

# Draft SFD Lite Report

## Nashik India

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

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# 1 The SFD Graphic

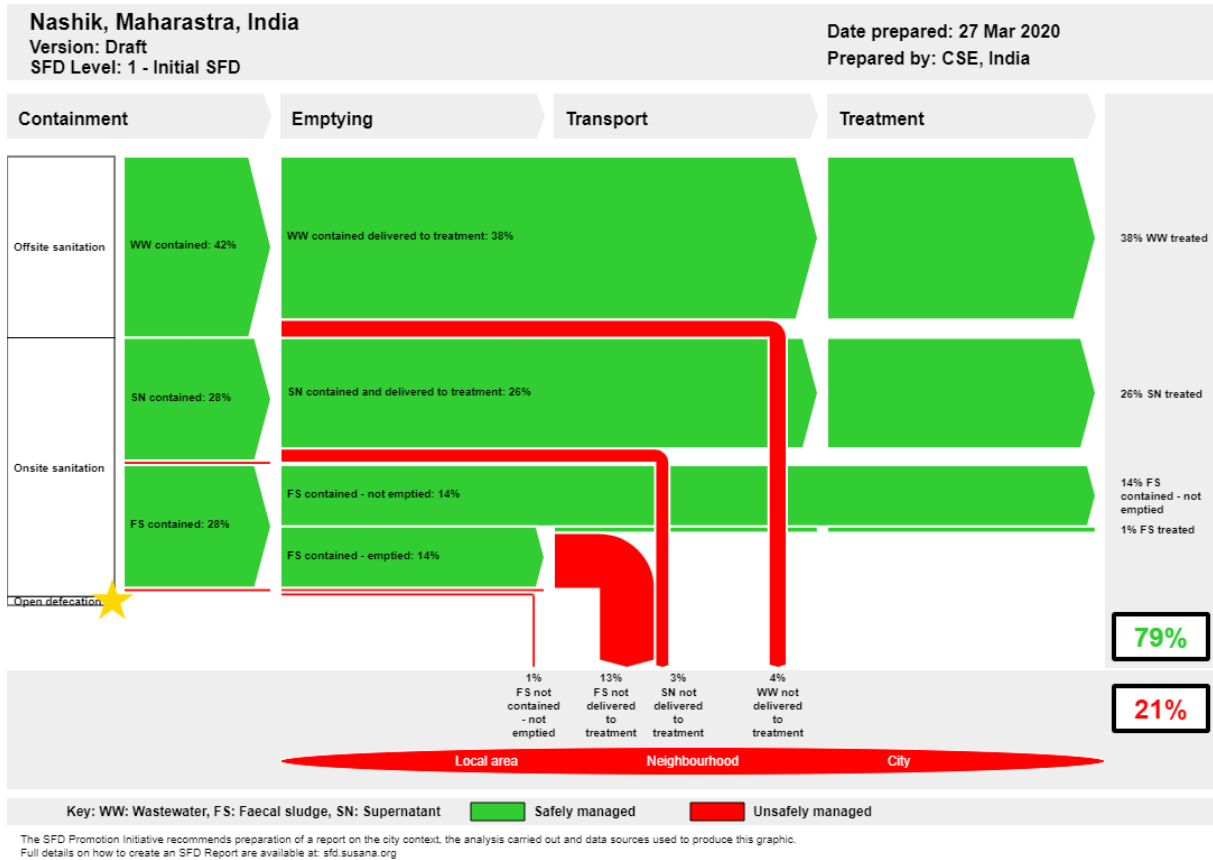


Figure 1: SFD Graphic for Nashik City

## 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 R. V. Game (IAS), Municipal Commissioner, Dr Bokhane, H.O.D. Health Department, Mr S. R. Vanjari, Deputy Engineer (Civil), Mr Sachin Gore HOD Town Planning Dept, Mr Dhananay, Water Supply Dept. and Mr Mali for providing all the required secondary data and cooperating for Key Informant Interviews (KIIs) & Focus Group Discussions (FGDs).
- This report would not have been possible without constant support of Mr Mali, Dr Bokhane, H.O.D. Health Department & Mr S. R. Vanjari, Deputy Engineer (Civil) who helped in conducting sample surveys and FGDs in the field.

### Collaborating partners:

- Nashik Municipal Corporation, Nashik, Maharashtra, India

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### 3 General city information

Nashik is an ancient Indian city situated on the banks of river Godavari. Geographically, it is located in the northwest part of the state of Maharashtra in the Western Ghats with mean elevation of about 565 msl at 20.00° N and 73.78° E. Its historical value attracts lots of tourist throughout the year and results in the diurnal floating population of about 2,00,000. The city additionally hosts the Simhashth Kumbh Mela Festival once in 12 years in Godavri River which attracts about 5,000,000 pilgrims within a week. (NMC, 2020)

Nashik Municipal Corporation is a first grade ULB which is divided into 6 administrative zones. According to 2011 census<sup>1</sup>, the population of the city was 14,86,053 and total no. of households (HH) was 3,36,333 and spread across an area of 259.13 sq km. The current population of the city is 20,40,000<sup>2</sup> and total no. of households (HH) is 3,80,000 with population growth rate of 4.66 which is divided into 31 election wards. The current population plus floating population is used for preparation of SFD.

**Table 1: Population Growth rate Nashik City**

Census Year	Population	Growth Rate (%)	Source
2001	10,77,236	-	Census 2001
2011	14,86,053	38	Census 2011
2019	20,40,000	37	NMC, 2020

Nashik has a tropical climate with max temperature in summers of 42.5° C and min temperature in winter less than 5° C and annual rainfall<sup>3</sup> of about 890.3mm (mostly June-September). The risk of groundwater contamination is low as the depth of water level ranges from 5-10 m to less than 2 m in pre-monsoon and post-monsoon<sup>4</sup> respectively (Central Ground Water Report, Nashik, 2014). The water supplied in the city is predominantly through 3 surface water sources namely Godavri River, Darna River & Mukane River. The total water supply in the city is 479.89 MLD and after the water losses, it is around 335.40 MLD with per capita water supply of 135 LPCD (KII-1, 2020).

### 4 Service outcomes

**Table 2: SFD Matrix for Nashik (CSE 2020)**

Nashik, Maharashtra, India, 27 Mar 2020. SFD Level: 1 - Initial SFD

Population: 2240000

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
<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 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	42.0	90.0	100.0							
T1A2C2 Septic tank connected to a centralised foul/separate sewer	56.0			50.0	10.0	100.0	90.0	100.0		
T1A3C2 Fully lined tank (sealed) connected to a centralised foul/separate sewer	1.0			50.0	10.0	100.0	90.0	100.0		
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	1.0			50.0	10.0	100.0			0.0	0.0

<sup>1</sup> Census, 2011

<sup>2</sup> ULB water supply data, 2019

<sup>3</sup> Central Ground Water Report, Nashik, 2014

<sup>4</sup> Central Ground Water Report, Nashik, 2014

Overview on 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 Nashik with total 1550 km of sewerage network which accounts for 42% of city's population but wards pipelines are under repair. Rest 57% of city's population is dependent on hybrid system of on-site containment systems (OSS) a Septic tank and fully lined tank, whose outlet is connected to sewer lines (Field Observation; KII- 2, 2020; KII-3, 2020).

There are 15 sewage pumping stations and 10 STPs in the city with installed treatment capacity of 360.5 MLD<sup>5</sup> (KII-6, 2020). The STPs are based on UASB, ASP, MBBR, SBR technology. As per the current scenario, ~90% of the wastewater is reaching to the STPs (w4a, s4d) considering the leakages from old defunct sewer lines which finds its way to either storm water drains and river. There are 67 nallahs<sup>6</sup> in the city (KII-7, 2020), out of which some are tapped and diverted to STPs while rest are directly flowing into rivers. Presently, there is ~100% wastewater treatment through STPs as wastewater generation is 268.32 MLD of total water supply which complies with total treatment capacity of 360 MLD. The lab report from the STP revealed that the discharge standards, prescribed by Central Pollution Control Board (CPCB), are met by the plant, hence the wastewater and supernatant treated at the STP is considered 100% (w5a, s5d) which is safely discharged into Godavari and Darna River.



Figure 2: Sewage Treatment Plant of 130 MLD capacity, Tapovan, Nashik (Source: Mudit/CSE, 2020)

#### 4.2 On-site Sanitation Systems

*Containment:* Based on sample household survey, KIIs and FGDs with relevant stakeholders it is estimated that 58% population is dependent on the On-site Sanitation Systems (OSS) (Field Observation; KII- 3, 2020; KII- 4, 2020; FGD-1 & 2, 2020). The containment systems prevalent in the city are septic tank (ST) connected to centralised foul/separate sewer (T1A2C2, 56%), fully lined tank

<sup>5</sup> Sewerage Network Plan, Nashik

<sup>6</sup> List of Nallahs by NMC

(FLT) connected to centralised foul/separate sewer (T1A3C2, 1%) and fully lined tank (FLT) connected to open drain or storm sewer (T1A3C6, 1%) (Field Observation; FGD-1 & 2, 2020).

The general size of STs and FLTs varies from 6 – 12 ft \* 4 – 8 ft \* 6 – 15 ft, depending upon the household size, income level, community, etc (Field Observation; FGD-1 & 2, 2020). Based on the size, the construction cost varies from INR 10 K to INR 50 K (USD 133.62 to USD 668.11<sup>7</sup>) (FGD-1, 2020). The septic tanks are two or three chambered with proper partition walls including plastered bottom whereas the FLTs are single chambered with impermeable walls & sealed vaults.

*Community Toilets/Public Toilets:* There are 84 PTs and 79 CTs spread in Nashik which have ST/FLT connected to sewer line (NMC, 2020). The average size of septic tanks in community toilet is 12 x 6 x 10 m which are desludged every 3-4 month. The average size of septic tanks in public toilet is 10 x 8 x 15 m which are desludged in 2-3-month time. The commercial buildings, NMC's Public Toilets (PTs)/ Community Toilets (CTs) and residential apartments have either STs/FLTs connected to sewer line as containment system (Field Observation; FGD-1 & 2, 2020).



**Figure 3: Direct connection to sewer line in Satpur Gaon (Ekta/CSE, 2020)**



**Figure 4: Direct connection to sewer line in Satpur Gaon (Ekta/CSE, 2020)**

As per 2011 census, 3.6 % of the population was defecating in open but the NMC has constructed PT/CTs across the city especially for Below Poverty Line (BPL) and near OD hotspots and as a result, the city has achieved ODF++ status in 2019 based on National Policy on FSSM.

*Emptying:* The city is dependent on Govt. operated mechanised desludging service for emptying faecal sludge from STs/FLTs (Field Observation; FGD-2, 2020; KII-4, 2020). The emptying frequency varies from 6 months to even 10 years (demand based) across the city depending upon the nature and the size of containment system (FGD-2, 2020). During field visits, it has been observed that a significant proportion of population has never emptied their STs and FLTs from a decade and a half, indicating a need for better IEC intervention and city level scheduled desludging plan. There are total 6 government vacuum trucks plying in the city, one for each municipal division (FGD-2, 2020). Each of these vacuum trucks are equipped with motorised pumps and have a storage capacity of 5000-6000 L. In order to carry out the work in narrow and congested areas, these vehicles are equipped with ~120 ft long hose (NMC, 2020).

<sup>7</sup> Conversion based on March,19, 2020

Form is filled by the households at the time of emptying service for record keeping by NMC (FGD-2, 2020). Emptying service is carried out by 3 workers and charges are based on the type of property i.e. the charges for bungalows is INR 200/ trip (USD 2.676) and for apartments, it is INR 500/ trip (USD 6.686) (FGD-2, 2020). The desludging services for the public and community toilets is carried out periodically by the NMC's service providers and hence free of cost (NMC, 2020). The desludging vehicles are maintained properly by NMC at the designated depot for all the municipal vehicles (Field Observation). The municipal workers are provided with Personal Protective Equipments (PPEs) which they partially use it while emptying (Field Observation, FGD-2, 2020).



**Figure 6: Discharge by vacuum truck in trunk sewer (Source: Ekta/CSE, 2020)**

Due to narrow roads in few areas manual emptying is undertaken. The services are charged based on size of containment and number of labourers required. In general, 5 to 6 labourers are required and each cost around INR 500 and the cost increases if any vehicle or chemical is used (FGD-3,2020). Mainly, a person without any safety gears goes in and removes the sludge & solid material using spade/buckets which is loaded into a tractor (FGD-3,2020).

*Transportation:* The emptied septage is transported through the truck mounted vacuum tankers. The average time taken to dispose emptied septage is around ~20 minutes (FGD-2, 2020). Around 5 to 6 trips per day are made by each vehicle (FGD-2, 2020). The faecal sludge (FS) emptied by vacuum trucks is discharged into trunk sewers in the vicinity (Field Observation, FGD-2, 2020). While, manual emptying of FS is transported by Ghanta Gadi (solid waste collection vehicle) to the landfill site (Household Survey, FGD-3, 2020). Since, 50% of FS getting emptied (F3) is delivered to the treatment facility, F4 is considered to be 10%.



**Figure 5: Sludge drying beds at STPs (Source: Mudit/CSE, 2020)**

*Treatment/Disposal:* The sludge generated in STPs is stored in sludge drying beds and given to the farmers but without adhering to standards compliance. In some cases, the dried sludge is also given to private agency contracted by NMC which is then further sold as manure (KII-8, 2020; KII-9, 2020).

The city has Waste to Energy plant setup by GIZ in Nashik, which uses the organic cooked food waste collected from hotels and mixes it with FS from public toilets (~10 KLD) in the ratio of 2:1 (Field Observation, KII-10, 2020; KII-11, 2020). The treatment process is bio-methanation and results in production of biogas and slurry. The biogas is used to produce electricity and slurry is dried in dry beds and then that sludge is transported to compost plant at waste management site for co-composting with organic solid waste in the ratio of 2:1 for the final compost (KII-11, 2020). The plant ensures full waste recovery, thus F5 is considered as 100%.

## 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 Nashik.

- 80% of water supplied is wastewater generated
- 50% of the contents of Septic tanks and Fully lined tank is Faecal sludge
- Proportion of wastewater & supernatant conveyed to STP is estimated to be 90% considering leakage and diversions into account
- Proportion of OSS emptied is considered as 50% assuming 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 Nashik (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](http://censusindia.gov.in/2011census/population_enumeration.html)
- Central Ground Water Report, Nashik, Maharashtra, 2014
- IHHL, SBM data, Nashik, Maharashtra (2019-2020)
- City Master Plan, Nashik Municipal Corporation, 2017
- CEPT, 2014. Performance Assessment Report of Urban Water supply and Sanitation – Maharashtra
- MoSJE. 2014. The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 [18th September, 2013]. Ministry of Social Justice and Empowerment.
- MoUD. 2017. National Policy on Faecal Sludge and Septage Management. Ministry of Urban Development
- MoUD. 2014. Guidelines for Swachh Bharat Mission.: Ministry of Urban Development. Government of India.
- MoUD. 2013. Septage Management in Urban India. Ministry of Urban Development, Government of India.
- SFD Report, Nashik (2015)

### Key Informant Interviews (KII)

- KII-1, 2020; Interview with Mr. Avinash, Water Supply Department, NMC
- KII-2, 2020; Interview with Dr Bokhane, Head of Health Department, NMC
- KII-3, 2020; Interview with Mr S. R. Vanjari, Deputy Engineer (Civil), NMC

- KII-4, 2020; Interview with Mr Khairnar, Deputy Engineer (Drainage), NMC
- KII-5, 2020; Interview with H.O.D Revenue Department, NMC
- KII-6, 2020; Interview with Mr Mali, STP O&M Incharge, NMC
- KII-7, 2020; Interview with Mr Sachin Gore, Head of Town Planning Dept., NMC.
- KII-8, 2020; Interview with Mr Hemant, Plant Incharge, Panchavati STP.
- KII-9, 2020; Interview with Mr Vikas, Plant Incharge, Chehadi STP.
- KII-10, 2020; Interview with Mr Wasim, Plant operator, WTE Plant
- KII-11, 2020; Interview with Mr Nitesh Kumar Tripathi, General Manager, MSWM Plant
- KII-12, 2020; Interview with Mr Jitender Kumar, Plant Incharge, Gangapur STP
- KII-13, 2020; Interview with Mr Sachin Vidhante, Junior Clerk, Election Office, NMC
- KII-14, 2020; Interview with Mr Deepak Malwal, Deputy Engineer, PWD, NMC.

#### Focus Group Discussions (FGD)

- FGD-1, 2020; Focus Group Discussion with masons
- FGD-2, 2020; Focus Group Discussion with Emptying Service Providers
- FGD-3, 2020; Focus Group Discussion with Manual Scavengers

#### Field Observations

- Survey of Public toilet (12 nos) and community toilets (3 nos)
- Visit to 3 Sewage Treatment Plant and its outlet/discharge point
- Visit to approximate 70 households covering Lower Income Groups (LIG), Middle Income Groups (MIG) and Higher Income Groups (HIG) spread throughout the city.
- Visit to WTE Plant & MSWM Plant.

Nashik, India, 2020

Produced by:

CSE, Ekta Gupta

CSE, Mudit Gupta

Editing:

CSE, Dr Suresh Kumar Rohilla

CSE, Praveen Chature

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