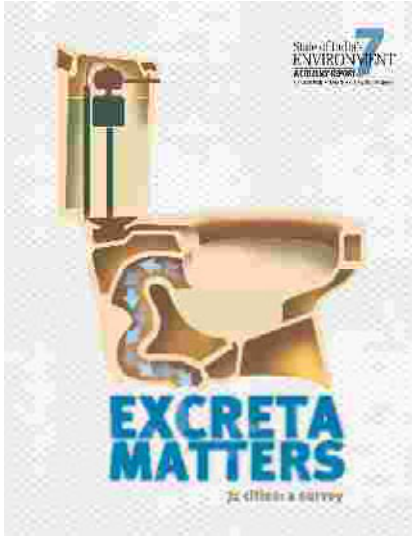
Sanitation's agenda: water-toilet-waste-pollution

Joining the dots for successful implementation of Swachh Bharat

CSE Delhi

Excreta Matters I

- file://localhost/Users/sunitanarain/Desktop/Excreta matter vol.1 PDF/Final chapters for book/Master Excel Checked.xls



71 city data analyzed
City water-waste profiles
Where does water come?
Where does waste go?
Simple questions
But not asked
Never answered

Water story in cities

Planners obsessed with water, not supply

Water sourced from further and further away

Leads to increasing cost of supply

Leads to high distribution losses

Less water to supply at end of pipeline

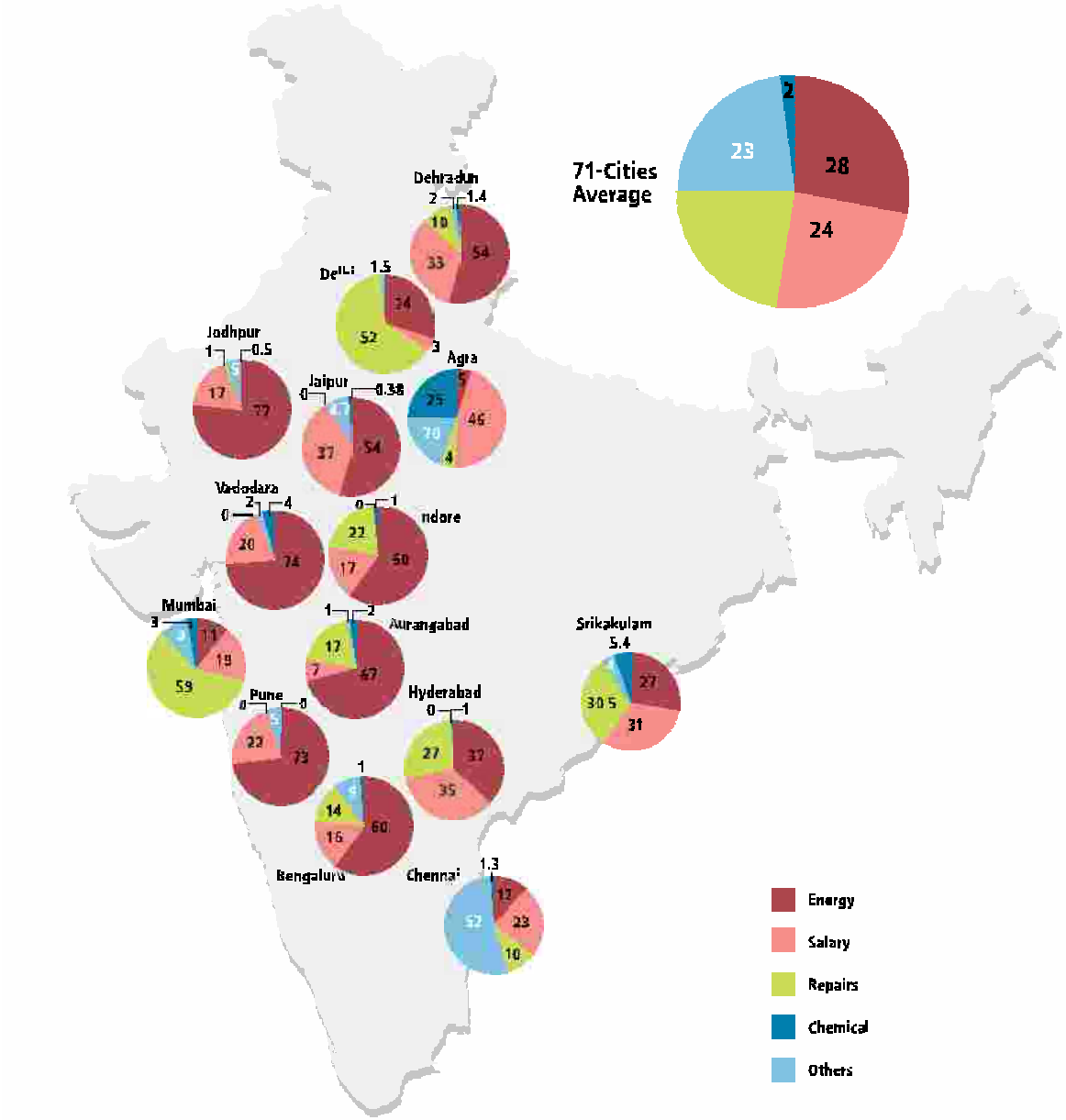
Less water means more costly water

Cities not able to recover costs of supply, have no money to invest in sewage

Energy costs are highest component of water supply

Make supply expensive
Difficult to reach all

COMPONENTS OF WATER SUPPLY IN DIFFERENT CITIES (IN PER CENT)



Source: Anon 2011, *71-City Water-Excreta Survey, 2005-06*, Centre for Science and Environment, New Delhi

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

- 2009:

Sewage generated = 38,255 mld

Capacity to treat = 11,788 mld (30%)

Sewage actually treated = 8,251 mld (22%)

78 % sewage is officially untreated and disposed off in rivers, lakes, groundwater

We flush, we forget

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

Generation of lost rivers

- Delhi knows only Najafgarh – a dirty drain
- Delhi does not remember that this was Sahibi – which once flowed from the Aravalli into a jheel
- Mumbai knows only Mithi – a dirty drain. But this was its river
- Ludhiana knows only Budha Nullah -- a dirty drain. But this was a darya – a river

We are a generation of lost rivers. How many more will we have to lose before we remember

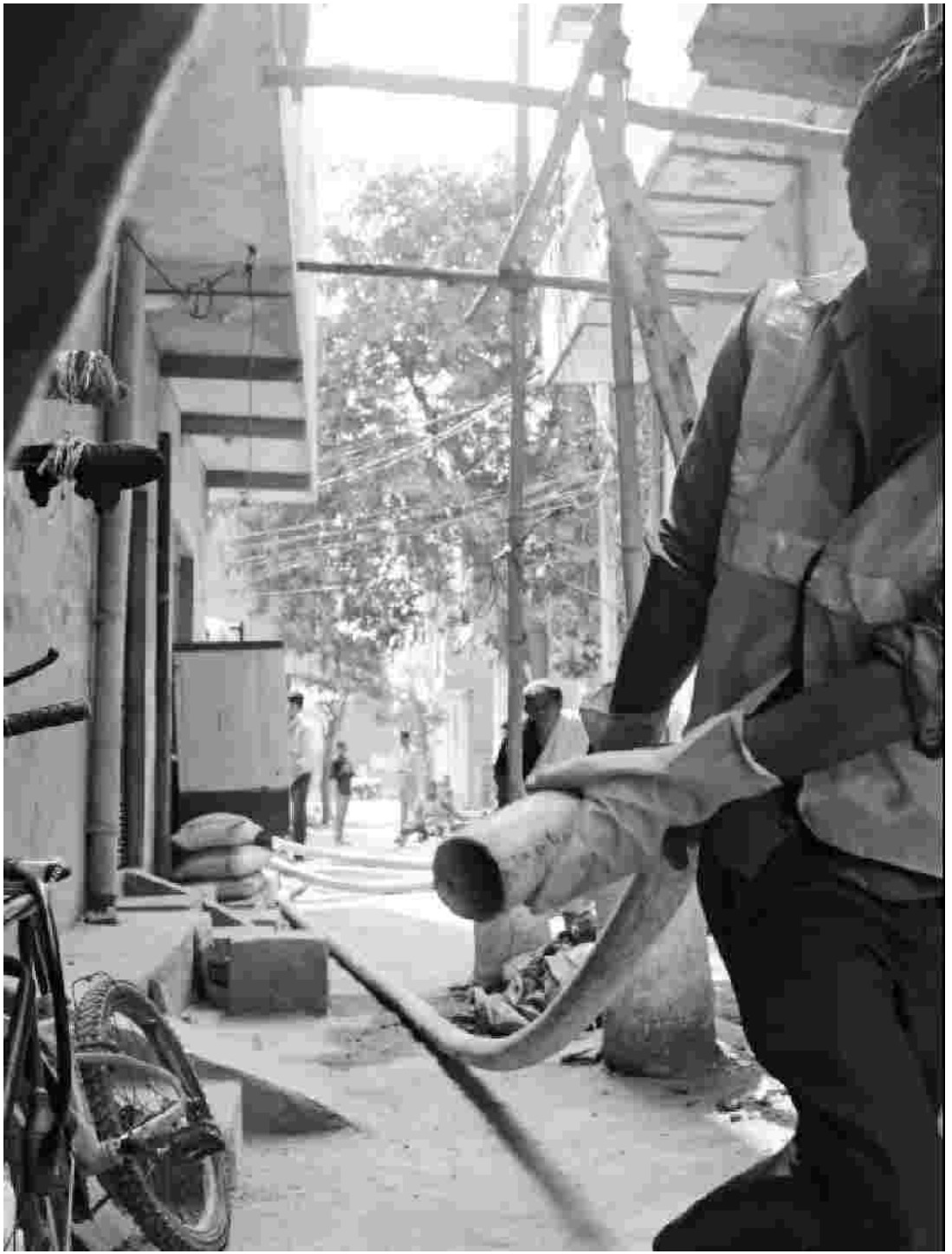
We forget
We all live downstream

Re-invent water and waste

1. Plan deliberately to cut costs of water supply
2. Invest in local water systems
3. Reduce water demand
4. Spend on sewage not on water
5. Cut costs on sewage systems
6. Plan to recycle and reuse every drop
7. Connect water conservation to sewage management

Excreta Matters II

Water-toilet-septage-sewage-treatment-reuse



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,

Cities do not have drains
New growth cities are growing without drains
Backlog and front-log impossible to fix
As cities fix one drain, another goes under

71-CITY SURVEY: AREA COVERED BY CLOSED DRAINS SHOWS REAL STATE OF SEWAGE COLLECTION

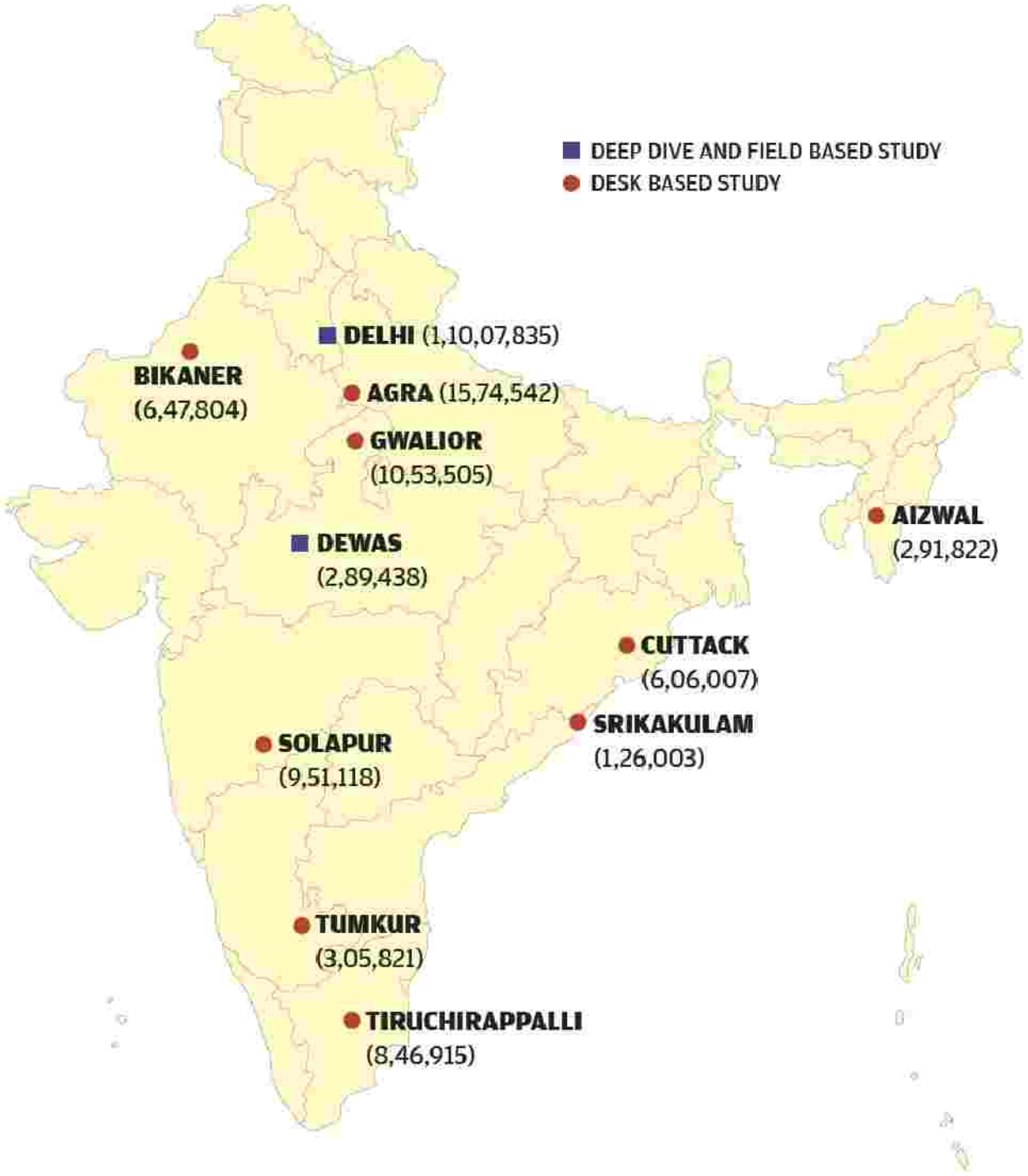
% of area covered	
0-10	Cuttack, Guwahati, Jabalpur, Jammu, Ranchi, Thane, Aizawl, Bathinda, Bhilwara, Siliguri, Srikakulam
10-30	Agra, Alwar, Aurangabad, Indore, Mathura, Meerut, Puducherry, Thiruvananthapuram, Dehradun, Dewas, Hubli-Dharwad, Jhansi, Kozhikode, Lucknow, Solapur, Tumkur, Udaipur, Ujjain, Dhanbad
30-50	Allahabad, Bengaluru, Bhopal, Delhi, Lucknow, Patna, Srinagar, Amritsar, Bhubaneswar, Jodhpur, Mumbai
50-70	Faridabad[2], Hyderabad, Jaipur[1], Kanpur, Kolkata, Nagpur, Gwalior, Mussoorie, Nainital, Rajkot, Vadodara, Yamunanagar
> 70	Chennai, Pune, Surat, Gurgaon[2]

[1]Claims 80% coverage in CSE survey, 65% in City Development Plan for JNNURM; [2]Faridabad and Gurgaon: only old-city within municipal limit included
Source: Anon 2011, *71-City Water-Excreta Survey, 2005-06*, Centre for Science and Environment, New Delhi

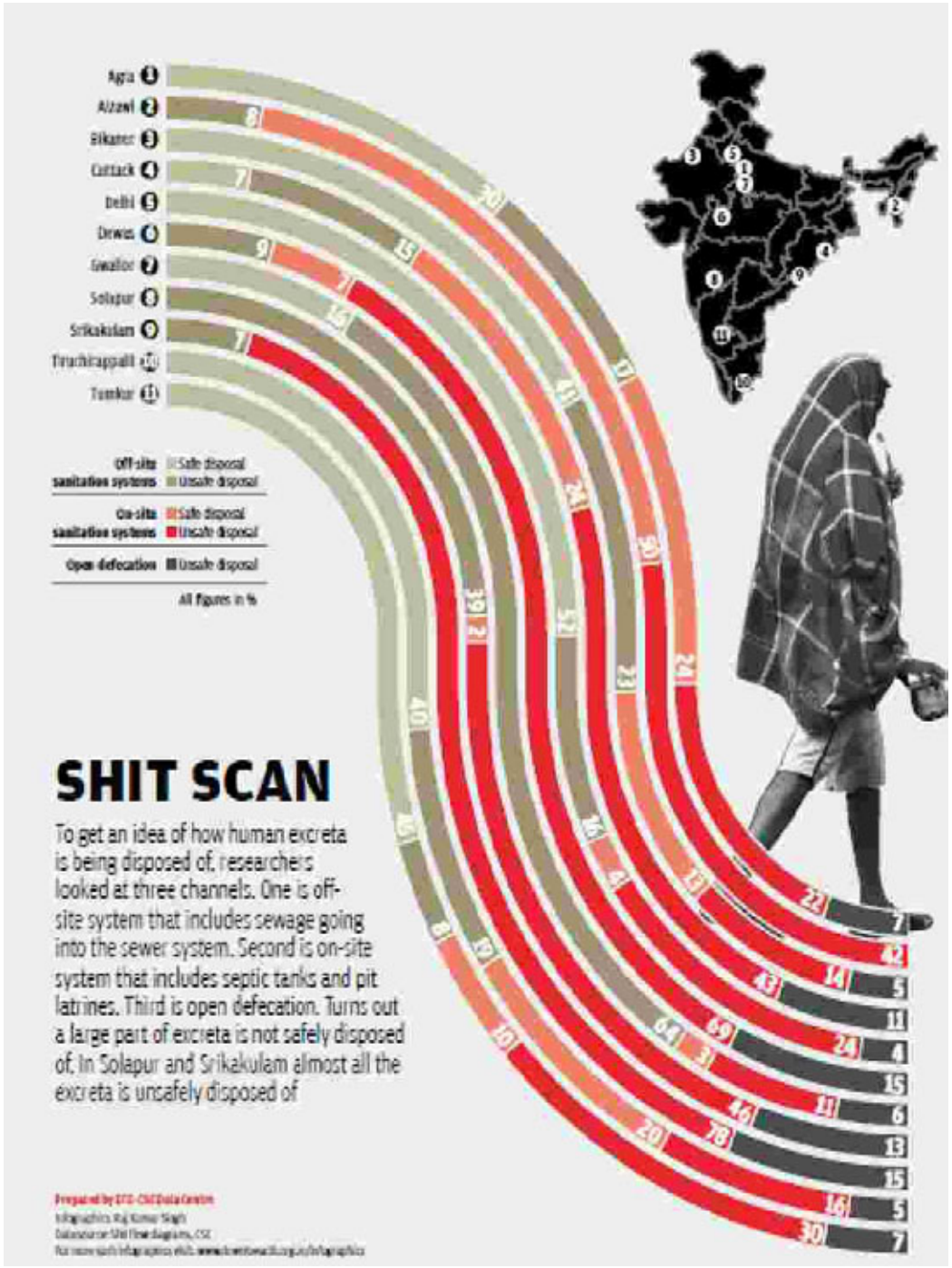
<10

Guwahati, Jabalpur, Jammu, Ranchi, Thane, Aizawl, Bathinda, Bhilwara, Jammu, Jabalpur, Siliguri, Srikakulam

Shit-Flow: mapping the sanitation story of cities



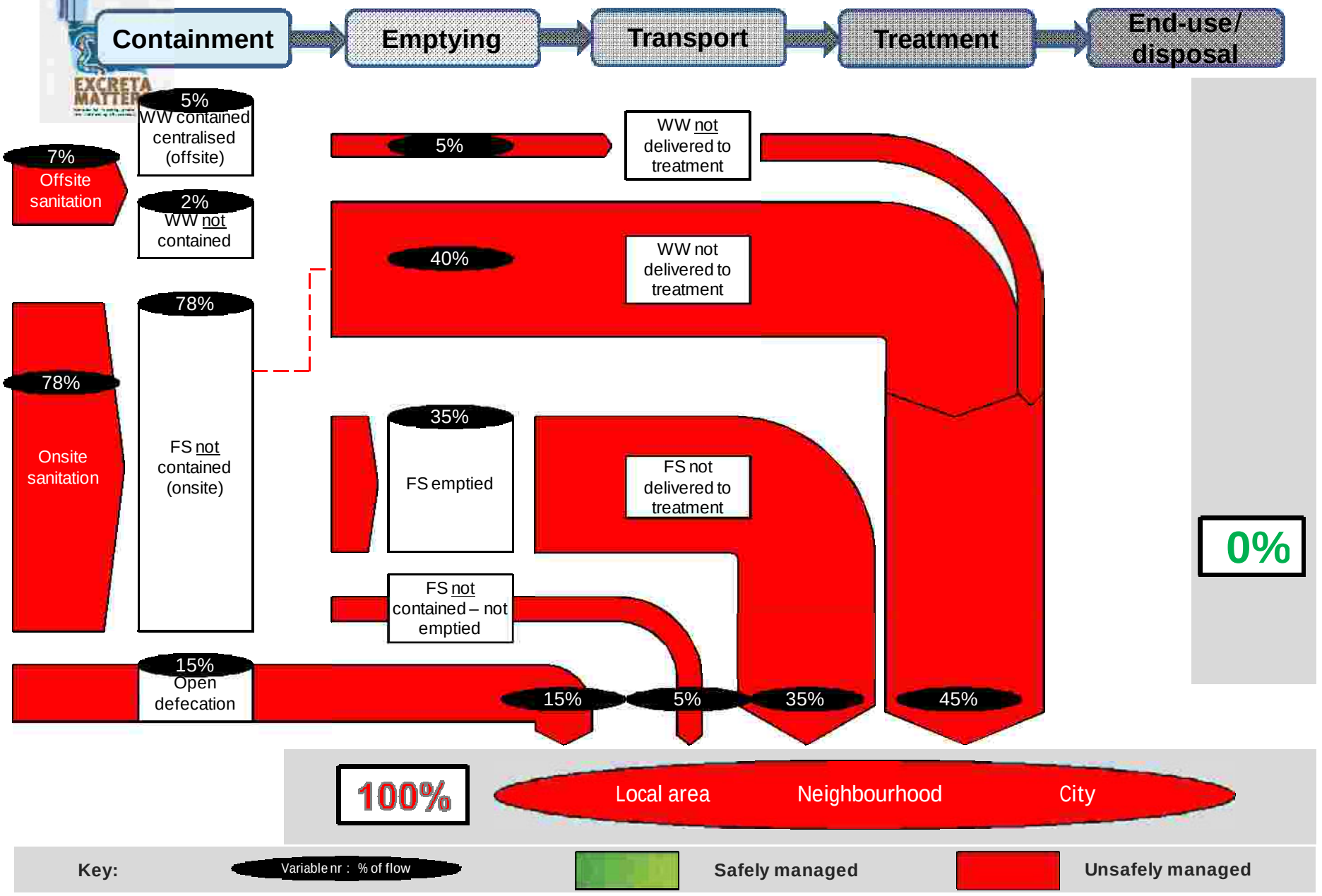

EXCRETA
MATTERS


Agra
Alizwl
Bikaner
Cuttack
Delhi
Dewas
Gwalior
Solapur
Srikakulam
Tiruchirappalli
Tumkur
Off-site sanitation systems
Safe disposal
Unsafe disposal
On-site sanitation systems
Safe disposal
Unsafe disposal
Open defecation
Unsafe disposal
All figures in %
SHIT SCAN
To get an idea of how human excreta is being disposed of, researchers looked at three channels. One is off-site system that includes sewage going into the sewer system. Second is on-site system that includes septic tanks and pit latrines. Third is open defecation. Turns out a large part of excreta is not safely disposed of. In Solapur and Srikakulam almost all the excreta is unsafely disposed of

Srikakulam- 31 July 2015

Desk based

Status: Final



Solapur-01 August 2015

Desk based

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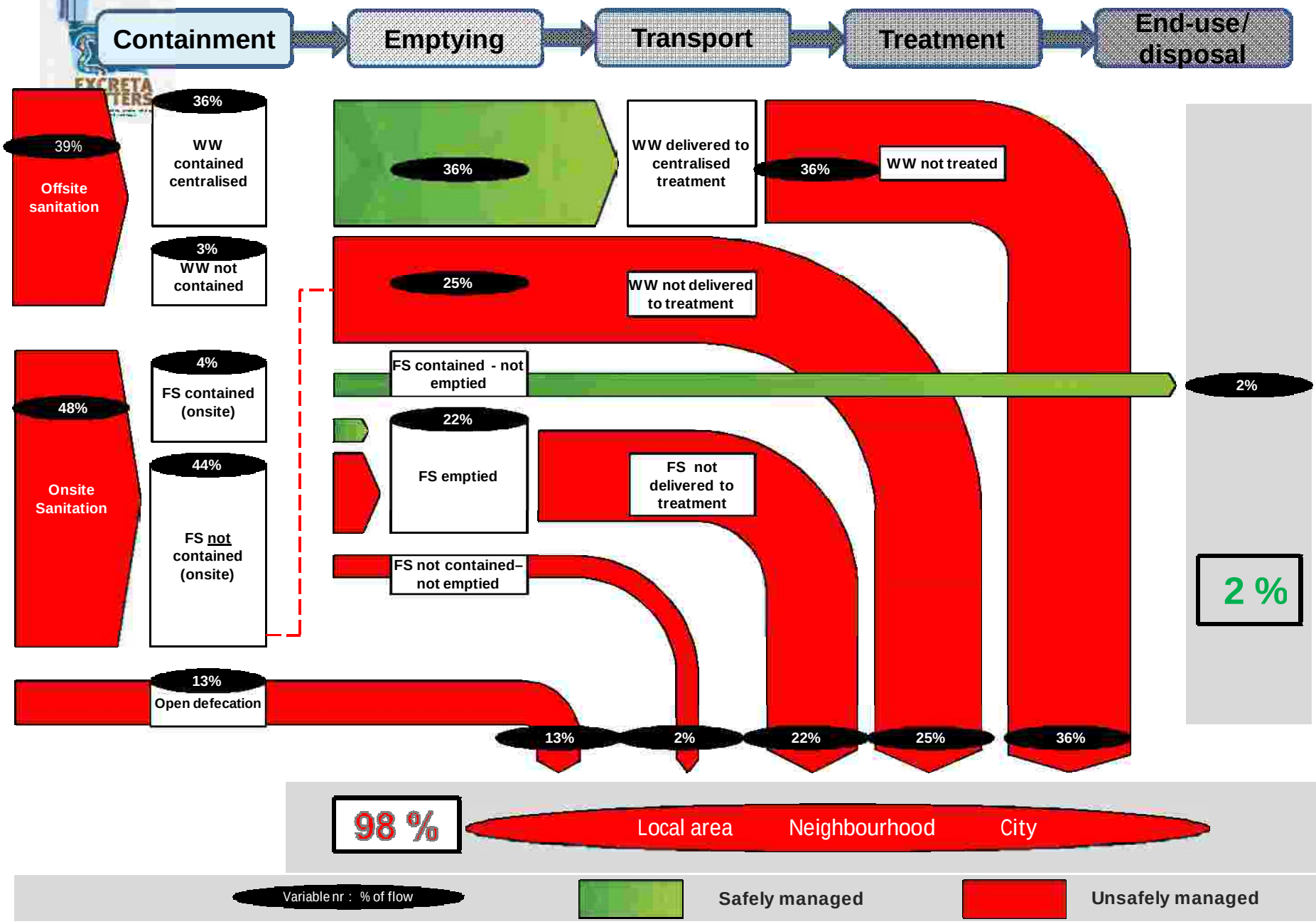

Dewas- 30 January 2016

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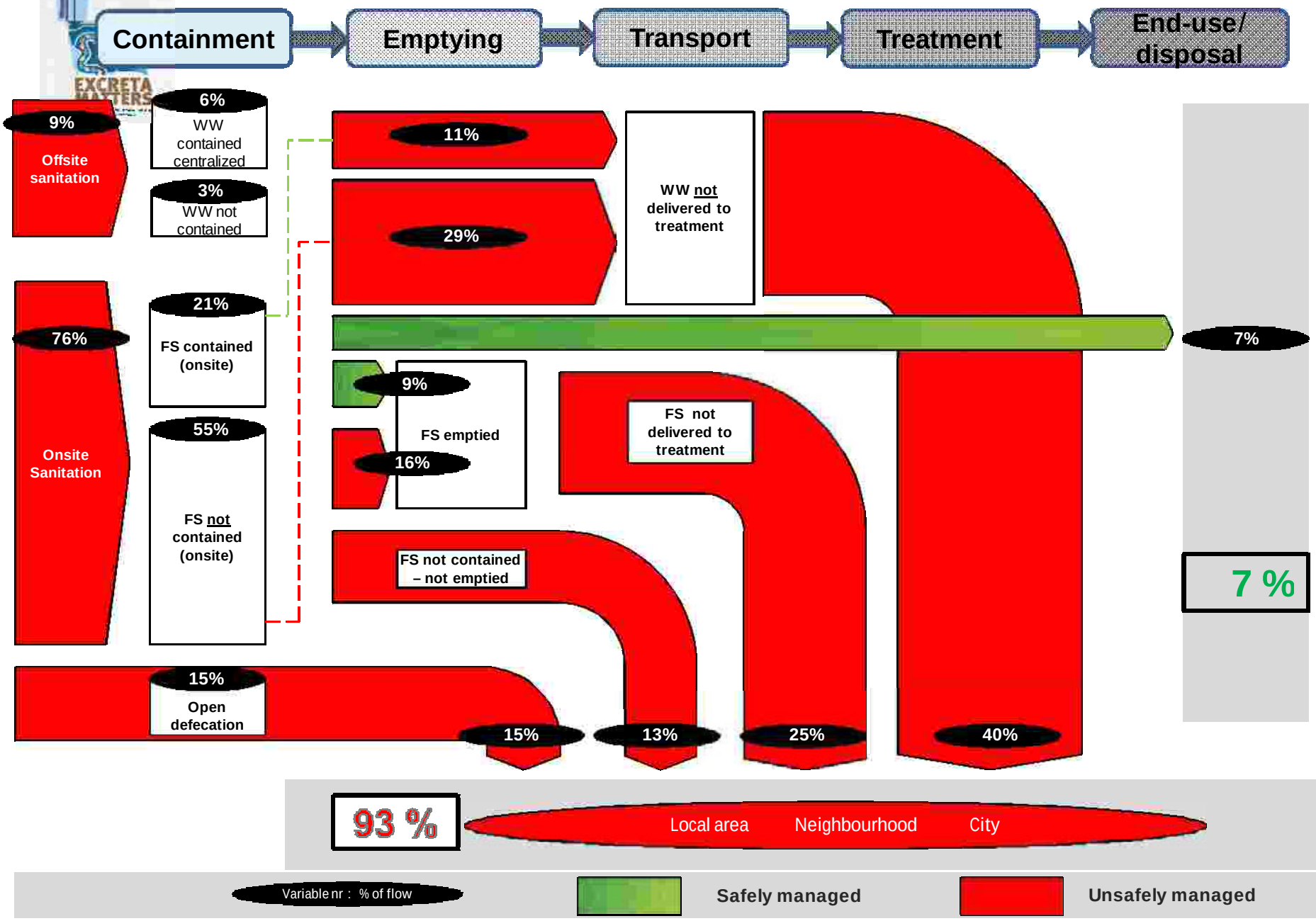

Gwalior-13 October 2015

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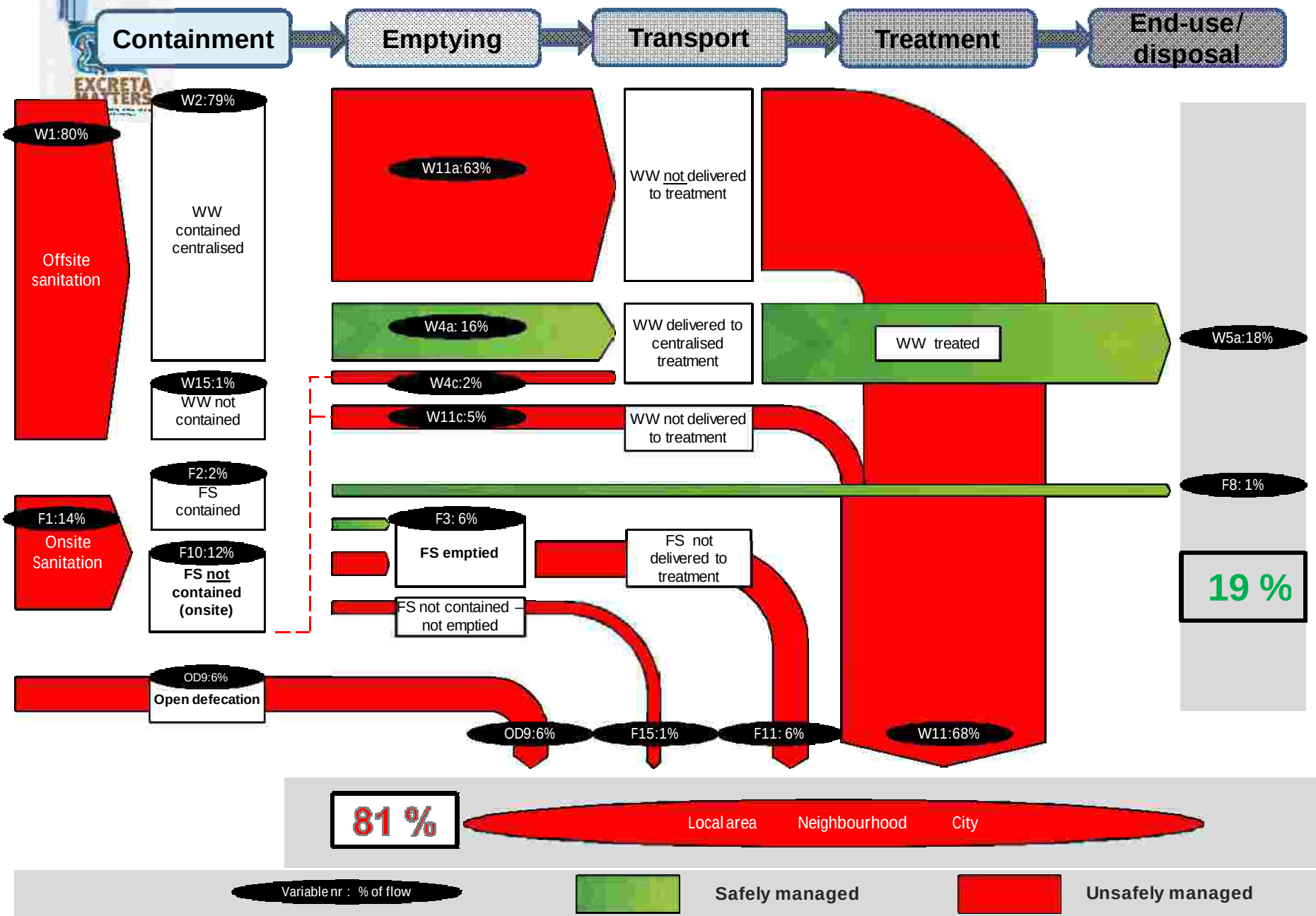

Cuttack- 28 July 2015

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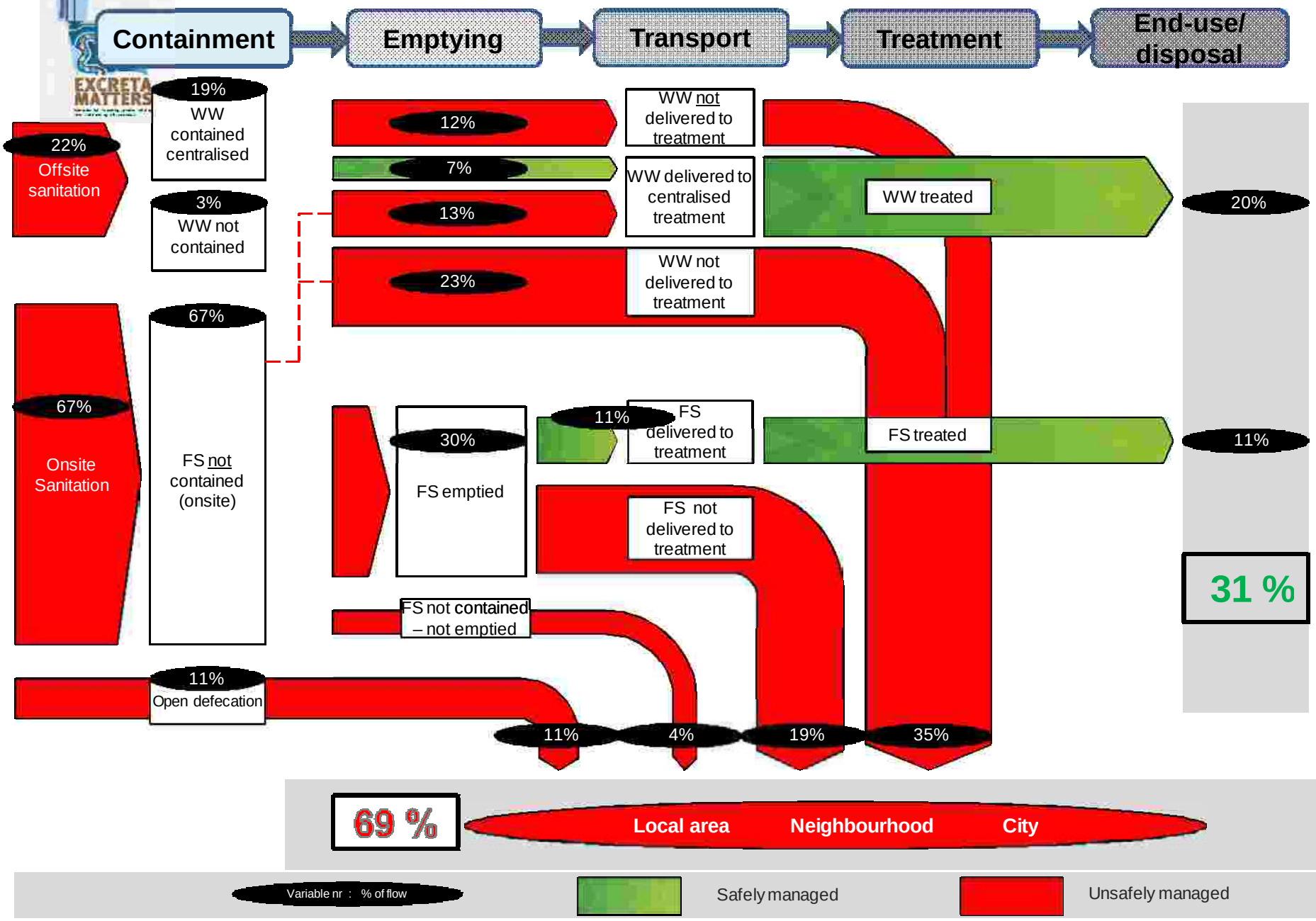

Aizawl- 29 July 2015

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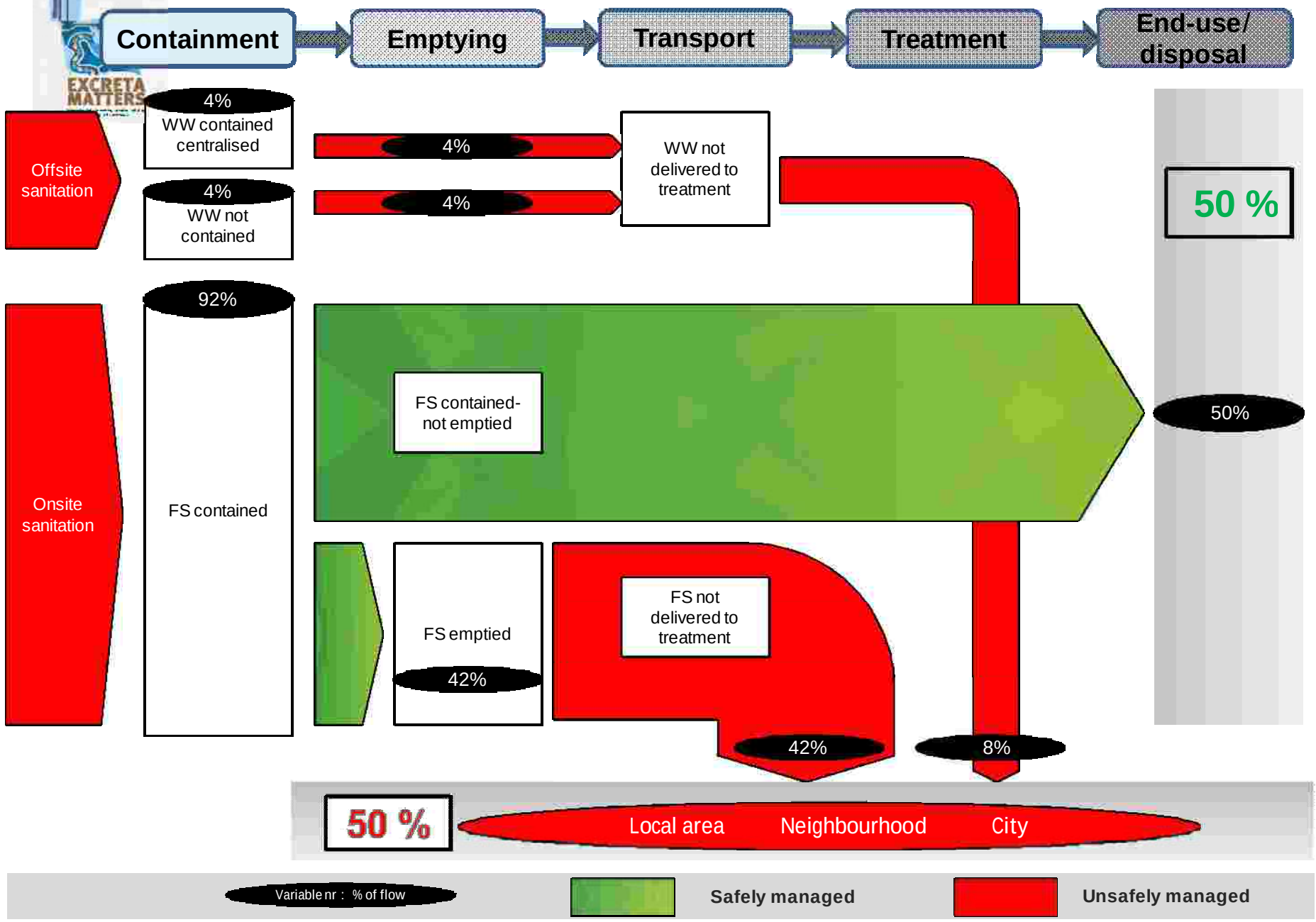

Agra – 21 October 2015

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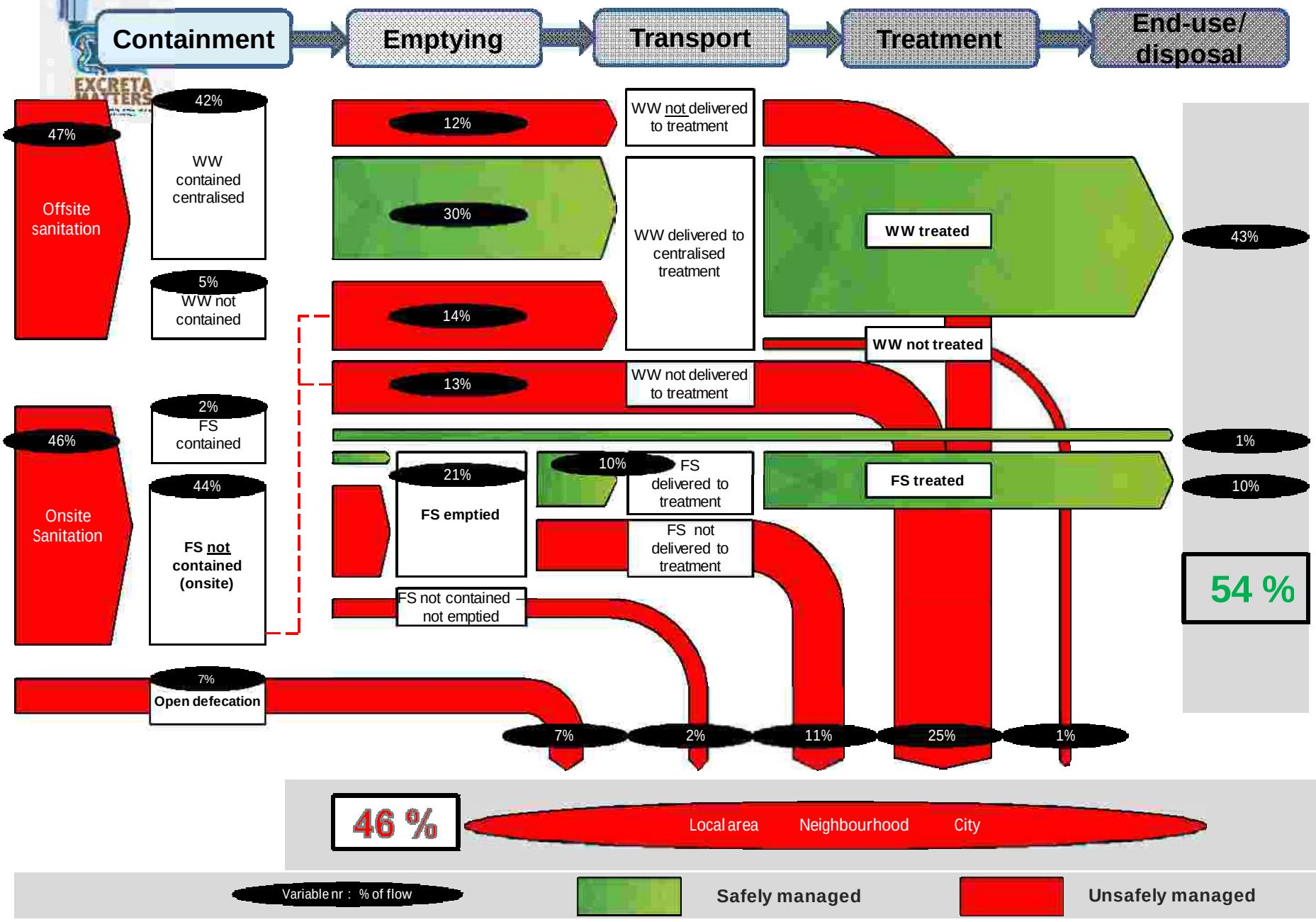

Tumkur- 03 August 2015

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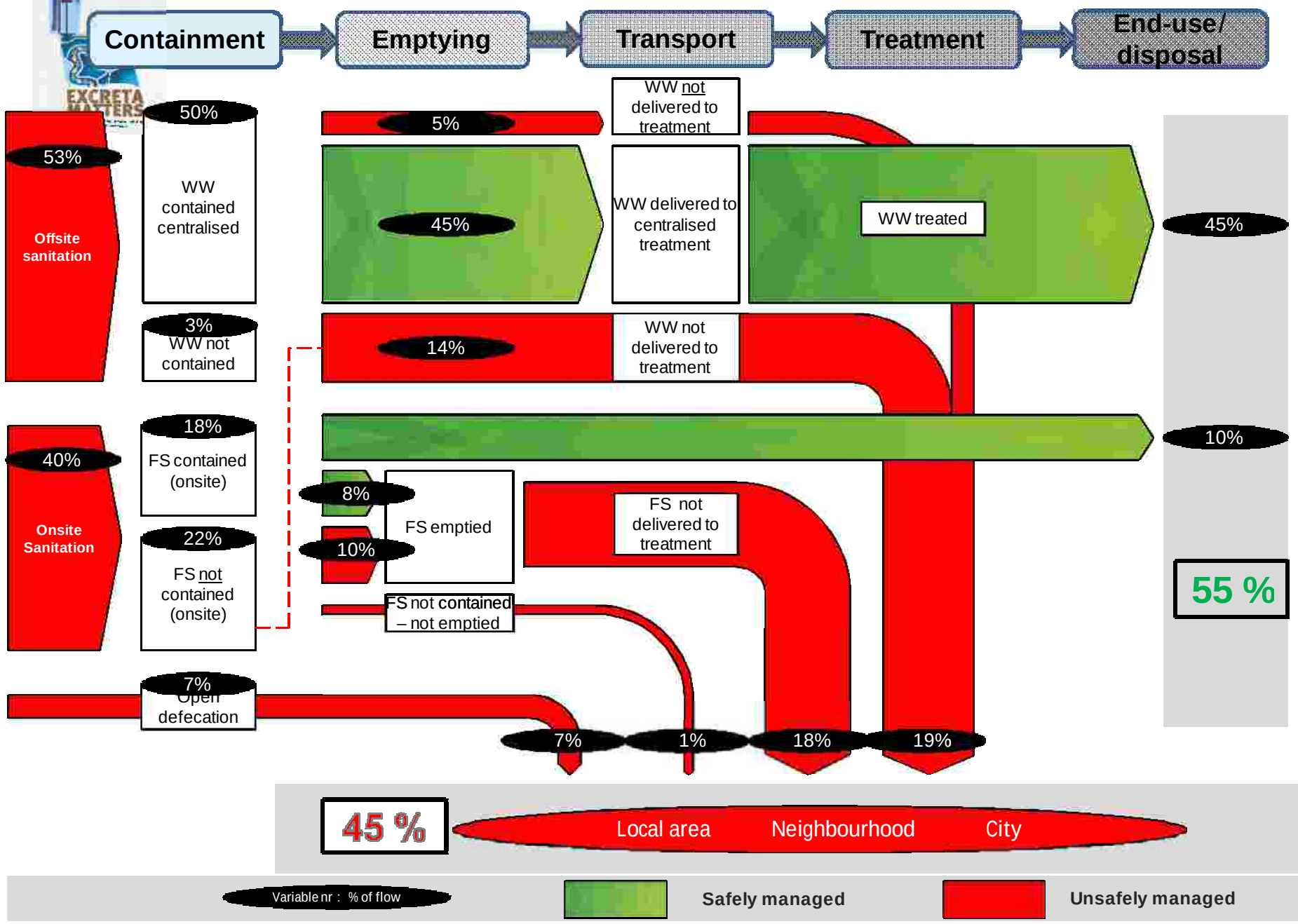
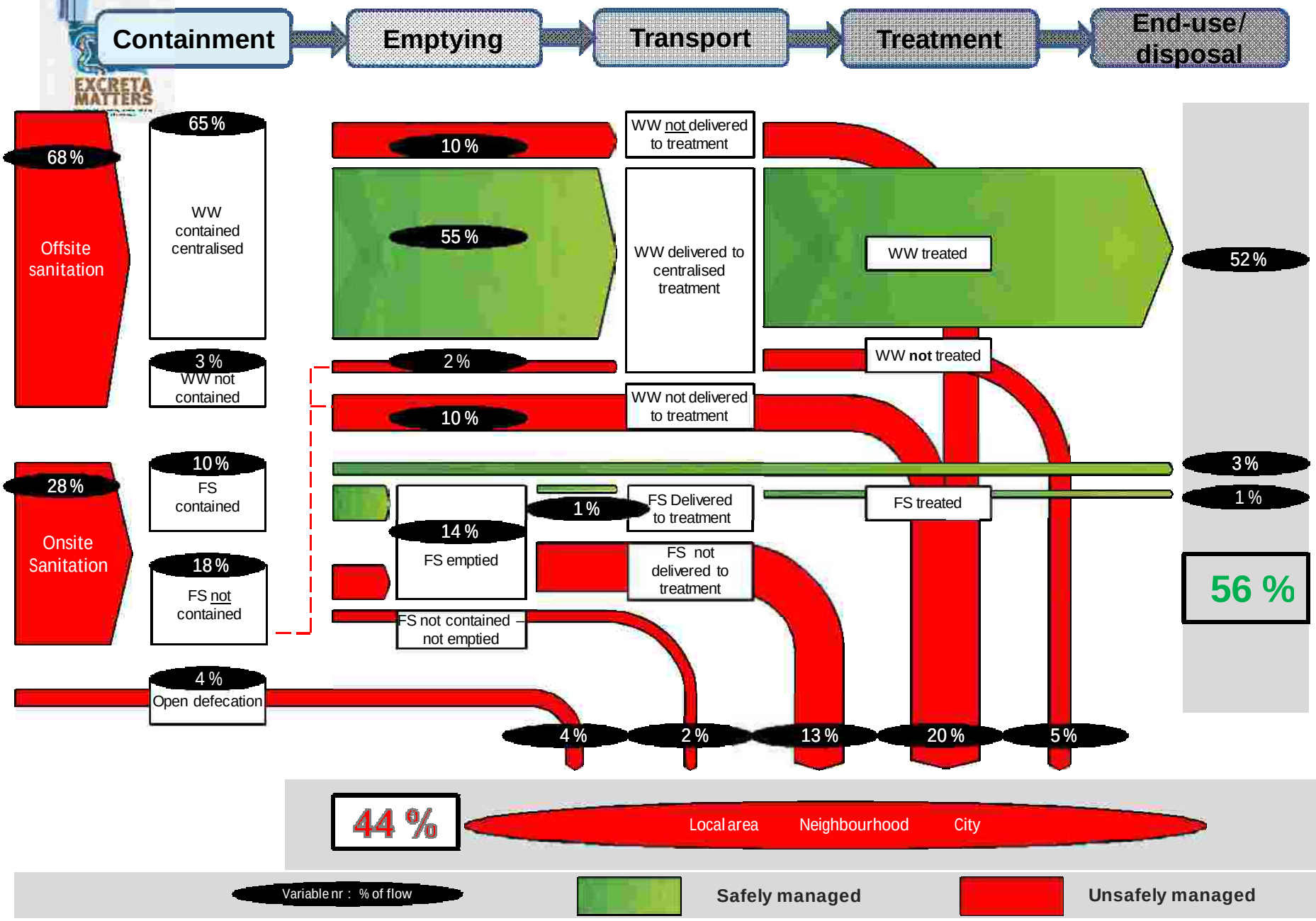


Delhi – 8 February 2016

Field based

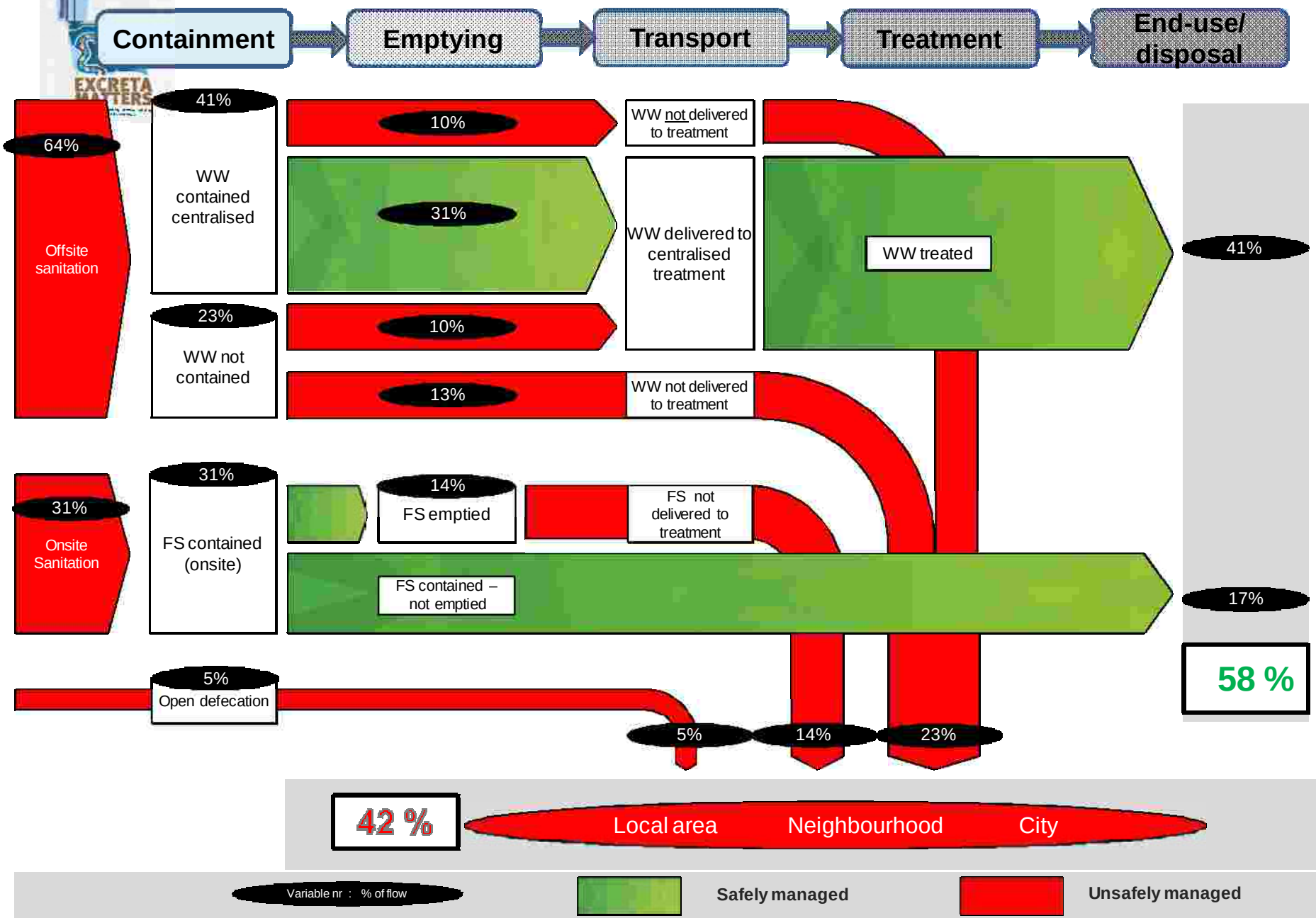
Status: Final



Bikaner- 14 September 2015

Desk based

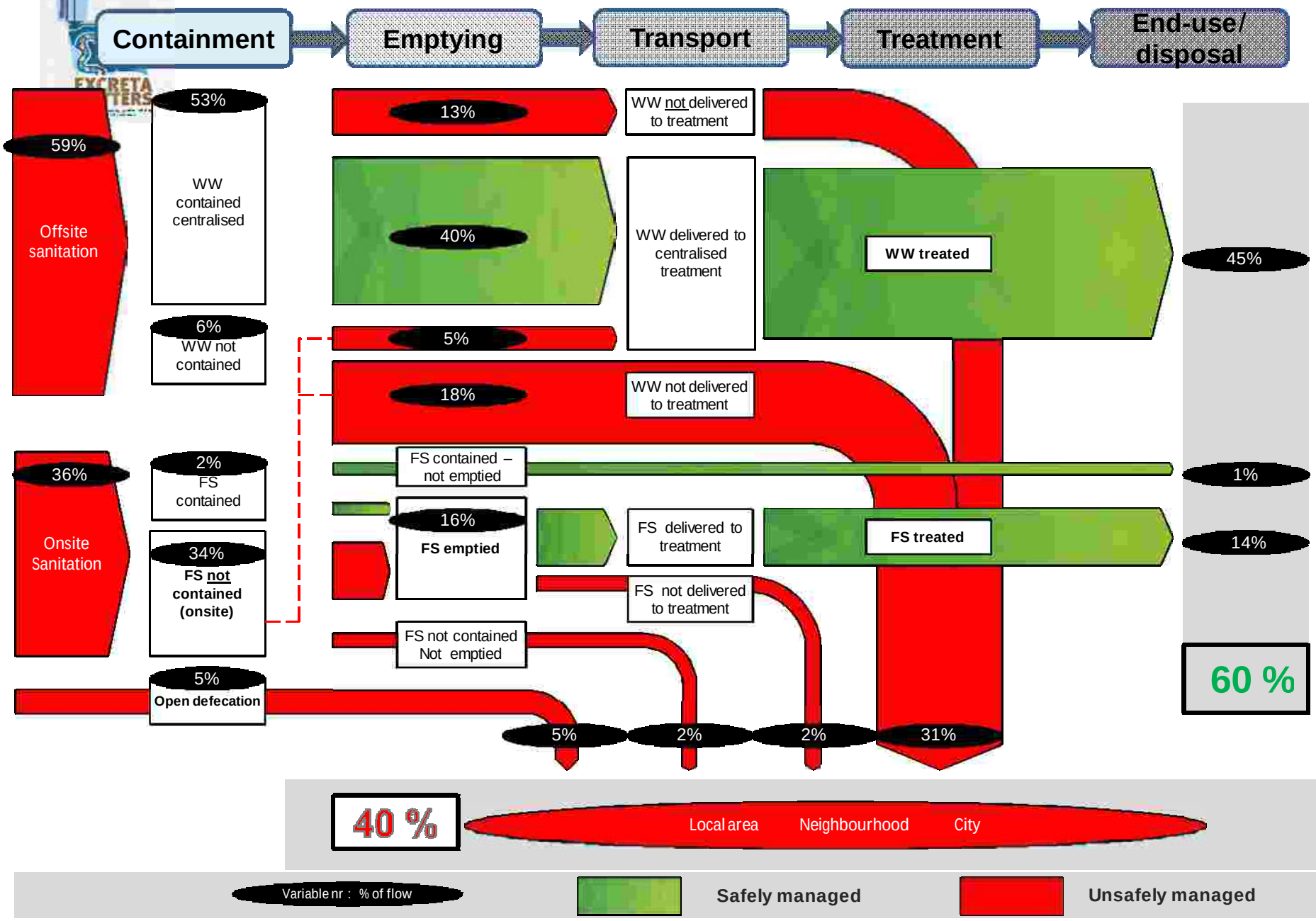
Status: Final



Tiruchirappalli- 26th September 2015

Desk based

Status: Final



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?

Delhi outskirts: untreated faecal sludge dumped in fields

Disposal in storm water drain Ghitorni, Delhi

Disposal in Sholapur: garbage dumps

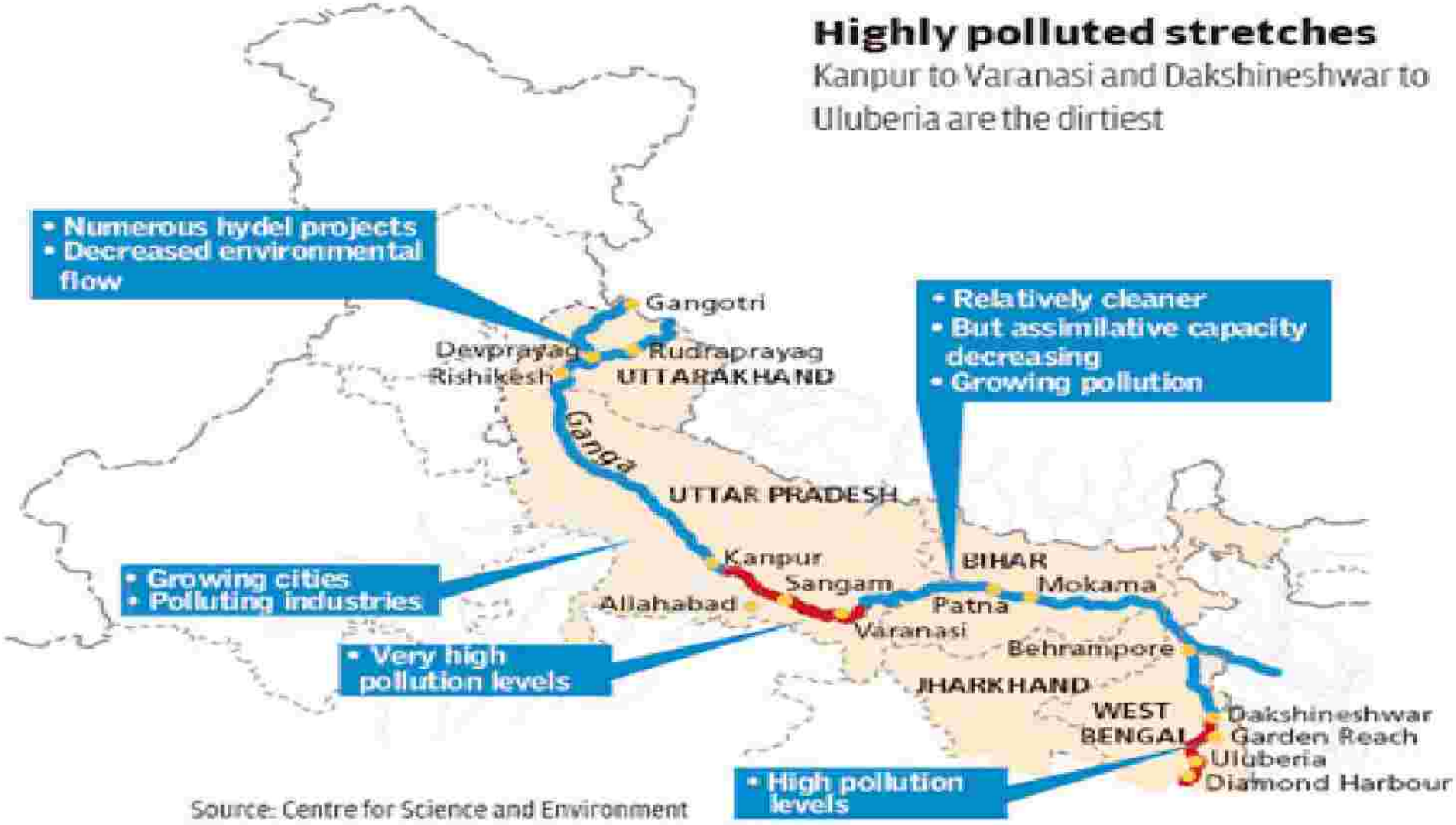
Cannot ‘clean’ India
Cannot ‘clean’ Ganga

- Important to join the excreta-dots – toilets have to be linked to disposal and treatment systems
- ODF++++
- Swatch Bharat ++++
- AMRUT ++++
- Ganga Mission ++++

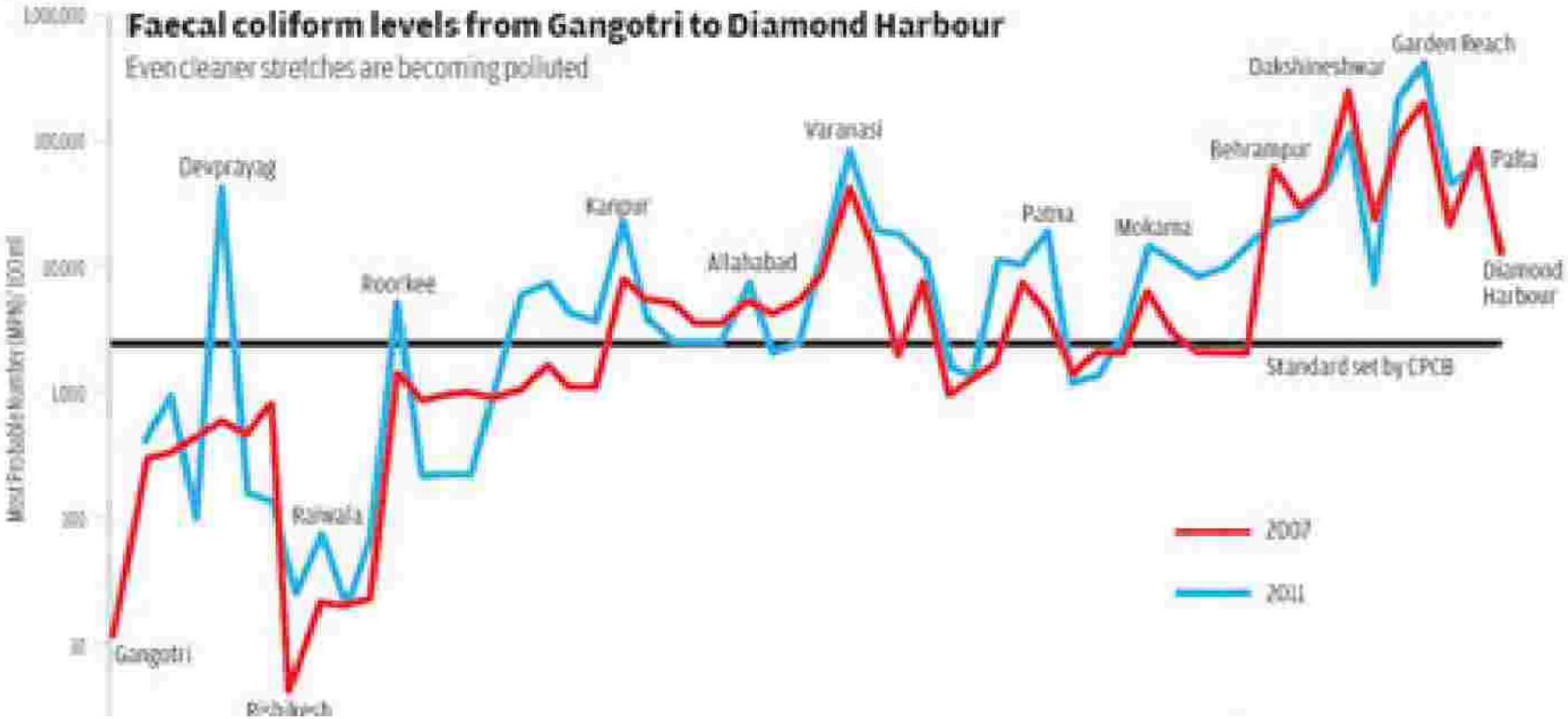
Toilet-STP+++

- 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

How polluted is the river?



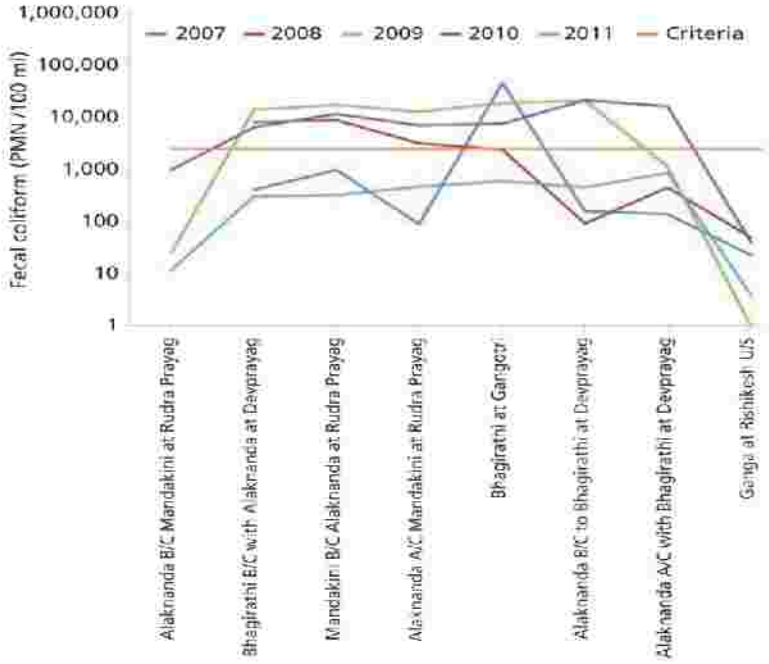
Ganga's journey: Gangotri to Diamond Harbour



Even the cleaner stretches are becoming polluted

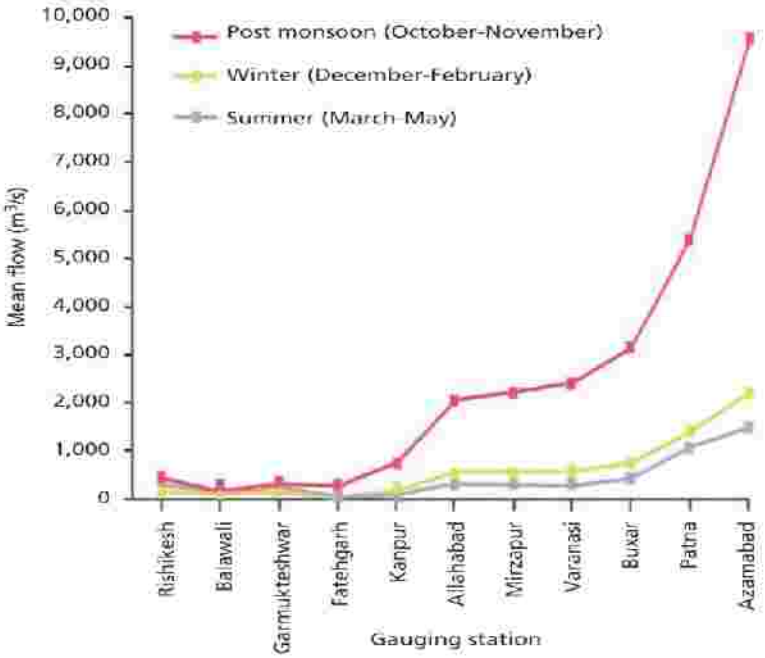
Ecological flow– need for dilution

Graph: Annual trend of fecal coliform: the upper reaches



Source: CPCB 2013, *Pollution Assessment: River Ganga*, Central Pollution Control Board, MoEF, July

Graph: Seasonal mean discharge into the Ganga



Source: CPCB 2013, *Pollution Assessment: River Ganga*, Central Pollution Control Board, MoEF, July

STP catch-up games: don't catch-up

Table: Sewage generation and treatment capacity created in the Ganga

	2009	2012
Sewage generation (MLD)	2,638	2,723
Treatment capacity (MLD)	1,174	1,208
Gap (MLD)	1,464	1,514
% gap: treated vs untreated	**55**	**55**

Source: CPCB 2009 and 2013

Even as we invest in sewage treatment capacity, the gap remains the same

Sewage generation is underestimated

Table: Difference between actual and measured sewage generation

	Official estimate of sewage generation (MLD)	No of drains	Actual measured sewage flow (MLD)	Gap (untreated waste) (%)
Uttarakhand	61	14	440	95
Uttar Pradesh	937	45	3,289	86
Bihar	407	25	579	71
West Bengal	1,317	54	1,779	69
Ganga mainstream	2,723	138	6,087	80

Source: CPCB 2013, *Pollution Assessment: River Ganga*, Central Pollution Control Board, MoEF, July

Underground sewerage does not exit: cannot convey waste to treatment plants

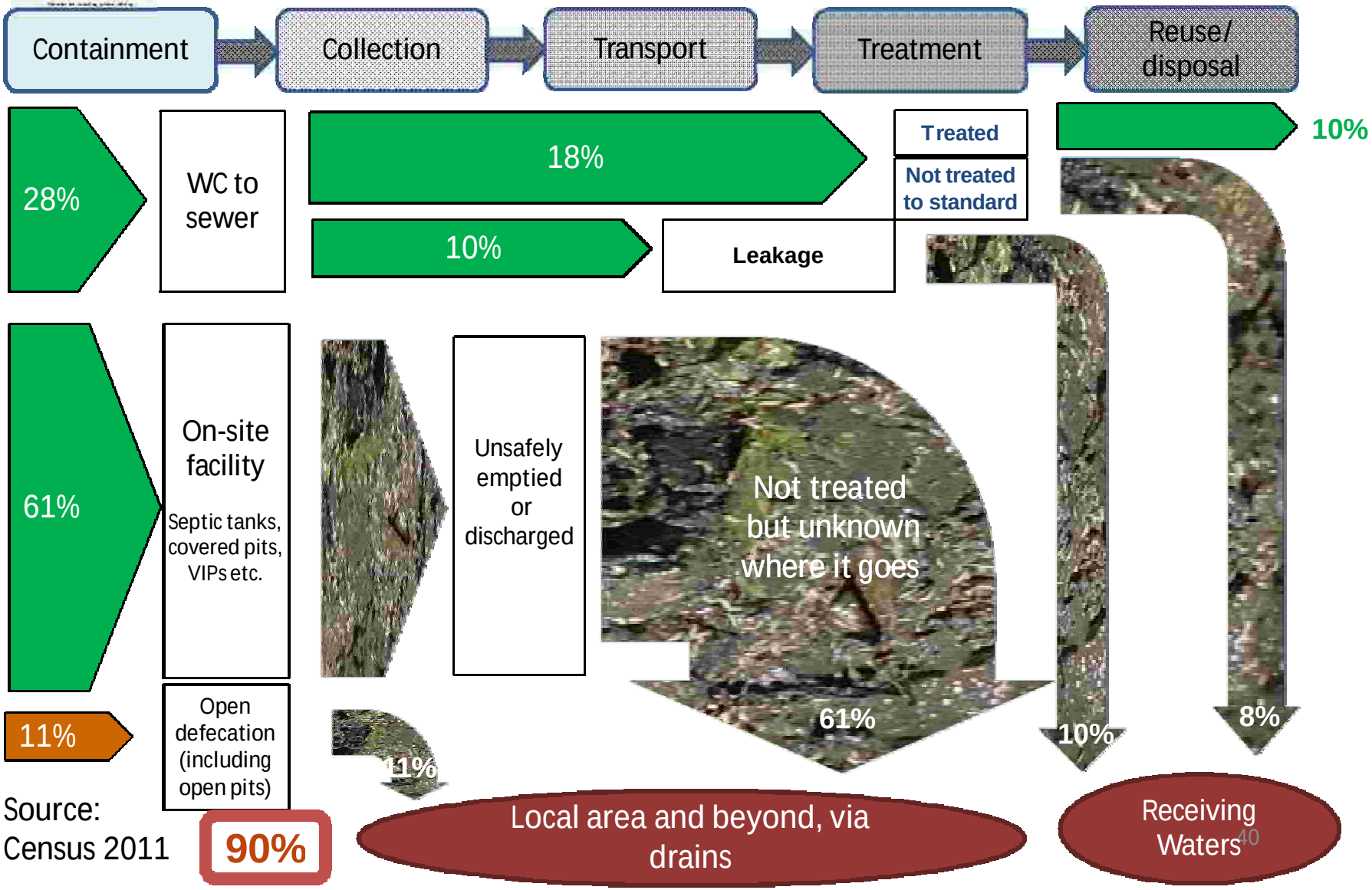
Table: Connectivity for sewage treatment plants: UP cities

City	Area of city (ha)	Area with sewerage (ha)	Un-sewered area (ha)	Un-sewered area (%)	Drains
Kanpur	25,810	7,558	18,252	71	37
Allahabad	9,510	2,013	7,397	78	57
Varanasi	10,058	1,635	8,432	84	23

Source: UP government 2010, Presentation made at the meeting of the Executive Committee of the State Ganga River Conservation Authority, Lucknow, *mimeo*

Ganga Basin Cities:
Excreta Flows

Sewer coverage	No of Cities	% of population	% population
<10 %	57	2%	25%
10 - 30%	64	6%	36%
30 - 60%	16	13%	27%
>60%	6	8%	12%



Source:
Census 2011

Opportunity: re-invent future sanitation solutions

- If India can jump-skip-leapfrog the landline-grid route in connectivity in telephones and energy access then why not in sanitation?
- Cost-effective (do not have to plan for underground sewerage for door-to-door conveyance)
- People are managers (if septic tank is overflowing then NIMBY kicks in)
- Already exist – do not have to re-engineer entire cities for sewerage networks

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

Opportunity: Re-use

- Water-based sewage systems destroy the nitrogen-cycle of world
- Water used to flush excreta; water as conveyance; water for disposal
- Nutrients lost
- Food security lost
- Water polluted
- Land-based sewage systems can repair this

Land-based: agenda

- Nutrients-Food-Excreta-Nutrients-Food
- Excreta is segregated in septage systems (mostly and challenge is to keep it like this)
- Excreta can be used as nutrients for soil – reused in agriculture or compost
- How? What is best practice? What is primary treatment required? Who will pay for it? How will city regulate reuse?

Our common agenda

- Link the Clean-India funds to water-sanitation plans (toilet++++)
- Map on-site in City Sanitation Plans
- Include on-site regulations in city sanitation plans
- Research the best-practice regulations and technologies for affordable and so sustainable sewage treatment

The nation needs to know

Where does your water come from?

Where does your excreta go?

https://www.youtube.com/watch?v=QU098R2pKHk