

Figure 4: Sequencing Batch Reactors (SBR) for STP of 245 MLD capacity

4.2 On-site Sanitation Systems

Containment: Based on sample household surveys, KIIs and FGDs with relevant stakeholders, it was concluded that only 3% population is dependent on the On-site Sanitation Systems (OSS). The prevalent OSS in the city are Septic tank (ST) connected to soak pits (T1A2C5, 2%) and Septic tank (ST) connected to centralized foul/ separate sewer (T1A2C2, 1%)[25].

The general size of septic tanks varies from 6 -12 ft * 4 - 8 ft * 10 ft depending upon the household size, income level etc[26]. The septic tanks are two to three chambered with proper partition walls including plastered bottom.

Figure 1: Septic tank of a public toilet near Lalbagh

Community Toilets/Public Toilets: Under *Swachh Bharat Mission* (SBM), around 12,384 Individual Household Latrines (IHHL) [27] have been provided to households (in slum areas, informal settlements and unplanned areas) having no toilets or to households with insanitary toilets as of 2020. There are 115 community toilets, 211 public toilets and 399 urinals in the city[28]. Urinals are directly connected to the centralised foul/separate sewer system whereas community toilets and public toilets have septic tanks connected to soak pits and their outlet is connected to the sewer system[29]. The average size of septic tanks in the community toilet is 3 x 3 x 3 m and in public toilets is 1.2 x 2.4 x 3.0 m[30]. Indore was declared as an Open Defecation Free (ODF++) city under *Swacch Survekshan 2019* and no instances of open defecation were observed during the field visits.

Figure 2: Septic tank of a public toilet located at Collectrate, Moti Tabela

[25] KII with desludging operator
[26] Field observation & KII with desludging operator
[27] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
[28] FGD with employees at Drainage Department, Indore Municipal Corporation (IMC)
[29] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
[30] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)

Figure 5: Public toilet at Indralok Colony, Annapurna Road

Figure 5: Public urinal at Ranjeet Hanuman Road

Emptying: There is only one private desludging operator responsible for emptying of faecal sludge (FS) in the city which is licensed by IMC[31]. The requests for the desludging process are either registered via a telephone helpline number, IMC website, Indore 311 android app or in written (registration form) at the IMC[32]. There are 7 truck-mounted vehicles (Suction Machine Mounted Tata 709) and one tractor-mounted vacuum tanker, out of which 4 are in regular use[33]. The tractor-mounted vacuum tanker is used for emptying in narrow and congested lanes. All vehicles are owned by the private operator whereas records are maintained by the IMC[34,35]. The vacuum tankers are equipped with a motorized pump and have a storage capacity varying from 3000-8000 L. The desludging fee charged per trip is INR 1500 for HHs, INR 1880 for commercial and INR 880 for the narrow & congested lanes[36,37]. Emptying frequency for the households varies from 6 to 15 years depending upon the nature and the size of the containment system. Whereas, the emptying frequency for the public toilets and community toilets is done once or twice in a month depending upon the requirement[38]. There are no instances of manual scavenging found in the city[39,40,41].

Figure 3: Treated wastewater disposed into Kanh River

Transportation: The emptied faecal sludge is transported through truck/tractor mounted vacuum tankers. Around 1-2 trips per day are made by tractor-mounted vacuum tanker and 4-5 trips by truck-mounted vacuum tanker[42,43]. The emptied faecal sludge is transported to the inlet of designated STP of 245 MLD capacity at Kabitkhedi[44,45]. Since, 90% of FS getting emptied (F3) is delivered to the

[31] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
[32] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
[33] KII with desludging operator
[34] KII with desludging operator
[35] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
[36] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
[37] KII with desludging operator
[38] KII with desludging operator
[39] KII with Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
[40] Field Observations, 2020
[41] KII with desludging operator
[42] Monthly log-sheet
[43] KII with desludging operator
[44] Monthly log-sheet
[45] KII with STP in charge

treatment facility, F4 & F5 is considered 90% in SFD matrix.

Treatment/Disposal: The IMC has three designated STPs for both wastewater & faecal sludge treatment which are working at their full capacity. The treated wastewater is used for the curing processes at the plant. Other than that, the treated wastewater is collected by assigned IMC tankers and used for watering the public parks and roadside plantations and the remaining is disposed off into the Kanh River[46]. IMC has recently proposed a designated site, close to Kabitkhedi STP for the disposal of sludge produced at STPs[47]. Earlier, the sludge was given away for free of charge to various organizations on a contract basis[48].

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 the field through KII, FGDs, observations, secondary data collected from relevant stakeholders and online portals of the ULBs.

Following assumptions were made for developing the SFD for Indore City-

- The volume of wastewater generated is 80% of water supplied
- 50% of the contents of Septic tanks is Faecal sludge
- The proportion of OSS emptied is considered 90% assuming frequent emptying service within 5-10 years as the threshold, based on the size of the tank and no. of people dependent on that system

6 List of data sources

Reports and literature

- District Census Handbook 2011 for Indore
- Household amenities and assets table HH-08: Percentage of households by availability of the type of latrine facility https://www.censusindia.gov.in/2011census/Hlo-series/HH08.htmlCentral
- Groundwater Board Ministry of Water Resources. (2013). *District Ground Water Information Booklet*.
- Indore Municipal Corporation. (2020). *Detailed Project Report Indore Sewerage System Volume 1: Main DPR*
- Ministry of Urban Development. (2017). *Swachh Bharat Newsletter May 2017*
- Indore Municipal Corporation. (2017). *Detailed Project Report Indore Sewerage System Volume 1: Main DPR*

Key Informant Interviews (KII)

- Executive Engineer, Drainage Department, Indore Municipal Corporation (IMC)
- Desludging Operator
- Plant in-charge of 235 MLD STP - Enviro Control Associates
- Supervisor, 12 MLD STP & 78 MLD STP
- Engineer, DRA Consultants

[46] KII with STP supervisor
[47] KII with STP supervisor
[48] KII with STP supervisor

- Supervisor, Desludging Complaint Registration, IMC

Focus Group Discussions (FGD)

- Staff of STPs and Public Toilets
- Residents of the city

Field Visit

- Survey of Public toilet (8 nos.), community toilets (2 nos.) and urinals (3 nos.)
- Visit to Sewage Treatment Plants at Kabitkhedi (3 nos.)
- Visit to approximate 25 households covering Slums, Lower Income Groups (LIG), Middle Income Groups (MIG) and Higher Income Groups (HIG) spread throughout the town

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