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Refining and contextualizing the Shit-Flow Diagram (SFD)

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Introduction to CANALPY – the larger initiative

The paper is available here: https://www.sciencedirect.com/science/article/pii/S0301479721010331

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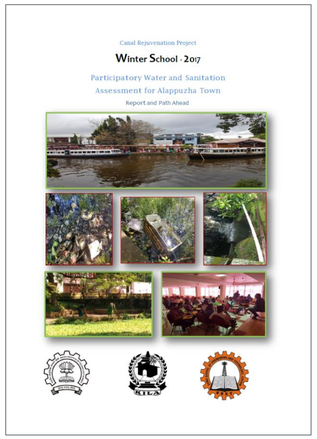
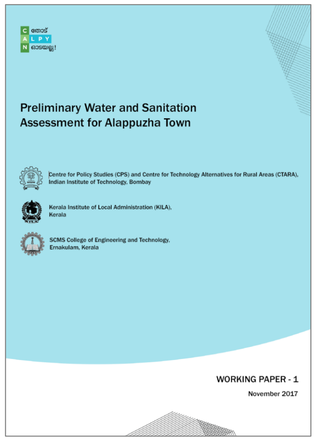
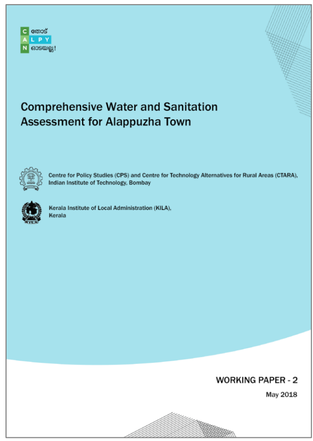
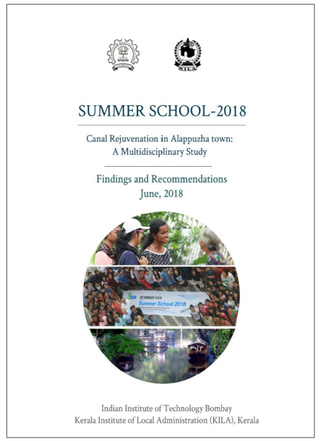
CANALPY

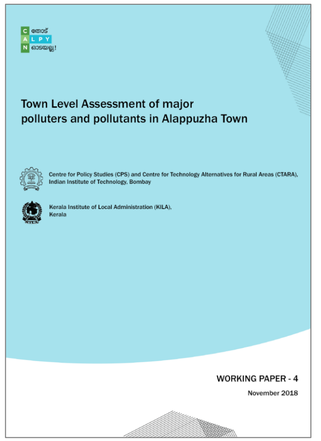
- A collaboration between IIT Bombay and KILA since 2017
- Aim:
  - capacitate students to analyse concrete problems on the ground while working with local people, elected representatives and civil society organisations ensuring accountability at local government level and creating '**student citizens'**
- Approach
  - Training /capacitating students
  - Inculcating analytical skills
  - Academic institutions (students) working with local towns/panchayats for generating local solutions, plans on various issues

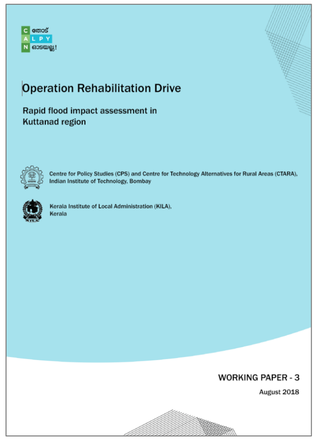












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Winter and Summer Schools

- Exposure to various facets of water and waste management through expert lectures
- Training of OS applications
- Hands-on experience
- Data collection and analysis

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Pilot project: Municipal Colony





- Serves sanitation workers of the Municipality
- Inclusions:
  - Toilet + Bathing and washing areas for each house
  - Conveyance and treatment of all the wastewater
- Funded by KMML under its CSR head
- Awarded the Best Small city in Innovation and Best Practices during Swachh Survekshan 2020 for the project

Pictures: The author
Related news: https://www.thehindu.com/news/national/kerala/alappuzha-municipality-innovates-and-wins/article32417086.ece#:~:text=Alappuzha%20municipality%20has%20been%20named,with%201%2D3%20lakh%20population.

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Refining and contextualising the SFD

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Introduction

- Safely managed sanitation remains a challenge
  - 80% wastewater disposed without treatment (WWAP 2017)
- Conventional solution is expensive, water intensive and time consuming (Öberg et al., 2020; Van Drecht et al., 2009)
- Alternate systems are needed to achieve SDG targets (Andersson et al., 2016; Larsen et al., 2016)
- FSM is gaining traction, wider acceptance and faster implementation is required (Berendes et al., 2017)
- Planning FSM is different
  - New tool to support planning process
- Challenges
  - Lack of data (Devaraj et al., 2021; Luthra, 2020)
  - Lack of local capacity (NIUA, 2017)

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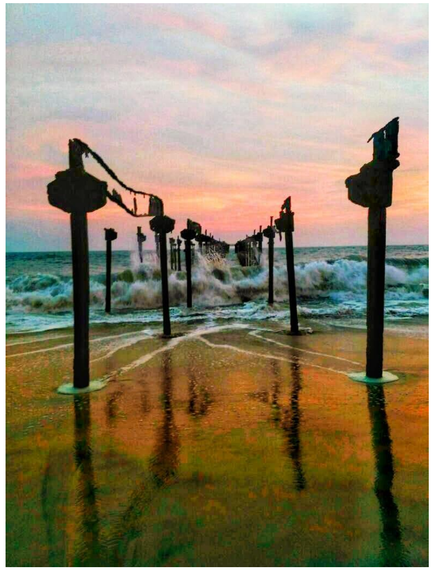
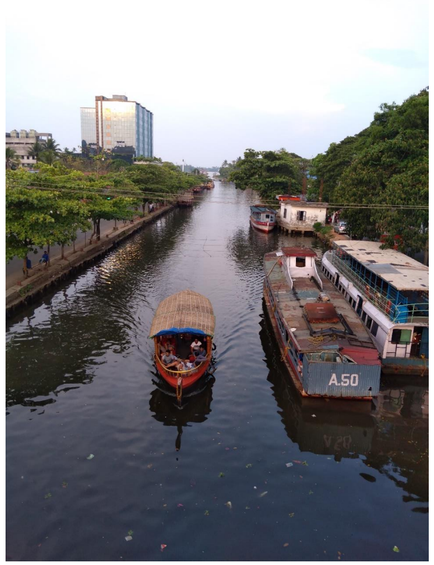
Study site – Alleppey

- Coastal town in Kerala
  - Part of Kuttanadu eco-system
  - Very high ground water table
- Port – no more significant
- Tourist attraction – proximity to Vembanad lake, backwaters, houseboats, beaches
- Eutrophication of canals hampers tourism
- Nutrient load in canals due to unmanaged wastewater
- Model of decentralised SWM





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Related twitter thread: https://twitter.com/Sparsh85/status/1148465373672402944?s=20

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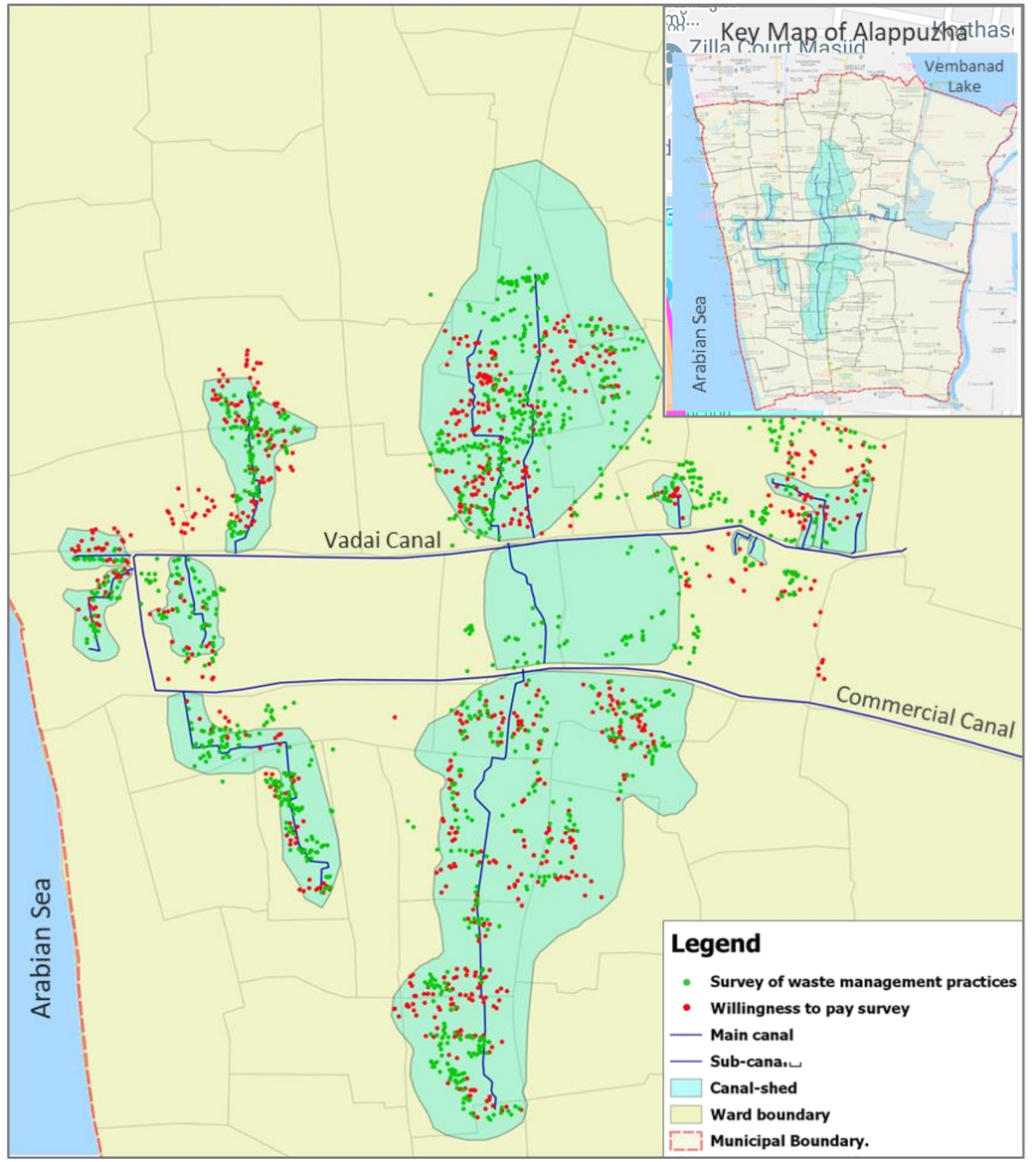
Methods

- Household survey
  - 2100+ households approached
  - Use of ~1700 responses

- Students as enumerators
  - Basic training in research ethics and use of applications (ODK Collect, Maps)
  - Questionnaire in Malayalam
  - Mock surveys by volunteers
  - Teams of 2, atleast one Malayalam speaker
  - Telephonic support by team leads



The map is reprinted from Chhajed-Picha, Paresh, and N. C. Narayanan. "Refining the shit flow diagram using the capacity-building approach–Method and demonstration in a south Indian town." *Journal of Environmental Management* 294 (2021): 112971

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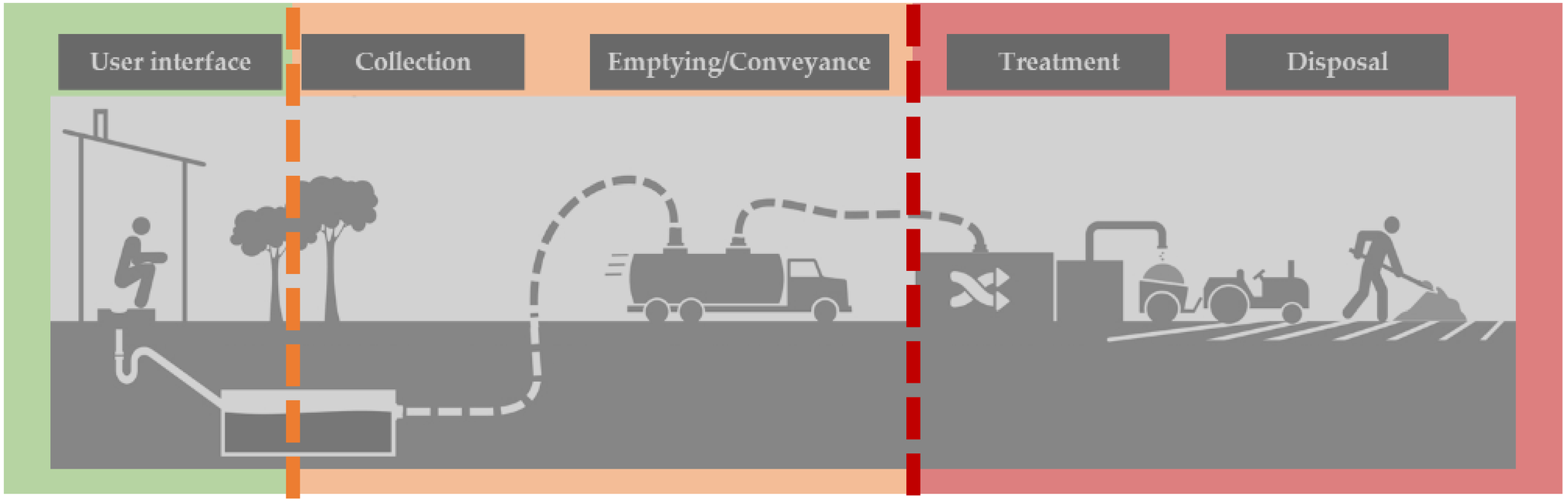
Results: Status of the FSM Service Chain in Alleppey



- All households have access to toilets

- Majority (2 in 3) of OSS are pits, inappropriate for the town
- Census information wrt OSS is inaccurate

- Manual emptying is reported
- Emptying by unregulated private service providers only
- 43% OSS never emptied, >30% 10 years or older
- Avg. emptying cycle of 3.5 years for emptied OSS

- No treatment facility
- 3 plants in vicinity, arrangement to treat FS did not last

- Dumping of untreated FS
- Reuse possibilities not assessed

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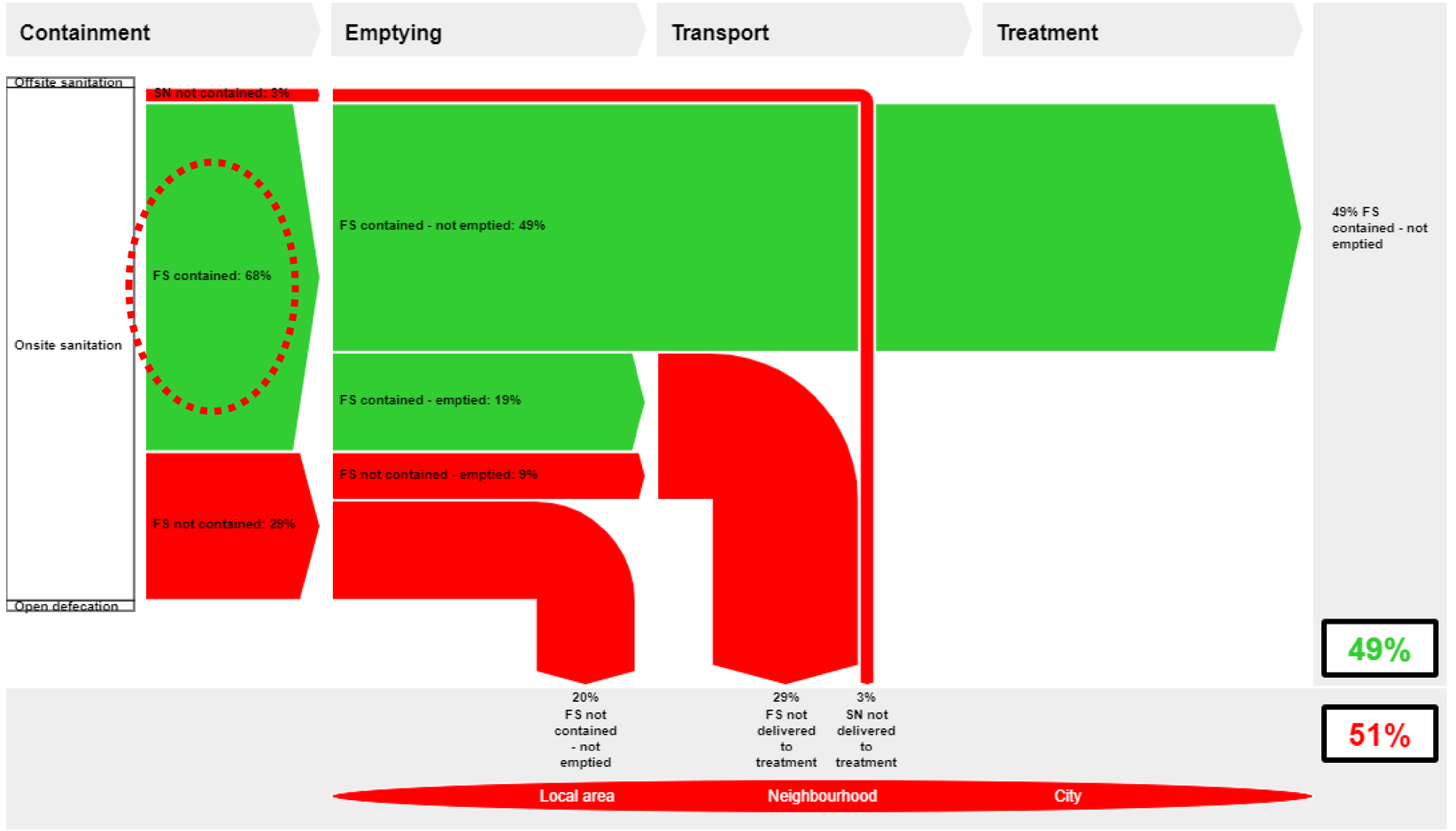
SFD prepared using the SFD-PI method

- Gives an impression OSS safely contain FS
  - Threat of groundwater pollution considered low as >75% households have piped water supply
- 2 Other issues
  - Containment of FS and disposal of SN needs is coupled (in some combinations)
  - Emptying frequency is not considered



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Revisiting the Assumptions

- Septic tanks that are emptied once in less than 5 years are considered to safely contain the FS. Disposal of the supernatant of such systems through soak pits is also considered safe. Disposal of supernatant in other ways, including into open-drain or stormwater sewer, open ground, and 'don't know where' is considered unsafe.
- Septic tanks not emptied once in less than 5 years are considered unsafe containment, disposal of the supernatant of such septic tanks through any mechanism is also considered unsafe.
- All types of pits, whether regularly emptied or not, are considered unsafe.

System Code	System Description	SFD-PI method		Context adapted SFD			
				If emptied periodically		If not emptied periodically	
		FS	SN	FS	SN	FS	SN
T1A2C5	Septic tank connected to soak pit	Safe		Safe	Safe	Unsafe	Unsafe
T1A2C6	Septic tank connected to open drain or storm sewer	Unsafe	Unsafe	Safe	Unsafe	Unsafe	Unsafe
T1A2C8	Septic tank connected to open ground	Unsafe		Safe	Unsafe	Unsafe	Unsafe
T1A2C9	Septic tank connected to 'don't know where'	Unsafe		Safe	Unsafe	Unsafe	Unsafe
T1A4C5	Lined tank with impermeable walls and open bottom, connected to a soak pit	Safe		Safe	Safe	Unsafe	Unsafe
T1A4C6	Lined tank with impermeable walls and open bottom, connected to an open drain or storm sewer	Unsafe	Unsafe	Safe	Unsafe	Unsafe	Unsafe
T1A4C8	Lined tank with impermeable walls and open bottom, connected to open ground	Unsafe		Safe	Unsafe	Unsafe	Unsafe
T1A4C9	Lined tank with impermeable walls and open bottom, connected to 'don't know where'	Unsafe		Safe	Unsafe	Unsafe	Unsafe
T1A4C10	Lined tank with impermeable walls and open bottom, no outlet or overflow	Safe		Unsafe		Unsafe	
T1A5C10	Lined pit with semi-permeable walls and open bottom, no outlet or overflow	Safe	NA	Unsafe	NA	Unsafe	NA
T1A6C10	Unlined pit, no outlet or overflow	Safe	NA	Unsafe	NA	Unsafe	NA

Note: A vertical line between FS (faecal sludge) and SN (supernatant) indicates that their safety is separately considered. An absence of vertical line indicates that the two are not delinked

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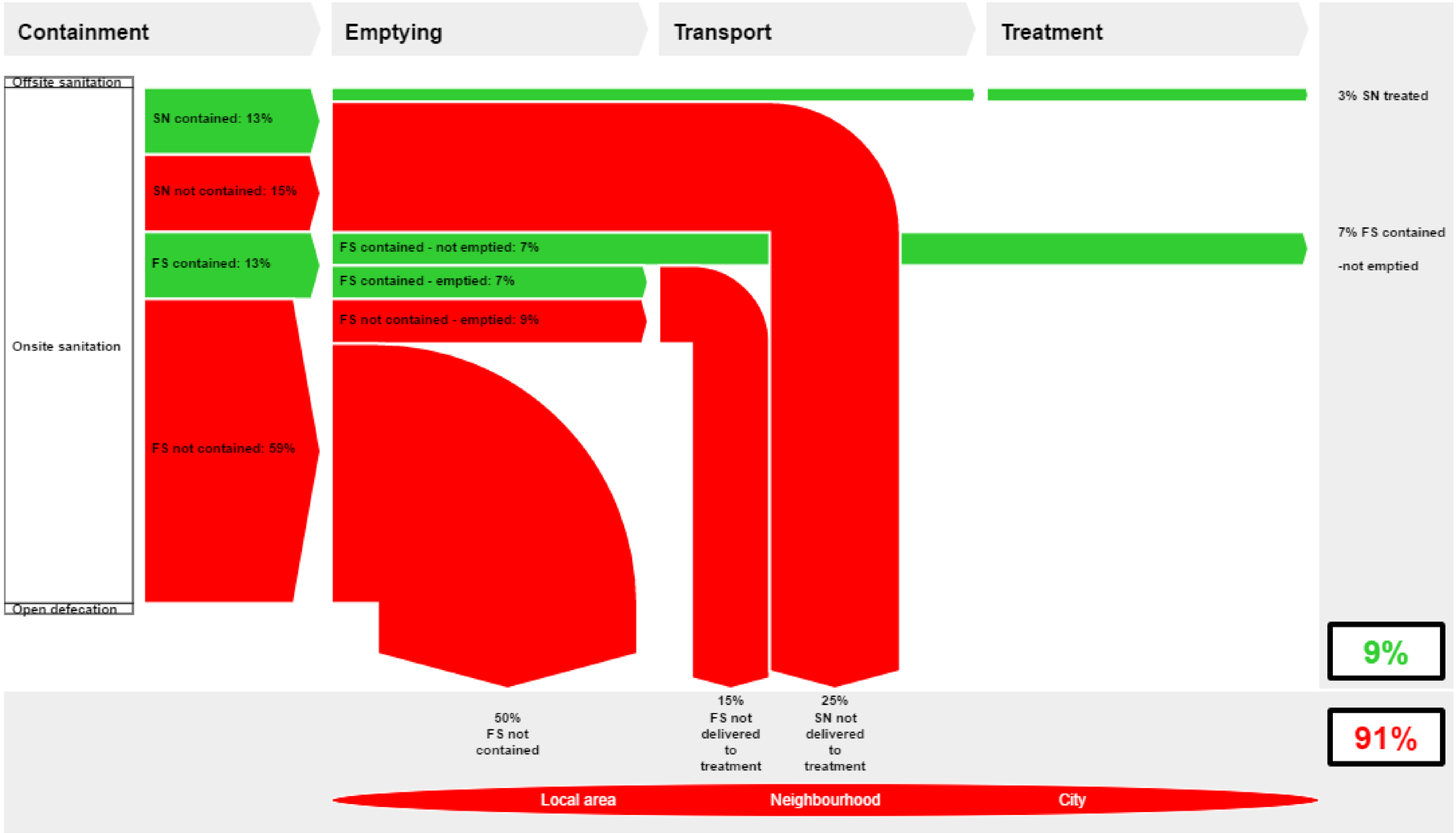
A Context Adapted SFD



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Discussion

- SFD needs refinement and adapted to the context
  - Containment of FS and disposal of SN needs to be decoupled
  - Regular emptying of OSS is necessary
  - Environmental consequences of unmanaged wastewater need attention
- Household surveys are necessary
  - OSS related information not available
  - Deeper probe regarding type of OSS is needed
  - Could otherwise lead to over or under estimation of treatment capacity

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Discussion

- Extending the Capacity-building Approach*
  - Capacity = *the ability of individuals, institutions and societies to perform functions, solve problems and set and achieve objectives in a sustainable manner (UNDP, 2010)*
    - Public agencies, private sector, civil society actors, individuals
  - Capacity building is a long term process (Edelmen and Mengers, 1997)
  - The approach builds capacity of future professionals and citizens
  - Need to be accompanied by other measures

*Introduced by Narayanan, et al. (2018). Towards sustainable urban sanitation: a capacity-building approach to wastewater mapping for small towns in India. J. Water Sanit. Hyg. Dev. 8, 227–237. https://doi.org/10.2166/washdev.2017.071

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Conclusion

- First independent feedback to SFD tool
- However good a tool be, local capacity is needed for its effective use
- Demonstration of method to refine SFD
  - Each OSS type needs to assessed for its impact on the issue of concern
  - Consider potential solutions to make the outcome useful for planning
- Capacity building approach can overcome the two challenges of data and lack of local capacity
- Long term collaborations between colleges and local governments
  - Can build layers of data that can be used for integrated planning
  - Build local capacity to analyse local problems

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Role of CSE’s training

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CSE's training

- Attended the Online Course on Preparation of Shit Flow Diagram conducted by the CSE in July 2018
  - Had been working in WASH for 6 years then
  - Had already decided that FSM will be the focus of the PhD research
- Exposure to the most popular tool
- Used the tool for the first time
- Invoked interest and allowed time to understand the nitty-gritties

- Play a vital role by exposing practitioners (and researchers) to evolving sector understanding and knowledge
- Encourages practitioners to apply the new knowledge in their day to day work
- Important element of building capacity of various actors
  - Government agencies
  - Civil society
  - Students

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Thank you

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