SFD Lite Report

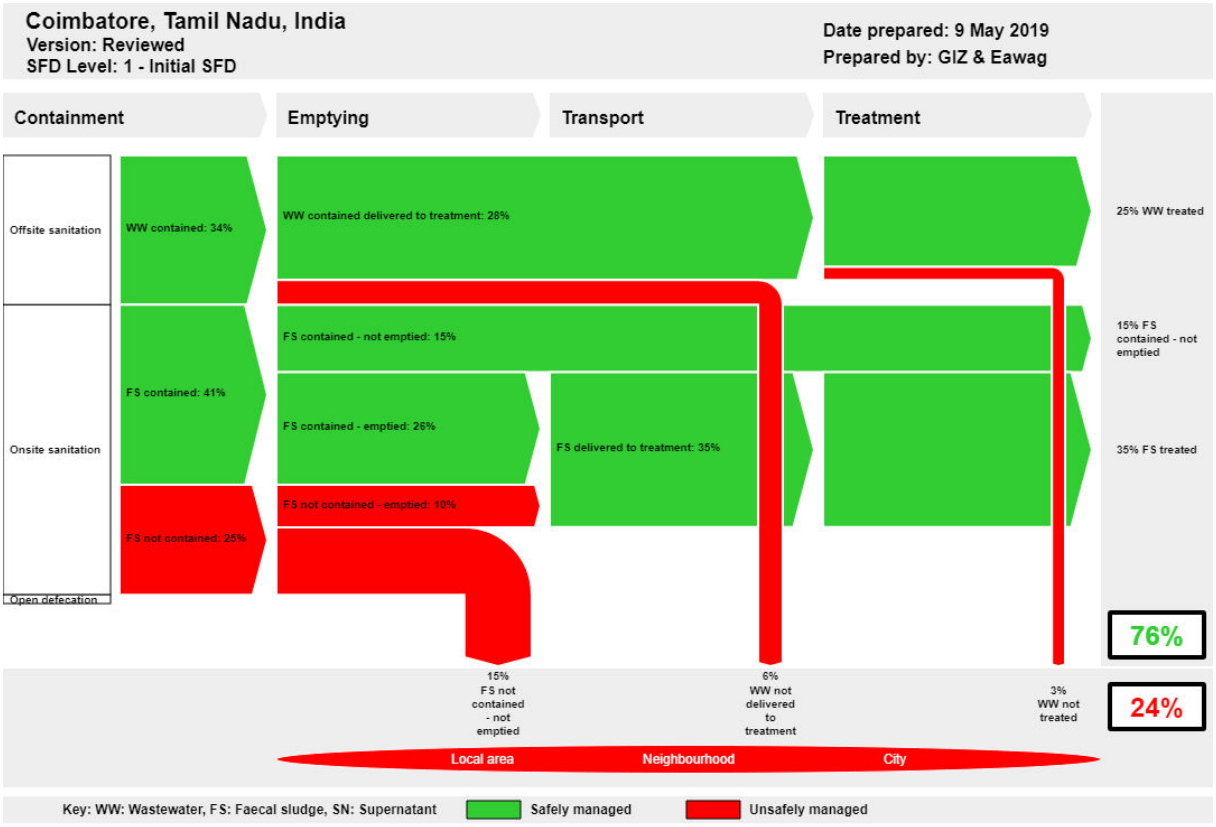
Coimbatore

India

This SFD Lite Report was prepared by:
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH &
Eawag-Sandec

Date of production: 09/05/2019

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:

- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (Rahul Sharma, K. Ravi Kumar, V. Venugopal and Harsh Yadava) and The Swiss Federal Institute of Aquatic Science and Technology - Eawag (Abishek Sankara Narayan and Kripa Ramachandran). Annex. 2 and Annex. 3 were supported by Mr. J. Kishore Kumar (Consultant – GIZ).
- Special thanks: Coimbatore City Municipal Corporation (CCMC).

Date of production: 09/05/2019

3. General city information

Coimbatore is the second largest city in terms of area in the state of Tamil Nadu. It is one of the fastest growing secondary cities in India and a major hub of textiles, industries, commerce, education, information technology, healthcare and manufacturing in Tamil Nadu. It is administered by the Coimbatore City Municipal Corporation (CCMC).

Coimbatore district is bounded by Kerala State in the West and South, Tiruppur District in the East, and parts of Nilgiris and Erode Districts in the North. The North western part and the Southern part of the Coimbatore are occupied by hill ranges of Western Ghats, namely Nilgiris hills in the North-West and Anamalai hills in the South. The average annual rainfall in Coimbatore District is 689.04 mm (Indian Meterological Department Chennai, year 2013 to 2017). The major river courses which come under Cauvery basin are Bhavani, Noyyal and Amaravathi (TWAD, 2017).

In 2011, the jurisdiction of CCMC was expanded to include three Municipalities (Kurichi, Kuniamuthur and Kavundampalayam), seven Town *Panchayats* (village councils) such as Chinnavedampatty, Kalapatti, Saravanampatti, Vellakinaru, Thudiyalur, Vadavalli, and Veerakeralam) and a village *Panchayat* (Vilankurichi), thereby increasing its area from 105.06 square kilometres (72 wards) to 257.04 square kilometres (100 wards) (TNUFIP, 2018). The administration boundary of CCMC has been chosen for the current study (SFD report preparation). As per Census 2011, the population of CCMC (post expansion) was 1,617,711 persons (426,482 households). The ward-wise population of CCMC is given in Annexure-1.

4. Service outcomes

Table 1 shows the SFD Matrix and the data used to prepare the SFD Graphic.

The 76% of the excreta properly managed originates from: Wastewater (WW) contained delivered to treatment and treated (25%), Faecal Sludge (FS) contained - not emptied (15%) and FS contained/not contained - emptied, delivered to treatment and treated (35%) from On-site Sanitation Systems (OSS). The 24% of the excreta unsafely managed is distributed as: WW contained but not delivered to treatment (6%), WW contained delivered to treatment but not treated (3%) and FS not contained - not emptied (15%) from OSS located in areas of high risk of groundwater pollution.

The area under the CCMC was declared open defecation free (ODF) in 2017 (KII-1, 2019). The additional areas that were included in the new municipal limits were already notified as ODF, hence the city with its new limits continues to be ODF. A few areas (Harijan Colony, Echanari, Moor market, settlements in peripheries of Noyyal River in ward 87) need some attention for maintaining and sustaining the ODF status (field observations).

Table 1:SFD Matrix for Coimbatore (GIZ & Eawag, 2019)

Coimbatore, Tamil Nadu, India, 9 May 2019. SFD Level: 1 - Initial SFD
Population: 1617711
Proportion of tanks: septic tanks: 50%, fully lined tanks: 50%, lined, open bottom tanks: 50%

System label	Pop	W4a	W5a	W4b	W5b	F3	F4	F5
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 sewer system, which is delivered to decentralised treatment plants	Proportion of wastewater delivered to decentralised 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
T1A1C2 Toilet discharges directly to a centralised foul/separate sewer	28.0	80.0	100.0					
T1A1C4 Toilet discharges directly to a decentralised foul/separate sewer	6.0			100.0	50.0			
T1A2C5 Septic tank connected to soak pit	5.0					100.0	100.0	100.0
T1A3C10 Fully lined tank (sealed), no outlet or overflow	16.0					100.0	100.0	100.0
T1A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow	17.0					75.0	100.0	100.0
T1A6C10 Unlined pit, no outlet or overflow	3.0					50.0	100.0	100.0
T2A2C5 Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	5.0					100.0	100.0	100.0
T2A4C10 Lined tank with impermeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	17.0					75.0	100.0	100.0
T2A6C10 Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	3.0					50.0	100.0	100.0

4.1. Sewered areas

Approximately, 28% of the population is covered by the centralized underground sewerage network (Annexure-2) (SAAP, 2017). In sewered areas, though the sewerage system is designed and constructed to convey both black water (wastewater from toilets) and grey water (wastewater from bathrooms, kitchen and washing), it was observed that in many parts of old town area, only black water was being discharged into the sewer system (KII-1, 2019; field observations). The grey water was being discharged into open drains (Figure 1) which ultimately ends up in water bodies and contributes to their pollution. In cases where the open drains were absent, individual soak pits (usually round and generally 8 feet deep (2.4m)) for the collection of greywater were observed.

Figure 1: Greywater discharged into open drains where sewer network is present (Harsh/GIZ,2019)

In some cases, the greywater pipe was directly connected to an open recharge bed (Figure 2). In few wards (e.g. ward number 10, 15, 20 etc.), it was also observed that sewer network was present but no

household (HH) sewer connection was existing (field observations). In some of the wards (e.g. 11, 12, 45 and 49) household sewer connections were being made at the time of the field visit (Figure 3). CCMC is charging INR 2,500 (USD 35) for new connections.

Figure 2: Recharge beds used for greywater discharge (Harsh/GIZ,2019)

Figure 3: Household sewer connection in progress in ward 11 (Harsh/GIZ,2019)

Currently, there are two Sewage Treatment Plants (STPs) in Coimbatore that are under operation viz. a 70 Million Litres Per Day (MLD) STP at Ukkadam and a 60 MLD STP at Ondipudur. Some details on the STPs in Coimbatore are provided in Table 2 and Figure 4.

Table 2: Sewage Treatment Plants in Coimbatore (Source: DPR, 2007; KII-2, 2019)

S. No	Location	Design Capacity (MLD)	Current sewage inflow (MLD)	Treatment Technology	Current Status & year of Commissioning	Sewage Catchment Zones (old Municipal area)	Discharge of treated sewage
1	Ukkadam	70	24-30	Sequential Batch Reactor (SBR)	Operational / 2011	I, II, V, VI	Noyyal River*
2	Ondipudur	60	3-7	SBR	Operational / 2019	IV, VIII	Noyyal River
3	Nanjundapuram	40	-	SBR	Under construction	III, VII	-

*at times, some portion (approx. 0.5MLD) of treated sewage is sold by CCMC to Coimbatore Golf Club (KII-3, 2019; KII-4, 2019; NIUA, 2017).

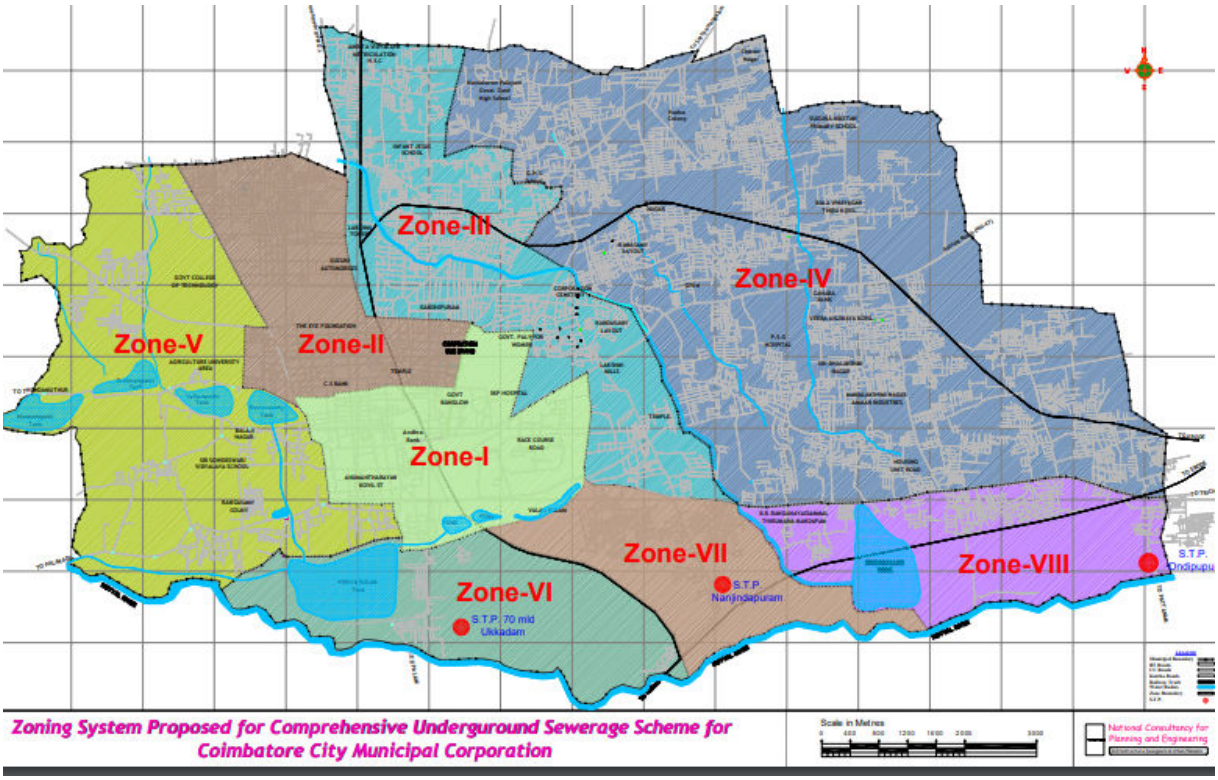


Figure 4: Zoning system proposed for Comprehensive Underground Sewerage Scheme for CCMC (old corporation limit) (Source: DPR, 2007)

Before the commissioning of the STPs in Coimbatore, the city used to mainly depend on anaerobic lagoon at Vellalore for treatment of sewage generated in the town Still some portion (volume not measured/ available, hence not reflected in the SFD graphic) of wastewater is diverted to Vellalore lagoons (Figure 5) (TNUFIP, 2018; KII-4, 2019).

At present, the Ondipudur STP receives a peak inflow of up to seven MLD. Often, the sewage inflow to Ondipudur STP is tapped by the local farmers for recharging their open wells (KII-2, 2019) (Figure 6). Due to the diversions observed at multiple locations, wastewater discharged from households to the treatment plants is assumed 80% (variable W4a=80%) of the total wastewater generated (for the SFD graphic) The sludge from the Ukkadam STP is dried and stored in the premises of the STP. Some quantity of dried sludge is also given to the Forest College and Research Institute in Coimbatore (KII-2, 2019). The treated effluent (variable W5a= 100%) from the STP meets the permissible effluent discharge standards required as per Government norms (Source: STP Lab. records).

Figure 5: Vellalore Lagoon (Harsh/GIZ,2019)

Figure 6: Open well comprising of inflow sewage of Ondipudur STP (Kripa/Eawag,2019)

4.2. Small Scale STPs

With the introduction of the amendments by the Central Ministry of Environment and Forests to the Environmental Impact Assessments (EIA) for new constructions, for large constructions with a built-up area of more than 20,000 square meters, mandatory management of wastewater within the premises was stipulated (Eawag, 2018). This has resulted in large apartment complexes, commercial establishments and even government buildings to build small scale STPs of varying capacities, all across Coimbatore. In the city over 114 Small Scale STPs have been documented to be in place and several more being built (Eawag, 2019). Overall, it can be estimated that over 10 MLD of wastewater is being treated through already operational Small Scale STPs, contributing to approx. 6% of the population in the SFD graphic (T1A1C4). However, in multiple cases, due to lack of operational capacity and maintenance personnel, these STPs are not fully functional and act as holding tanks before discharging into sewers, or worse, storm water drains.

Figure 7: Small Scale STP installed in a gated colony comprising 80 residential units in ward 20 (Kripa/Eawag,2019)

Small Scale STPs were observed to be in operation in some gated colonies in ward 20, 67 and 68 (Figure 7). In many gated colonies, the treated wastewater from Small Scale STPs was being reused for toilet flushing and, in some wards, (e.g. ward 68) the treated wastewater was being reused for gardening purposes (field observations). An exhaustive study of the small scale STPs in the city shall help in delving deeper into the extent of the burden taken off the central STPs by the small scale STPs situated in the city. For the purpose of the SFD graphic, the proportion of wastewater delivered to decentralised treatment plants which is treated was assumed to be 50% (variable W5b=50%).

Figure 8: Under-construction Rectangular Fully Lined Tank (FLT) sealed (Harsh/GIZ,2019)

4.3. On-Site Sanitation Systems (OSS)

Containment

Nearly 60 wards in CCMC are non sewered. The non-sewered areas are mainly dependent on OSS comprising Septic Tanks (ST) connected to a soak pit, Fully Lined Tank (FLT) sealed (Figure 8), Lined Tank with Impermeable walls and Open bottom (LIO) (Figure 9) and unlined pits (Annexure-3).

Figure 9: Lined Tank with Impermeable walls and Open bottom (LIO) (Harsh/GIZ,2019)

66% of the HHs in Coimbatore are dependent on OSS. Out of this, nearly 34% of HHs have LIO. These systems are common in areas of added municipalities, town *panchayats* and village *panchayats* (KII-1, 2019; field observations; FGD-1, 2019). As the groundwater

level fluctuates between 7 mbgl (meters below ground level) to 25 mbgl (TWAD, 2017), for the purpose of the SFD graphic, the LIOs are divided (assumed) equally on (17% each for SFD) significant (T2A4C10) and insignificant risk (T1A4C10) to groundwater. Fully Lined Tanks (FLT) sealed, which are common in middle income and higher income groups (field observations; FGD-2, 2019), make up for the 16% of OSS (T1A3C10). Septic Tanks (ST) forms 10% of OSS. It was observed that ST were followed by soak pits for the collection of the supernatant. ST connected to soak pits are further divided equally (5% each) on point of ground water risk (T2A2C5, 5% and T1A2C5, 5%). Unlined pits (6%), common in the newly added wards which were erstwhile village *panchayats* comprising lower income households and peripheral areas of corporation, are also further divided equally (3% each) on groundwater risk (T2A6C10, 3% and T1A6C10, 3%). Mostly, the FLT sealed containments or LIO were either in rectangle shape or round shape (Annexure-3). The ring structured LIO are usually the improved version of unlined pits, mostly installed in houses who have refurbished their pits in the recent past (KII-1, 2019; FGD-2, 2019; field observations). These pre-fabricated concrete rings are easy/quick to install, costs relatively lesser and are widely available in the market (FGD-2, 2019) (Figure 10).

Figure 10: A pre- fabricated concrete ring found near an under-construction house (Harsh/GIZ,2019)

Emptying

The OSS are mechanically emptied by the households through desludging vehicles operated by private operators (KII-5, 2019; FGD-2, 2019). Currently, there are nearly 68 registered private desludging vehicles with CCMC. The capacity of vehicles of the private operators varies from 2,500 litres to 6,000 litres (KII-3, 2019; FGD-2, 2019). An operator on an average receives two or three emptying requests per day and charges approximately INR 1,500 (USD 21) to INR 3,000 (USD 43) per trip, depending upon the dimensions of the tank and distance between the household and the septage decanting point. The frequency of emptying of OSS varies from three years to ten years, depending upon the type and dimensions of the containment systems (FGD-1, 2019; FGD-2, 2019). The CCMC has one vacuum truck of 5,000 litres dedicated for emptying Septic Tanks of government buildings and public toilets (KII-5, 2019).

Transport and Disposal

After emptying (the OSS), the desludging vehicles discharge the faecal sludge (FS) at the CCMC designated FS decanting point (allowed by CCMC for registered private operators, Figure 11) which is nearly 1.5 kilometres upstream of the Ukkadam STP. This decanting point opens at 6am and closes around 8pm every day (field observations). It receives a load of nearly 150 desludging vehicles (data from one day monitoring of the decanting point).

Figure 11: Septage Decanting Point near Ukkadam STP (Harsh/GIZ,219)

As per the local regulations, all the registered private operators are directed to empty their trucks only at the designated septage decanting point at Ukkadam STP. However, it is likely that sometimes few operators discharge the septage outside the city limits (usually on coconut or fodder farms) for saving costs (field observations). Since it was not

possible to quantify the amount of FS discharged this way, this practise is not shown in the SFD but a deeper inquiry to the operational behaviour of the private operators could help CCMC to understand the important factors that act as barriers to compliance with the established septage management regulations.

4.4. Risk of groundwater contamination

Major part of the town is supplied with piped water supply (Fichtner, 2017) but the supply is highly intermittent (varies from water supply once every alternate day to once in fifteen days). Hence, the city also depends on the underground sources of water supply (Borewells) (CGWB, 2008). The groundwater level fluctuates between 7 mbgl (meters below ground level) to 25 mbgl (TWAD, 2017). The soil of Coimbatore district can be broadly classified into 6 major soils types viz. Red calcareous Soil, Black Soil, Red non-calcareous, Alluvial and Colluvial Soil, Brown Soil, and Forest Soil. About 60 per cent of the district is covered by red soils, of which red calcareous soil is predominant. They occupy most parts of Coimbatore and other taluks (CGWB, 2008). For SFD purpose, most of the onsite sanitation systems have been divided equally (significant or insignificant risk) on the point of risk of groundwater contamination.

4.5. Septage management related policies

In 2014, concerning the unsafe and indiscriminate disposal of septage, the Tamil Nadu Government issued operative Guidelines for Septage Management for Urban and Rural Local Bodies within the state (GO-106, 2014). These guidelines mandate the local bodies to to ensure proper design of septic tanks, proper collection (transportation) system, treatment of septage at the nearest STP and its safe disposal.

The 'National policy on faecal sludge and septage management (NFSSM)' was launched in 2017. The key objective of the national FSSM Policy is to set the context, priorities, and direction for, and to facilitate, nationwide implementation of FSSM services in all Urban Local Bodies such that safe and sustainable sanitation becomes a reality for all (MoUD, 2017).

On the social justice aspect, the prohibition of employment as manual scavengers and their rehabilitation Act, 2013 defines insanitary latrine as a latrine which requires human excreta to be cleaned or otherwise handled manually, either in situ, or in an open drain or pit into which the excreta are discharged or flushed out, before the excreta fully decompose in such manner as may be prescribed (MLJ, 2013). The ‘Guidelines for Swachh Bharat Mission SBM – Urban, 2014’ considers even single pit latrines as insanitary latrines. The SBM mandates to convert 100% of households having insanitary latrines to sanitary latrines during the mission period 2014-19 as a way to completely eradicate manual scavenging (MoUD, 2014).

4.6. Ongoing and proposed sanitation projects

Work had been awarded in 2018 to Larsen and Toubro Ltd, for executing Underground Sewage Scheme (UGSS) through Tamil Nadu Water Supply and Drainage (TWAD) Board in the added areas of the corporation Kurichi and Kuniamuthur under AMRUT scheme Phase–I with the help of Asian Development Bank (Budget, 2018). Construction of a new Sewage Treatment Plant (STP) 30 MLD is proposed as a Subproject under the UGSS for Kurichi and Kuniamuthur areas under the corporation (TNUFIP, 2018).

Currently, preparation of Detailed Project Report (DPR) is ongoing for the construction of Underground Sewage Scheme Phase - II in the remaining 9 added areas of the corporation (Budget, 2018).

Individual household sewer connections are being executed in old corporation area that were not covered hitherto (field observations; KII-3, 2019).

5. Data and assumptions

Population data are based on Census 2011 http://censusindia.gov.in/DigitalLibrary/Archive_home.aspx

The proportion of various onsite sanitation systems mentioned in the report is based on a rapid field visit by the authors to the town and various rounds of discussions with different stakeholders.

In addition, and to prepare the SFD graphic, the following key assumptions were made:

- The proportion of the contents of each type of onsite sanitation system is considered as 50% faecal sludge (step two of the Graphic Generator).
- Most of the commercial establishments, institutions, etc. are located within the old municipal limit and all these have sewer connections.
- The old Corporation area like Town Hall, Sukhravarpet, R.S. Puram, North Coimbatore, Gandhipuram, Devangapet, Ramnagar, Ranganathapuram, Kattur West, MGR Puram, Sivanantha Colony, SaibabaColony, Tatabad, Trichy Road, Puliakulam, Ramanathapuram, Siddhapudur and a few more are fully sewered but the household connections to the sewers are assumed on field observations. The wards which were found sewered without 100% household sewer connections are taken to be partially connected to sewers i.e. 50% households of that ward are assumed to be connected to sewers.
- The proportion of FS emptied from septic tanks and fully lined tanks was assumed to be 100% (variable F3).
- The proportion of FS emptied from lined tanks with impermeable walls and open bottom was assumed to be 75% (variable F3).
- The proportion of FS emptied from unlined pits was assumed to be 50% (variable F3).
- All FS collected from OSS is delivered to treatment and treated in the STPs (variables F4 and F5 set to 100%).

6. List of data sources

Reports and literature

- Budget, 2018; Coimbatore Municipal Corporation (CCMC) 2018, Budget for the financial year 2018-2019.
- CGWB, 2008; Central Ground Water Board, South Eastern Coastal Region, District Ground Water Brochure Coimbatore, Tamil Nadu, 2008.
- DPR-UGD, 2007; Detailed Project Report for UGD Scheme in Coimbatore under JNNURM, 2007.
- Eawag, 2018, Policy Brief on Small scale sanitation in India as part of 4S project.
- Eawag, 2019, Project Summary of Small-Scale Sanitation Scaling up in South Asia forthcoming report.
- Fichtner, 2017; Detailed Project Report (DPR) on Improving & Revamping the Existing /Proposed Water Supply Distribution System with Continuous Pressurized Supply to Coimbatore Corporation.

- GO-106, 2014; Government Order (Ms) Number 106, Dated 01.09.2014, from Municipal Administration and Water Supply (MA.3) Department for Urban and Rural Local Bodies in Tamil Nadu.
- MLJ, 2013; The prohibition of employment as manual scavengers and their rehabilitation Act, Ministry of Law and Justice, Government of India.
- NIUA, 2017; National Institute for Urban Affairs, Coimbatore Co-treatment Case Study, Ukkadam STP, 2017.
- MoUD, 2014; Guidelines for Swachh Bharat Mission – Urban, Ministry of Urban Development, Government of India.
- MoUD, 2017; National policy on Faecal sludge and Septage management, Ministry of Urban Development, Government of India.
- SAAP, 2017; State Annual Action Plan, prepared under Atal Mission for Rejuvenation and Urban Transformation (AMRUT).
- TNUFIP, 2018; Tamil Nadu Urban Flagship Investment Program (TNUFIP) – Coimbatore Underground Sewerage System, May 2018.
- TWAD, 2017; Tamil Nadu Water supply and Drainage Board, Website Accessed on 23/01/2019. https://www.twadboard.tn.gov.in/content/coimbatore.

Key Informant Interviews (KIIs)

- KII-1, 2019; Interview with Mr. Thirumaal Reddy, Swachh Bharat Mission (SBM) Nodal Officer, CCMC.
- KII-2, 2019; Interview with Mr. Shanmugam (In-Charge Ukkadam STP) and Mr. Manivannan (In-Charge Ondipudur STP), Gharpure Engineering and Construction Private Ltd.
- KII-3, 2019; Interview with Mr. K. Saravana Kumar, Executive Engineer, CCMC.
- KII-4, 2019; Interview with Mr. Vimal Raj, Junior Engineer, Selvapuram Pumping Station, CCMC.
- KII-5, 2019; Interview with Dr. Santhosh Kumar, City Health Officer, CCMC.

Focus Group Discussions (FGDs)

- FGD-1, 2019; Focus Group Discussion with Mr. B. Antony Raj, Field Testing Manager-Sanitation Technology Platform, RTI International-India, Student-1 and Student-2, of PSG College, Coimbatore
- FGD-2, 2019; Focus Group Discussion with Private Emptiers, Drivers and Helpers at Ukkadam decanting point.

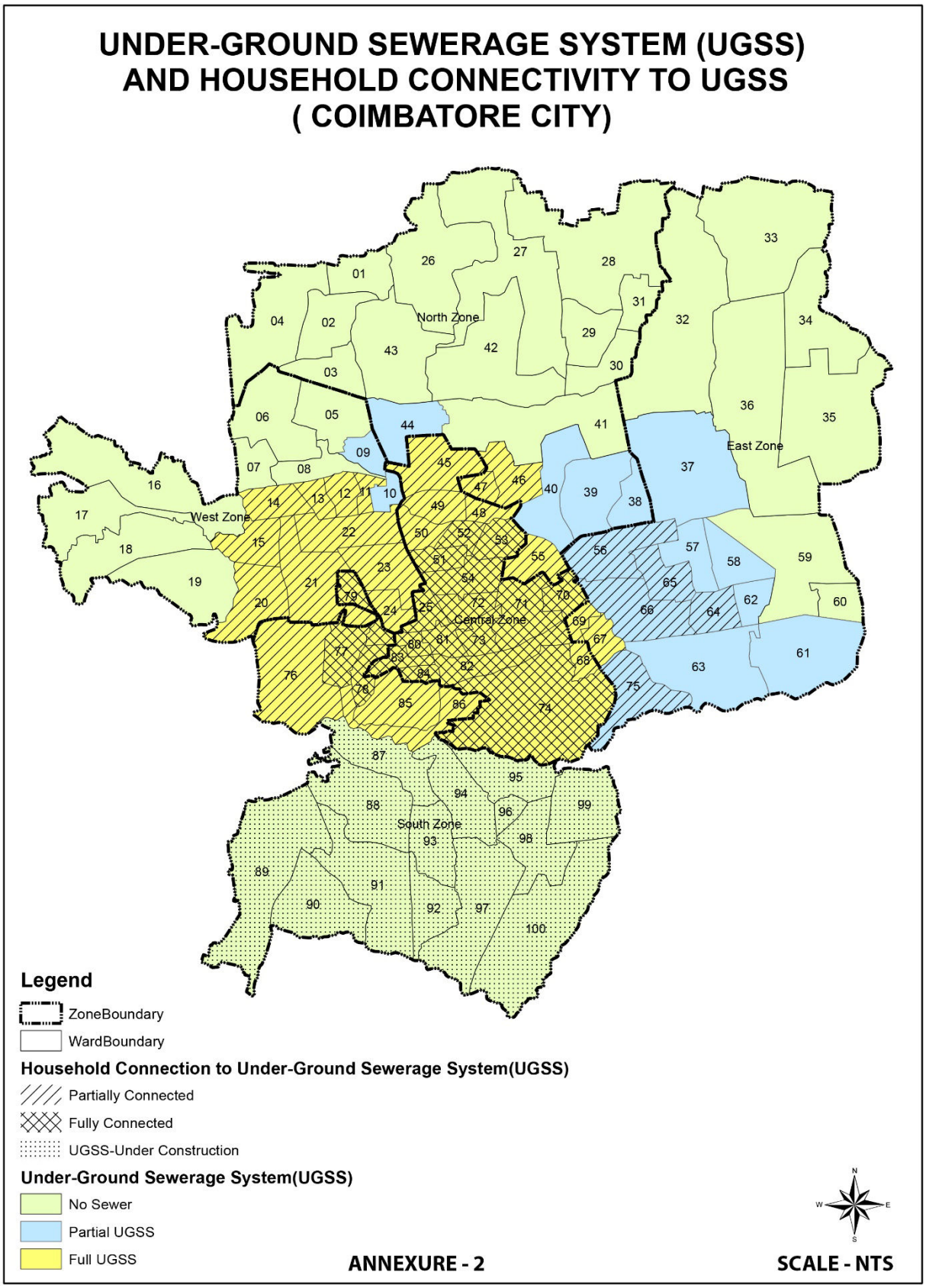
Field Observations

- STP at Ukkadam, STP at Ondipudur, STP at Nanjundapuram, Sewage Pumping Station at Selvapuram, Small Scale STPs (Small Scale STPs) in gated communities, Singanallur lake, Septage Decanting point at Ukkadam.
- Visit to approximate 100 households spread throughout the city.

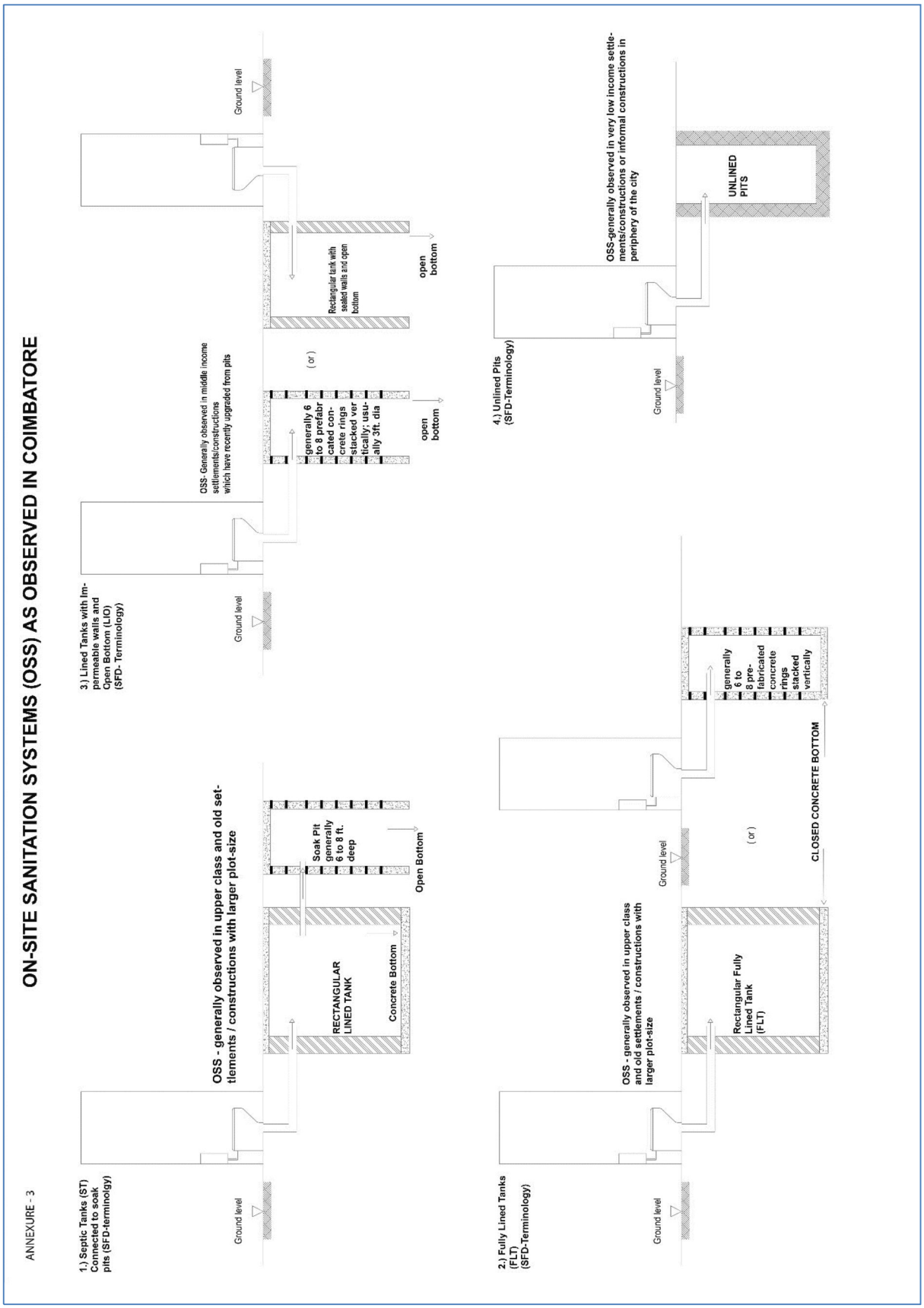
Annexure-1: Ward-wise population of CCMC as per 2011 Census

Ward No	Population of the ward	Ward No	Population of the ward	Ward No	Population of the ward	Ward No	Population of the ward	Ward No	Population of the ward
1	7,466	21	17551	41	49,154	61	20,785	81	18,350
2	8,513	22	19,287	42	9,824	62	15,679	82	16,066
3	13,375	23	8,799	43	8,574	63	14,023	83	13,677
4	9,892	24	20,452	44	18,291	64	14,434	84	16,455
5	18,527	25	20,312	45	31,197	65	15,731	85	14,095
6	20,105	26	6,824	46	10,774	66	15,042	86	39,995
7	23,070	27	8,670	47	21,305	67	14,537	87	14,528
8	21,831	28	8,411	48	23,238	68	12,042	88	12,989
9	15,745	29	11,205	49	23,521	69	13,355	89	10,875
10	8,394	30	8,903	50	12,375	70	15,650	90	1,1832
11	10,450	31	4,768	51	13,075	71	10,827	91	14,306
12	14,925	32	26,941	52	17,468	72	11,059	92	17,192
13	16,080	33	5,138	53	12,709	73	9,365	93	14,248
14	13,490	34	10,941	54	9,693	74	22,714	94	16,232
15	16,554	35	11,522	55	23,940	75	19,919	95	26,531
16	20,081	36	12,669	56	20,925	76	27,941	96	10,888
17	19,825	37	12,965	57	20,282	77	18,080	97	20,498
18	13,041	38	15,560	58	22,265	78	10,821	98	17,444
19	11,024	39	13,521	59	26,685	79	21,932	99	14,247
20	14,021	40	26,916	60	15,361	80	14,847	100	20,060
Total Population		**1,617,711**							

Annexure-2


UNDER-GROUND SEWERAGE SYSTEM (UGSS)
AND HOUSEHOLD CONNECTIVITY TO UGSS
(COIMBATORE CITY)
North Zone
West Zone
East Zone
Central Zone
South Zone
Legend
ZoneBoundary
WardBoundary
Household Connection to Under-Ground Sewerage System(UGSS)
Partially Connected
Fully Connected
UGSS-Under Construction
Under-Ground Sewerage System(UGSS)
No Sewer
Partial UGSS
Full UGSS
ANNEXURE - 2
SCALE - NTS

Annexure-3


ON-SITE SANITATION SYSTEMS (OSS) AS OBSERVED IN COIMBATORE
ANNEXURE - 3
1.) Septic Tanks (ST) Connected to soak pits (SFD-terminolgy)
Ground level
OSS - generally observed in upper class and old settlements / constructions with larger plot-size
RECTANGULAR LINED TANK
Concrete Bottom
Soak Pit generally 6 to 8 ft. deep
Open Bottom
3.) Lined Tanks with Impermeable walls and Open Bottom (LIO) (SFD- Terminology)
Ground level
OSS- Generally observed in middle income settlements/constructions which have recently upgraded from pits
generally 6 to 8 prefabricated concrete rings stacked vertically; usually 3ft. dia
open bottom
(or)
Rectangular tank with sealed walls and open bottom
open bottom
Ground level
2.) Fully Lined Tanks (FLT) (SFD-Terminology)
Ground level
OSS - generally observed in upper class and old settlements / constructions with larger plot-size
Rectangular Fully Lined Tank (FLT)
(or)
generally 6 to 8 prefabricated concrete rings stacked vertically
CLOSED CONCRETE BOTTOM
Ground level
4.) Unlined Pits (SFD-Terminology)
OSS-generally observed in very low income settlements/constructions or informal constructions in periphery of the city
UNLINED PITS
Ground level