



SFD Lite Report

Cuttack India

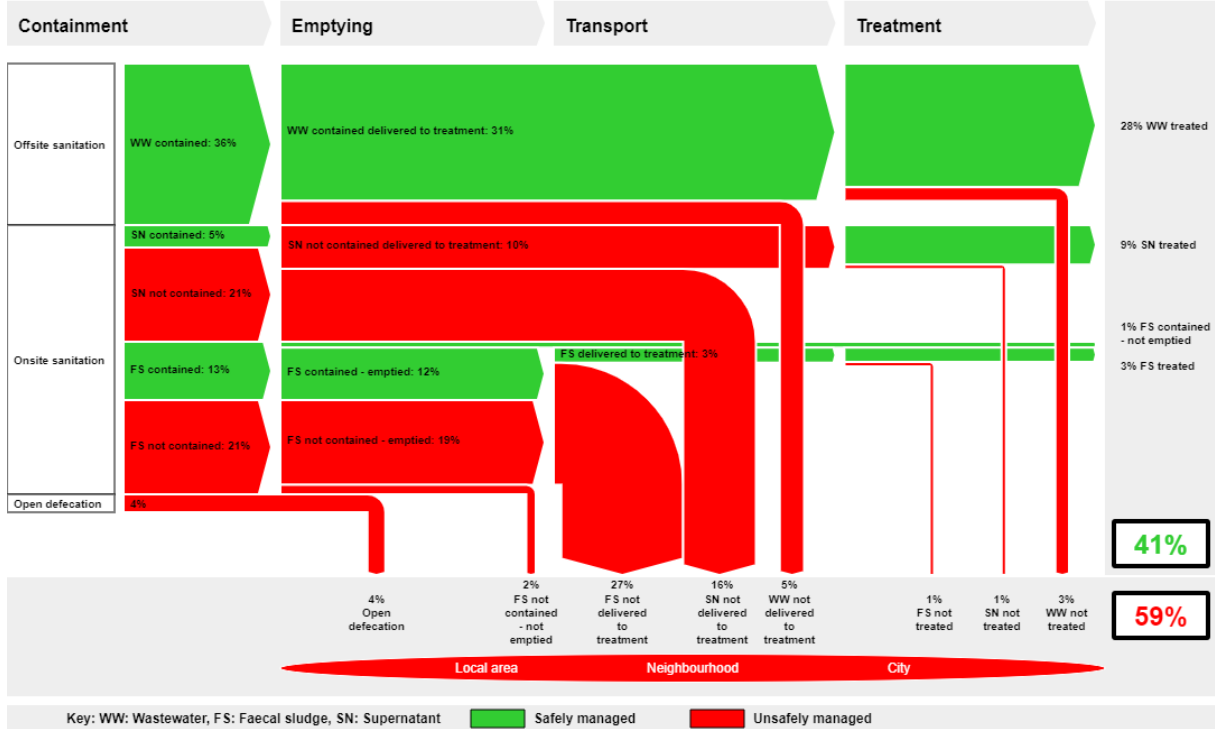
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1 The SFD Graphic

Cuttack, Odisha , India
Version: Reviewed
SFD Level: 1 - Initial SFD

Date prepared: 9 Apr 2020
Prepared by: CSE



2 SFD Lite information

Produced by:

- Centre for Science and Environment, New Delhi
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Collaborating partners:

- Cuttack Municipal Corporation (CMC), Cuttack, Odisha

Date of production: 03/04/2020

3 General city information

Cuttack is located at 20°31'23" N and 85°47'17" E. The city has a tropical wet and dry climate. Temperatures may exceed 45°C in summer and may fall below 10°C in winter. It gets most of its annual rainfall of 144 cm from July to October (CMC). Due to the proximity to the coast, Cuttack is prone to floods and cyclones from Bay of Bengal (National Policy On Disaster Management, 2009)¹. Major soil types of the city are Alfisol, Ultisol and Entisol. Depth of groundwater in pre and post monsoon ranges between 1.56-8.17 mbgl and 0.44-5.38 mbgl respectively (Central Ground Water Board, 2013)².

The urban local body governing the city is Cuttack Municipal Corporation (CMC). Current population of the city is 731412, total no. of households (HH) is 146262, area of the city is 192 sq. km and divided into 59 administrative wards. The population density of the city is 3809 persons per sq.km., this is considerably high when compared with the entire State of Odisha, i.e., 269 persons per sq.km. The slum population is 129471, representing 18% of the total population (KII-1, 2020 and KII-2, 2020)³.

Census Year	Population	Growth Rate (%)	Source
1991	403418	-	
2001	534654	3.2	Census 2001
2011	610189	1.4	Census 2011
2020	7,31,412	2.2	CMC

Table 1: Population Growth rate Cuttack City Source: (CMC, 2020), (Census, 2011)

4 Service outcomes

¹ National Policy On Disaster Management ,2009 [Online] Available at <https://www.ndma.gov.in/images/guidelines/national-dm-policy2009.pdf>.

² Central Ground Water Board, Govt. of India ,Ministry Of Water Resources, Ground Water Information Booklet of Cuttack District, Orissa,May,2013 [Online] Available at:<http://cgwb.gov.in/District Profile/Orissa/Cuttack.pdf>.

³ Department data received from Cuttack Municipal Corporation during Key Informative Interviews with Mrs. Sanjibeeta Ray (Deputy Commissioner, Sanitation) and Mr. Jagannath, (Sanitation Expert).

Cuttack, Odisha , India, 9 Apr 2020. SFD Level: 1 - Initial SFD

Population: 731412

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	36.0	85.0	90.0							
T1A2C6 Septic tank connected to open drain or storm sewer	19.0			90.0	11.0	95.0			0.0	0.0
T1A3C10 Fully lined tank (sealed), no outlet or overflow	8.0			90.0	11.0	95.0				
T1A3C2 Fully lined tank (sealed) connected to a centralised foul/separate sewer	10.0			90.0	11.0	95.0	0.0	0.0		
T1A3C6 Fully lined tank (sealed) connected to an open drain or storm sewer	23.0			90.0	11.0	95.0			85.0	90.0
T1B11 C7 TO C9 Open defecation	4.0									

Table 2: SFD Matrix for Cuttack (CSE 2020)

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

4.1 Offsite Systems

According to Census 2011, sewer network coverage was of about 18.55% in the city⁴ and at present, almost after a decade, it has extended only to about 36%. So, in Cuttack 36% population has connected their toilets to the centralized foul separate sewer system with transportation efficiency of 90%. This sewer system leads to the STP, which has a collective treatment efficiency of 90% (KII-3, 2020). The total wastewater (WW) of the city, is conveyed through three systems (1) sewerage network, (2) two main open drain and (3) few small open drains. Sewage is conveyed to Sewage Treatment Plants (STPs) through sewerage networks.

There are in total 2 STPs in the city; one with the capacity of 36 MLD is running under, with receiving capacity of 17 MLD and the other 16MLD capacity STP is under construction. These STPs have deployed different technologies, Activated Sludge Process (ASP) and Modified Ludzack Ettinger process (MLE). Treated sewage from the STP is discharged into Mahanadi River (KII-3, 2020). KII with Odisha Water Supply and Sewerage Board (OWSSB), Public Health Engineering Organisation (PHEO) officials, revealed that the collective treatment efficiency of the STP is 90%.The untreated wastewater flows in open drains, not intercepted flows directly into Mahanadi or Kathajodi Rivers.



Fig 1: Sewage Treatment Plant (Source: CSE, 2020)

⁴ Census of India. 2011. Houselisting and housing data, Households by availability of type of latrine facility, viewed 29 May 2015, Census digital library [Online] Available at: <http://censusindia.gov.in/DigitalLibrary/TablesSeries2001.aspx>,

4.2 On-site Sanitation Systems

Containment: Based on sample household survey, KII and FGDs with relevant stakeholders it is established that 61% of the city population is dependent on OSS. Out of this, 19% population is dependent on the septic tank connected to open drain (T1A2C6), 23% on fully lined tank connected to open drain (T1A3C6), 8% on fully lined tank (sealed) with no outlet or overflow(T1A3C10) and 10% fully line tank (sealed) connected to a centralized combined sewer (T1A3C1) (KII-2, 2020 & FGD-1, 2020).

Due to limited information, it was difficult to assess the volume of effluent and solid FS generated by each of these containment systems, hence it is assumed 50% each, in the SFD matrix to reduce maximum error. Thus, the 41% of the population dependent on systems T1A2C6, T1A3C6 and T1A3C1 constitute the 21% 'SN not contained' and 21% population constitutes to 'FS not contained'. The system T1A3C10 and T1A3C1 shows that 13% FS Contained and 5% SN contained.



Fig 2: Fully Lined Tank (Source: CSE 2020). Fig 3: Septic Tank (Source: CSE, 2020).

Community Toilets/Public Toilets: To be certified as Open Defecation free city, CMC constructed 6474 IHHL and 26 Public toilets and 39 Community toilets with a total 939 seats and they received the certification. However, it was observed in-field survey that slum areas near Mahanadi didn't get access to toilets yet so they open defecate near the river and this population constitutes about 4% of the total population. (KII-2, 2020; Field observation)⁵

Emptying: CMC owns and operates two truck mounted vacuum tankers with faecal sludge carrying capacity of 3000 liters. There are also 7 private truck mounted vacuum tankers ply in the city, with a carrying capacity of 4000 liters (KII-5, 2020)⁶. The emptying frequency differs widely across the city.

⁵ CT/PT Data received from Mr.Jagannath (Sanitation Expert, CMC), 2020.

⁶ KII Conducted with E&Y, Representative and Private emptier, March, 2020.

In general, the frequency of emptying the containment system is varying from 8 months to 3 years in the city. The CMC’s desludging charges ranges between 1200 and 2000 Rs. per trip (15.47 USD –25.78 USD), a record is maintained on a daily basis by the sanitary department. Emptying process is usually carried out by 2 people (1driver + 1 helper), no personal protective equipment was used while emptying (as per our field observation).

Although, most of the desludging work is done mechanically but there have been some instances of manual emptying as well, (as revealed by the residents during FGD). The city is unplanned, with many informal settlements having narrow streets, vacuum tankers are inaccessible in such areas and due to this reason manual emptying is carried out. Generally, people entrust lower caste and community for this work.



Fig 4: Emptying Onsite Sanitation System by Vacuum Tanker (Source: CSE,2020)

The population dependent on T1A3C1, T1A2C6, T1A3C6 and T1A3C10 systems, get their contaminants emptied. In the SFD graphic, 21% ‘FS not Contained’, is further bifurcated into 9.5% from septic tanks connected to open drains (T1A2C6) and 11.5% from fully lined tanks connected to open drain (T1A3C6). Also, in the case of 13% ‘FS Contained’, the percentage is bifurcated into 8% from fully lined tank with no outlet or overflow and 5% from fully lined tank (sealed) connected to a centralized combined sewer (T1A3C1).

Transportation: Faecal Sludge/Septage (FSS) is mostly transported through the truck mounted vacuum tankers. The supernatant generated from a containment system like septic tank/fully lined tank, is transported through lined open drains (if the outlet is connected to the small drain). These small drains eventually connect to the big drain and there are 2 such big drains (locally called nullahs)⁷ in the city (KII-6, 2020; KII-7, 2020, KII-8, 2020). On an average, it takes about 1 – 1.5 hours for completing one trip of 10– 20 km distance (KII-5, 2020; KII-6, 2020; FGD-2, 2020). Due to the long distance to SeTP from the core city, approximately 20 km distance, the trips are limited to 6 per day. Due to the close proximity of 10-12 kms to the STP and long distance of 20 Kms to SeTP⁸, desludgers prefer delivering the FS in STP or dispose of untreated in the low lying areas. The desludgers make 10 trips per day and 40 KLD FS is delivered to the STP for the treatment. Since, FS emptied and delivered to the treatment plant is limited, F4 is considered between 11%.

⁷ KII with CMC official and field survey, March, 2020.

⁸ KII with Mr. Patitapawan Mahapatra (Sanitary Inspector, CMC); Ms. Rashmi Biswal (E&Y, Representative) and FGD with Private Emptier, March, 2020.



Fig 5: Transportation By Vacuum Tanker (Source: CSE, 2020)



Fig 6: Transportation by Big Nullah (CSE, 2020)

Treatment/Disposal: Since the collective treatment efficiency of STP is 90%⁹, therefore, out of the 9% 'FS delivered to treatment', 8% constitutes 'FS treated' and the rest 1% constitutes the 'FS not treated'. A Septage Treatment Plant (SeTP) of 60 KLD capacity has been set up to treat faecal sludge/septage with intake capacity of 24 KLD through 6 trips per day on an average of 4 KLD truck capacity¹⁰. Since, the FS delivered to the SeTP and STP is treated hence F5 is considered 95%.



Fig 7: Septage Treatment Plant (Source: CSE, 2020)

⁹ KII with Mr. Bikram Mishra (Project engineer, Sewerage department, JICA), March, 2020.

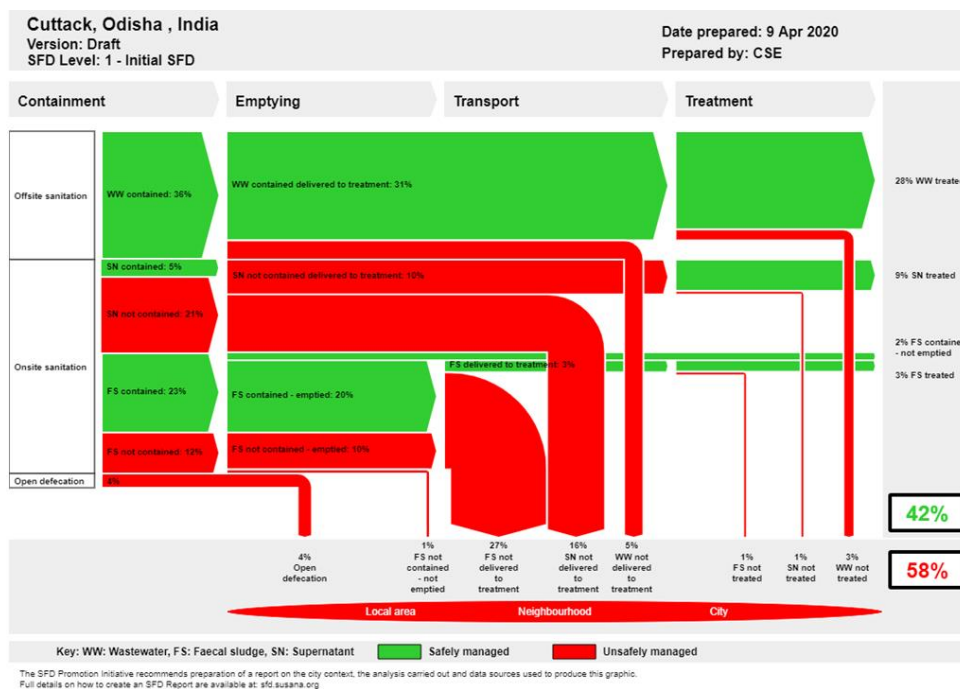
¹⁰ KII with Mr. Sunil Padhi (Project Engineer, JICA), March, 2020

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 Cuttack.

- 80% of water supplied is wastewater generated
- 50% of the contents of Septic tanks and fully lined tanks is Faecal sludge
- Proportion of wastewater conveyed to treatment plant in open drain is estimated to be 80% considering leakage and diversions into account
- Proportion of OSS emptied is considered to be 87% for septic tanks and fully lined tanks as observed in the survey.
- Proportion of OSS emptied is considered to be 90% for fully lined tanks with no outlet.

6 Context adapted SFD Graphic



The only difference suggested in the context adapted SFD is at containment stage for correctly designed septic tanks, though connected to open drains. With an earlier assumption of 50% of the proportion of the content of the septic tank which is solid FS, generated and collected inside the septic tanks. 50% of the content is supernatant which attributes to be 9.5% of the population flows through open drains. The solid FS collected in the septic tank are considered to be contained and hence 9.5% of FS is contained (represented green in colour at containment stage). Followed by this, 8.55% FS contained is emptied, remaining 0.95% is FS remains in the tank which is contained and never

emptied. The supernatant generated from the septic tank connected to open drain are not contained and hence considered to be unsafely managed (represented in red colour). Overall, excreta of 58% population is not managed safely according to the context adapted SFD.

7 List of data sources

Reports and literature

- District Census Handbook 2011 for Cuttack (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
- Ground Water Information Booklet of Cuttack District, Orissa, Ministry of Water Resources, CGWB, May 2013.
- National Policy on Disaster Management, 2009
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- NMCG. 2011a. National Mission for Clean Ganga. [Online] [Accessed 15 February 2020] Available at: http://nmcg.nic.in/about_nmcg.aspx
- SFD Report, Cuttack (2015)
- Draft Report Rapid Baseline Assessment – Cuttack City, Capacity Building for Urban Development, Government of India, MoUD. 2013a, New Delhi.

Key Informant Interviews (KII)

- KII-1, 2020; Interview with Mrs. Sanjibeeta Ray, Deputy Commissioner sanitation, CMC
- KII-2, 2020; Interview with Mr. Jagannath, Sanitation Expert CMC
- KII-3, 2020; Interview with Mr. Sunil Kumar Padi, Project Engineer, PHD JICA office
- KII-4, 2020; Interview with Mr. Hadibandhu Behra, Superintendent Engineer, PHD Water Department
- KII-5, 2020; Interview with Ms. Rashmi Biswal, FSM Expert, E&Y
- KII-6, 2020; Interview with Mr. Patitapawan Mahapatra (Sanitary Inspector, CMC);
- KII-7, 2020; Interview with Mr. Bikram Mishra, Project Engineer, PHD Sewerage Department
- KII-8, 2020; Interview with Mr. Ghadei, Executive Engineer, PHD Water Department

Focus Group Discussions (FGD)

- FGD-1, 2020; Focus Group Discussion with masons
- FGD-2, 2020; Focus Group Discussion with private desludging operators

- FGD-3, 2020; Focus Group Discussion with ward members
- FGD-4,2020, Focus Group Discussion with Jaidev Singh (STP operator) & Staff, VA Tech Wabag Limited.
- FGD-2, 2020; Focus Group Discussion with CMC desludging operators

Field Observations

- Survey of Public toilet (6) and community toilets (6)
- Visit to Sewage Treatment Plant and its outlet/discharge point
- Visit to approximate 60 households covering Lower Income Groups (LIG), Middle Income Groups (MIG) and Higher Income Groups (HIG) spread throughout the city.
- Visit to current FS discharge locations.

SFD Promotion Initiative



Cuttack, India, 2020

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