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Water and Sanitation in
Developing Countries

Innovations in Sanitation Planning

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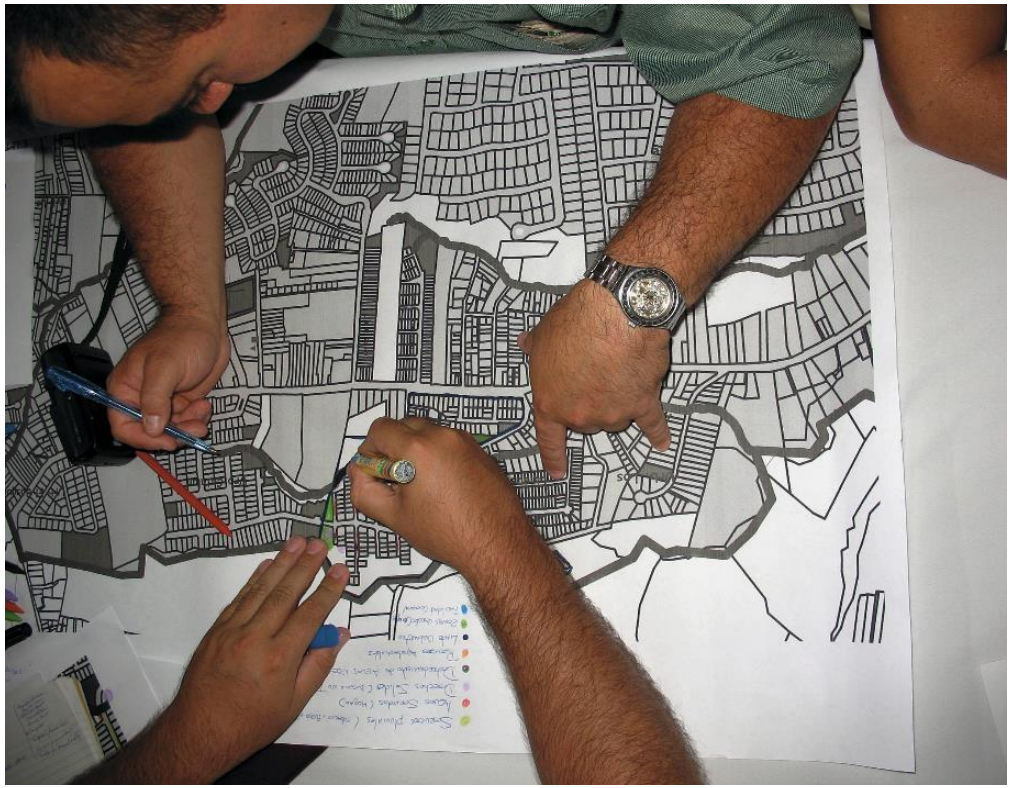
Learning Goals



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1. ***Understand the City-wide Inclusive Sanitation approach***
2. ***Examples of latest research in planning***
3. ***Video example from India***

Potential for integrated planning models?

	1 Planning model	2 Market model	3 Collective action model
Overriding principal	Bureaucratic organization	Market processes	Community action
Decision-makers	Administrators, engineers, public officials	Individuals, households, vendors, enterprises	Leaders and members of grass-roots organizations
Criteria for decisions	Policy, and conformity with a plan	Efficiency, maximization of profit or utility	Interests of members and visions of leaders
Guides for behaviour	Targets, regulations and technical standards	Price signals, sanitation marketing	Agreements and accepted goals
Sanctions	State authority backed by coercion	Financial loss	Social pressure
Mode of operation	Top-down	Individualistic	Bottom-up

Urban WASH – complexities & pressures

- Urbanization issues:
  migration, slums, population density, inequities, tenure insecurity etc.,
- Multi-sectoral interactions:
  water, solid waste, storm water, public health, urban planning, environment etc.,
- Multi-dimensional aspects:
  social, cultural, engineering, economic, institutional etc.,

Advancements in urban WASH

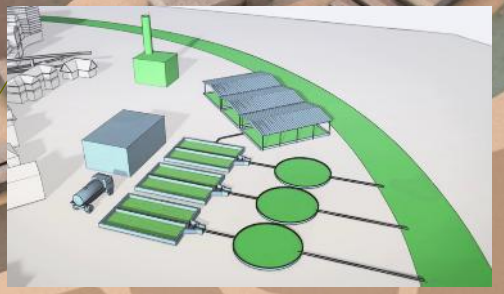
1. Infrastructure focus only to service focus
2. Public health only to environmental health
3. Sewered only to non-sewered & decentralized
4. Pollution management only to resource recovery
5. Public service only to involvement of private sector
6. Top-down planning only to collective action and market model

Aurin Resource Recovery from Vuna ©

Equity in service

Inclusive Planning

Conxtextual solutions



Environmental and social justice

CWIS brings together evolved thinking of urban sanitation under one umbrella

Emergence of CWIS

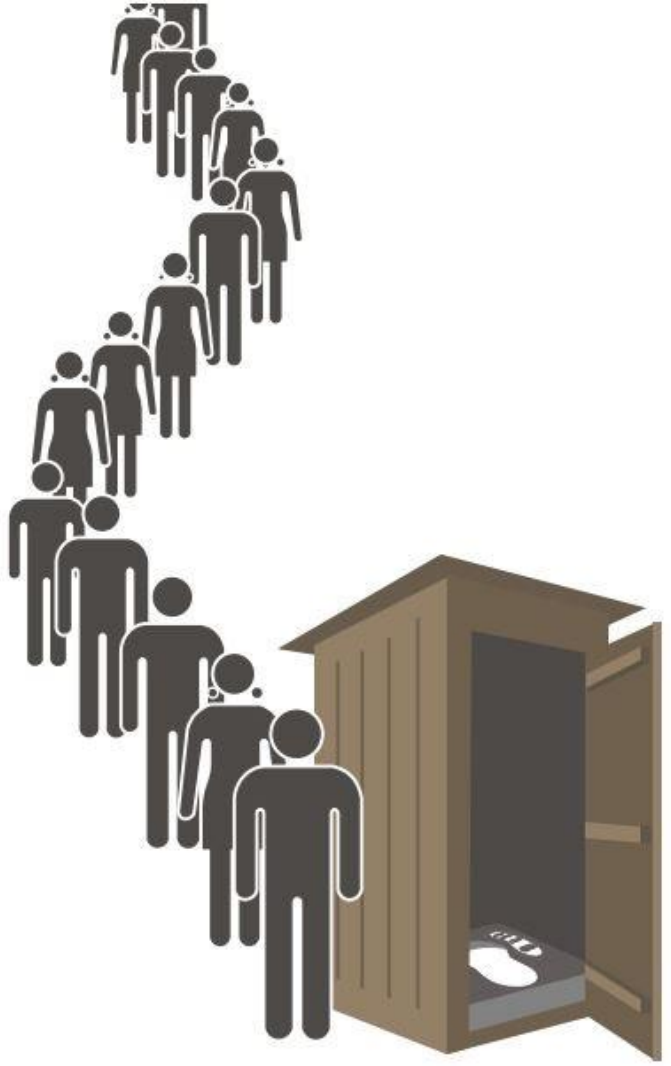
- Brings various evolved thinking under one holistic approach.
  - Prioritize the Human rights approach
  - Deliver safe management of whole service chain
  - Recognize sanitation's role in urban economy
  - Work in partnerships (BMGF et al., 2017)

- A consensus between research institutions, development banks, NGOs governments etc.

- CWIS emerged as a paradigm shift since 2016 and has gained huge traction since.

What is CWIS?

"An approach to urban sanitation, where al members of the city have **equitable access** to adequate and affordable **improved sanitation** services through **appropriate** systems of al scales (sewered & non-sewered), without any contamination to the environment along the **entire sanitation value chain"**.



(Narayan and Lüthi 2020)

Manila Principles on CWIS

1. Equity

Everyone in an urban area — including communities marginalized by gender, social, and economic reasons — benefit from equitable, affordable, and safe sanitation services.

2. Environment and public health

Human waste is safely managed along the entire sanitation service chain, starting from containment to reuse and disposal.

3. Mix of technologies

A variety of sewered and non-sewered sanitation solutions coexist in the same city, depending on contextual appropriateness and resource recovery potential.

4. Comprehensive planning

Planning is inclusive and holistic with participation from all stakeholders including users and political actors — with short- and long-term vision and incremental perspective and is synergistic with other urban development goals.

5. Monitoring and accountability

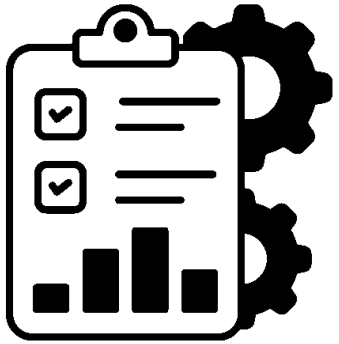
Authorities operate with a clear, inclusive mandate, performance targets, monitoring requirements, human and financial resources, and accountability.

6. Mix of business models

Sanitation services are deployed through a range of business models, funding sources, and financial mechanisms to reach all members equitably.

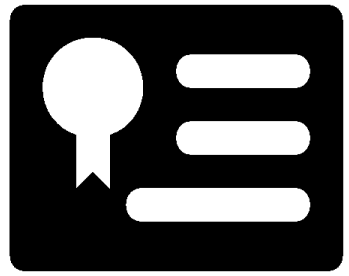
(Narayan and Lüthi 2020)

CWIS has wide uptake



Implementation of CWIS projects mainstreamed

Way forward in International development

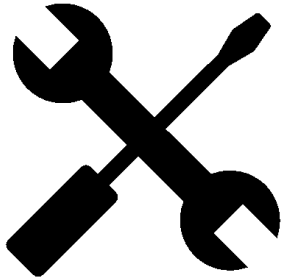


Degree programs and Cap Dev initiatives

$6+ Billion

Invested in CWIS project by various Banks and Dev agencies

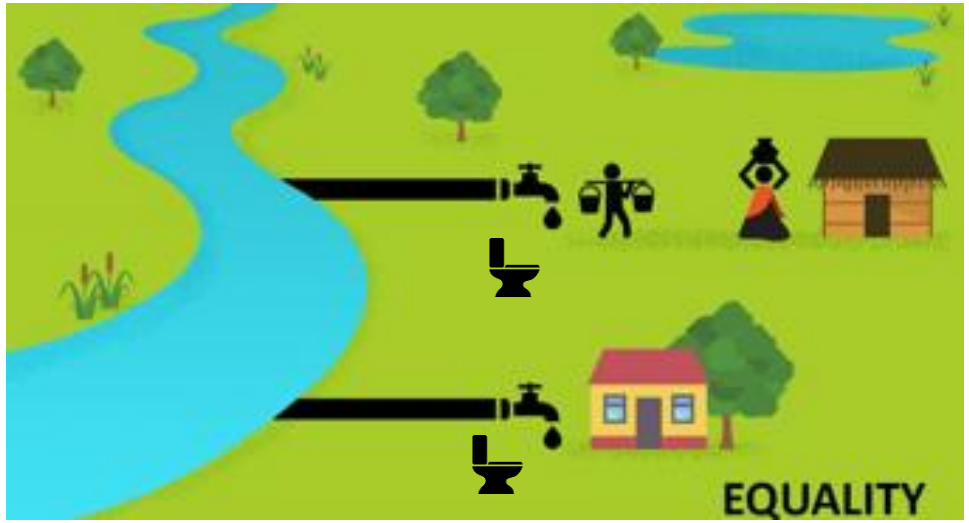
Wide research on CWIS topics



Tools to plan and design CWIS

Planning for Equity

Equality, Equity and Justice in WASH



(Narayan and Agarwal, 2021)

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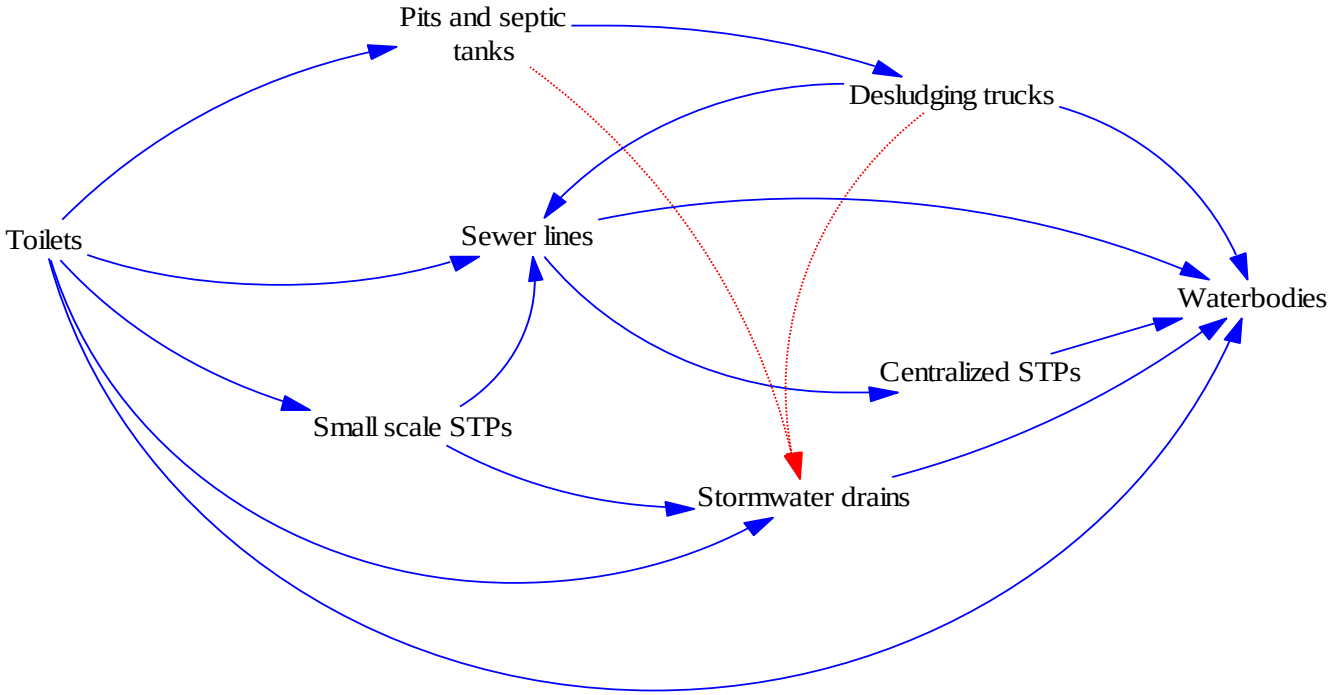
ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

Planning for Environmental Health

Environmental Health

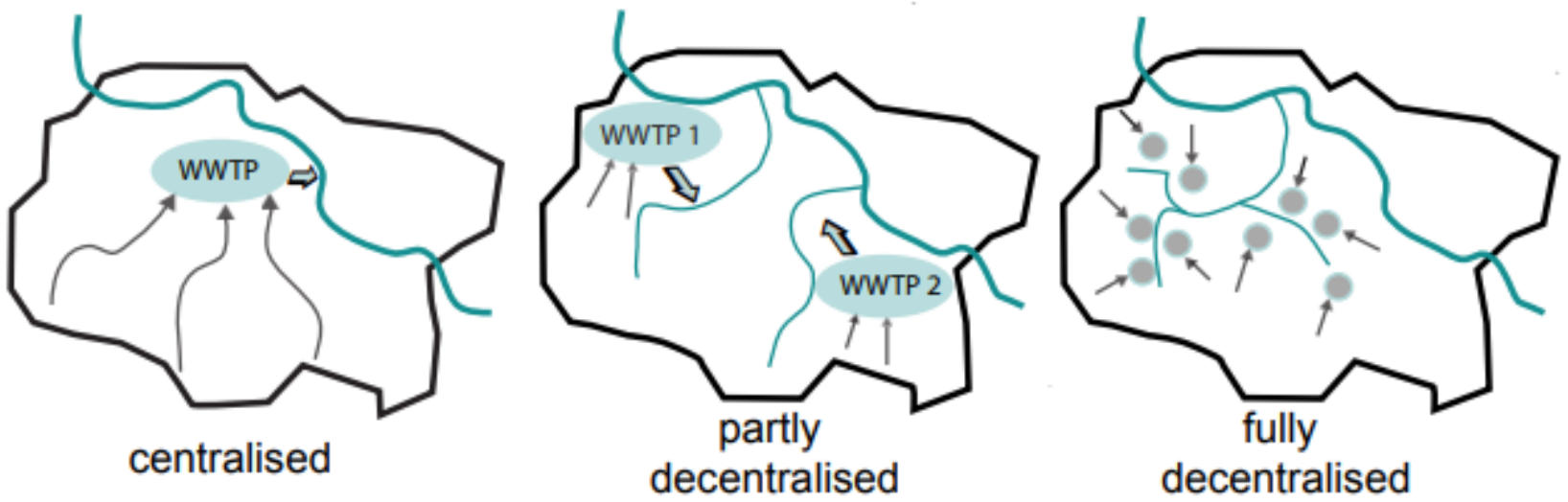
- 80% of all wastewater is left untreated globally (UN Water 2018)
- Poor sanitation pollutes the urban water bodies.



Godwin, Narayan & Scholten 2021

Planning Technology scales

What does decentralization mean ?



Terminologies on Decentralization

Decentralisation Terminology Box

1. Decentralized sewage treatment plants (STPs)
2. Distributed Systems
3. Small Scale Sanitation Systems
4. Semi Centralized STPs*
5. Modular STPs
6. Community Scale STPs
7. Cluster Sanitation Systems*
8. Local Treatment
9. Household STPs
10. Satellite Treatment Systems
11. Development Scale Systems
12. Non Network Solutions
13. Off-Grid Sanitation Systems
14. Non Sewered Technologies
15. On-site Sanitation Systems
16. Fecal Sludge Management
17. Container Based Sanitation
18. Nature Based Sanitation Systems
19. Omniprocessor *
20. Hybrid Systems
21. District Scale STPs
22. Neighborhood Scale STPs
23. Adaptable Systems
24. Precinct Sanitation Systems
25. Dry Sanitation
26. Disconnected
27. Rural Systems
28. Unconventional
29. Condominial
30. Small Grid Systems
31. Local Scale wastewater management system

*Terms that were not identified by the participants, and taken only from literature.

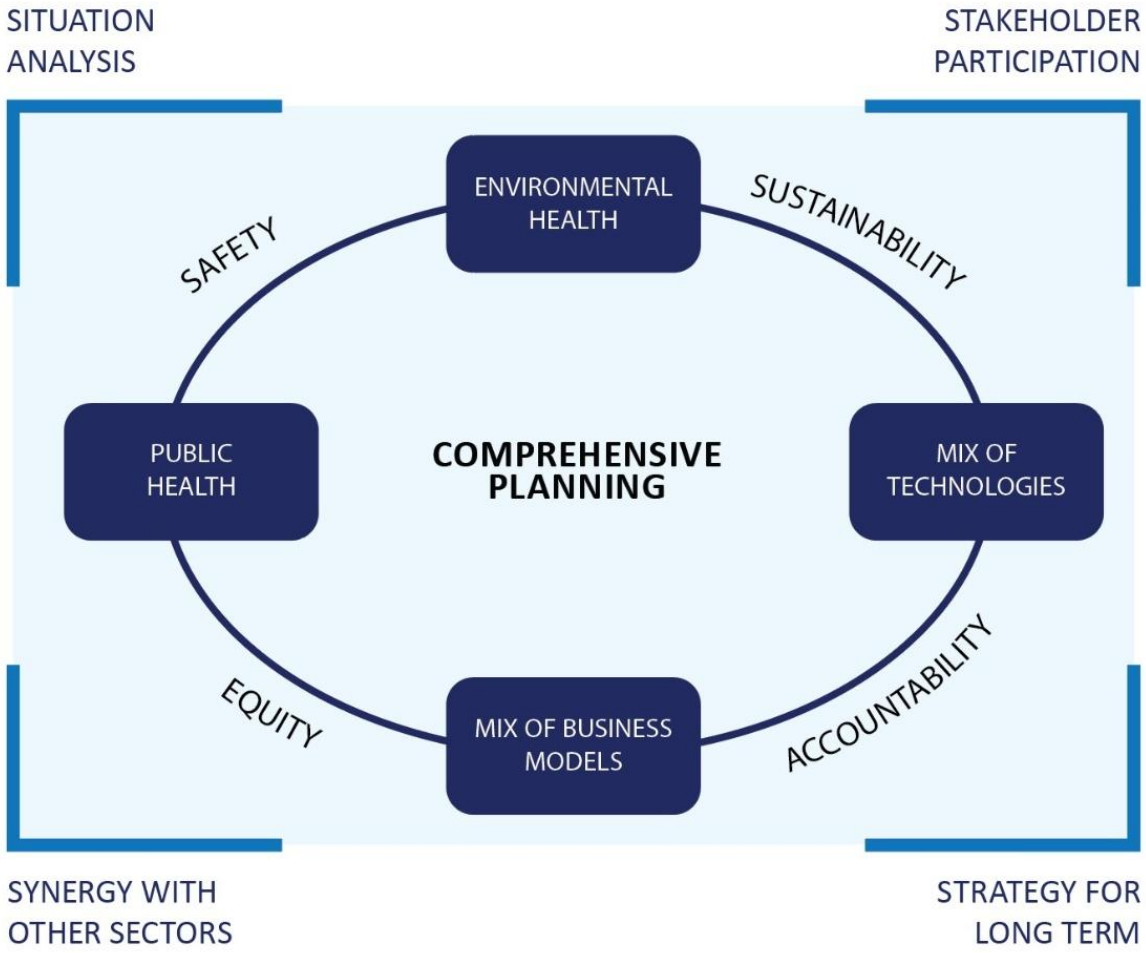
Narayan et al., 2020

Context Specific technologies

- Centralised systems where economy of scale works
- Decentralised systems in areas dictated by topography, population density, and fund availability
- Faecal Sludge Management in areas where access is an issue. e.g. slums or peri- urban settlements

Planning Framework

CWIS Planning Framework

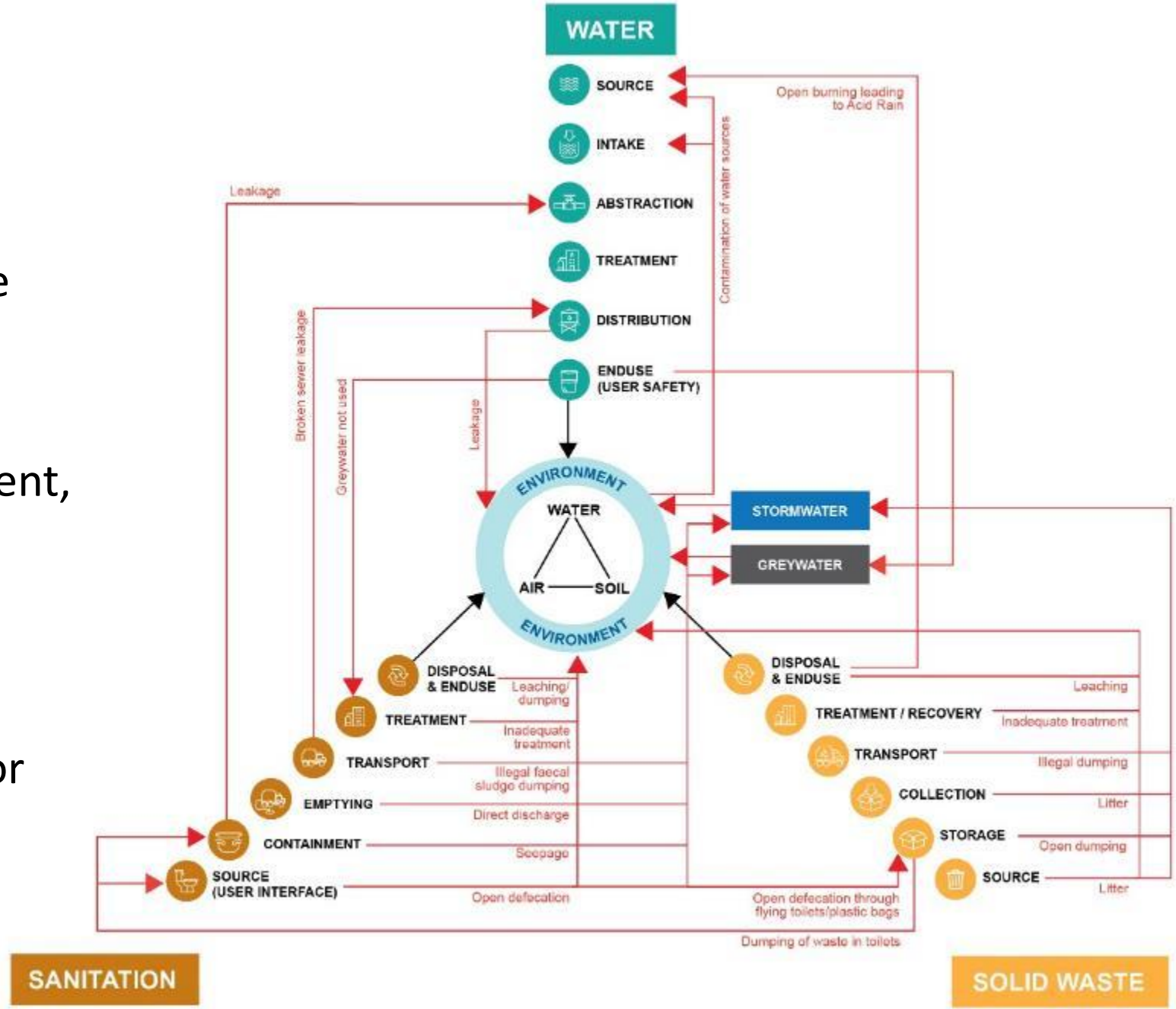


(Narayan et al., 2021)

Synergistic Service Planning

Negative interactions

- Water, Sanitation and Solid Waste are inherently linked.
- Often because of poor management, there are negative interactions between these sectors.
- E.g: Solid waste clogging sewers or untreated wastewater contaminating water sources.

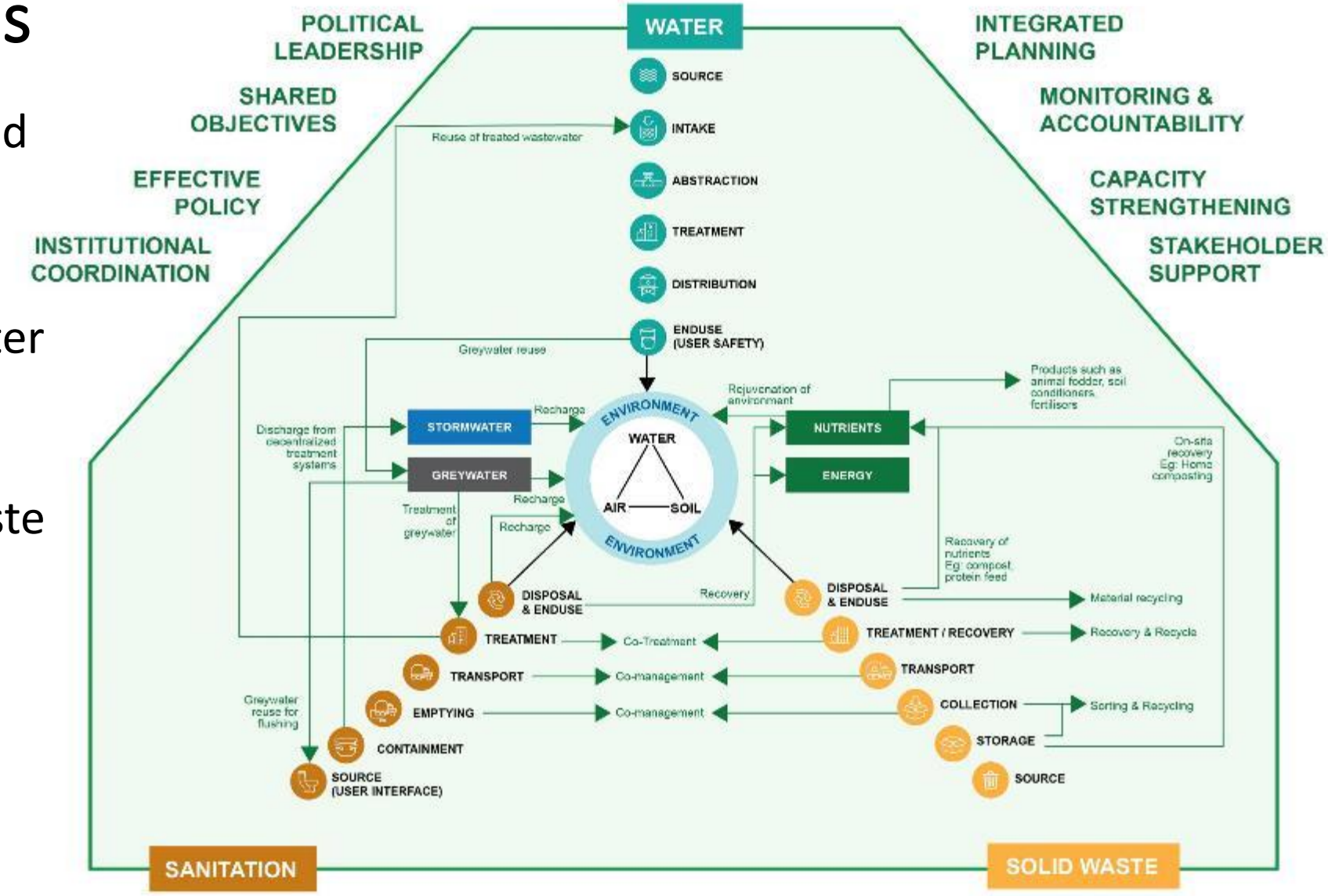


Narayan et al., 2021

Enabling Environment is key!

Positive interactions

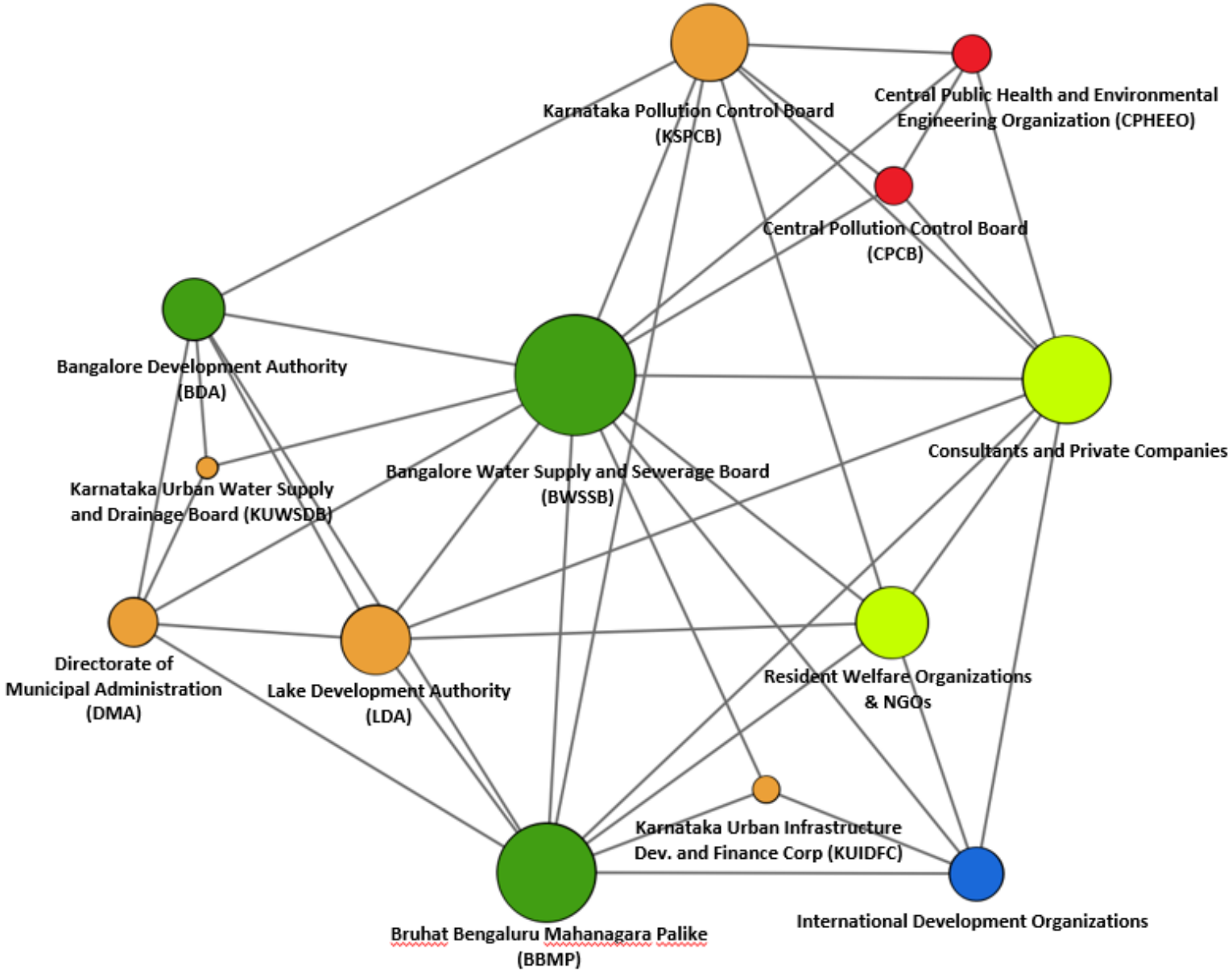
- Can tap into synergies and co-benefits.
- E.g: Reuse of treated water for flushing. Co-digestion of organic and faecal waste
- Needs strong leadership and an enabling environment.



Narayan et al., 2021

Planning and Governance

Coordination between agencies is a challenge



(Narayan et al., 2019) "Social Network Analysis for WASH" in Frontiers in Env. Sci

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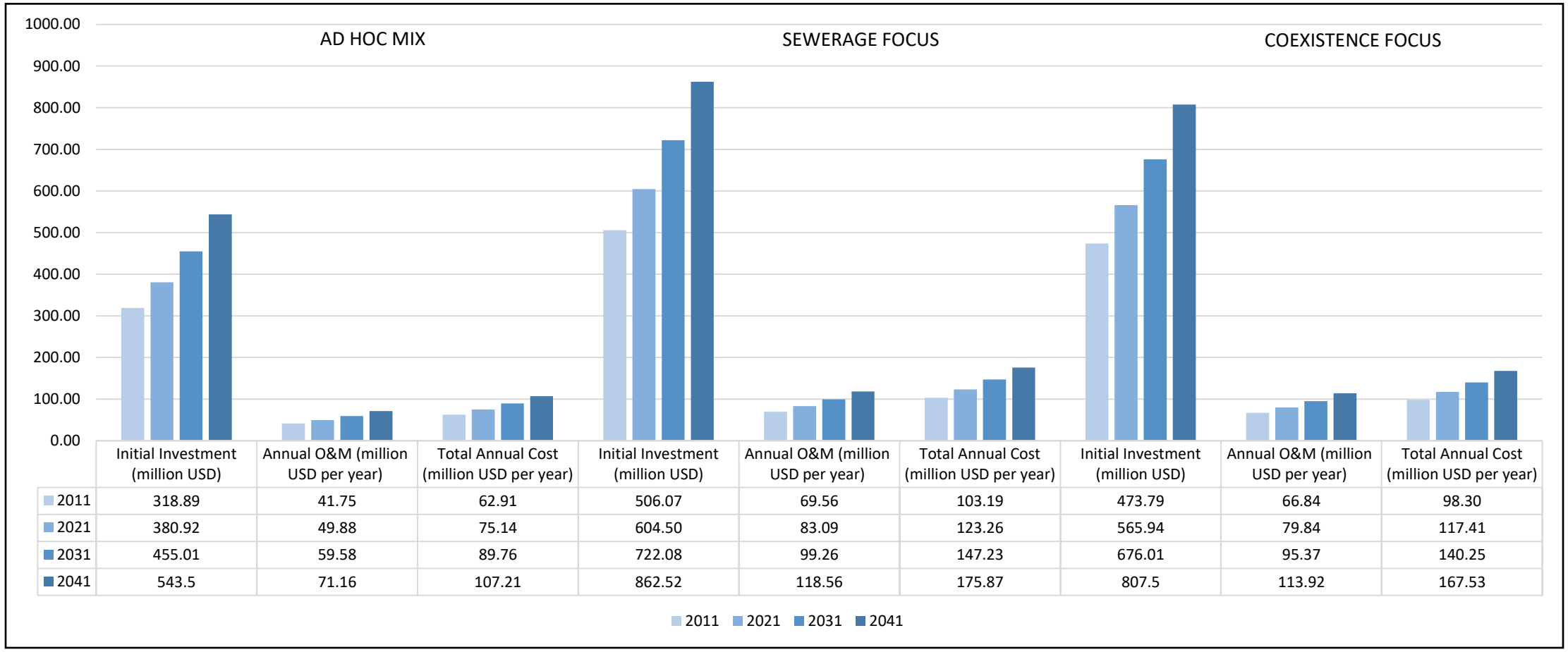
Planning & Financing

Mix of Services cheaper



	AD HOC MIX			SEWERAGE FOCUS			COEXISTENCE FOCUS		
	Initial Investment (million USD)	Annual O&M (million USD per year)	Total Annual Cost (million USD per year)	Initial Investment (million USD)	Annual O&M (million USD per year)	Total Annual Cost (million USD per year)	Initial Investment (million USD)	Annual O&M (million USD per year)	Total Annual Cost (million USD per year)
2011	318.89	41.75	62.91	506.07	69.56	103.19	473.79	66.84	98.30
2021	380.92	49.88	75.14	604.50	83.09	123.26	565.94	79.84	117.41
2031	455.01	59.58	89.76	722.08	99.26	147.23	676.01	95.37	140.25
2041	543.5	71.16	107.21	862.52	118.56	175.87	807.5	113.92	167.53

Dutta, 2021; Daudley 2018

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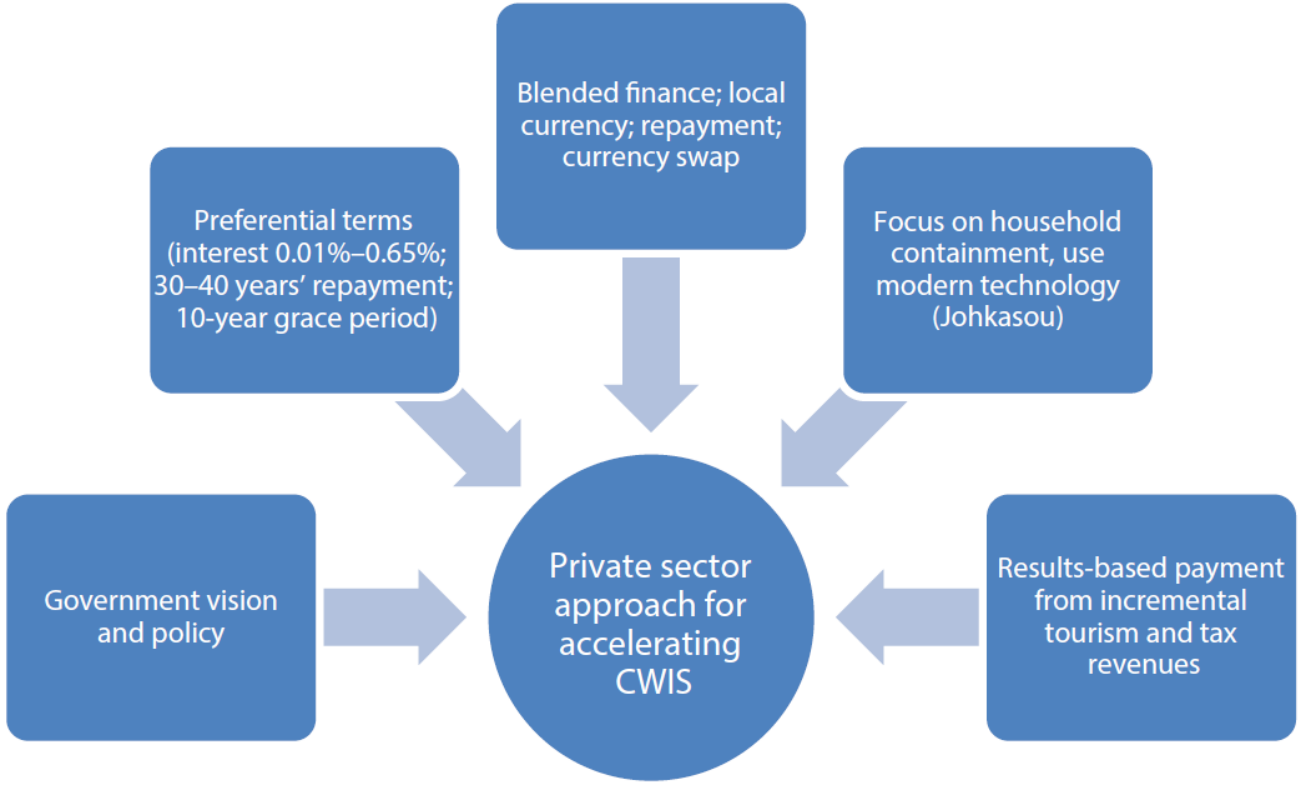
Investments in long-term financing

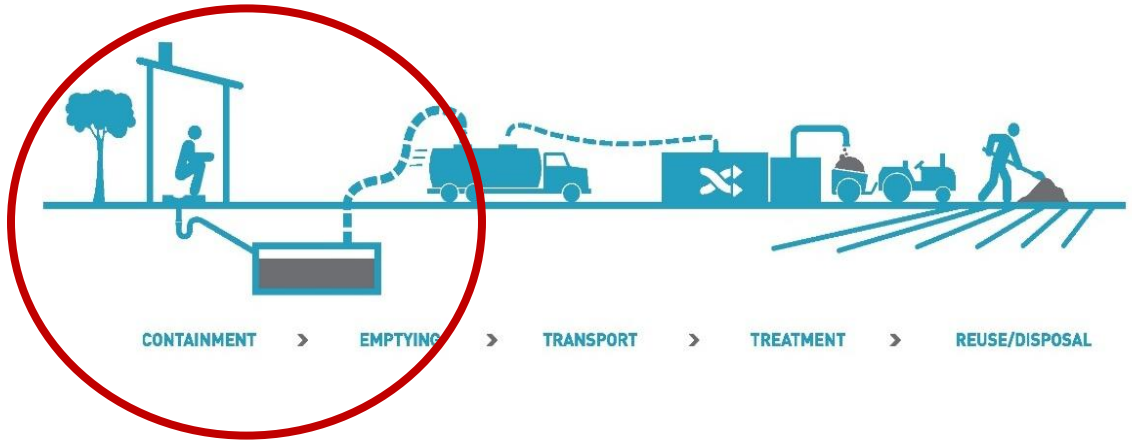
- CWIS can benefit from long-term financing for it's CapEx, and accrue benefits and returns in the long-term.
- Long term financing options include Public Financing, PPPs, Blended Financing, Concessionary Loans, Impact investing etc.
- No suitable examples exist in the sector. Needs novel institutional mechanisms

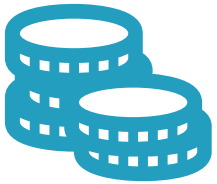


Wibowo et al., 2023

Challenges

- Public Good vs Private Good
- Incentive structures for private sector participation
- Governance of diverse sanitation solutions
- Standardization for onsite systems
- Planning for CWIS is complex





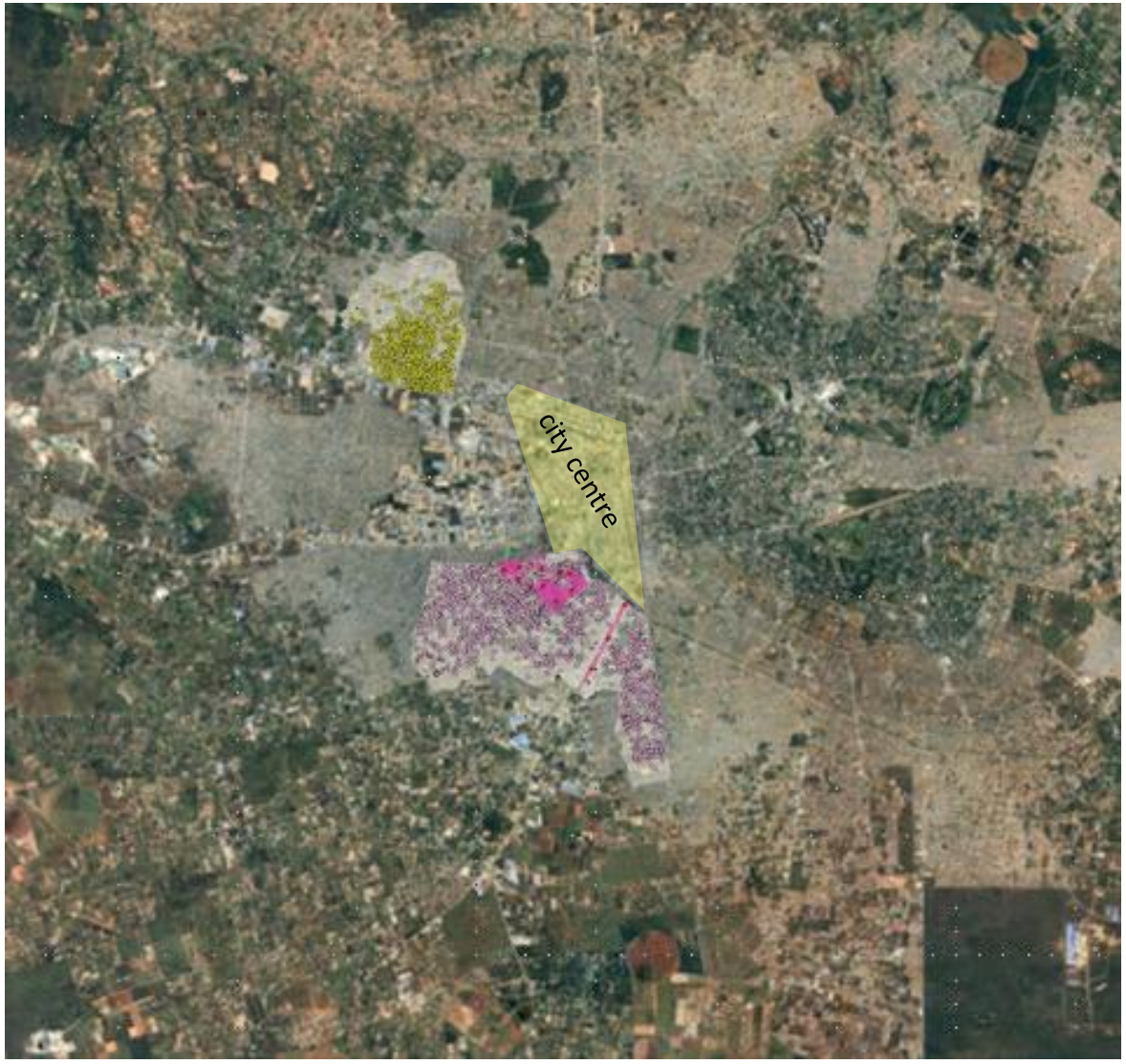
Example Lusaka, Zambia

Lusaka CWIS Implementation (World Bank + AfDB)

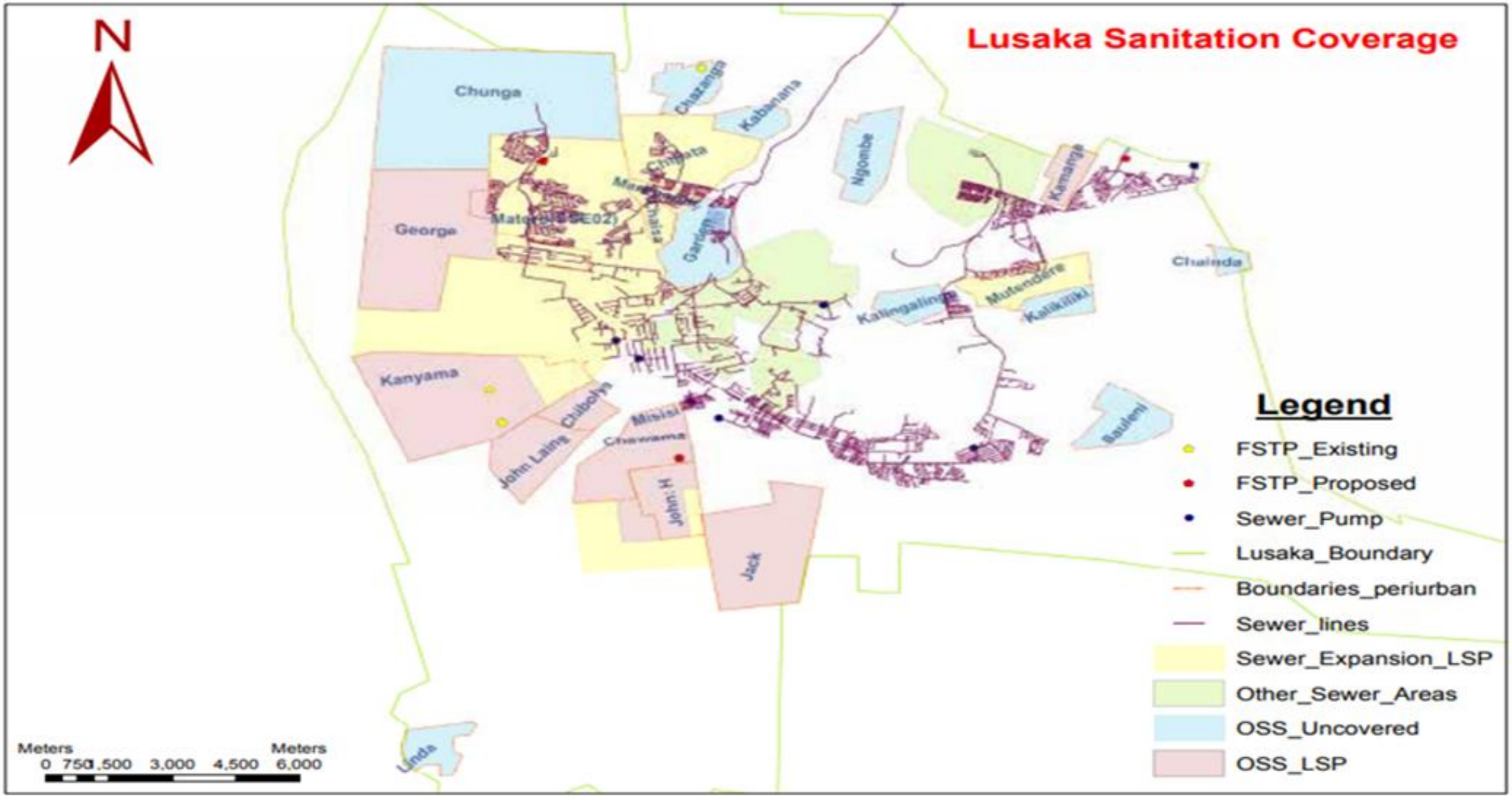
3.1m inhabitants

70% live in peri-urban areas
90% use on-site sanitation
Regular cholera outbreaks
Sewer network serves 15% of residents

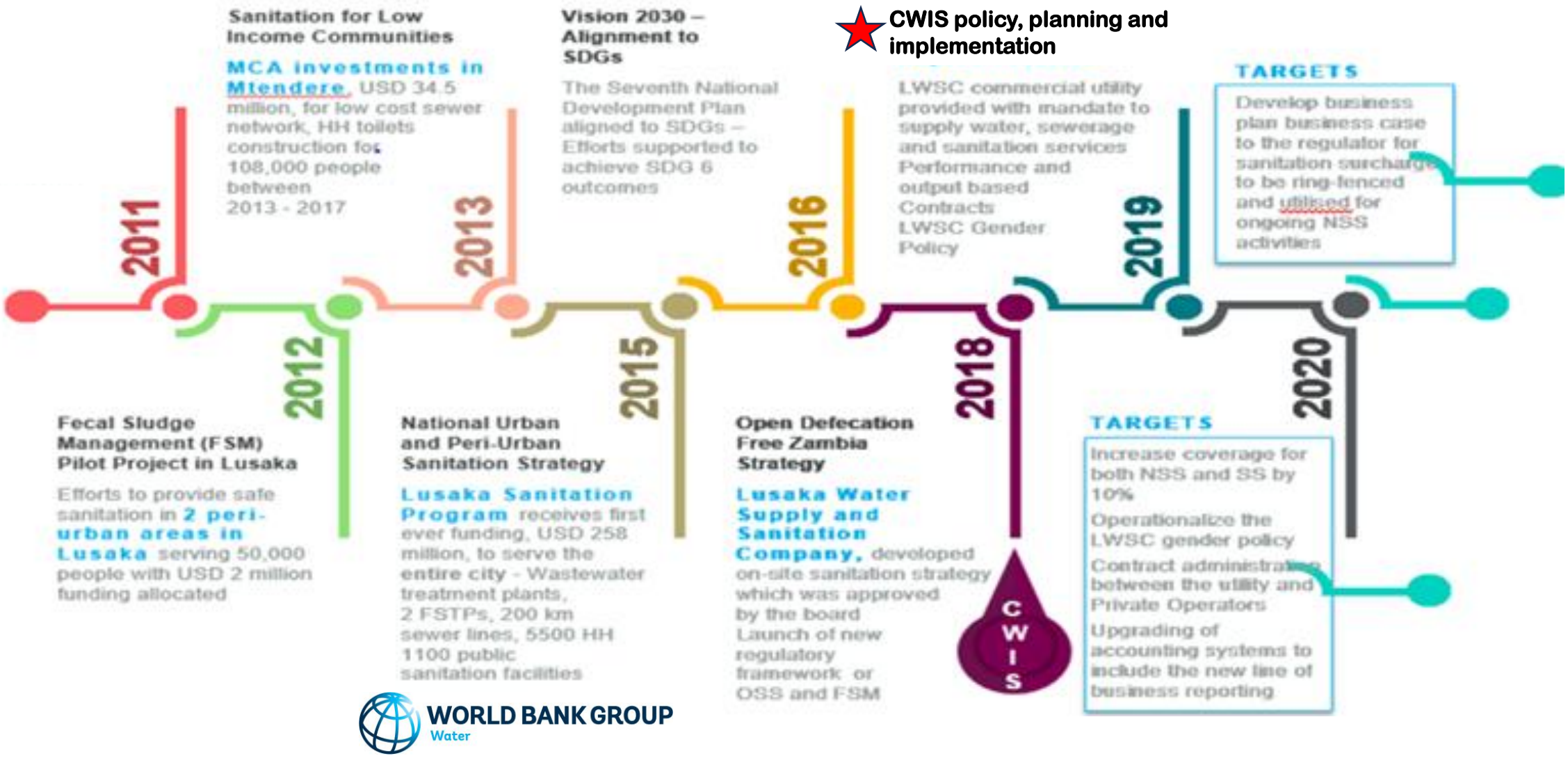
Primary intervention areas:
Kanyama, Chawama, George



Lusaka Sanitation Coverage (2024)



CWIS Timeline in Lusaka



WORLD BANK GROUP
Water

World Bank Results in Lusaka (2015-2024)

Indicator	2015 Baseline	2024 Achievement	Target (2024)	Notes
Population Benefited	-	**345,000**	305,000	50% women, surpassing target.
Improved Sanitation Access	-	81,000	75,000	Exceeded target, focusing on peri-urban areas.
Improved Faecal Sludge Management	-	**264,000**	230,000	Exceeded target, supported by Manchinchi Treatment Plant.
New Sewer Connections	-	2,200	-	Part of infrastructure expansion.
Sewer Lines Rehabilitated/Constructed	-	117 km	-	Enhanced network coverage.
Improved Sanitation Facilities	-	3,500	-	Targeted low-income areas.
Sewer Blockage Complaint Resolution	28% within 48h	100% within 48h	-	Significant improvement in service delivery.

HH TOILETS

5838/5500 HH toilets in Kanyama and Chawama and George Compound in Lusaka City

PUBLIC TOILETS

100/100 Public Toilets in Lusaka:

21 Schools
4 Health Centres
5 Markets

FS EMPTYING & TRANSPORT

18,290/12,800 Toilets emptied

Sanitation Master Plan under development

Scheduled Pit emptying being piloted

SEWERS

309 km/180 of sewer Network

10119/9000 Sewer connections in Kanyama, Emmasdale, Chaisa, Kafue road, Matero, Kaunda Sqr 1, industries

FS TREAT-MENT

2 FSTPS in Matero and Manchinchi

additional works to enhance operations at the FSTPs

Questions Regarding Case Study Wobulenzi?

Video: Warangal https://www.youtube.com/watch?v=Xdd4b2yAkgw