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SANITATION IN A CHANGING CLIMATE

Building Resilience and Sustainability in Service Delivery

Learning Labs *is an initiative by the NFSSM Alliance to drive discourse and foster cross-learning among its partners and other practitioners across key thematic areas and priorities in the sector.*

LEARNING LAB ON CLIMATE-SANITATION LINKAGES

The Climate-Sanitation Linkages for Urban Resilience Taskforce (CSTF) aims to prioritise climate-resilient service delivery through evidence-building and nurturing an enabling environment. This approach informs the sanitation sector with a **climate focus** across the sanitation value chain, benefiting vulnerable communities and protecting the environment.

This Learning Lab by CSTF focused on understanding the foundational interlinkages between climate and sanitation, by engaging with the work of Alliance partners on adaptation, mitigation, and resilience-building across service delivery.

GUIDING QUESTIONS

1. How are sanitation and climate change interlinked?

2. How can we tackle water insecurity with used water management?

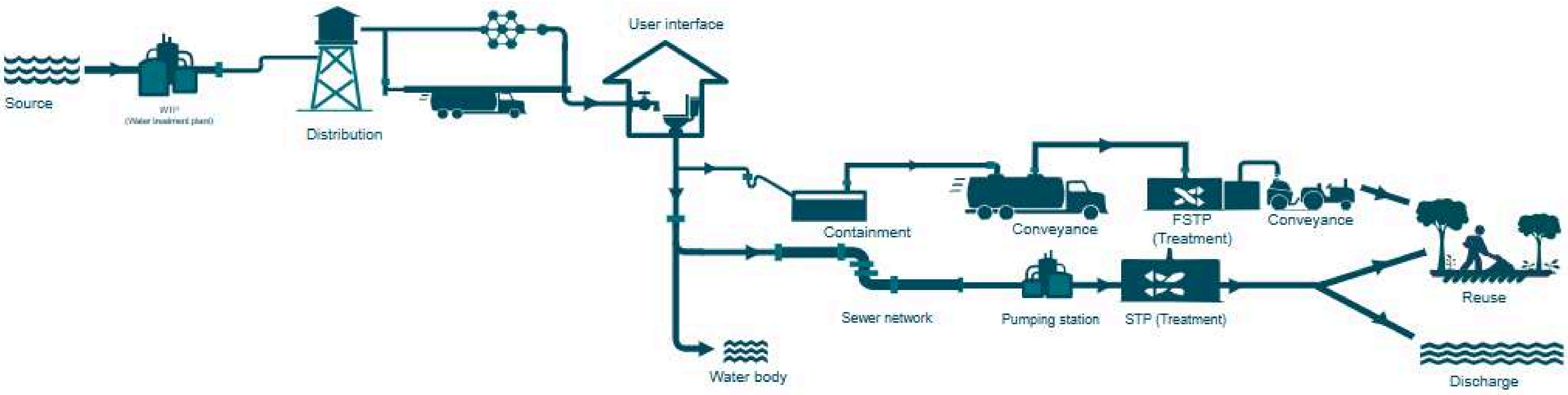
3. Can we unlock agricultural sustainability through used water and sludge reuse?

01

HOW ARE SANITATION AND CLIMATE CHANGE INTERLINKED?

Climate change significantly disrupts the WSH service value chain, threatening water security and exposing communities to extreme weather events such as floods, droughts, and heatwaves.

Vulnerable populations, especially communities relying on shared sanitation infrastructure, face heightened risks. Additionally, emissions generated by the sanitation value chain can further exacerbate the climate crisis, emphasising the need for future-proofing sanitation services.



Insights on Climate-Sanitation Linkages across the WSH Value Chain

The **Center for Water and Sanitation (CWAS)** team presented an overview of the climate-sanitation linkage across the WSH value chain and its impact. The references and detailed slides are linked ***here***. Here are some of the foundational concepts and strategies:

Adaptation

Adaptation is the process of adjusting to actual or expected climate impacts to reduce harm or harness potential benefits. In human systems, it involves proactive measures like resilient infrastructure, while in natural systems, it may include facilitating ecosystem adjustments. Some adaptive measures include:

1. Access to Private WSH Infrastructure

Extreme weather events disproportionately affect communities reliant on shared sanitation systems. Providing private household WSH infrastructure, such as individual household toilets (IHHT) and water taps, enhances resilience. Programs like **Har Ghar Nal** demonstrate how improving water access at the household level can bolster climate adaptation.

2. Rainwater Harvesting and Groundwater Recharge

In drought-prone areas like Kutch, rainwater harvesting offers a practical solution to water scarcity. Additionally, maintaining urban groundwater recharge systems helps mitigate flooding risks during heavy rainfall.

3. Empowering Women in Climate-Resilient WSH Services

Women bear a disproportionate burden of climate-related challenges, particularly in peri-urban areas. They are often responsible for securing water for their families, which may involve long and labour-intensive journeys. Empowering women through livelihood opportunities, such as contracts for operating and maintaining WSH infrastructure can promote gender equity while strengthening community resilience.

Mitigation

Mitigation is the process of human intervention to reduce greenhouse gas (GHG) emissions or enhance their absorption to limit climate change. It includes measures like adopting renewable energy technologies, minimising waste, and promoting sustainable practices.. Efforts to mitigate climate impacts could involve:

1. Regular Desludging of Septic Tanks

Scheduled desludging every 2–3 years reduces methane emissions from septic systems, minimising their environmental impact.

2. Solar-Powered WSH Infrastructure

Adopting solar-powered technologies for Sewage Treatment Plants (STPs), Faecal Sludge Treatment Plants (FSTPs), and Water Treatment Plants (WTPs) can substantially cut GHG emissions.

3. Urban Forests (Carbon Sinks)

Urban forests, planted with indigenous species near treatment plants absorb carbon dioxide, contributing to climate change mitigation. The usage of treated used water for irrigation reduces the need for freshwater, conserving this valuable resource while promoting sustainable practices.

Resilience

Resilience is the ability of communities, businesses, and governments to anticipate climate risks, prepare for and respond to climate events, absorb shocks, adapt to stresses, and transform pathways to withstand and thrive amidst the impacts of climate change.

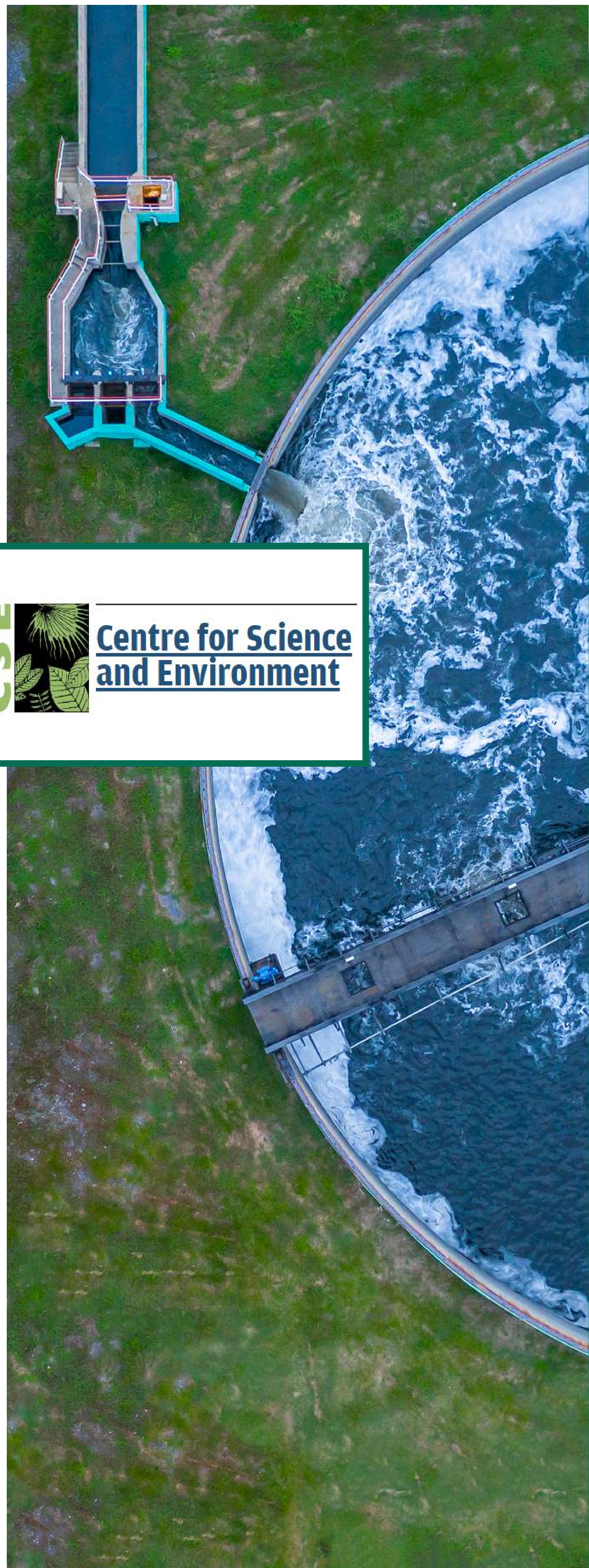
KEY TAKEAWAY

Integrating adaptation and mitigation efforts can enhance our ability to address climate impacts through sustainable WSH systems. This approach improves resilience, reduces emissions, promotes equity, and ensures water security.

02

HOW CAN WE TACKLE WATER INSECURITY WITH USED WATER MANAGEMENT?

In the Indian context, climate change can aggravate water insecurity, with per capita water availability falling below scarcity levels and only **37% of used water being treated**. This increasing strain on urban water systems highlights the urgent need for improved water treatment, reuse strategies, and sustainable practices to address the growing challenges of urbanisation and contamination.



Insights from State-Level Reuse of Treated Water — Policy and Practice:

The **Center for Science and Environment (CSE)** team highlighted the findings from a case study on the use of treated used water in Haryana, Tamil Nadu, Karnataka, Maharashtra, Uttar Pradesh, Rajasthan, and Delhi. The key recommendations and detailed slides are available ***here***. Some of the key insights and recommendations include:

A significant gap of **49%** remains between used water generated and available treatment capacity. Only **17%** of the total treated capacity complies with established treatment standards for reuse.

1. Need for State-Level Policies Developed through Public Engagement

There is a pressing need to formulate state-level policies through public engagement, starting with states identifying their reuse priorities and instituting mechanisms for comprehensive consultations.

2. Standardised Reuse Frameworks

The lack of standards for treated used water poses a significant challenge. Developing tailored, purpose-specific standards, instead of adopting a one-size-fits-all approach, is essential for achieving effective and scalable implementation.

3. The Potential and Constraints of Scaling up Treated Water Reuse

Decentralised treatment plants present a viable solution by facilitating local treatment and minimising dependence on expensive infrastructure. With a significant portion of the country comprising small and medium towns, there is considerable potential to scale up the use of treated used water across diverse geographical contexts. This underscores the importance of supportive policy frameworks to enable such initiatives.

KEY TAKEAWAY

To address water scarcity and contamination, it is crucial to implement urgent **advancements in used water treatment, strengthen reuse strategies, and emphasise public engagement to ensure long-term sustainability**. Treated used water offers a viable solution to meet growing demands in the industrial, agricultural, and construction sectors.

Agriculture, which is highly water-dependent, stands to benefit significantly from this approach. With irrigation accounting for over 80% of India's water consumption and a projected 50% supply-demand gap by 2030, scaling water reuse is crucial to combat water insecurity, as it not only conserves freshwater but also ensures agricultural resilience.

03

CAN WE UNLOCK AGRICULTURAL SUSTAINABILITY THROUGH USED WATER AND USE OF TREATED SLUDGE?

Excessive use of fertilisers, particularly urea, significantly contributes to GHG emissions and soil degradation. These issues result in “hidden hunger” where nutrient deficiencies in soil reduce the nutritional value of crops. Organic fertilisers provide a sustainable alternative, improving soil health and reducing emissions.

Insights on Used Water and Sludge Application in Agriculture

The **Consortium for DEWATS Dissemination Society (CDD)** team shared findings from their study on used water and resource recovery in agriculture, across urban and peri-urban regions. The detailed insights and slides are available ***here***. Recommendations on applications of treated used water and sludge in agriculture include:

Application of treated used water

The case study highlighted the benefits of the effective application of treated used water in agriculture, combined with practices, such as segregation of medical waste - reducing health risks for farmers using the treated water. This approach can provide farmers with an **alternative water source and enhance soil nutrients.** Treated used water offers a sustainable solution for agriculture and enables the economic well-being of farmers:

Low-Cost Cultivation

Crops irrigated with treated used water required less fertiliser than those grown with freshwater, due to its rich nutrient content,

Higher Yield

Crops grown with treated used water had higher yields in comparison to crops grown using freshwater irrigation.

The study also highlighted the importance of effective collaboration between stakeholders - policymakers, sanitation experts and civil society organisations to maximise the application of treated used water.

Application of treated sludge

The application of treated sludge in agriculture encompasses a variety of safe and effective practices, where it can be utilised to enhance soil fertility and serve as an organic fertiliser, providing a sustainable alternative to chemical inputs while improving soil health and supporting agricultural productivity, while ensuring that harmful contaminants are eliminated to reduce risks on human health and environment. The study highlighted the importance of:

Solar Drier

Solar drier effectively reduced the pathogens in sludge, making the sludge safe to use as manure/fertiliser

Co-Compost Sludge

Co-composted sludge yielded better results for crop productivity compared to treated faecal sludge.

KEY TAKEAWAY

The application of treated used water and treated sludge in agriculture offers a sustainable way to tackle **water scarcity, enhance soil nutrients, and decrease fertiliser use, resulting in higher crop yields and better environmental outcomes**. Key to these are the effective segregation of waste, stakeholder collaboration, and the use of co-composted sludge and solar drying.

HOW CAN WE BUILD A CLIMATE-RESILIENT & SUSTAINABLE SANITATION FUTURE?

To advance climate-integrated sanitation services, key strategic exercises such as **strengthening evidence-based policy** state-level frameworks, public engagement, and data-driven insights must be deployed. **Scaling decentralised treatment solutions in small and medium towns** can address regional disparities and reduce emissions.

Multi-stakeholder collaboration is vital to align efforts across sectors, build local capacities, and enhance scale and replication of climate-resilient WSH initiatives. Integrating adaptation and mitigation measures, such as groundwater recharge and empowering marginalised communities, can further make service delivery more resilient.

Finally, scaling the application of treated used water and treated sludge in agriculture through pilots, waste segregation, and partnerships can optimise fertiliser use, improve yields, and promote sustainable practices. A climate-integrated approach to sanitation services can drive lasting change, protecting communities and the environment for generations to come.

KEY TAKEAWAYS

- *Adaptative and mitigative measures within WSH systems enhance resilience, reduce emissions, and ensure water security.*
- *Urgent used water treatment advances and reuse strategies, with robust public engagement, are essential to combat water scarcity and contamination.*
- *Utilising treated used water and treated sludge in agriculture provides alternative irrigation sources, enhances soil, optimises fertiliser use, and improves crop yields.*

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