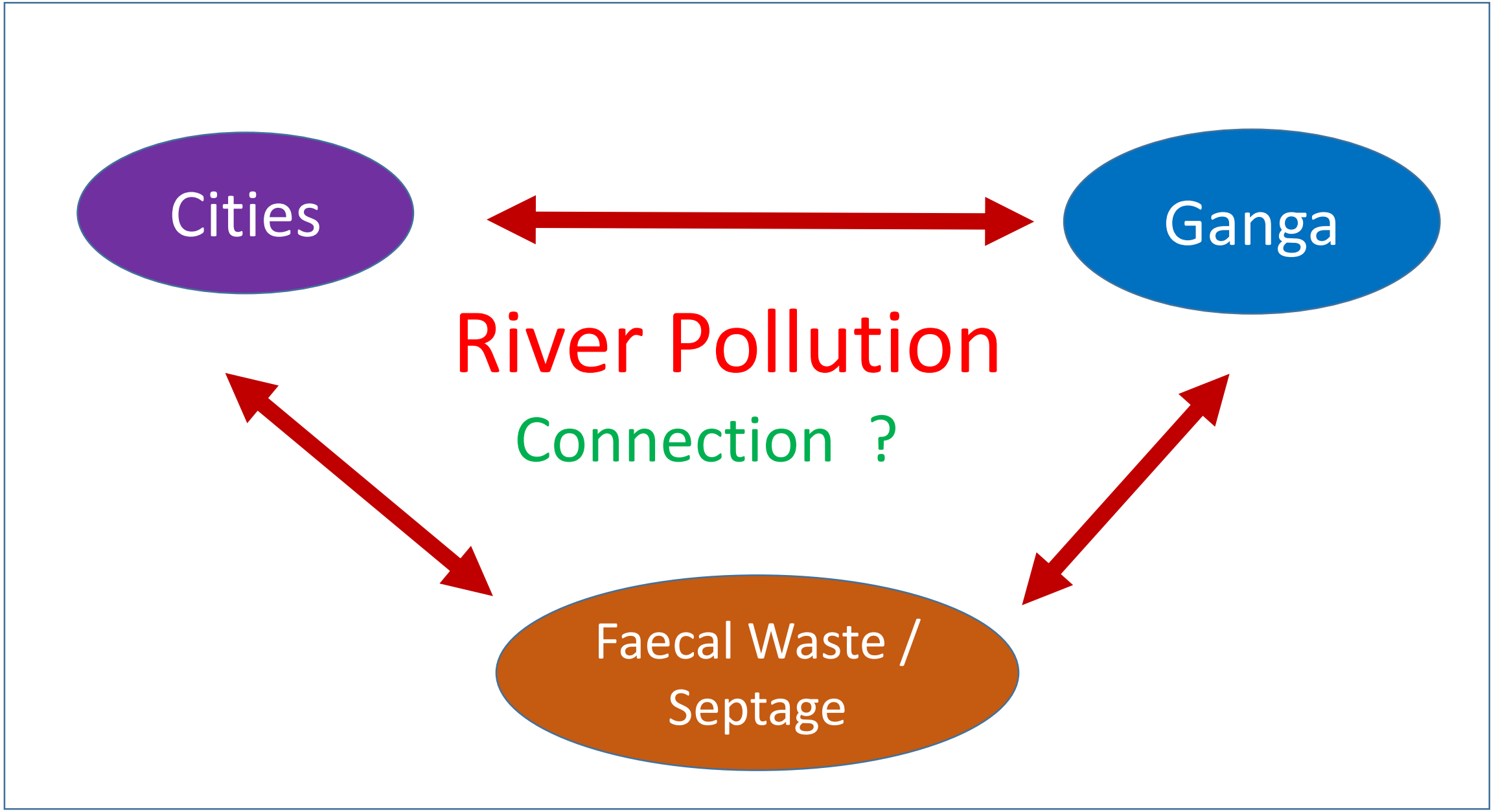
Faecal Connection - Ganga and its cities

Suresh Kumar Rohilla, Senior Director
Water Programme

Anil Agarwal Dialogue :

AAETI

Feb.12, 2019


Cities
Ganga
River Pollution
Connection ?
Faecal Waste / Septage

Sewage Vs Faecal Sludge & Septage ?

Sewage : untreated wastewater (faeces + urine) and generally grey water (kitchen & bathroom water) also become part of Sewage. BOD range is 150-350 mg/l.

Faecal Sludge / Septage : Semi solid slurry emptied out of septic tanks / pits and is much more concentrated than sewage.

But ,

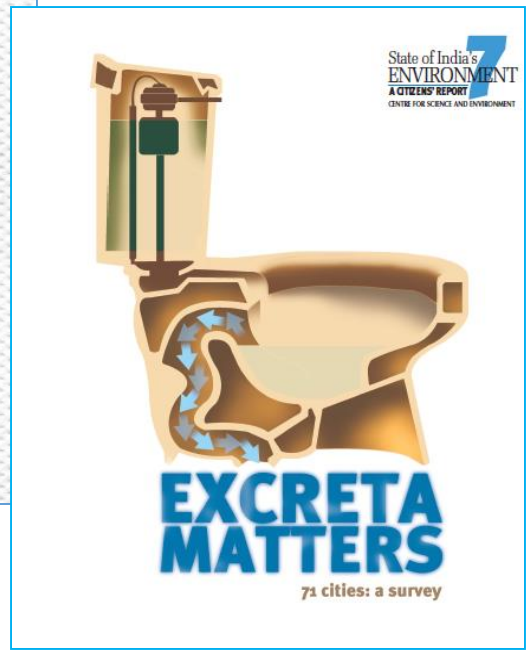
What is BOD of FSS ?

2000-40000/60000/ even above 200000 mg/l

Note: BOD *(Biological D0): It's the* ***amount of DO used by microorganisms*** *while metabolising organic matter (sewage or pollutants)*

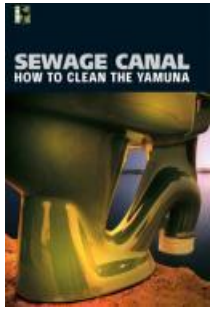
Water – Wastewater Management Scenario

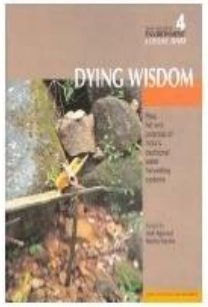
CSE's Assessment

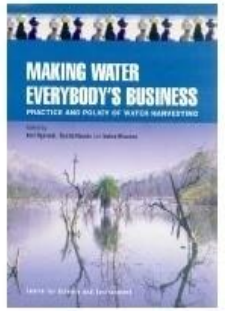


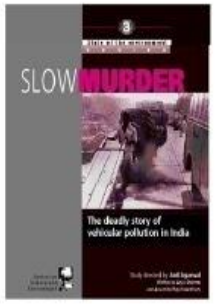
Volume 1 - dwells on how urban India is soaking up water, polluting rivers and drowning in its own waste (296 pages).

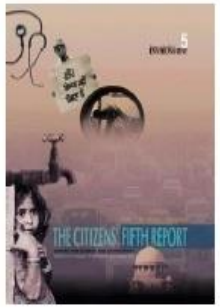
Volume 2 - contains a very detailed survey of 71 cities, and presents an assimilation of the survey's results (496 pages) building on various Previous publications:











Excreta Matters I

- Where does water come?
- Where does waste go?
- Simple questions.
- But not asked
- Never answered

Water=waste

Cities plan for water, **forget waste**

80% water leaves homes as sewage

More water=more waste

Cities have **no accounts** for sewage

Cities have **no clue** how they will convey waste of all, treat it, clean rivers

Excreta: sums

Challenge

Most of our cities do not have underground sewerage

Where there is pipeline; broken; sewage does not reach treatment plants

Most treatment plants are **under-utilized**

Building hardware will not clean rivers

So what do we do?

First count of toilets and their connections:

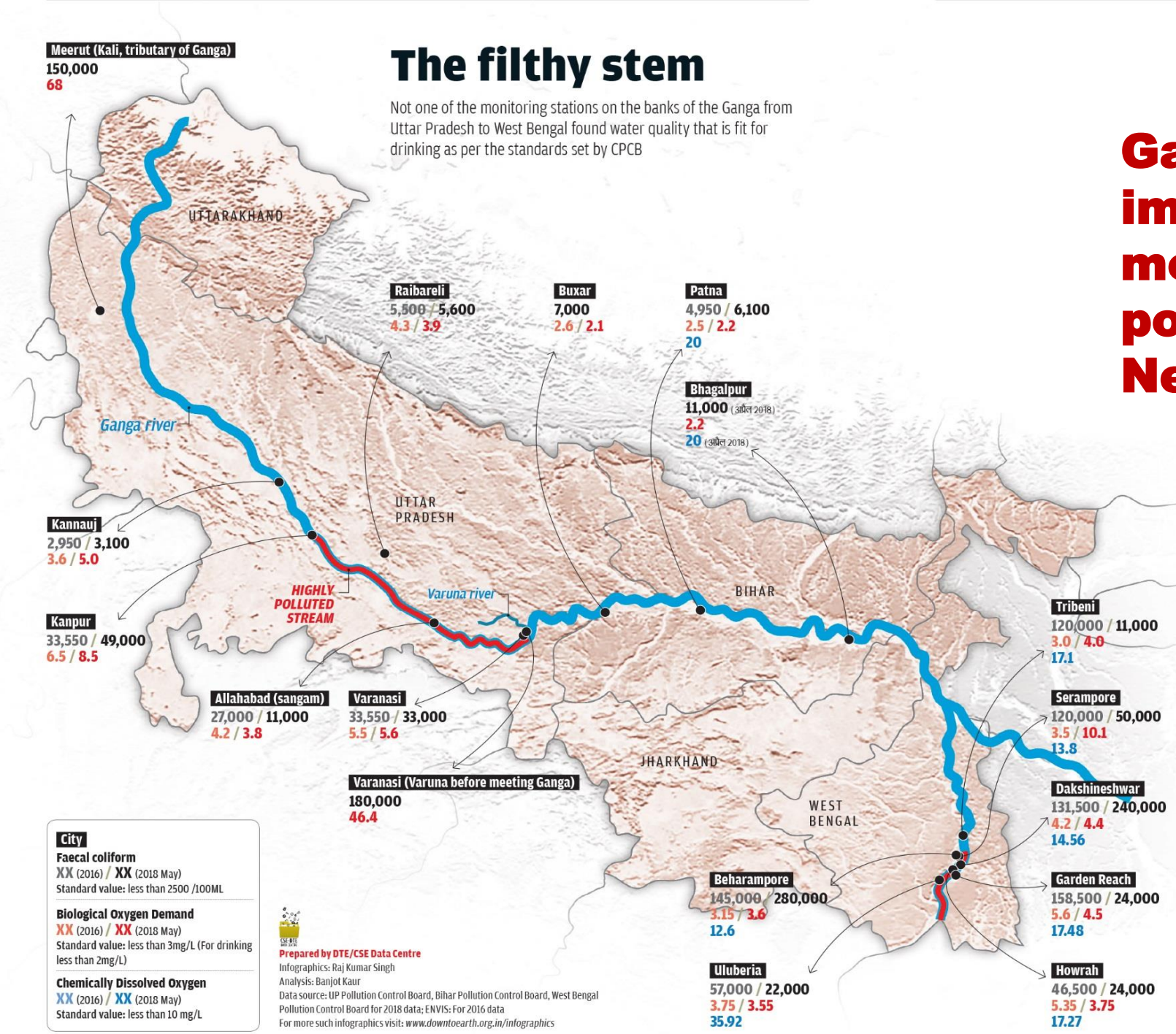
where waste goes ?

Census 2001	Census 2011	
No latrine	**Flush/pour toilet latrine connected to**	**72.6**
Service latrine	a. Piped sewer system	32.7
Pit latrine	b. Septic system	38.2
Water closet	c. Other system	1.7
	Pit latrine	
	With slab/ventilated improved pit	6.4
	Without slab/open pit	0.7
	Night soil disposed into open drain	1.2
	Service latrine	
	Night soil removed by human	0.3
	Night soil serviced by animals	0.2
	No latrine within premises	
	Public latrine	6.0
	Open	12.6

Source: Census of India 2011, Houses, Household Amenities and Assets: Latrine Facility,

Recognise our reality…

- People are not connected to sewage system
- They have ‘on-site’ treatment
- Septic tanks – connected to soak pits or connected to drains or with no underground lining
- **CSE research shows situation is the same in UP as in the rest of the country**
- This is where **new opportunity lies to address river pollution**

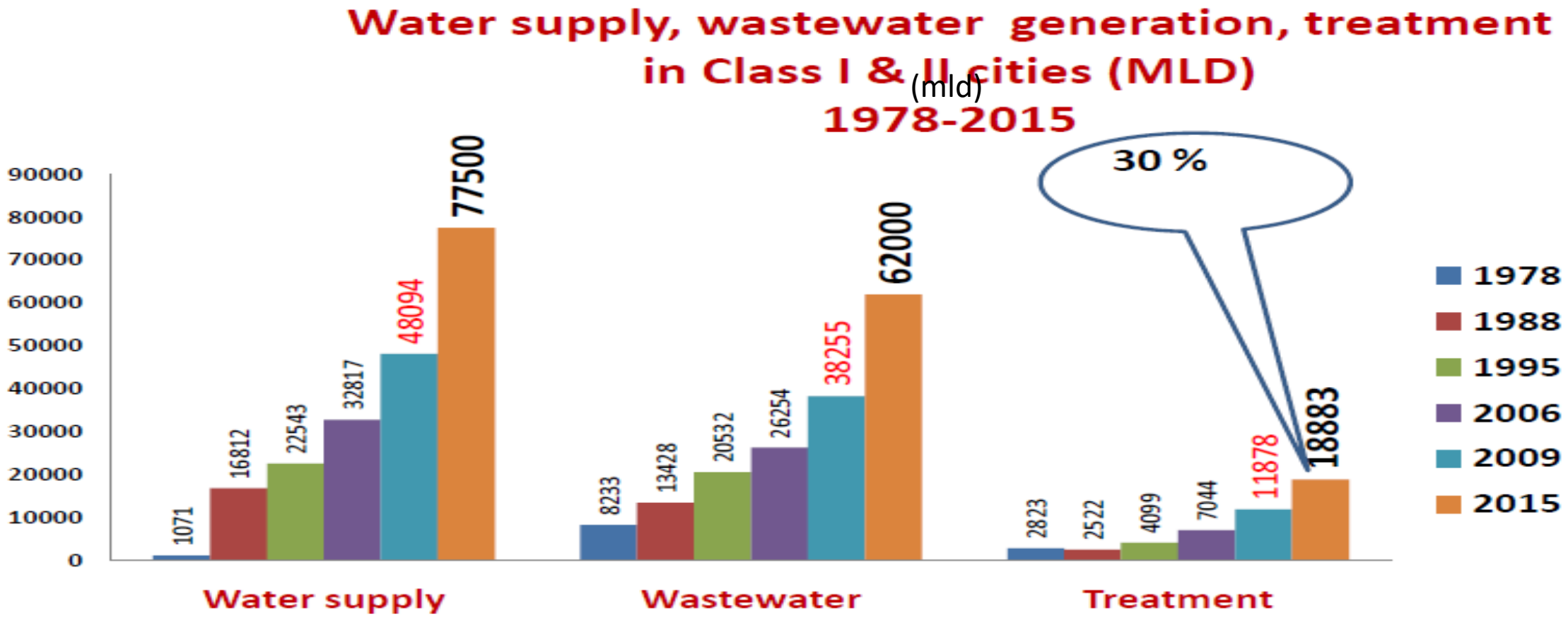


Ganga cleaning very important - CPCB data shows more is needed to reduce pollution.
New approach

From U.P to West Bengal not even one of the monitoring stations on the banks of Ganga **reported water quality fit for drinking** as per standards set by CPCB

70 % of Ganga river pollution is attributed to dumping of untreated municipal sewage

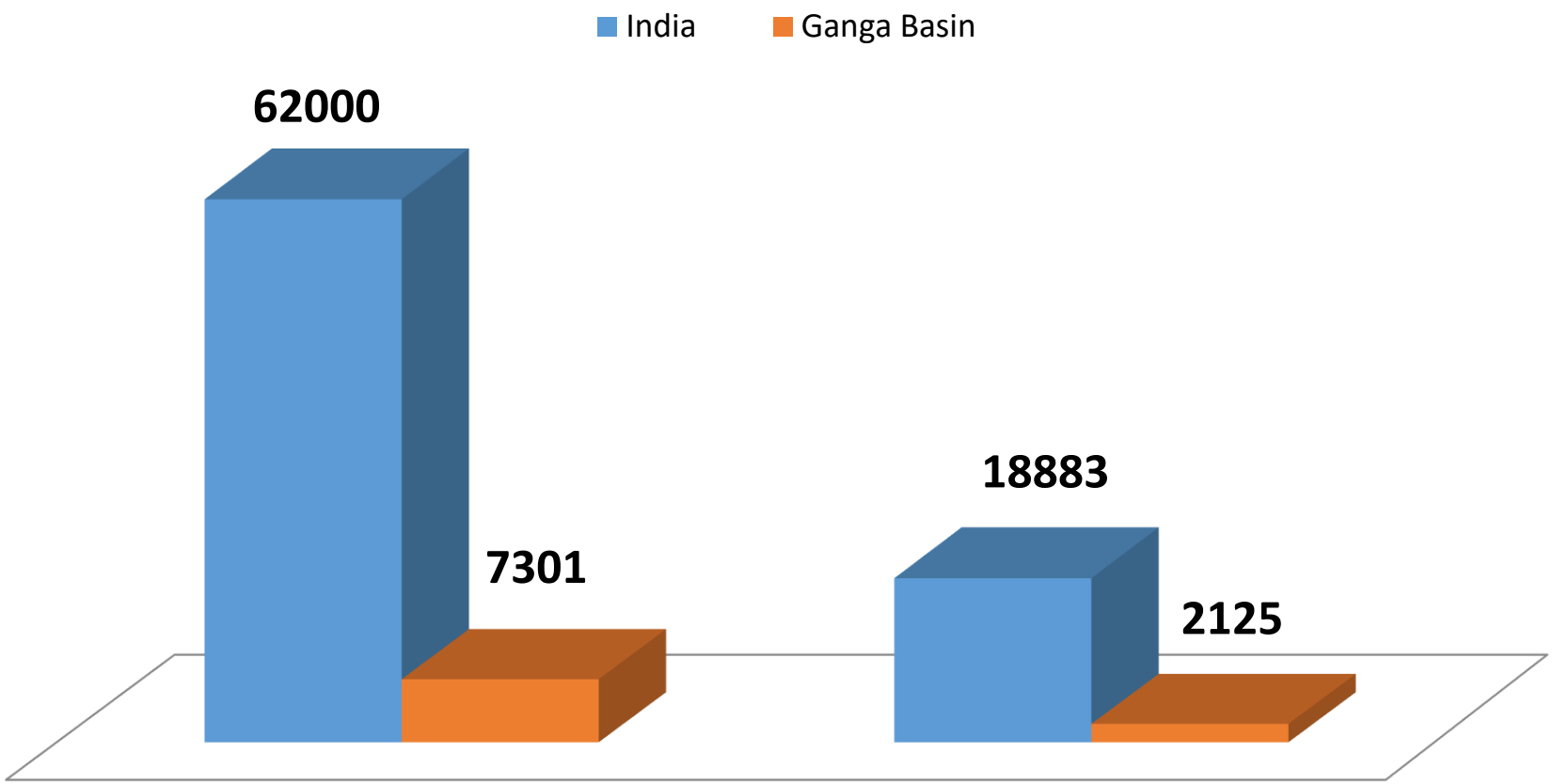
Excreta : sums



Two cities Delhi & Mumbai have 31% of total treatment capacity installed in India.

Source: CPCB Reports (1978,1988,1995,2006,2009,2015)

Sewage Generation & Treatment Gap (in MLD)



Sewage Treatment in Ganga Basin - Gap

- Sewage generation in India- 62000 mld and Sewage Treatment Capacity in India- 18883 mld
- **11 Ganga Basin States- 12050 mld (class I & II cities) - approx. 20 % of total.**
- **5 Ganga basin state along main river stem (175 Class I and 102 Class II towns) generate- 7301 mld**
- **Sewage Treatment Capacity in Ganga Basin – 2125 mld (1188 mld under approval/ construction) 3313 mld**
- **Shortfall of 8737 mld / 3988 mld along river stem**

Source: MoWRRD&GR, RAJYA SABHA UNSTARRED QUESTION NO. 152 ANSWERED ON 25.04.2016

CLEANING THE RIVER: DAUNTING CHALLENGE

Status of existing sewerage infrastructure

10 out of 97 towns contribute almost **64%** **2,953 MLD**

1,897 MLD of total sewage discharge

(10 towns: Kolkata (highest sewage discharge) followed by Kanpur, Patna, Varanasi, Allahabad, Howrah, Haridwar, Bhagalpur, Farrukhabad & Bally)

Projection of sewage generation in 97 towns by 2035
3,603 MLD

Treatment capacity of existing 84 sewage treatment plants (STPs) - **1,584 MLD**

Status of 84 existing STPs:

39 are working satisfactorily (treat 733 MLD)

14 operational but underutilised (Capacity - 581 MLD)

31 are defunct (Capacity - 270 MLD)

GANGA CLEANING BANKS ON FATE OF ONGOING PROJECT

- No. of sanctioned projects under 'Namami Gange' programme - 195
- No. of sewage infrastructure projects - 102 (out of 195)
- It'll treat 2,369 MLD of sewage
- Remaining projects (93 out of 195) are related to crematoria development, river front development, river surface cleaning, institutional development, biodiversity conservation, afforestation, rural sanitation and public participation

STATUS OF 102 SANCTIONED SEWAGE INFRA PROJECTS:

Completed **24**

Under execution **45**

Under various stages of tendering **33**

Planning for **hardware**

Cities plan for treatment not sewage

- Treatment plants are not simple answers

- Most cities do not have underground sewage But engineers sell pipe-dreams of **catching up with infrastructure**

- We lose rivers. Generations of **lost rivers**

Wastewater Scenario

The current paradigm – water supply

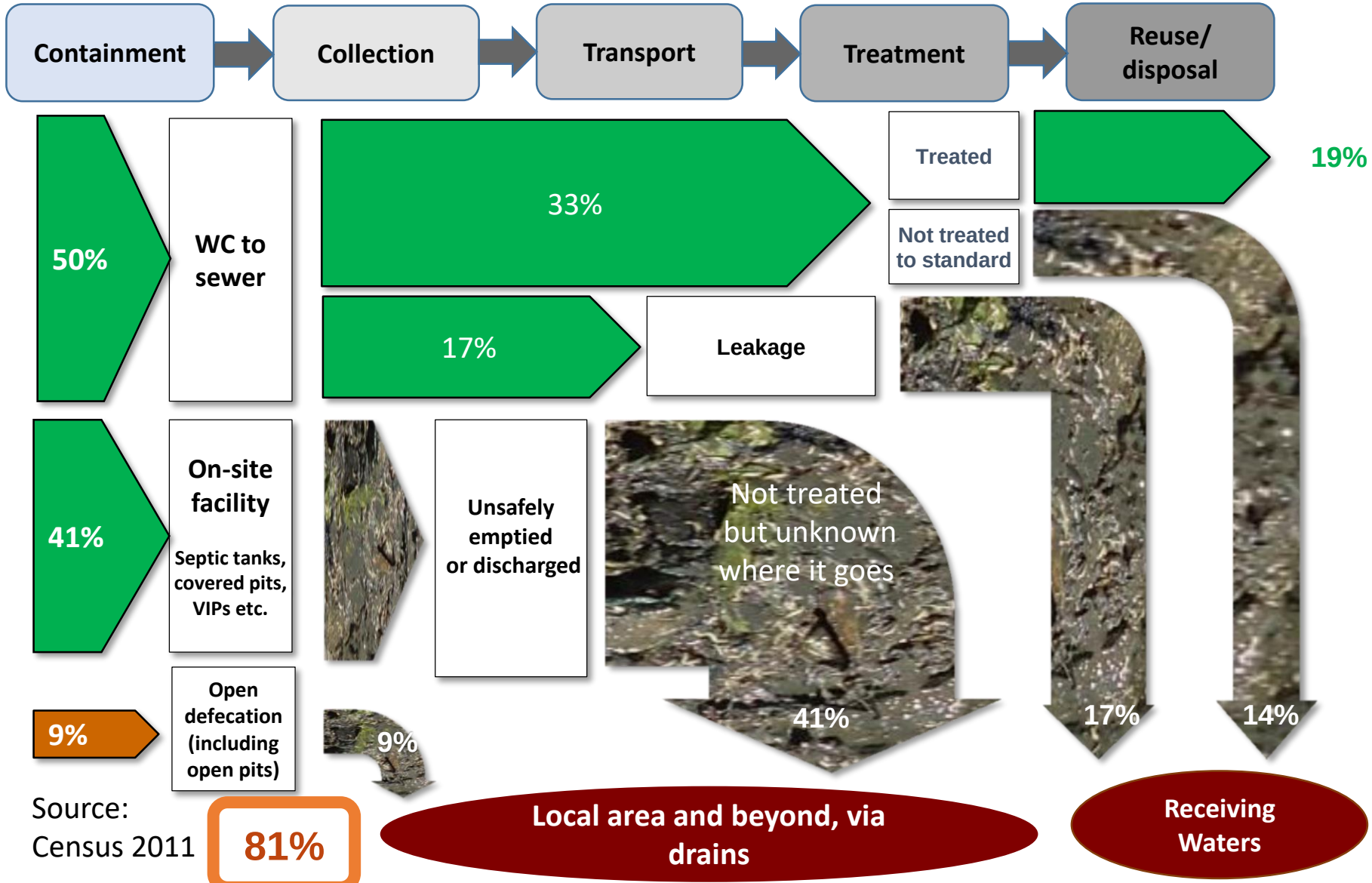
More water supplied = More waste water generated = more costs for treatment = Unsustainable

Excreta Matters II

Water-toilet-**septage / faecal sludge -**sewage-treatment-reuse in town / cities

Urban India – Septage / Sewage : Shit Flow Diagram

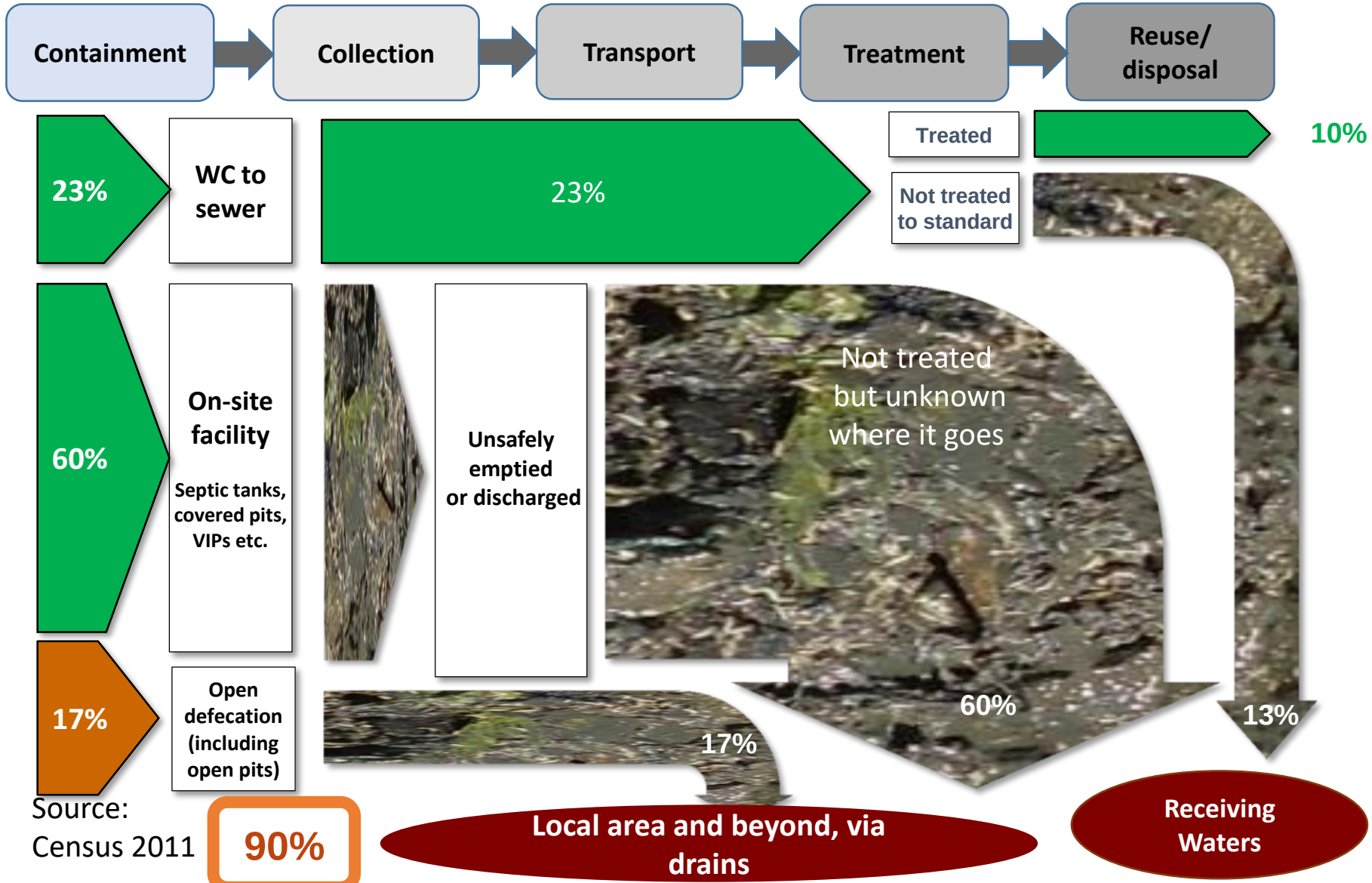
Sewer coverage	No of Cities	% of population
<10 %	191	16.45%
10 - 30%	158	20.10%
30 - 60%	75	24.22%
>60%	78	39.23%



Source: Census 2011

Ganga Basin – All Classes of Towns in Basin States

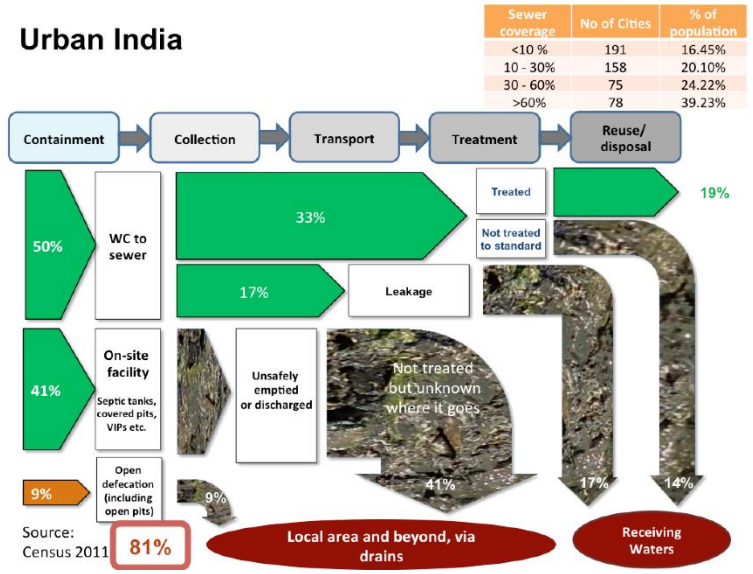
Sewer coverage	No of Cities	% of sewered population	% of population
<10 %	738	10%	2%
10 - 30%	348	24%	6%
30 - 60%	33	38%	9%
>60%	17	28%	6%



Source: Census 2011

90%

Excreta Flow Comparison to National Average



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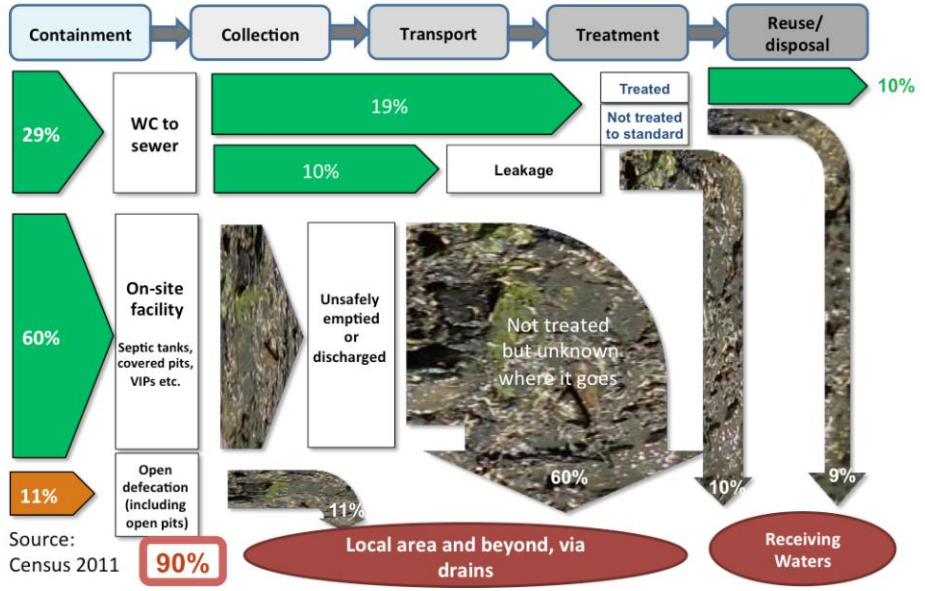
Excreta Flow - unsafe disposal in Ganga Basin states is 90-95 % as higher compared to 81 % national average

SBM lists 400 town /cities to be declared ODF have only 8 cities from Ganga basin

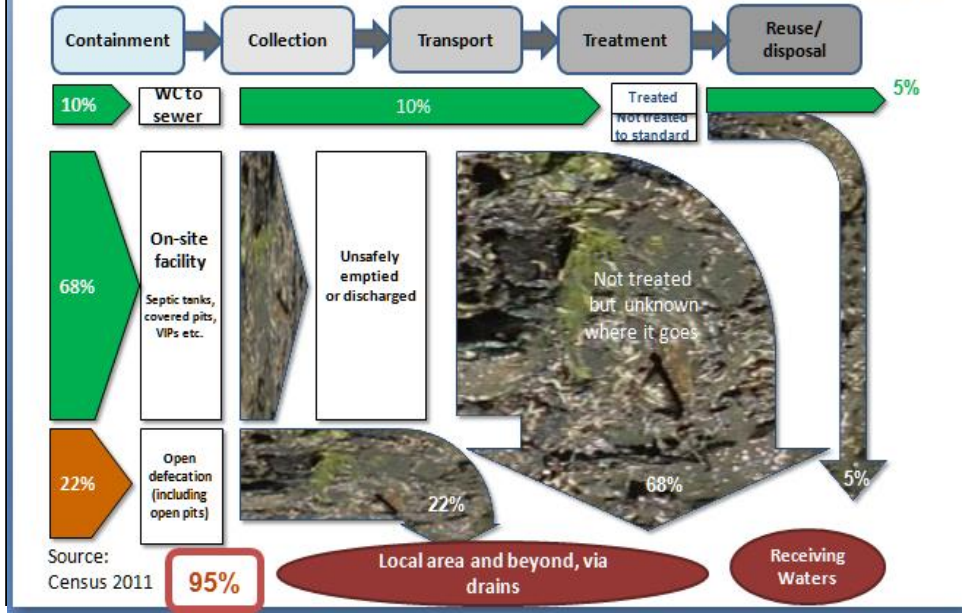
Ganga Basin: Class I towns in Basin States

Sewer coverage	No of Cities	% of sewered population	% population
<10 %	60	6%	2%
10 - 30%	77	21%	6%
30 - 60%	17	42%	12%
>60%	6	31%	9%

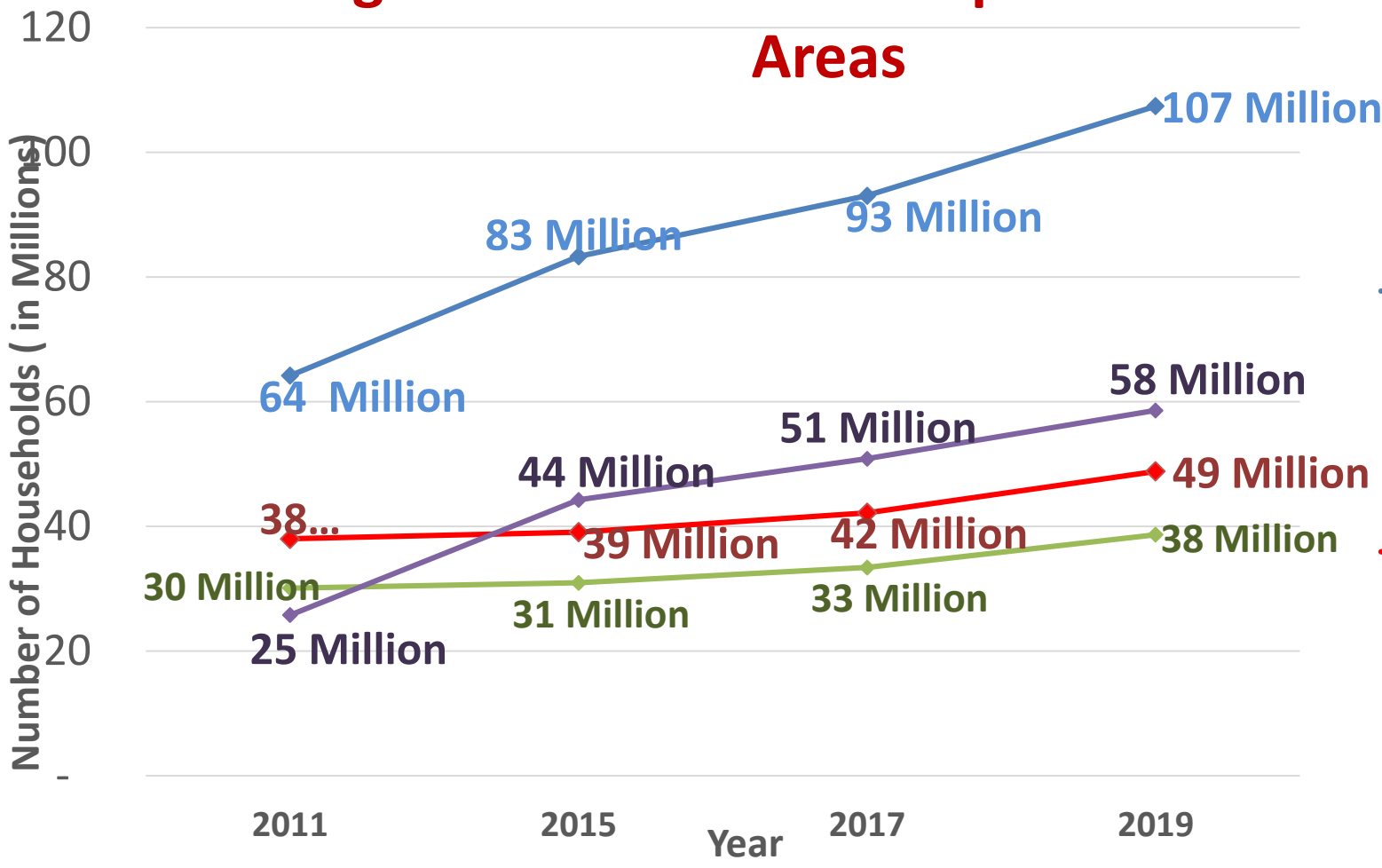


Ganga Basin – Class II Towns in Basin States

Sewer coverage	No of Cities	% of sewered population	% of population
<10 %	88	37%	4%
10 - 30%	40	47%	5%
30 - 60%	2	5%	5%
>60%	2	11%	1%



Coverage of Toilets and its Dependence in Urban Areas



Septic Tanks continue to be a constant source of containment considering the current rate of Sewerage network growth

2.56 Billion litres set to seep into ground water with pit technology

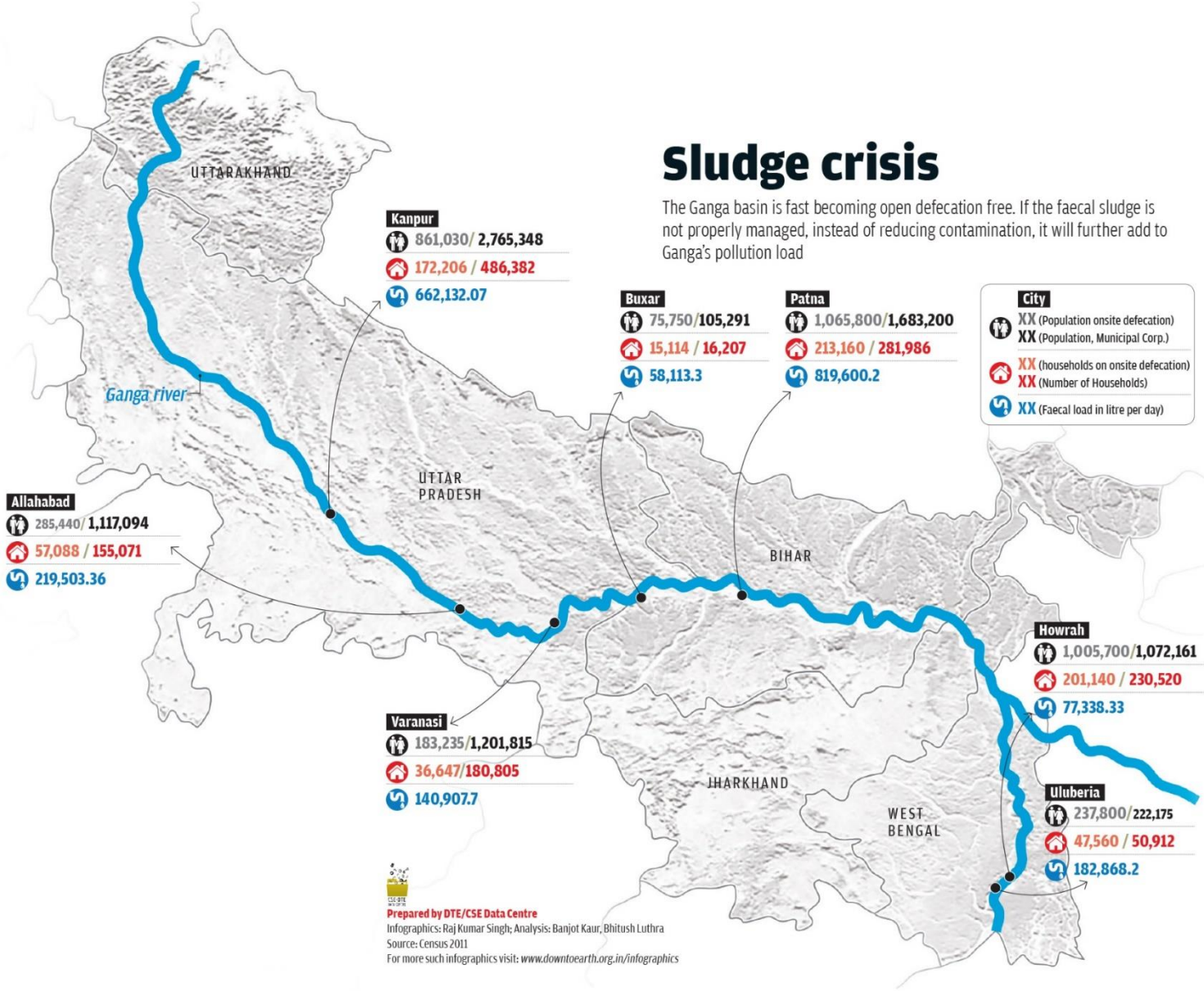
On-site challenges

- **Toilet connected to underground ‘box’**
- Design quality of septic tank is unknown – in many cases these are tanks, emptied regularly or simply linked to municipal drain
- In most cities Informal (mafia) collects waste for a price – growing and thriving business
- In all cities there is **no system for safe disposal of this waste**
- In all cities, waste from septic tanks is **‘dumped’ in open sewers; rivers; municipal sewers; fields…**

Thriving private business:
but where does this go?

Disposal : Over land or Drains - River

Disposal : in garbage dumps



Ganga Basin is fast becoming ODF. If the fecal sludge is not managed , instead of reducing contamination, it will further add to Ganga's pollution load.

Ganga in peril

Under Namami Gange, the government will check the flow of untreated sewage into the river from 118 towns and cities. CSE visited 10 towns and cities along the Ganga and found that the authorities have miserably failed to manage faecal sludge, which is only going to increase in volume with the implementation of on-site sanitation under Swachh Bharat Mission

Load of Swachh Bharat Mission

Faecal sludge to be produced by states along the Ganga on going open defecation-free

180 MLD
Total faecal sludge generated by the states following the Swachh Bharat Mission

Prepared by DTE/CSE Data Centre
Infographics: Raj Kumar Singh; Analysis: CSE Water Team
Data source: Various sources
For more such infographics visit: *www.downtoearth.org.in/infographics*

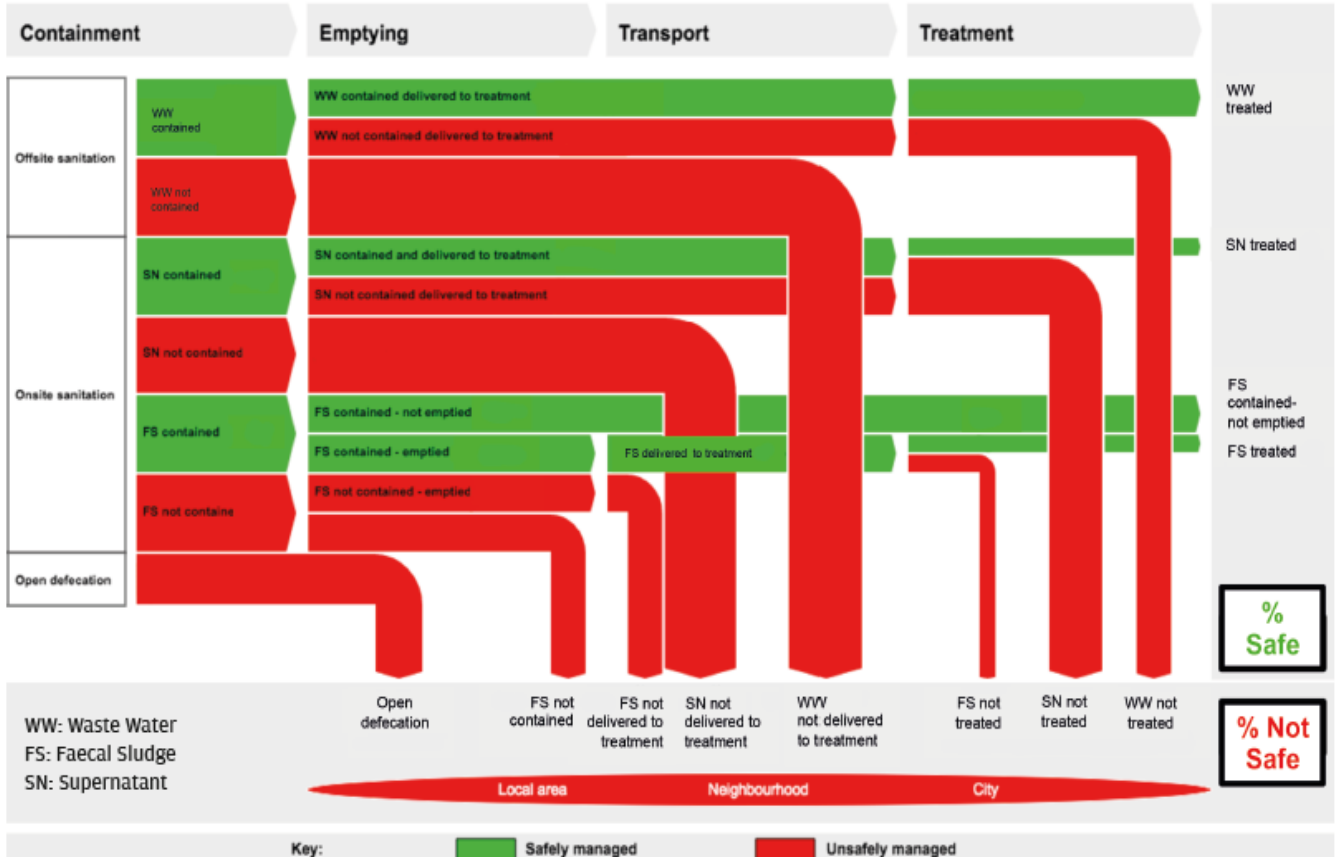
Centre for Science and Environment

Promoting excreta (sewage and septage) flow analysis to inform urban sanitation programming at a city-wide scale

SFD- Shit Flow Diagram

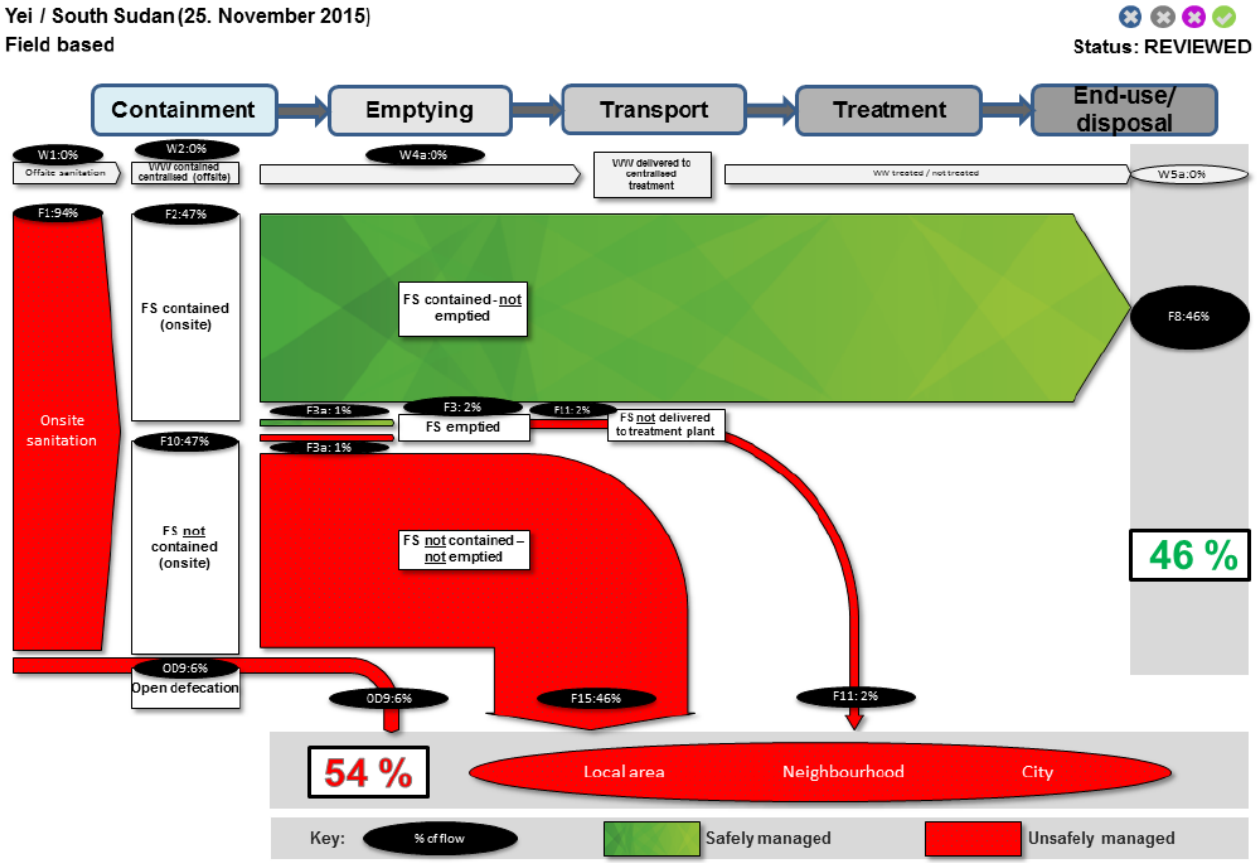
City name and date of production
Desk based / Field based

SFD- Shit Flow Diagram



Excreta Management : Understanding Sanitation Chain - SFD

What is an SFD



An SFD is a graphic that shows faecal flows and its fate in conjunction with a service delivery report – IT IS NOT a stand alone diagram.

What is an SFD

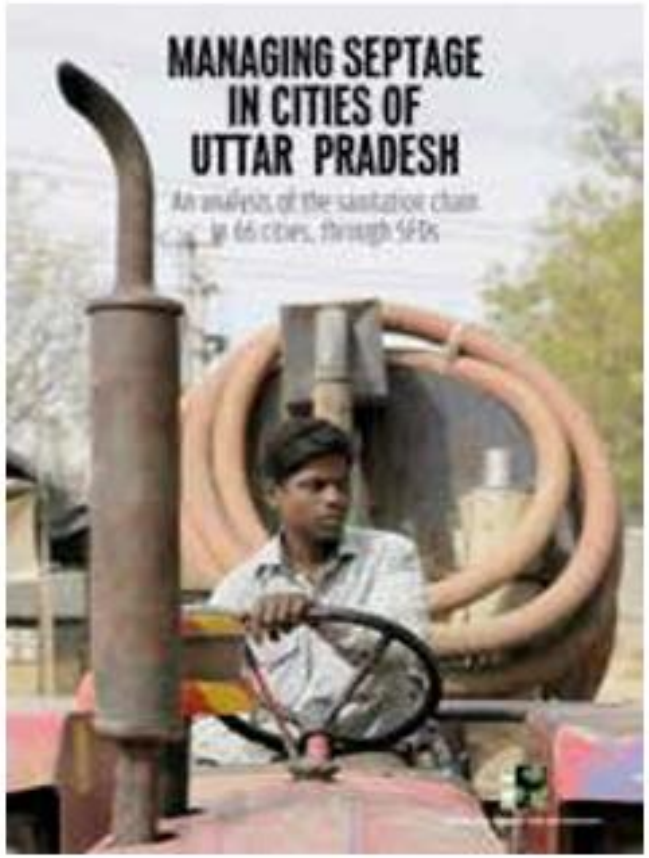
- An effective communications and advocacy tool to engage city stakeholders
- **Based on contributing populations, it gives an indication of where the excreta goes**
- A representation of public health hazard
- An overview from which to develop sanitation priorities

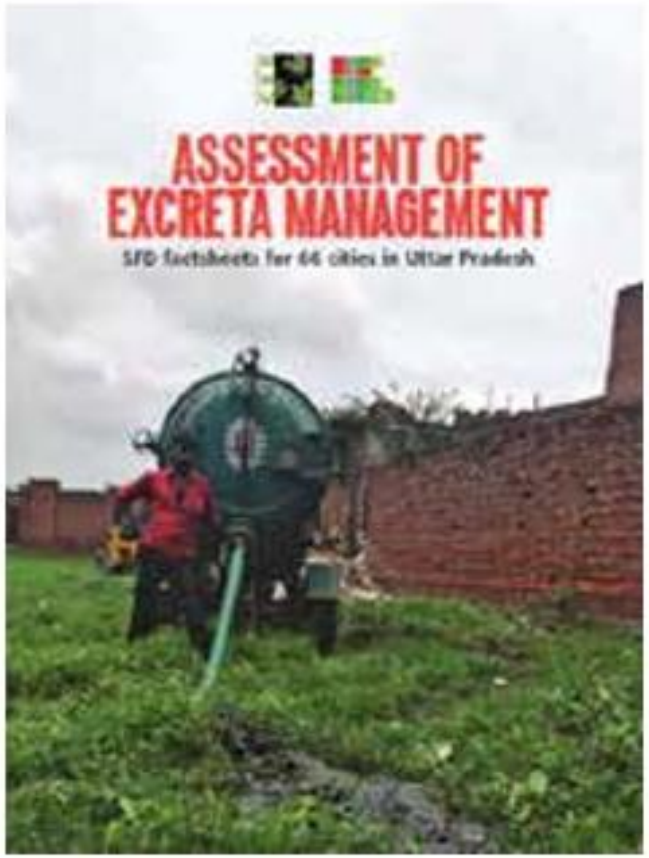
What is NOT an SFD

- Based on volumes/mass – these are determined by other related factors
- A representation of public health risk (risk = hazard x behaviour)
- A precise scientific analytical tool

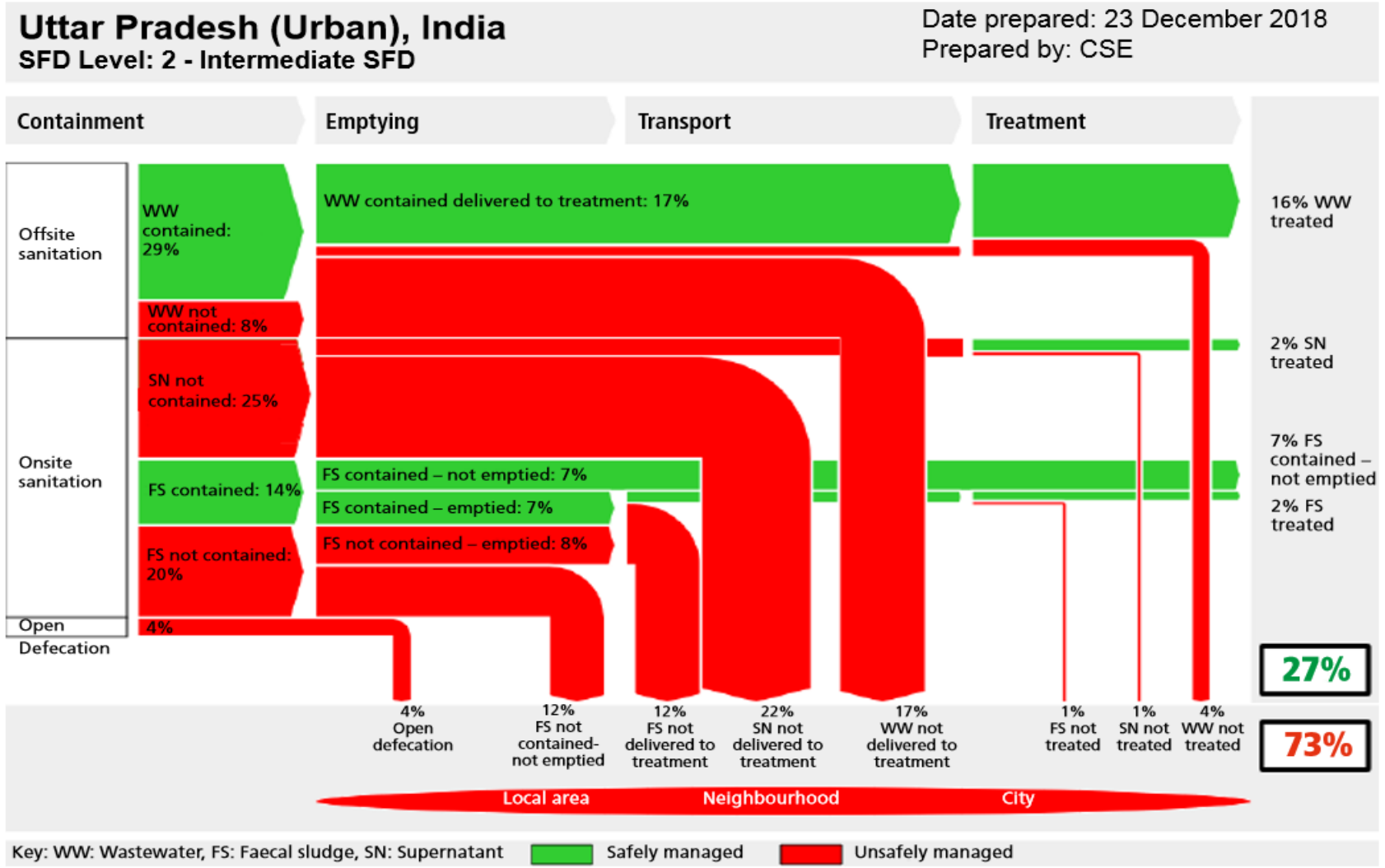
Using excreta flow diagrams (SFDs) as an integral part of city wide sanitation planning for Indian cities

Faecal Flow Assessment: Shit Flow Diagram (SFD) of target AMRUT & Namami Gange Towns / cities in Uttar Pradesh





Assessment of Faecal Sludge and Septage Management in Uttar Pradesh



Note: This SFD is done based on study of 66 towns and cities, representing 60% of urban population in UP
To know more about SFDs, visit https://sfd.susana.org

Analysis of Sanitation Chain in 66 cities of Uttar Pradesh through SFDs :

Assessment of Faecal Sludge & Septage Management

Assessment of Faecal Sludge and Septage Management in Uttar Pradesh : Summary

KEY OBSERVATIONS

More than **60%** of the total population is dependent on onsite sanitation systems like septic tank and pit latrine. Out of which, the faecal sludge and septage of 7% of the population is treated

Septic tank effluent (overflow) of **50%** of the population is discharged in open drains, of which, 2% is treated by tapping of nullahs and drains

29% of the population is connected to sewerage network. Of which, sewage of 16% of the population is treated

More than **80%** of the sewerage network in state is found in 7 cities (out of 635)

Sanitation provision through sewer system increases with the increase in population of cities

Excreta of **8%** of the population is discharged directly in open drains

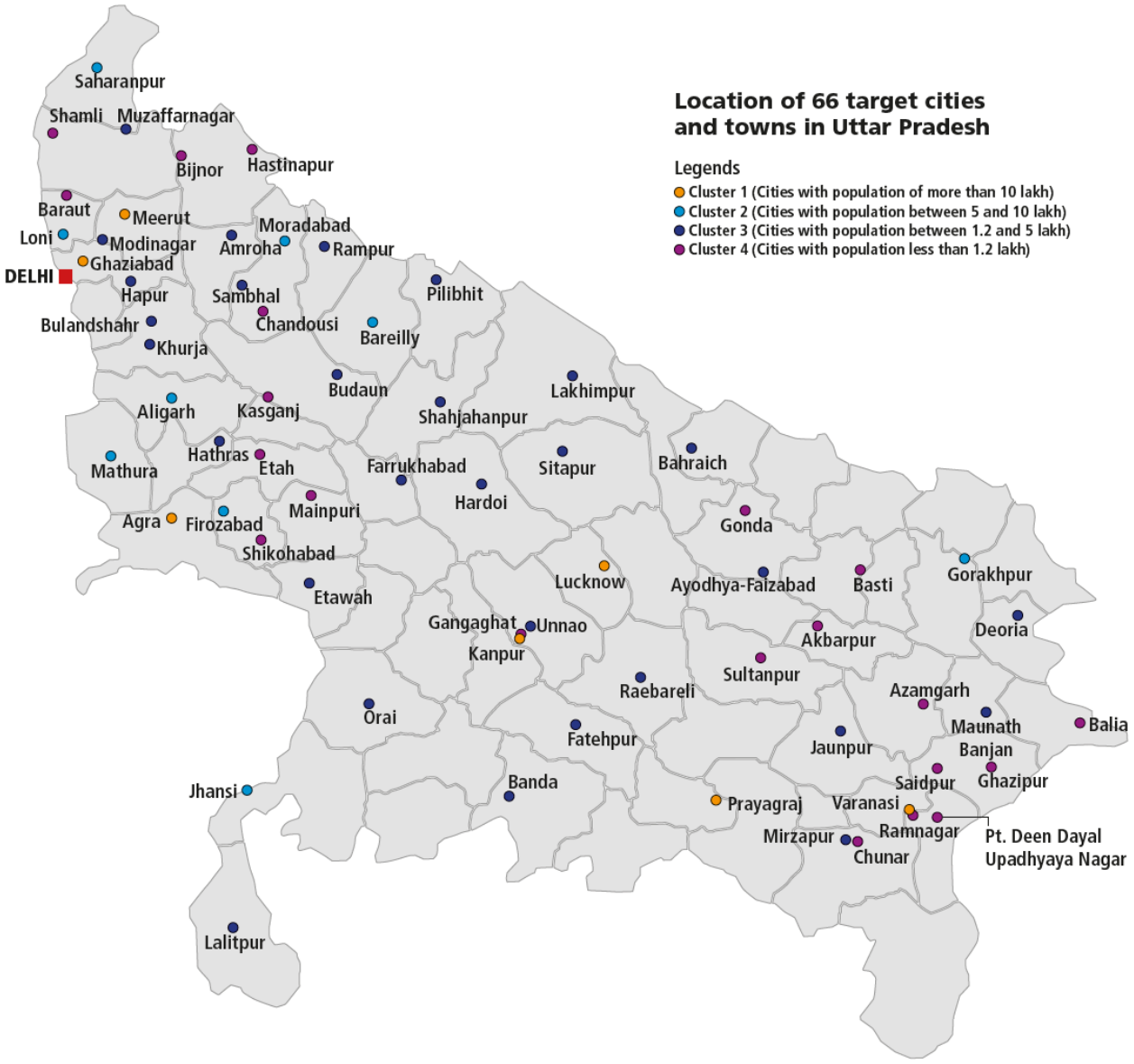
4% of the population still defecates in the open

Excreta of **27%** of the total population is safely managed. 7% of which is safely stored in containment systems

No city is 100% sewered

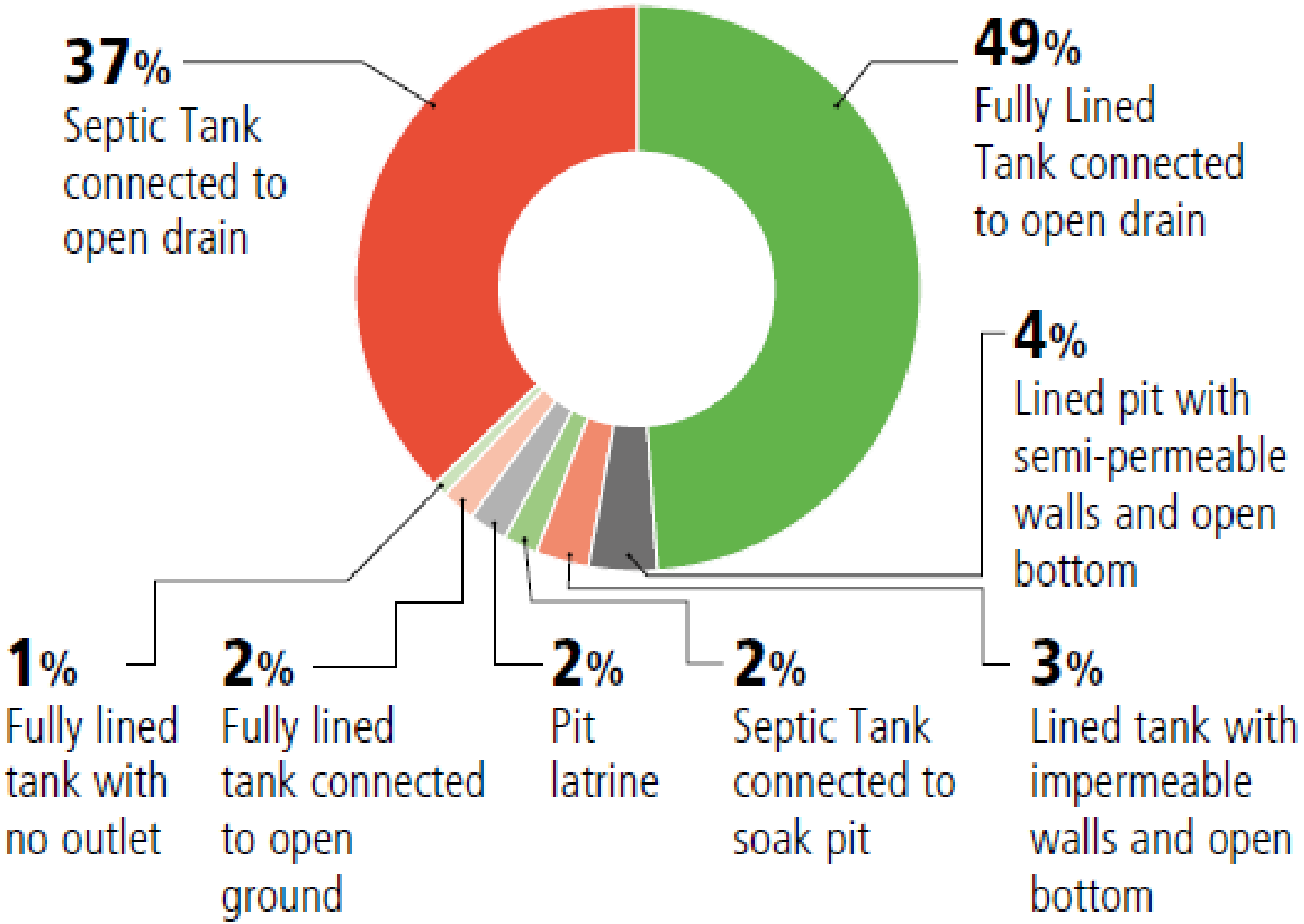
NOTE: This study is done based on data collected by CSE in October 2018

Assessment of Faecal Sludge and Septage Management in Uttar Pradesh



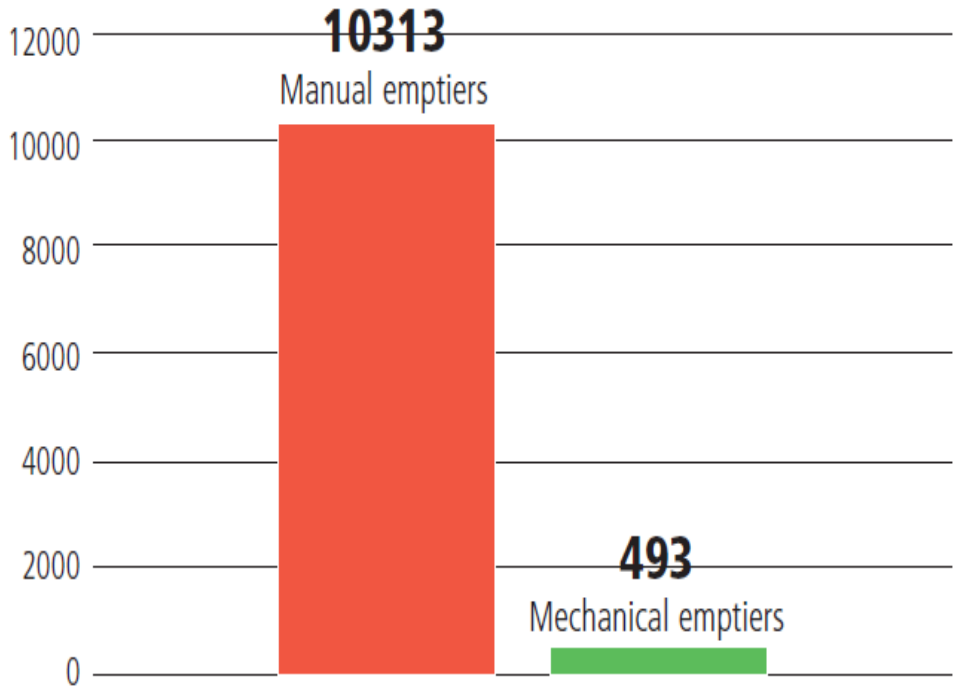
	CITY	POPULATION	OPEN DEFECATION	OFFSITE	ONSITE
CLUSTER 4	Saidpur	24,338	14	0	72 14
	Hastinapur	26,452	9	2	87 2
	Chunar	37,185	31	0	66 3
	Ramnagar	49,132	13	71	15 1
	Gangaghat	84,072	14	2	81 3
	Bijnor	93,297	0	6	87 7
	Baraut	101,277	2	8	88 2
	Kasganj	103,764	10	3	74 13
	Ballia	104,424	30	10	57 3
	Shikohabad	107,300	5	22	69 4
	Sultanpur	107,640	22	15 4	48 11
	PDDUN*	109,650	8	14	68 10
	Ghazipur	110,698	10	0	82 8
	Azamgarh	110,983	1	0	85 14
	Akbarpur	111,447	18	9	66 7
	Gonda	114,046	3	12	81 4
	Chandausi	114,383	3	8	83 6
	Basti	114,657	11	10	73 6
	Mainpuri	117,327	1	10 2	73 14
	Etah	118,517	7	3	77 13
	Shamli	118,605	1	7	82 10
CLUSTER 3	Khurja	121,207	2	23	70 5
	Pilibhit	127,988	2	3	89 6
	Deoria	129,479	3	3	81 13
	Modinagar	130,168	3	22	73 2
	Lalitpur	133,305	11	6	72 11
	Hathras	135,594	3	13	82 2
	Lakhimpur	151,993	1	4	78 17
	Budaun	159,285	2	2	91 5
	Banda	160,473	6	4	82 8
	Sitapur	177,234	9	4	75 12
	Unnao	177,658	11	11	69 9
	Bahraich	186,223	8	21 2	67 2
	Orai	190,575	3	2	86 9
	Jaunpur	191,092	9	3	86 2
	Fatehpur	191,316	15	6	64 15
	Raebareli	193,193	12	27	49 12
	Hardoi	197,029	7	23	65 5
	Amroha	198,471	0	1	90 9
	Sambhal	220,813	1	5	87 7
	Ayodhya	221,118	7	5 9	73 6
	Bulandshahr	230,024	11	17	67 5
	Mirzapur	233,691	9	13 17	35 26
	Etawah	256,000	0	6 8	86
	Hapur	262,983	4	12	78 6
	Farrukhabad	276,012	1	24 1	67 7
	Maunath Bhanjan	278,745	2	0	90 8
	Rampur	323,512	1	11	79 9
	Shahjahanpur	341,225	4	4	79 13
	Muzaffarnagar	392,768	1	4 3	71 21
CLUSTER 2	Jhansi	507,293	0	21 1	66 12
	Loni	516,082	1	10 7	56 26
	Firozabad	603,797	5	21 1	71 2
	Gorakhpur	673,446	4	9 4	60 23
	Saharanpur	705,478	2	25 22	29 22
	Mathura	826,808	12	11 36	32 9
	Moradabad	887,871	1	2	89 8
	Aligarh	889,408	8	22	62 8
	Bareilly	898,167	2	43	49 6
CLUSTER 1	Prayagraj	1,112,544	3	18 43	26 10
	Varanasi	1,198,491	1	44 21	6 28
	Meerut	1,305,429	1	15 32	51 1
	Agra	1,648,643	2	9 23	38 28
	Ghaziabad	2,135,327	0	17 50	29 4
	Kanpur	2,765,348	3	14 33	43 7
	Lucknow	2,957,960	4	15 38	12 31

Type of Containment Systems in select 66 cities

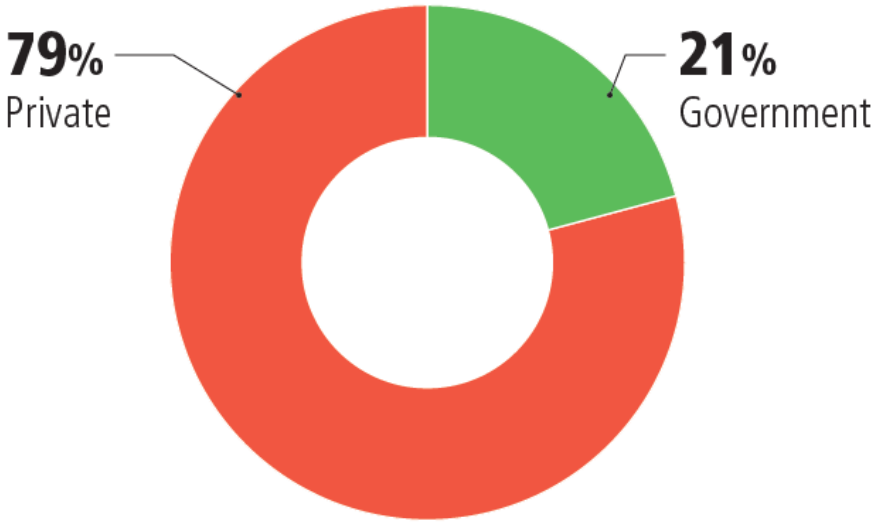


Type of Containment Systems

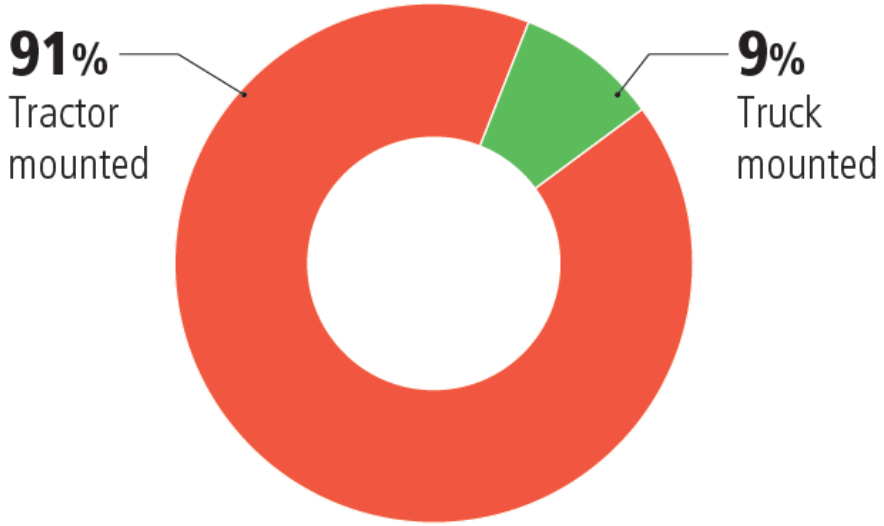
Emptying practices in select 66 cities



Type of emptiers prevalent



Break up of service providers

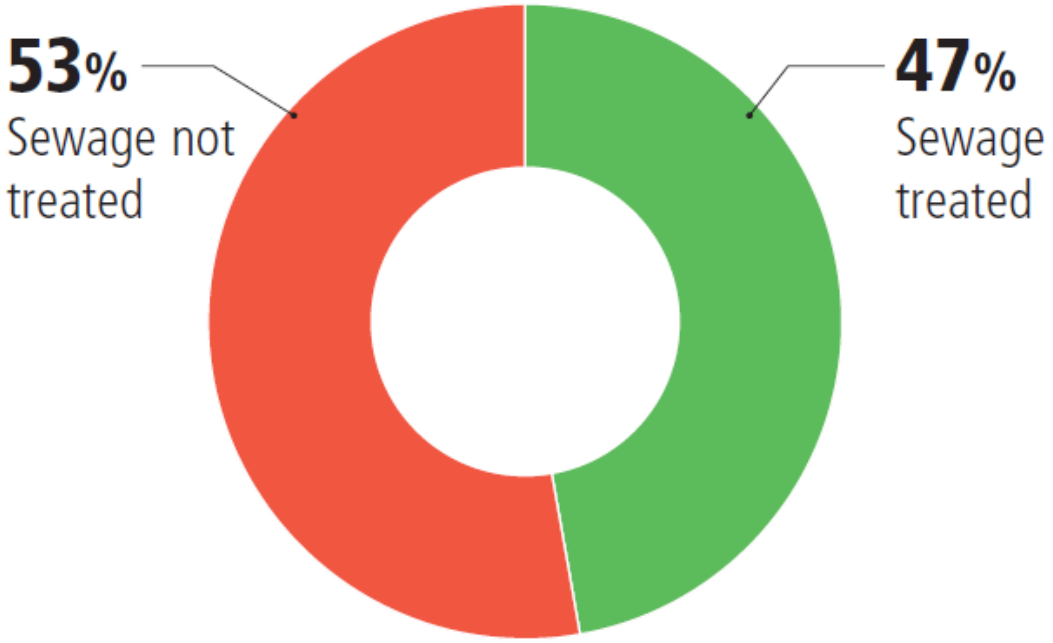


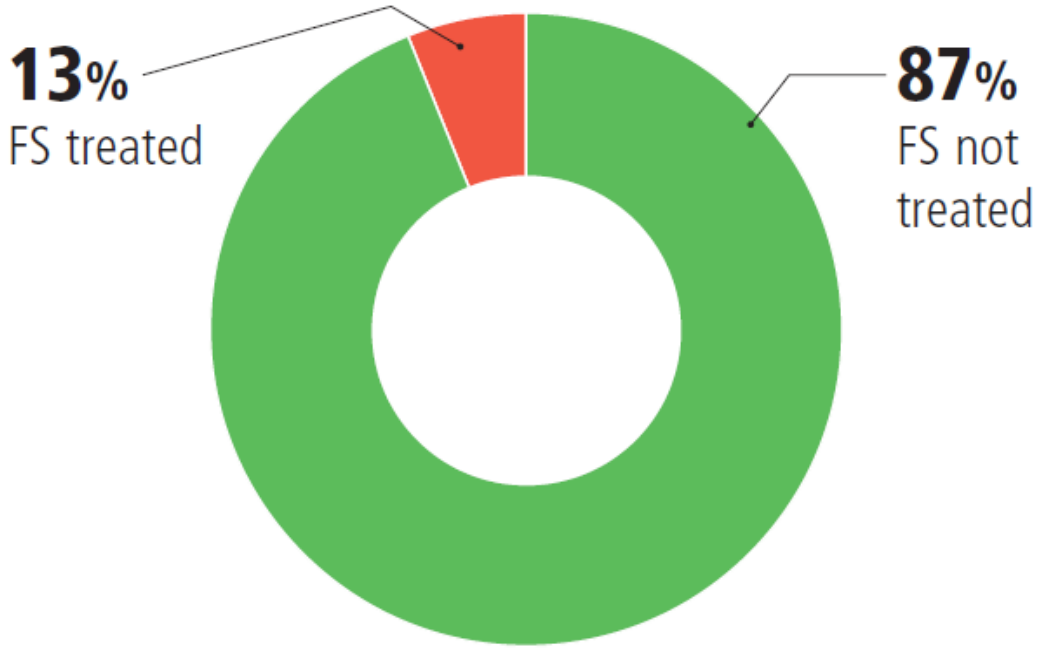
Type of vehicles prevalent

Type of Emptying

Transportation

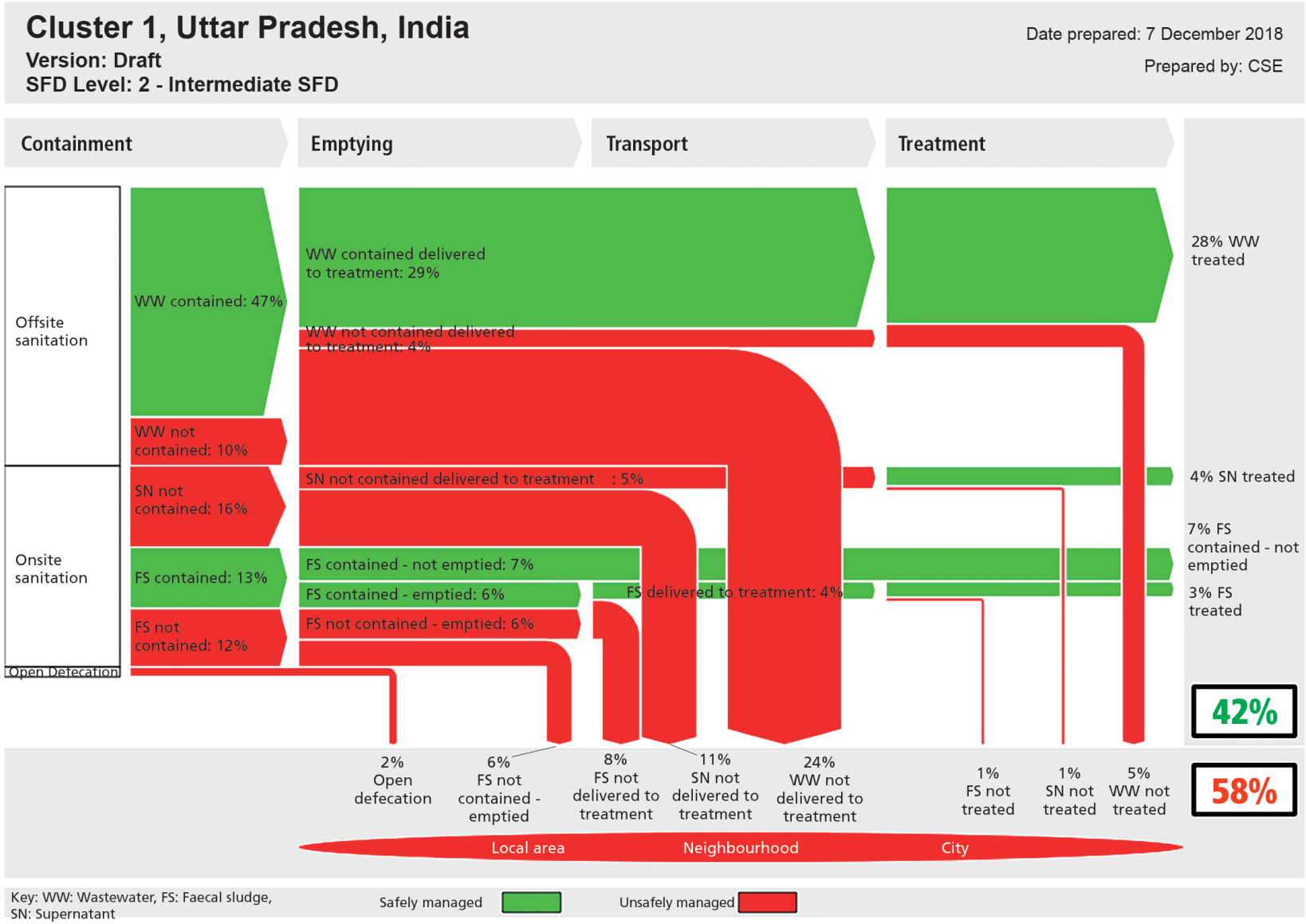
Extent of Sewage and faecal sludge treatment





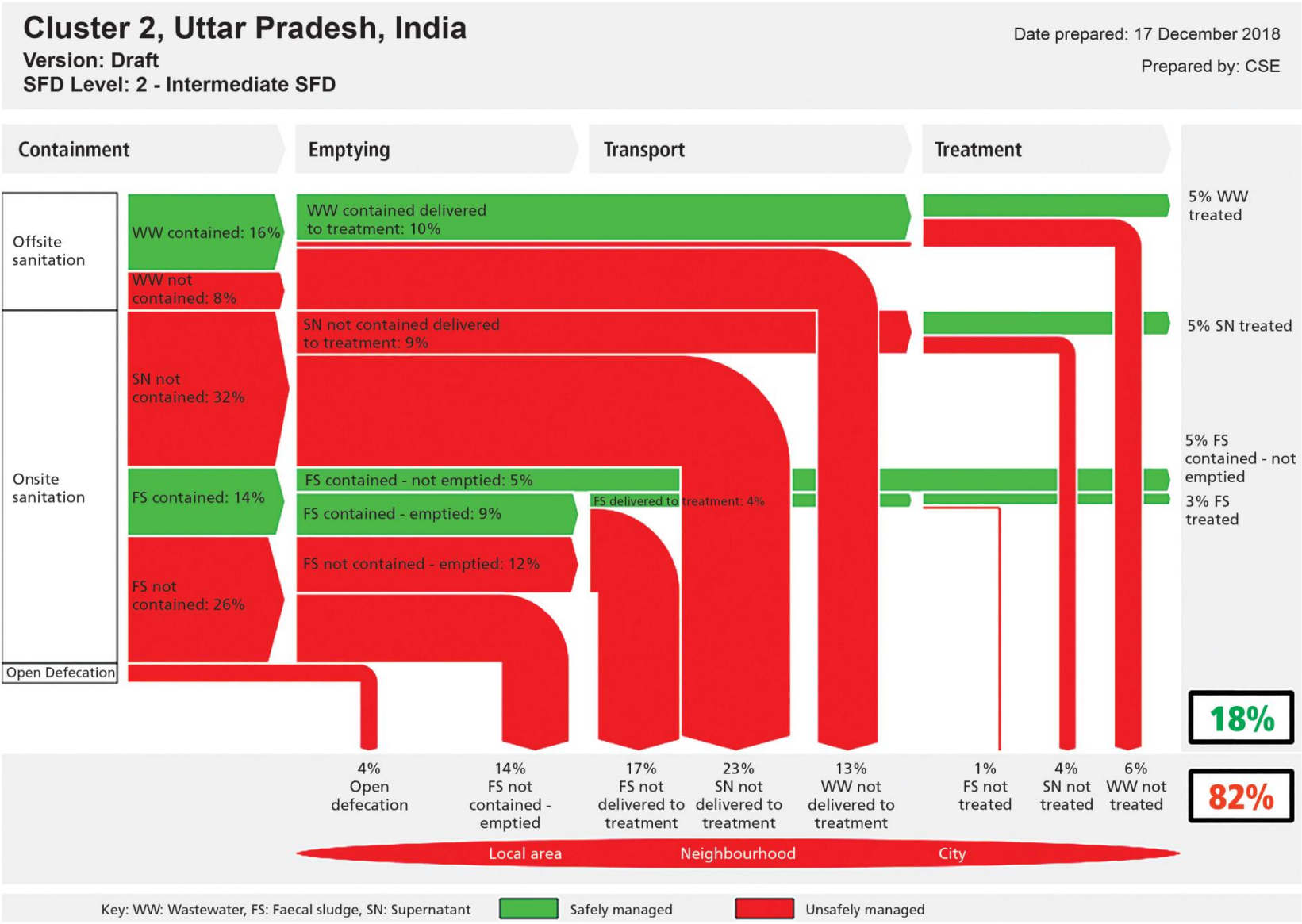
Treatment and Disposal

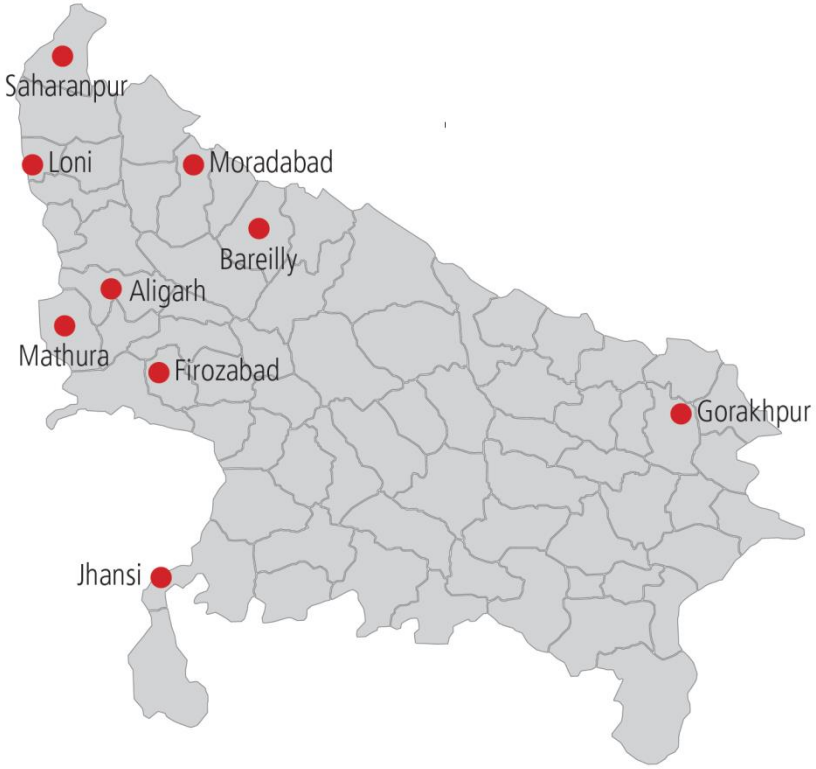
Cluster 1: Large cities (More than 10 lakh)



- **47% population is connected to sewerage network**
- 41% population connected to onsite systems
- Around 38% population gets their tank emptied only after 15 -20 years
- Most of these cities have allowed disposal of faecal sludge at pumping stations or STPs
- There are 43 STPs in the cluster, with 1952 MLD capacity, but **receive only 1532 MLD of wastewater**

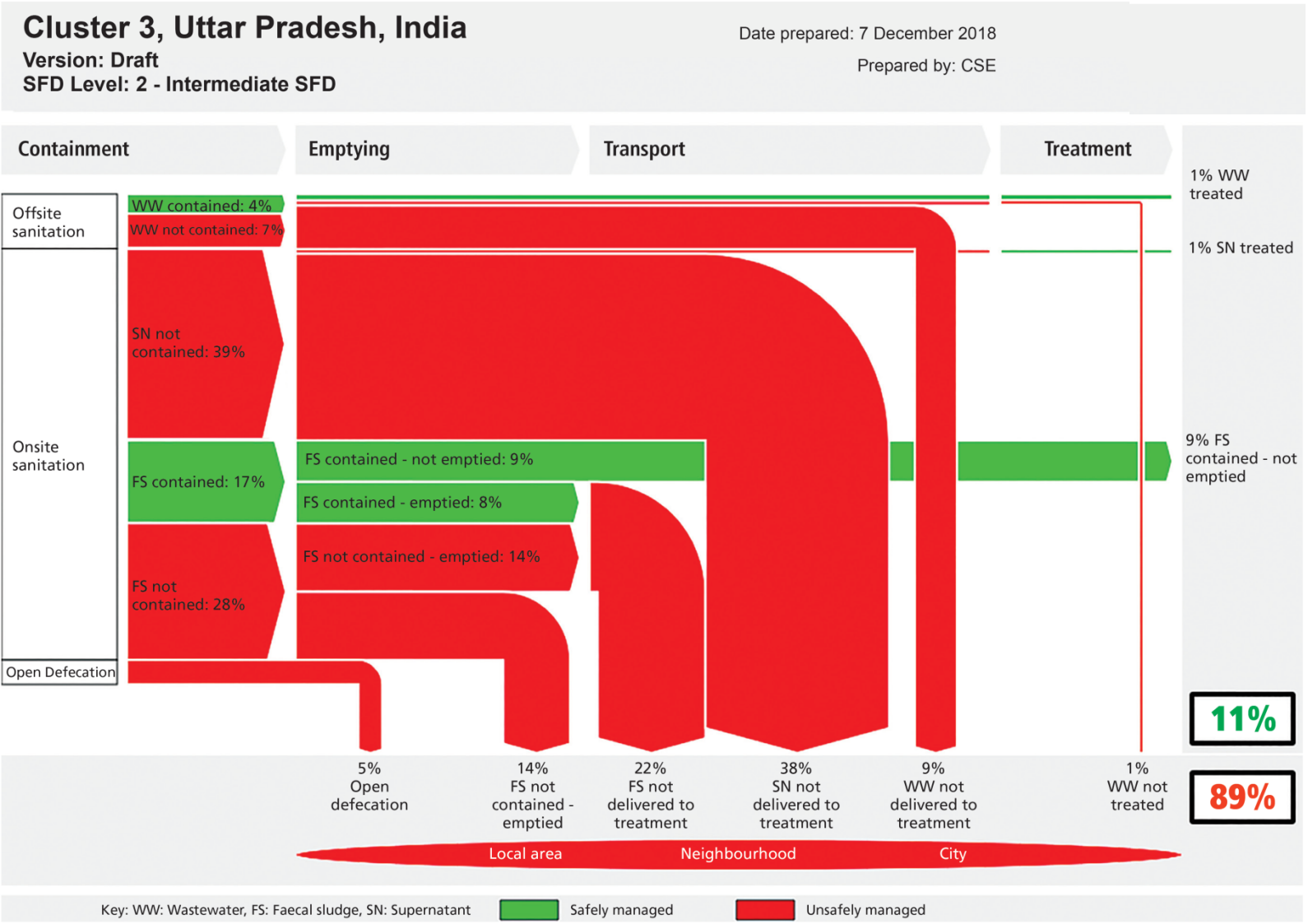
Cluster 2: Medium cities (5- 10 lakh)

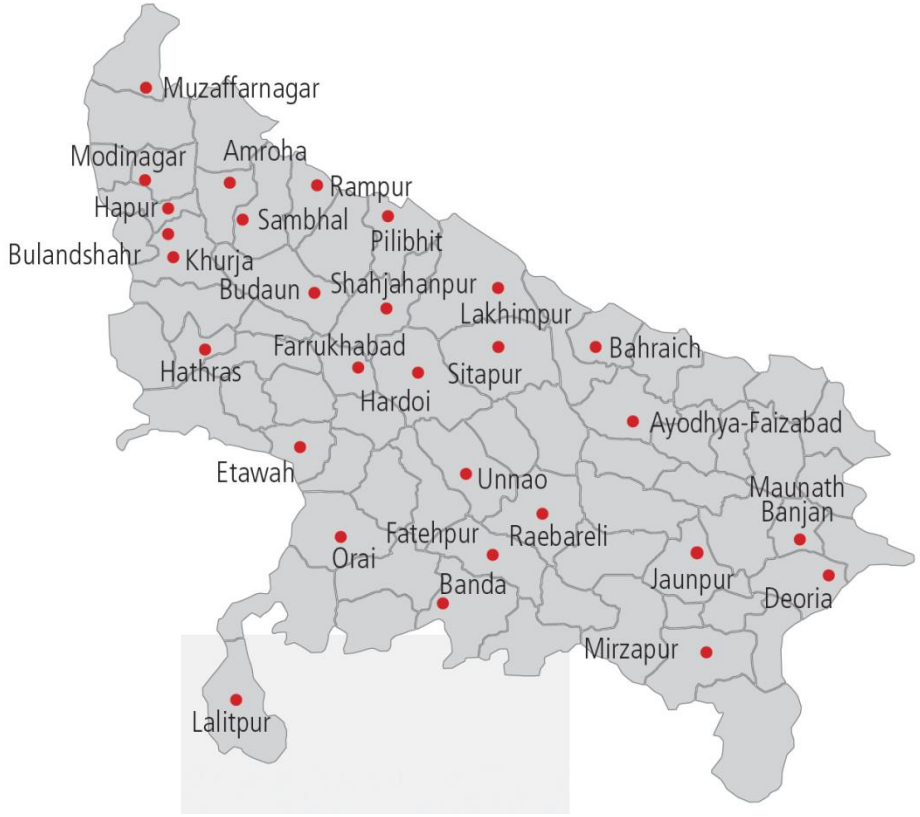




- **72% population depend on onsite systems** and more than 60% of these tanks are overflowing in drains
- Around 38% population gets their tank emptied only after 15 -20 years
- Wastewater that is being treated at STP is majorly by **interception and diversion** of open drains
- There are 11 STPs in the cluster, with 230 MLD capacity, but **receive only 168 MLD of wastewater**

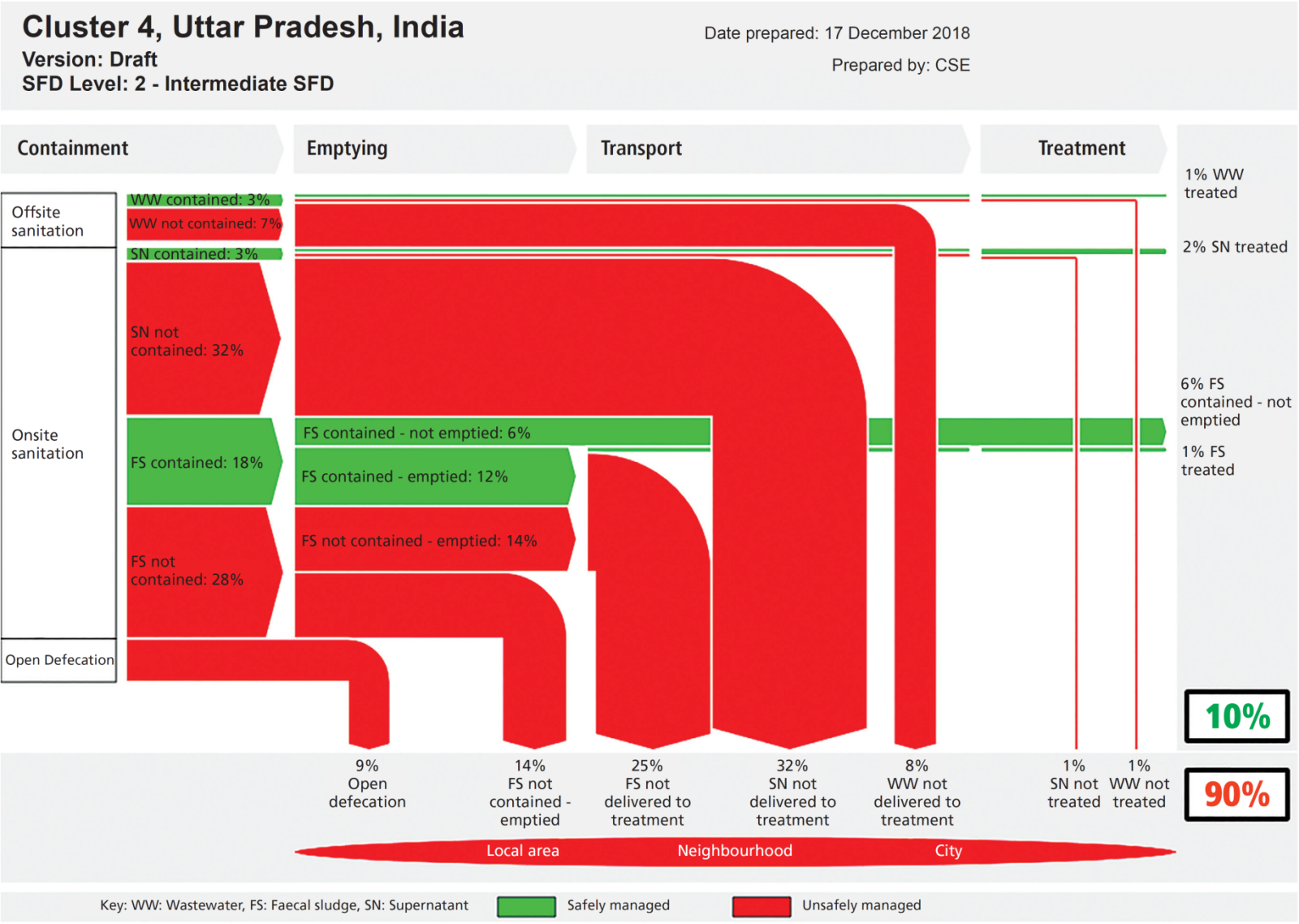
Cluster 3: Small and medium cities (1.2 -5 lakh)

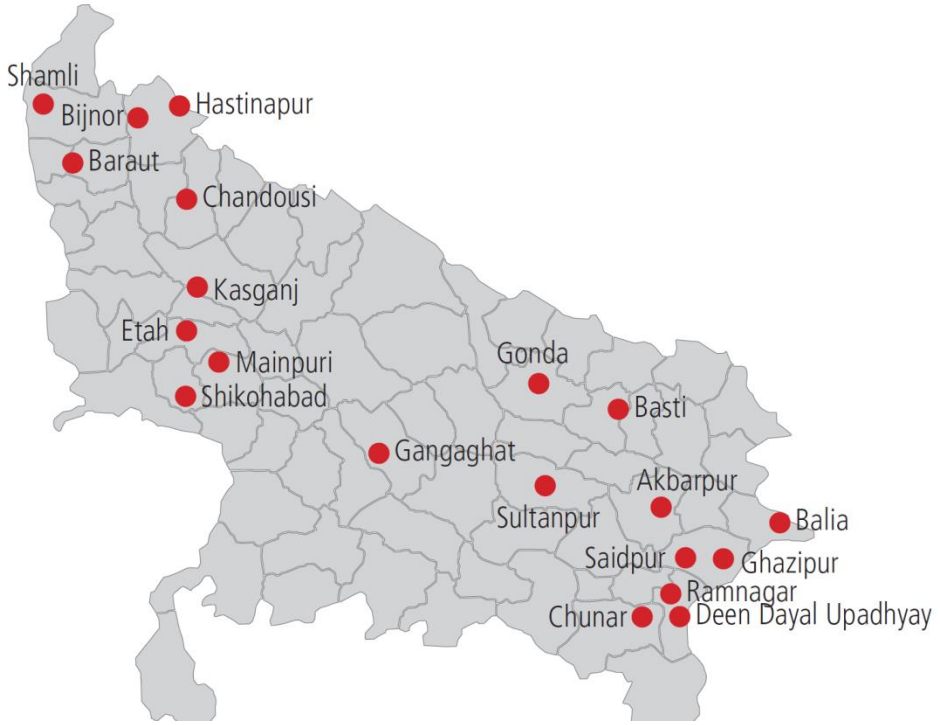




- **84% population depend on onsite systems** and more than 75% of these tanks are overflowing in drains
- Only 28% tanks qualified to be called as septic tanks
- Around 46% population gets their tank emptied only after 15 -20 years
- 5% population still defecates in open
- There are 10 STPs in the cluster which only take care of **excreta of only 2% population**

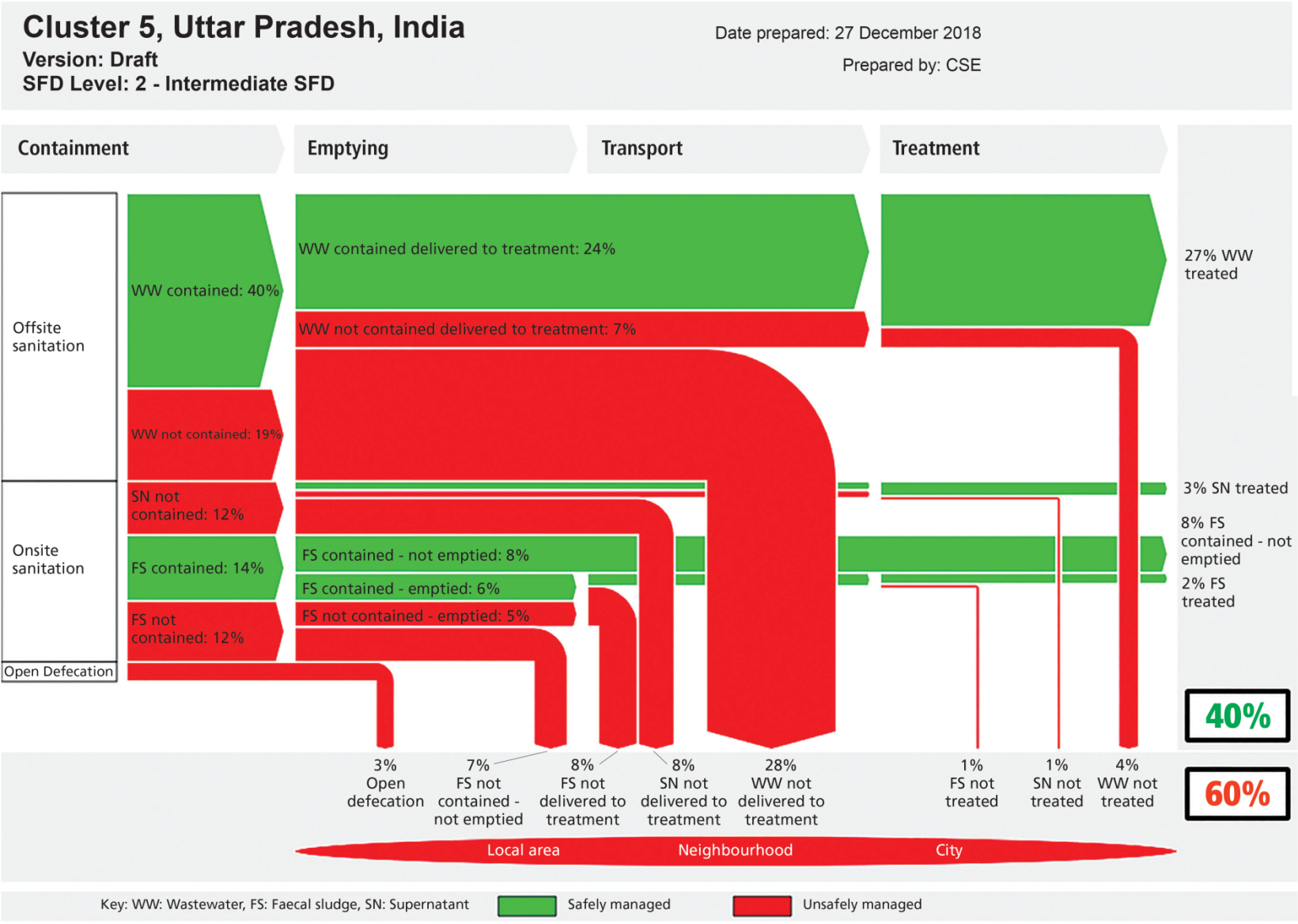
Cluster 4: Small cities (less than 1.2 lakh)

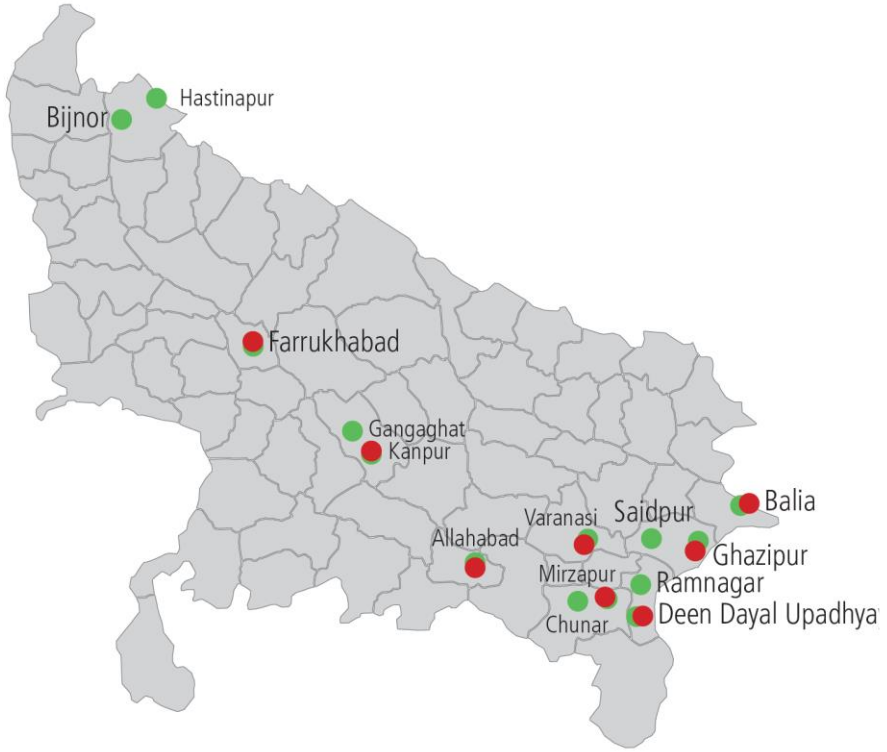




- **81% population depend on onsite systems** and more than 70% of these tanks are overflowing in drains
- **9% population still defecates in open**
- Around 40% population gets their tank emptied only after 15 -20 years
- 97% of vacuum tankers are tractor mounted
- Sewage treatment plants in **only three cities out of 21 cities** in the cluster

Cluster 5: Select cities along the River Ganga





- **40% population connected to sewerage network**, but excreta of 27% managed
- 38% population connected to onsite systems, out of which 24% overflow in drains
- **19% population directly discharging excreta in drains** without any onsite systems
- There are **18 STPs** in the cluster of cumulative capacity of 826.5 MLD, **which receive 655.7 MLD**

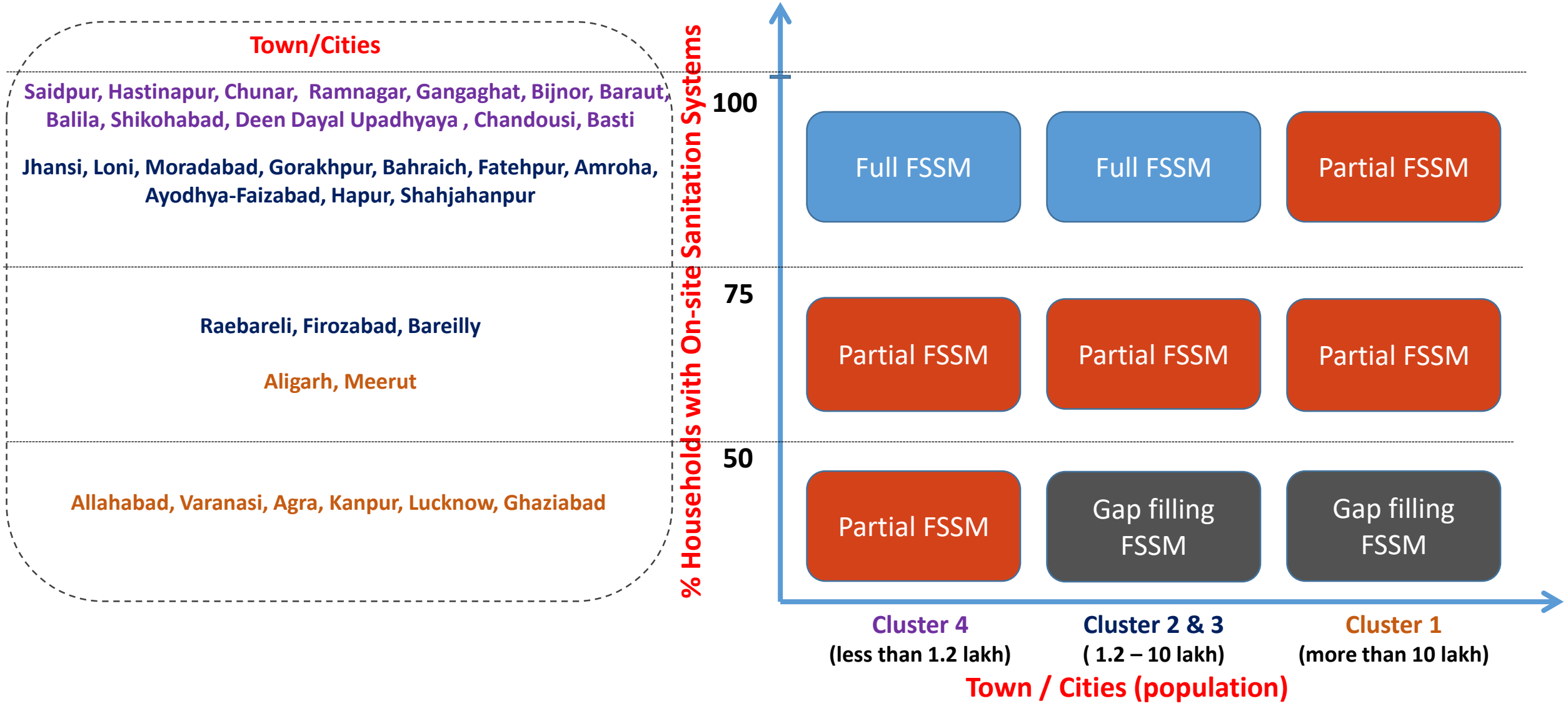
Toilet - STP+++

- Current sanitation focus is on **building toilets (important and necessary)**
- Current pollution-control focus is on **building sewage treatment plants (unnecessary without conveyance)**
- But people are building septic tanks – there is no official conveyance; **no official treatment**
- **End result is: pollution**

On-site needs:

- **Recognition**: official acceptance that these are not part of the past but the future
- **Regulations**: construction; collection; treatment
- **Technologies**: disposal and reuse

Proposed FSSM Approach Urban Areas in U.P.



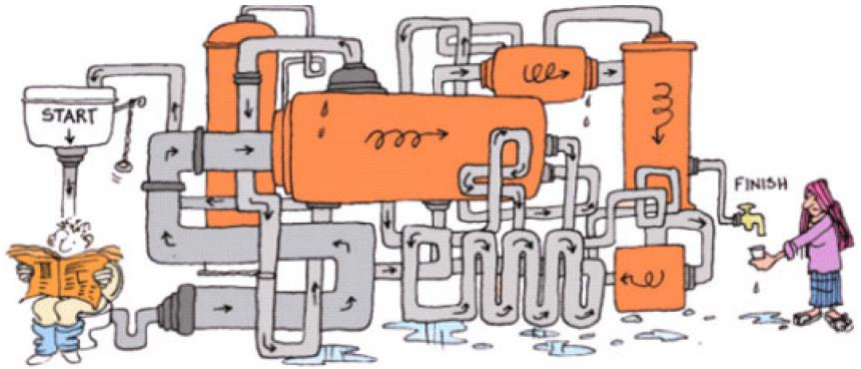
Full FSM with dedicated treatment facility

Partial FSSM – Combined FSSM & Sewerage system; co- treatment; DEWATs; On-site treatment system, FSSTP wherever necessary.

Gap Filling – Complete Sewerage; FSSM only for non - sewered pockets with treatment at FSSTP or Co-treatment at STP

More toilets and septic tanks built without sewer or safe disposal / treatment of septage will swamp the state & further increase manifold Ganga river pollution attributed to faecal coliform

Thank You



COVER STORY

URBAN SHIT

Every four in 10 houses in Indian cities and towns use latrines connected to septic tanks. Most municipalities do not have a proper plan to dispose of the faecal sludge collected in these tanks. Where does this sludge go?

RESEARCH BY SURESH KUMAR ROHILLA, BHITUSH LUTHRA, RAHUL SANKA VARMA, SHANTANU KUMAR PADHI AND ANIL YADAV

REPORTING BY JIGYASA WATWANI

MANOJ KUMAR should know the national capital's dirty little secret: where does the excreta of its residents not connected to the sewer system go? He has been working as a septic tank cleaner for 20 years. By now he owns three vacuum tankers that suck faecal sludge from septic tanks. Accompanied by his helper Rajbir Pal, he arrives at a house in Sangam Vihar locality in south Delhi. Rajbir Pal hops off the tanker and lays out a pipe to the septic tank in the house. He uses bare hands and laughs sarcastically at the idea of using a gas mask. "We have heard of instances where workers die when they have to go deep into the tank where toxic gases are emitted. We should at least be provided gloves," he says.

It is a two-storey building that houses seven families. Its septic tank should ideally have two chambers, with an outlet connected to a soak pit or some other treatment system for safe dispersal of effluent after the faecal sludge has settled at the bottom. Instead it is a single-chambered tank without any outlet, so its entire content has to be emptied. Small wonder

BLIND SPOT IN NAMAMI GANGE

Two flagship programmes of Prime Minister Narendra Modi are working at cross-purposes. By 2019, when Swachh Bharat Mission comes to an end, some 30 million septic tanks and pits would have been dug along the Ganga. These tanks and pits would produce 180 million litres of faecal sludge every day, which will eventually find its way into the Ganga, defeating Namami Gange. It's time the Central, state and local sanitation programmes recognised faecal sludge management as a priority to ensure a clean Ganga

RESEARCH BHITUSH LUTHRA, SHANTANU KUMAR PADHI, ANIL YADAV, AMRITA BHATNAGAR, BHAVIK GUPTA AND AISHWARYA VARADHARAJAN

REPORTING ANUPAM CHAKRAVARTTY

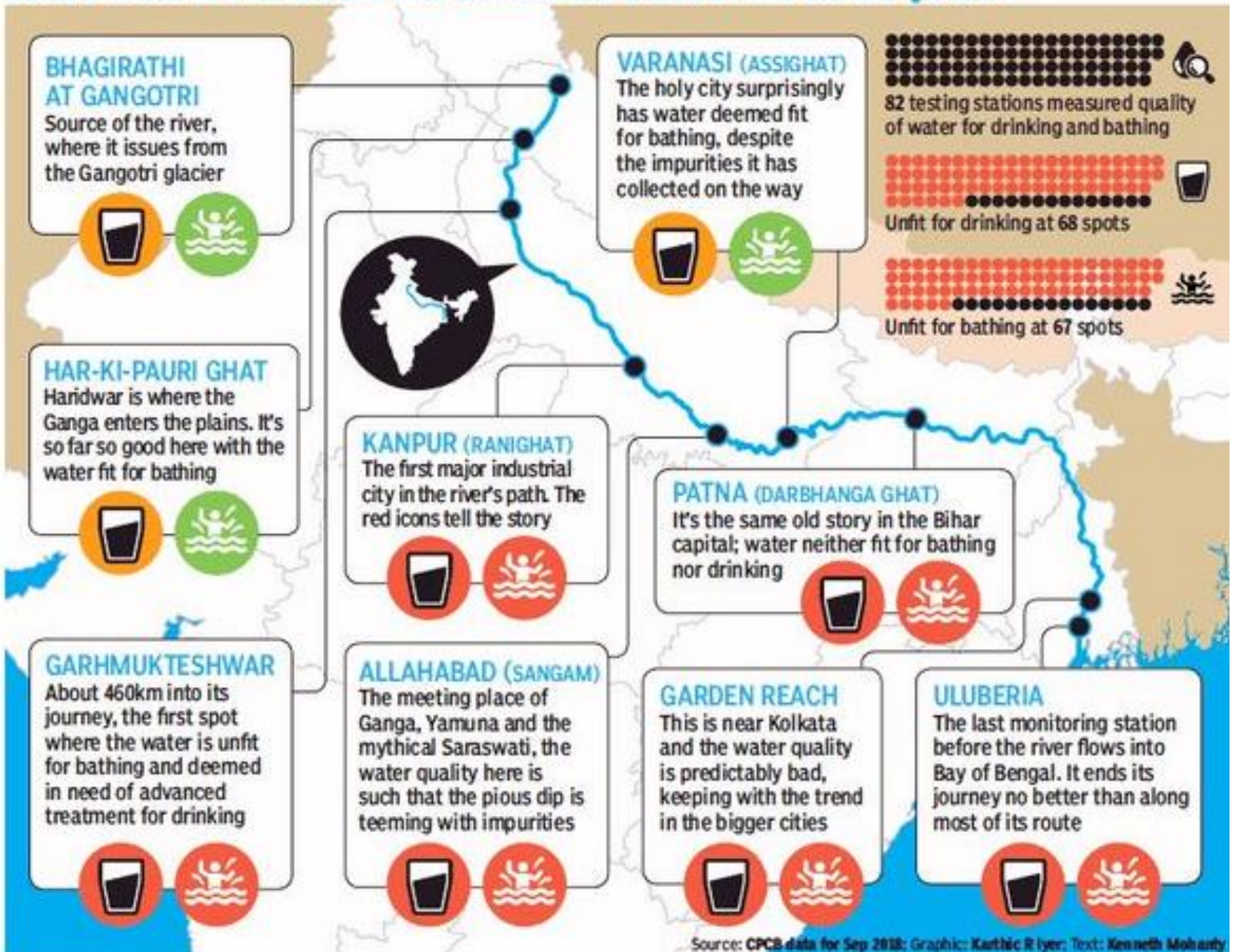
In Bihar's Katihar town most people have toilets with septic tanks. The urban local body collects septage and simply dumps it in the landfill at Udma Rekha

Defining & Monitoring River Water Quality

- **DO** (Dissolved Oxygen): refers to free non-compound oxygen present in water or other liquids. **It is crucial for survival of aquatic life.**
- **BOD** (Biological D0): It's the **amount of DO used by microorganisms** while metabolising organic matter (sewage or pollutants)
- **Total Coliform** : Class of bacteria found in faeces / excreta. It's **presence in drinking water** may indicate a possible presence of harmful, **disease causing organisms**

CPCB : What makes water fit for drinking ?

HERE'S WHAT A TRIP DOWN THE GANGES SAYS ABOUT ITS WATER QUALITY



Source: CPCB data for Sep 2018; Graphic: Karthic R Iyer; Text: Kenneth Mohanty