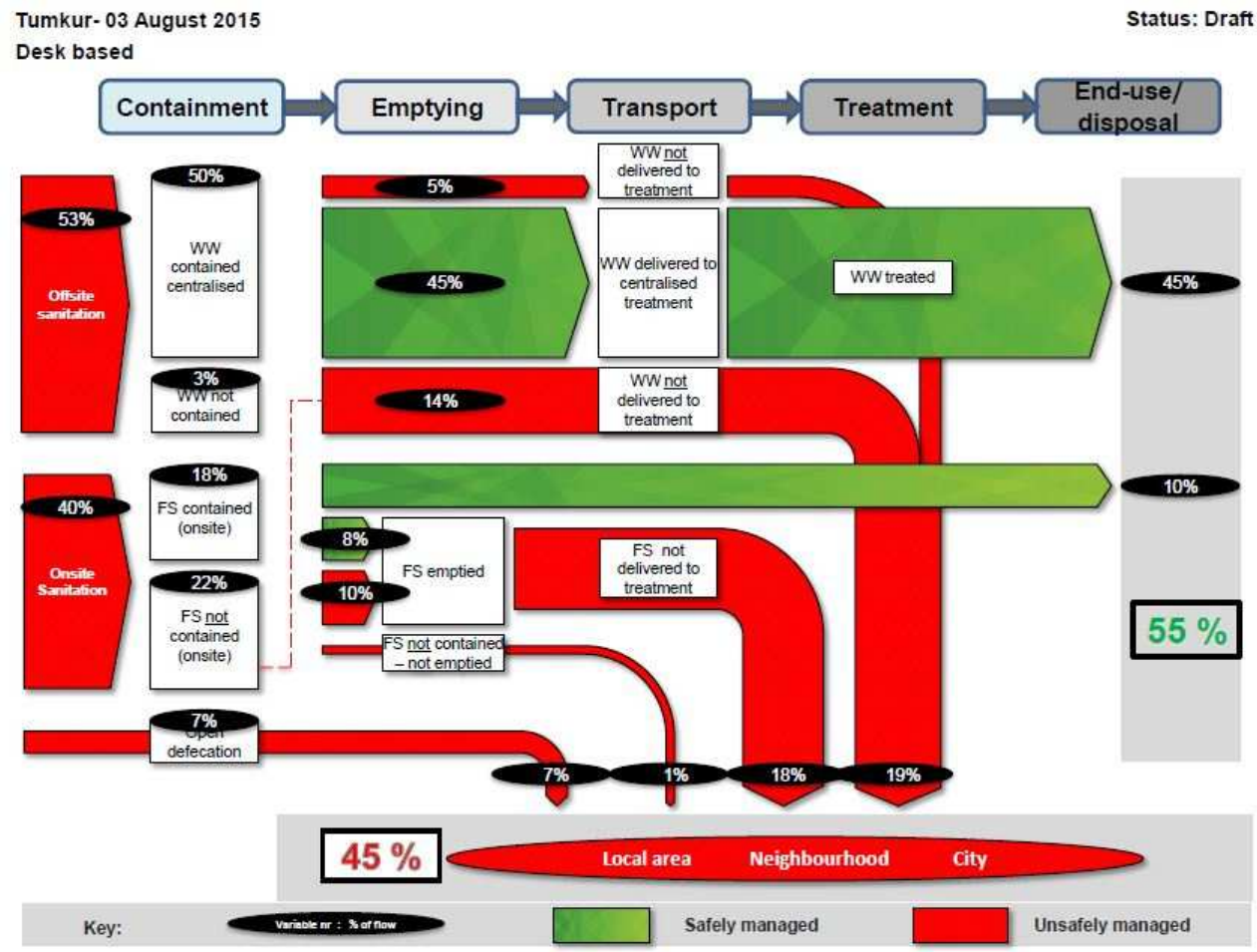
1. The Diagram



2. Diagram information

Desk or field based:
This is a desk based SFD

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Status:
This is a draft SFD

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3. General city information

Tumkur (also known as Tumakuru) is located along the Pune-Bangalore National Highway no. 4. It is the district headquarter. The city is surrounded by hills and mountains (CSP, 2012).

The population of city as per the 2011 Census is305,821.The density of city is 6,292 persons per sq.km which is very high when compared to state average of 319 persons per sq.km. Total slum population is 52,429which is 17% of the total population (Census of India, 2011).

Municipal boundary has been chosen for the current study.It comprises of an area of48.60 sq.km (CSP, 2012).

City falls in the southern plateau region of India. The temperature starts rising from January and peaks in May, around 40^{0}C is common in Tumkur (CSP, 2012).

4. Service delivery context

In 2008, the Ministry of Urban Development (MoUD) issued the National Urban Sanitation Policy (NUSP). The policy aims to: raise awareness, promote behaviour change; achieve open defecation free cities; develop citywide sanitation plans; and provide 100% safe confinement, transport, treatment and disposal of human excreta and liquid wastes. The NUSP mandates states to develop state urban sanitation strategies and work with cities to develop City Sanitation Plans (CSPs). Furthermore, it explicitly states that cities and states must issue policies and technical solutions that address onsite sanitation, including the safe confinement of faecal sludge (USAID, 2010).

The objectives of NUSP are to be realized through CSPs and state sanitation strategies. As of now there are very few cities which have finalized their CSPs, and those plans are also not implemented. This remains a major drawback in implementation of NUSP.

The advisory note on septage management in urban India, issued by MoUD in 2013, recommends supplementing CSPs with Septage Management Sub-Plan (SMP). Still septage management in India is not prominent due to lack of knowledge, consideration of septage management as an interim solution, lack of sufficient funding and many other socio-political issues.

There are no specific legal provisions relating to septage management, but there are a number of provisions relating to sanitation services and environmental regulations, which majorly stems from, The Environment (Protection) Act, 1986 and the Water (Prevention and Control of Pollution) Acts. Municipal acts and regulations usually refer to management of solid and liquid wastes but may not provide detailed rules for septage management (MoUD, 2013).

5. Service outcomes

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

Containment:There is sewerage network which covers half of the population. Rest of the city is majorly dependent on septic tanks which are generally not adhering to design prescribed by Bureau of Indian Standards (BIS). The effluent from the septic tank flows into open drains. Some households are also connected to pits. The pits are constructed with concrete concentric rings placed one above the other with open bottom.

Emptying: There are five private emptiers with eight vacuum tankers of 5000 litres capacity each.The emptying fees ranges from 13 to 18 USD per trip. On an average each private vacuum tanker empties 30–50 septic tanks/pits per month. Monsoon is the peak season for emptying. There are no instances of manual emptying reported.

Transport: Private emptiers transport septage by truck mounted vacuum tankers to disposal sites. Sewage is conveyed to a sewage treatment plant (STP).

Treatment: There is one Sewage Treatment Plant (STP) with the capacity of 24.5 MLD to treat the sewage generated. There are no treatment facilities for septage.

End-use/Disposal: The emptied septage is disposed in agriculture farms; farmers dry the raw sludge and use it for agriculture. It is a common practice to use the dried sludge as compost in banana gardens and grape orchards. The local farmers collect tipping charge of 156 USD per year from private emptiers for allowing septage to dispose in their farms. Treated sewage is disposed in to Beemasandra Lake, leading to eutrophication. Untreated sewage flows in to Shimsha River and Amanikere Lake.

Figure 1:Toilet connected to pit with opening for emptying septage (Source: Rahul/CSE, 2015)

According to Census, 53% of city is dependent on offsite systems, population connected to sewer line is 50% and user interface directly discharging in open drain is only 3%, it is assumed that 5% of waste water is lost in transportation, and 45% is treated and hence shown safe in SFD.

Figure 2: Water hyacinth in Bheemasandra lake **(Source: Rahul/CSE, 2015)**

Rest of the 40% of the city is dependent on onsite sanitation systems (OSS), out of which 22% is dependent on septic tanks and 18% on pits. The public latrines are connected to septic tanks and hence are incorporated in onsite systems. Septic tanks are not contained as they are connected to open drains but pits are contained as ground water table is more than 10 mbgl.

There is no clear differentiation between percentage of effluent and septage generated from septic tanks, it's assumed to be 50% each. Therefore, 11% of faecal sludge (FS) which is effluent goes into open drain and rest is emptied from tanks whenever full. Some FS is always left in the tanks and is assumed to be 1%. Whereas FS from pits is considered contained and is calculated as 10% which includes infiltration of water as well.

6. Overview of stakeholders

The 74th Constitutional Amendment Act of 1992 reformed the sector by transferring responsibility for domestic, industrial, and commercial water supply and sewerage (WSS) from state agencies, such as Departments of Public Health Engineering and State Water Boards, to Urban Local Bodies (ULBs). This transfer has resulted in a variety of implementation models, as well as lack of clarity in allocation of roles and responsibilities between state and local agencies, which sometimes leave large gaps in implementation (USAID, 2010).

The following stakeholders are responsible for sanitation service delivery in Tumkur:

Key Stakeholders	Institutions / Organizations
Public Institutions	Karnataka Urban Water Supply and Drainage Board (KUWSDB), Tumkur City Corporation (TMC) State Pollution Control Board(SPCB)
Private Sector	Private emptiers

Table 1: Key stakeholders (Source: compiled by CSE, 2015)

KUWSDB is responsible for planning, designing and construction of sewerage system. TMC is responsible for operation and maintenance of sewerage network. The city corporation licenses private emptiers and allows them to park vacuum tankers inside their office premises.

Private emptiers are responsible for septage management. They are providing services within the city and some rural areas nearby. SPCB is responsible for monitoring and evaluation of STPs.

7. Credibility of data

Two key sources of data are used; Census of India, 2011 and draft of CSP, 2012. Most of the data is then updated by Key Informant Interviews (KIIs). Three KIIs have been conducted with different stakeholders.

Data on containment is available in Census. Data on emptying and transport is collected by KIIs. However most of the data is qualitative.

Some of the issues and challenges are listed below:

- Data insufficiency & non availability:
  - No data available on how many septic tanks are connected to open drains
  - No data on waste water generated from commercial hubs, institutions etc.
- Accuracy: Discrepancy observed between Census data and actual ground situation
- Data available at different time lines
- Limited data available on reuse (formal / informal).

Assumptions followed for preparing SFDs:

- Data provided by Census, 2011 is correct
- Septic tanks and sewer connections on ground are as per septic tanks & sewer connections defined in Census
- Volume of waste water generated is 80 % of water supplied
- 90% of the people get their tanks emptied when full

8. Process of SFD development

Data is collected through secondary sources, and then a visit to the city is done to conduct KIIs with relevant stakeholders, to fill in the gaps in data and to crosscheck the data collected.

To start with, a relationship between sanitation technologies defined in Census of India and the ones defined in project is established.

The data was fed into the calculation tool to calculate the excreta flow in terms of percentage of population.

Overall 55% of excreta is safely managed in the city and rest 45%, which also includes 15% of city defecating in open, is shown unsafe in SFD.

Limitations of SFD:
It's dependent on secondary data and true picture of the city may differ.

The data available is at different timelines, for example data on containment is from census 2011, and data on emptying and transportation is collected through KIIs conducted in 2015.

Whether excreta is safely managed or not is dependent on whether the system is contained or not, and not on whether waste is safely handled.

9. List of data sources

Below is the list of data sources used for the development of SFD.

- Published reports and books:
  - Census of India 2011, House listing and Housing data, Government of India
  - Service levels in water and sanitation sector, MOUD, 2012.
  - Excreta Matters- volume 2, Centre for Science and Environment, 2012
  - A Rapid Assessment of Septage Management in Asia, USAID,2010
- Un–published documents:
  - Draft CSP of Tumkur, Directorate of Municipal Administration, Govt. of Karnataka, 2012
- KIIs with representatives from
  - Government agencies: TMC, KUWSDB
  - Service providers: Private emptiers
  - Residents
- Websites/web links:
  http://moud.gov.in/cityplan
  http://www.tumkurcity.gov.in/

SFD Promotion Initiative

sustainable sanitation alliance

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH — On behalf of Federal Ministry for Economic Cooperation and Development

UNIVERSITY OF LEEDS

WORLD BANK GROUP Water

wsp water and sanitation program

WEDC | Loughborough University

CSE

eawag aquatic research — Sandec Water and Sanitation in Developing Countries

BILL & MELINDA GATES foundation

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