Opportunities for methane mitigation from sanitation systems in India

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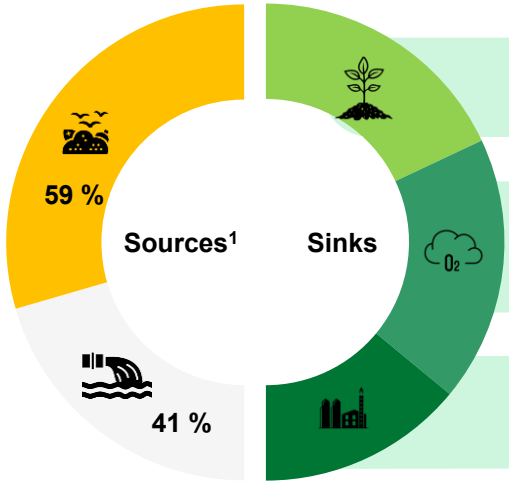
Waste and sanitation, a key area in urban sector to tap methane emissions

Methane hotspots at city level

- Industries, wetland and other sector (45%)
- Natural Gas (9%)
- Solid waste and waste Water (46%)

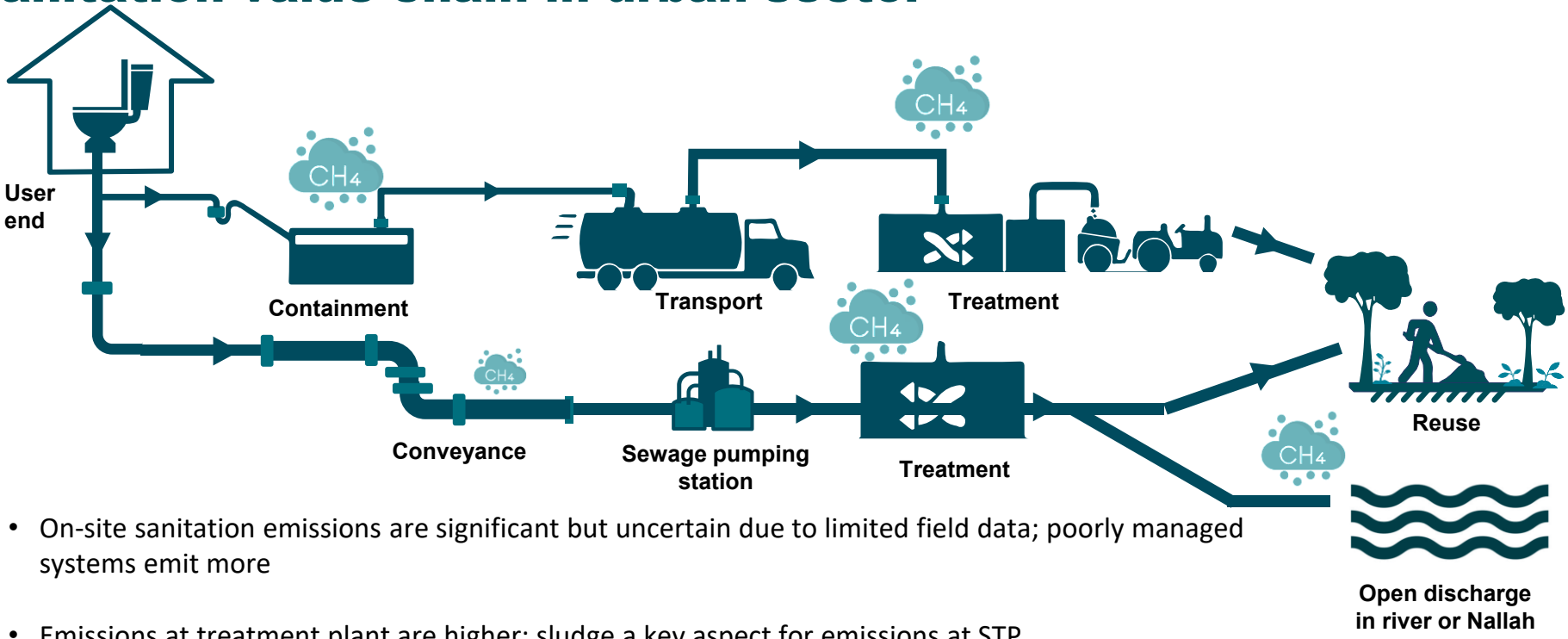


- Soil and green spaces
- Atmospheric oxidization process
- Methane capture units and improving technological processes

- Sanitation and waste are the key sectors whose improved and safe management will not only help in improving the public health but also support in reducing methane emissions
- City Climate Action Plans mention about sanitation and waste sector, however actions focus more on transport and energy sector primarily
- Sanitation a missing piece that can help in achieving methane reduction goals

(Nesser, H. et. al., 2024)

Potential to mitigate and capture methane from across sanitation value chain in urban sector



- On-site sanitation emissions are significant but uncertain due to limited field data; poorly managed systems emit more
- Emissions at treatment plant are higher; sludge a key aspect for emissions at STP
- Untreated sewage is a major methane source; appropriate treatment technologies can reduce emissions and enable methane recovery

India is focused on improving sanitation services

National focus on improving overall sanitation condition across the urban sector with focus on circularity

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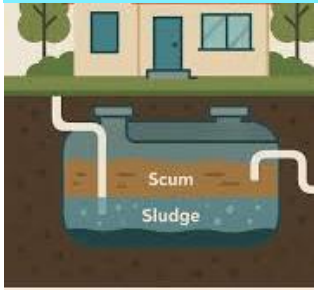
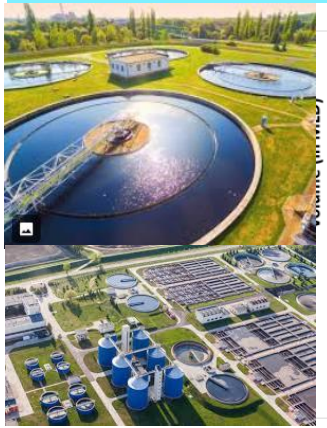
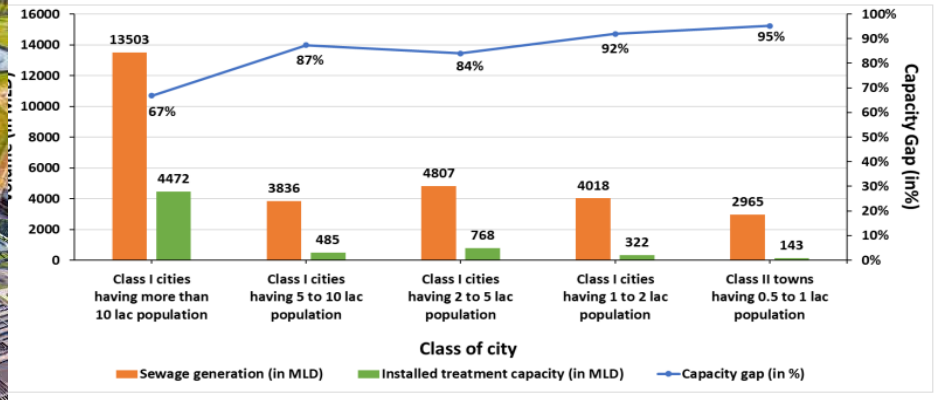
Many cities depending on onsite sanitation services



- In India, of 4,700 cities, only 400 cities have sewerage networks that are connected to treatment plants
- ~17.5 BLD of treatment plants upcoming

Gap in treatment facilities, especially in small and medium towns





Mehta, M., et. al., 2019; NITI Aayog, 2022; NITI Aayog, 2023

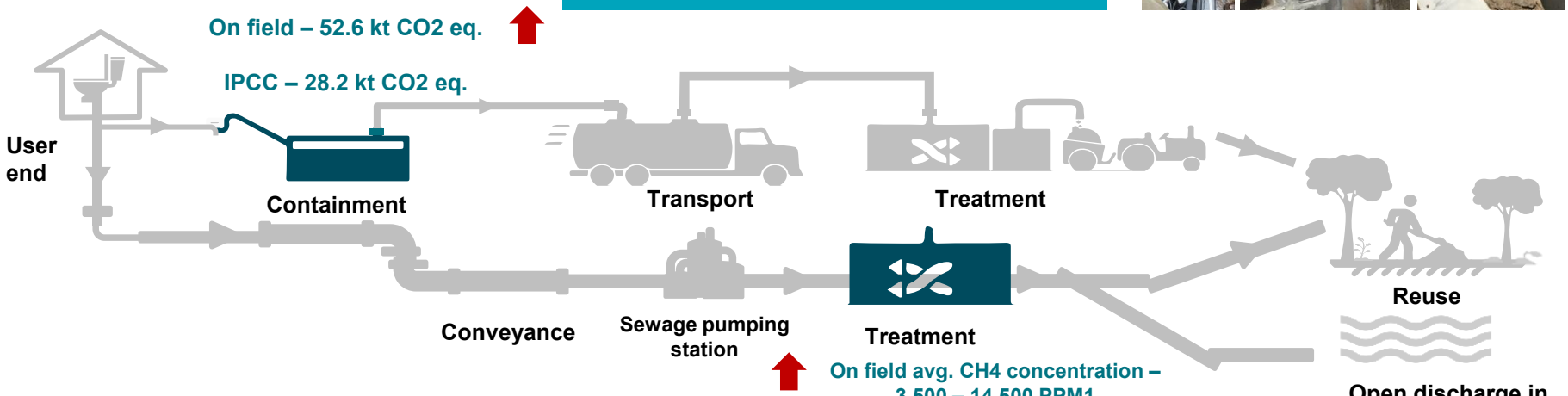
Evidences of methane emissions across the sanitation value chain

Conducting on-field measurements to estimate methane emissions from sanitation value chain

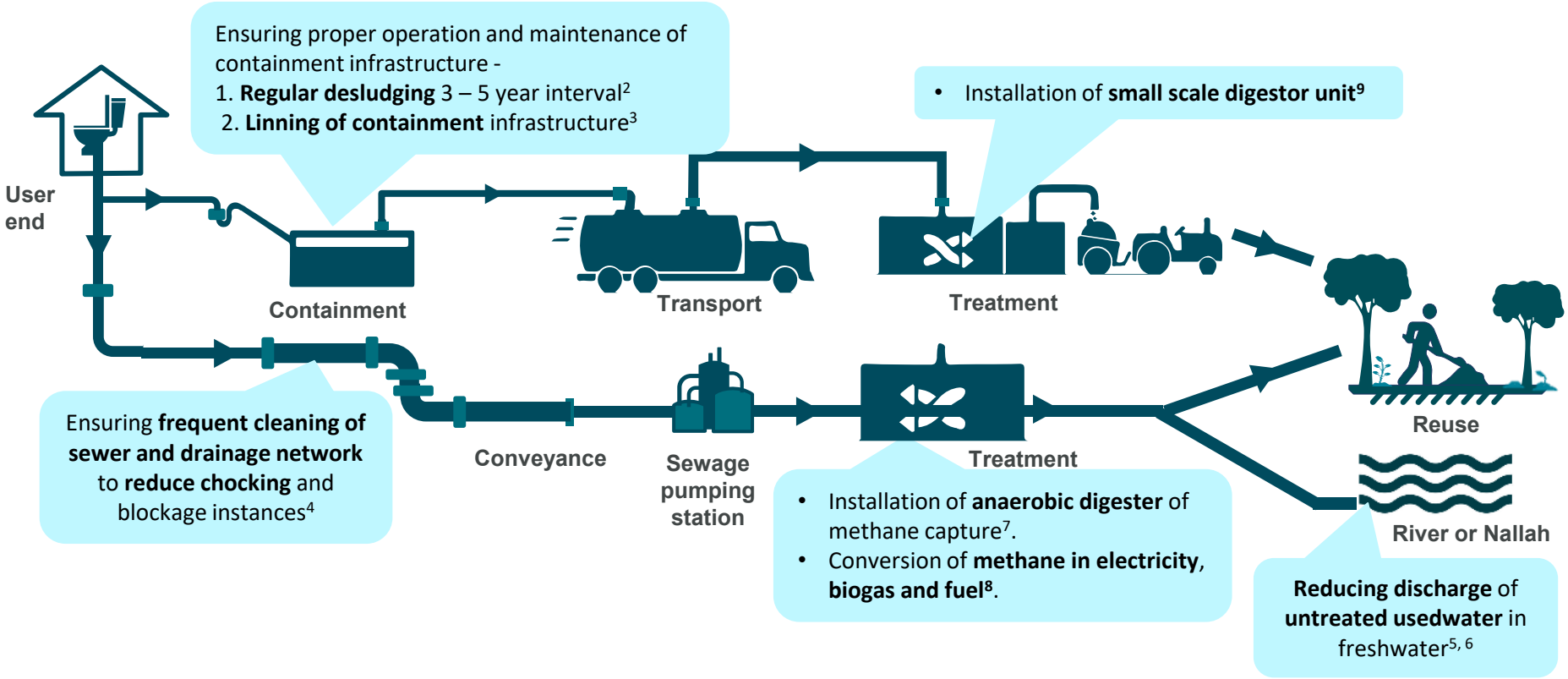
On field estimations using gas analyzer and flux chamber

Quantification exercise across a 3 cities of Maharashtra, India

Measurements at septic tanks, STPs
Exploring at sewage pumping station



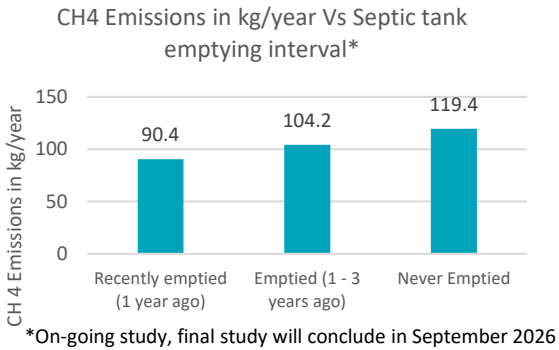
Efforts needed to mitigate methane emissions / resource recovery across sanitation value chain . . .



UNEP, 2025; 2. Huynh, L.T., et. al., 2021; 3. Poudel, P. et. al., 2024; 4. Mohit, M., et. al., 2025; 5. James, S., et. al., 2023; 6. Peterse, I.P., et. al., 2024; 7. Huang, M., et. al., 2025; 8. Mukherjee and Chakraborty, 2016; 9. WaterAid, 2025

Regular desludging of septic tanks as well as methane capture as resource at STPs are being explored

Regular desludging and maintenance of septic tanks



*On-going study, final study will conclude in September 2026

- CWAS supporting cities to provide regular desludging of septic tanks as a public service
- Private sector engaged for providing services
- Local government resolution passed to finance through sanitation tax.
- Focus on sanitation workers safety by using PPEs and regular desludging eliminates the need of manual scavenging

Methane capture and resource unit at the STPs

- Landscape study of existing STPs with methane capture units in India showcases many challenges and enablers
- Sludge management at STP, a key aspect to focus for methane reduction
- Better business models needed to promote engagement of private service providers
- Monitoring quality and biogas generation is crucial

Unlocking methane mitigation potential in sanitation requires action across multiple fronts

Focus on sanitation is crucial for both aspects of climate change as well as public health

Data, Estimates and Evidence building

- Further studies are required to quantify the emissions across the waste sector to bring in focus on them in policies and programs

Policies and Programs

- Promoting biogas/ sludge as a green energy
- encouraging private sector engagements
- Knowledge partnership across countries

Research, Technology and Innovations

- Technology innovations supporting higher production of methane
- Ties with allied sector- increased methane production and capture

Innovative financing

- Explore carbon credits, Municipal Bonds/ Green Bonds
- PPPs- Performance Linked Annuity Model, Hybrid Annuity Models (HAM)

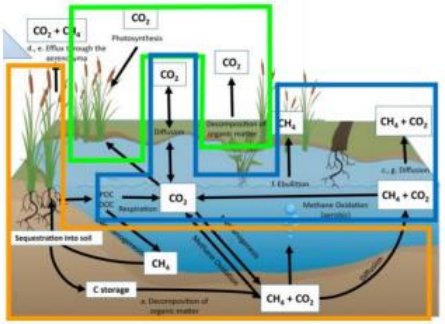
Moving towards SDG 11 and NDCs by focusing on methane reductions as well as low carbon solutions

Regular maintenance

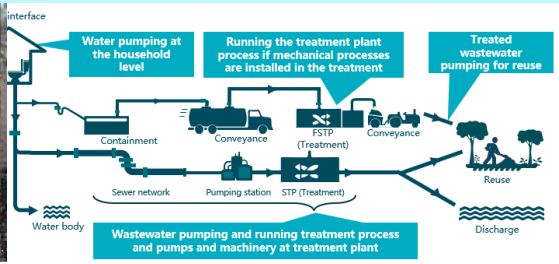
Methane as a resource

Urban forests

Improving lake health



Energy transition and energy audits



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Thank you

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About us

The Center for Water and Sanitation (CWAS) is a part of CEPT Research and Development Foundation (CRDF) at CEPT University. CWAS undertakes action-research, implementation support, capacity building and advocacy in the field of urban water and sanitation. Acting as a thought catalyst and facilitator, CWAS works closely with all levels of governments - national, state and local to support them in delivering water and sanitation services in an efficient, effective and equitable manner.

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