

# Global South Academic Conclave

## WASH and Climate Linkages

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# Report



## SUMMARY

Climate change, manifested by extreme weather events, has severely impacted WASH services. This poses many challenges for achieving the SDG 6. It has also worsened existing vulnerabilities. In this context, there is a need to share the knowledge and practices for both mitigation and adaptation across countries.

The Center for Water and Sanitation (CWAS) organised a Conclave on WASH and Climate Change during February 2-4, 2024. This was done in collaboration with the Faculty of Planning at CEPT University and with support from the Bill and Melinda Gates Foundation (BMGF). The conclave was visualised as a pathway to future work in this critical area. It also recognised that while many countries in the Global South have made significant strides in improving water and sanitation services, the next big challenge is to prepare cities and villages for making these services climate resilient.

The Conclave supported significant cross-learning among sector partners, academia, and researchers. It was attended by over 350 participants representing 30 countries. In addition, over 700 persons also joined virtually. The 6 keynote addresses from practitioners and researchers across the globe and two high-level panels highlighted key issues and emerging directions. There were 8 technical sessions with over 45 presentations on themes related to: i) Climate change mitigation and adaptation, ii) WASH climate policies, iii) Climate finance and iv) Inclusivity in infrastructure services. Several sector partners, including - IWA, ITN-BUET, ASCI, UMC and NFSSM Alliance, -also organised special sessions. Technical sessions were accompanied by poster exhibitions showcasing work done by participants and work by the students at CEPT University.



Discussions at the Conclave recognised the multidimensional aspects of climate change for the WASH sector. It was agreed that more research is needed to estimate the GHG contribution of WASH sector

and to inform the global community. Considering that cities have become hotspots for climate impacts, simultaneous transitions in energy, industrial processes, governance, infrastructure and societal behavioural changes are required. The urban poor are most vulnerable to climate change, and more adaptation efforts are needed in the global south to address the impacts on these vulnerable communities.

The conclave participants agreed that there are several gaps in the WASH climate evidence chain, and there is a need to build up a sound narrative on the linkages between WASH and climate change for mitigation and adaptation. This will also help open up the WASH sector for innovative financing. The challenge will be making such financing viable and sustainable by making the public funds more climate-responsive and using the public resources to leverage private capital and market resources. Discussions among academics and researchers also recognised that WASH and climate linkage is a relatively new area, and a collaborative effort is needed to share research materials and develop joint programmes in the coming years. It was agreed that countries across the globe, both from the south and the north, will need to recognise the mutual learning opportunities and work together.



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## INAUGURAL SESSION

*The inaugural session began with Dr. Dinesh Mehta welcoming CEPT University's leadership and the BMGF team. Dr. Mehta expressed gratitude for the participants' enthusiastic response to the event. Dr. Mona Iyer spoke about the importance of collaboration, and Dr. Roshan Shrestha (Deputy Director WSH, BMGF) voiced the need for integrating sanitation with the climate agenda. Dr. Meera Mehta (Center Head, CWAS) highlighted CEPT's legacy of blending academic knowledge with practical experience, and Dr. Suren Vakil (Vice Chairperson, CRDF) discussed CRDF's climate change initiatives and CWAS's impactful work. Mr. Barjor Mehta (President, CEPT University) emphasised the importance of practical, implementable and financeable solutions. With this, the speakers inaugurated the Conclave by watering plants to symbolise commitment to the environment.*

Dr. Dinesh Mehta (Center Head, CWAS, CRDF, CEPT University) welcomed the leadership of the University, CRDF and the Faculty of Planning, including Mr. Barjor Mehta (President, CEPT University), Dr. Suren Vakil (Vice-Chairperson, CRDF, CEPT University) and Dr. Mona Iyer (Dean, Faculty of Planning, CEPT University), along with the online presence of Mr. Roshan Shrestha (Deputy Director-WASH, BMGF). He thanked all participants for their overwhelming response to the event, mentioning the selection process from over 100 abstracts. **Recognising the event's carbon footprint, Dr. Mehta suggested ways to mitigate it and pointed out measures already taken by the Conclave by including plantable pages in the booklets and seed-tipped pencils in the conclave kit to promote tree planting.** The speakers on the dais were invited to water plants, symbolising the institution's commitment to the environment. The chosen indigenous plants, including Banyan, Mango, and Hibiscus, showcased water conservation and climate resilience.

Dr. Mona Iyer welcomed attendees to the conclave, emphasising the importance of collaboration between academia, researchers, and practitioners. **Dr. Iyer noted three key strengths of hosting such events: internal collaboration within CEPT University, collaborations with external partners, and the relevance and value of such events.** She

discussed CEPT University's Faculty of Planning, its programs, and its recognition as a Center for Excellence in Urban Planning and Design. She highlighted the multidisciplinary approach of CEPT's planning programs. She also recognised the support from the student volunteers and the Faculty of Planning for the Conclave. Dr. Iyer discussed the significance of the Conclave's scale, diversity, and aspiration for making it a regular annual event, fostering cross-learning and curriculum relevance. She ended the welcome note encouraging the group to draw learning from the vast pool of practice experiences to take it to the classroom through various pedagogy tools, case studies, role play and monographs.

Dr. Roshan Shrestha expressed regret for not being able to attend the conclave in person. In his online address, **Dr. Shrestha pointed out that such an event would integrate sanitation and WASH components in the climate agenda resulting in learning and sharing among the large group of participants.** He praised the collaboration between academia and practitioners, citing examples from CEPT University and BMGF's long-standing partnership, including initiatives such as the PAS (Performance Assessment System) Project, the FSSM (Faecal Sludge and Septage Management) journey in India and the CWIS (Citywide Inclusive Sanitation) program. Dr. Shrestha expressed the need for continued

collaboration to address sanitation challenges effectively and advocated for the establishment of a discussion platform dedicated to this purpose. He concluded with best wishes for the success of the conclave.

Dr. Meera Mehta welcomed participants to the conclave and expressed gratitude for the overwhelming response. She highlighted the synergy between academic knowledge and practical experience at CEPT University, referring to the institution's legacy of balancing academics and real-world applications. **Dr. Mehta underscored the importance of global collaboration and the need to learn from both the Global North and South.** She commented that while some of the climate related aspects discussed by the group are already integrated in the WASH sector, the climate agenda will help to emphasise them. She cited the challenges of using our existing local resources, such as groundwater or surface water, efficiently and having better water and sanitation plans. Dr. Mehta also underscored the value of shared learning. She applauded the young team at CWAS and the students from the Faculty of Planning, CEPT for their energy and dedication in organising the event. She concluded with a warm welcome to the participants at CEPT campus.

Dr. Suren Vakil welcomed attendees on behalf of CRDF, underlining that activities on climate change are carried out across all centers of CRDF. He illustrated this through the Global Cooling Prize Competition at CARBSE, electric mobility for public transport at COE-UT and AI experimentation for flood forecasting at CAG. He appreciated the impactful work of CWAS, citing a recent interaction with a confident

woman SHG (Self Help Group) member who operates the solar powered wastewater treatment plant in her city. He noted that CWAS's initiatives also have a direct positive impact on societal upliftment through women's empowerment and environmental sustainability through the use of renewable energy and reuse of treated effluent. **Dr. Vakil also discussed the importance of technology in achieving sustainable solutions and advocated for high-quality infrastructure in the Global South, urging against compromising standards.** He invited attendees to participate in upcoming CRDF professional conferences to facilitate such interdisciplinary discussions. He extended a warm welcome to delegates, acknowledging the importance of global collaboration in addressing water and climate challenges.

Mr. Barjor Mehta, the President of CEPT University, spoke about the University's autonomy and its recognition of the transformative power of education. **Mr. Mehta urged for collaborative knowledge exchange across borders, especially on the need for practical and implementable financial solutions to address climate change challenges, particularly in the context of urban issues.** He advocated for a robust system of measurement and financial mechanisms aligned with climate sensitivity and social inclusivity. He also stressed the importance of resolving water and sanitation challenges faced by vulnerable populations, especially those in informal settlements. He welcomed participants to the CEPT campus and expressed his wishes for a successful event.



## KEYNOTE ADDRESSES

*The keynote speakers brought their diverse expertise and experience to the conclave. Mr. Arbogast, with his experience in leading WASH through global philanthropy, brought forward both the large sanitation challenges and opportunities at the global level. Prof. Revi, with his interdisciplinary academic experience and practice, talked about the “local to global WASH climate nexus” and the need for climate resilient development. Prof. Evans, a leader in public health engineering, talked about the “climate and sanitation puzzle” and focused on adaptive management approaches that respond to local contexts. Dr. Vairavamoothy, an expert in water management, discussed urban water and sanitation issues in the climate change context. Prof. Koottatep, specialising in environmental engineering, addressed climate risks and sanitation challenges and provided innovative solutions. Prof. Willetts, a research director, provided insights into risk and resilience in WASH.*

The keynote speakers covered innovative solutions for climate change, calling for holistic approaches and evidence-based decision-making in WASH services. They discussed challenges such as the historical neglect of sanitation, the dynamic nature of greenhouse gas emissions, and the need for profitable business models. As evident from the keynote speeches, the way to tackle this will be to adopt integrated approaches to climate resilience, foster decentralised systems, and develop inclusive frameworks for addressing climate change in the WASH space. It was also noted that collaborative efforts are crucial in building resilience and ensuring equitable access to sustainable sanitation services.

### Keynote Address by Mr. Brian Arbogast, Director of WASH, BMGF

*Mr. Arbogast delivered the first keynote address at the Conclave, focusing on sanitation, climate change and innovative solutions. He described various ideas and technological innovations supported by BMGF. Throughout the address, Mr. Arbogast emphasised the importance of holistic approaches to sanitation and integrating climate considerations into policy and practice.*

Dr Meera Mehta introduced the first keynote speaker, Mr Brian Arbogast, Director of Water, Sanitation and Hygiene, at the global Growth and Opportunity division at the Bill and Melinda Gates Foundation (BMGF). Mr. Arbogast has led and guided the WASH program of BMGF across several countries in Asia, Africa and Latin America. He applauded the global participation at the Conclave and acknowledged the growing influence of research from various regions across the globe on sanitation practices.

Mr. Arbogast's address described sanitation policies in different countries of the Global South, including India, Bangladesh, Nepal and Zambia. He appreciated the efforts of the

NFSSM Alliance in India to bring together practitioners and researchers who have become a trusted voice to the Government of India and other stakeholders. He discussed other global initiatives and partnerships, such as the Climate Resilient Sanitation Coalition, aimed at integrating sanitation and climate policies and practise on a global scale. **Mr. Arbogast outlined challenges in measuring sanitation outcomes and climate impacts, advocating for improved local data systems and resilience strategies. He stressed on the importance of adaptation alongside mitigation, elaborating opportunities for innovative financing and transformative technologies like the reinvented toilet.** He also pointed out the need for developing the

state-of-the-art approaches for measuring greenhouse gas (GHG) emissions associated with sanitation technology.

Mr. Arbogast also addressed specific hazards such as droughts, floods, unplanned urban growth and the need for resilient sanitation systems to overcome these challenges effectively. He highlighted the role of local engagement and geospatial data in developing relevant adaptation projects. He concluded by showcasing transformative technologies like the Reinvented Toilet supported by BMGF, which offers an innovative solution to a longstanding sanitation issue and has the potential to revolutionise the sector globally. Dr. Mehta praised the presentation's breadth, likening it to the richness of a Marathi thali.

During the interactive session, participants posed various questions on the reinvented toilet, related business models, their climate friendliness and the feasibility of carbon financing. Mr. Arbogast explained that cost reduction is a learning curve, and as production increases, costs will decrease, making them more accessible. He mentioned that reinvented toilets are climate-friendly due to zero methane emissions, but reducing electricity usage remains a challenge for cost and energy efficiency. He also noted that **there are potential funding opportunities for carbon financing in sanitation. However, there is a need for more precise definitions of adaptation benefits to enable its qualification for climate funding.**



### Keynote address by Prof. Aromar Revi, Director, Indian Institute for Human Settlements (IIHS)

*Prof. Revi delivered a keynote address that navigated from the global to the local scale, emphasizing the need for evidence-based narratives to drive conversations and policy decisions effectively. His insights underscored the urgency of adopting integrated approaches to climate resilience and the need for evidence-based decision-making for addressing the critical gaps in knowledge and action.*

Prof. Shalini Sinha from CEPT University introduced Prof. Aromar Revi, the founding director of the Indian Institute of Human Settlements, as the second keynote speaker..

She welcomed Prof. Revi and detailed out his extensive interdisciplinary experience spanning 40 years, his involvement in key international commissions and his significant

contributions in bringing together global, urban and climate change agendas.



Prof. Revi delivered a keynote address that navigated from the global to the local scale, emphasising the need for evidence-based narratives to drive conversations and policy decisions effectively. With the contextual background of interconnected crises such as the COVID-19 pandemic, economic recession, and approaching biodiversity collapse, he pointed out the disproportionate impact of poverty and inequality, particularly in the regions of Global South. He also underscored the fragmented nature of intergovernmental cooperation and the challenge of linking local actions, such as sanitation practices, with the broader climate objectives. He noted that **there is a noticeable absence of attention to water and sanitation issues in key global policy documents, indicating a gap in research and evidence.**

Prof. Revi noted that cities have become hotspots for climate impacts and there is a need to link the three different systems: climate, human and biosystems. He cited the concept of **climate resilient development (CRD), which brings together sustainable development for all, integrating climate adaptation, mitigation, and biodiversity conservation efforts.** He argued against compartmentalised solutions that neglect critical interdependencies and stressed the need for systemic responses to address climate risks effectively. He mentioned five simultaneous system transitions to address

systemic risks: i) energy systems, ii) industrial systems, iii) land, coastal, ocean and freshwater ecosystems, iv) urban and infrastructure systems, and v) societal choices and transitions. He highlighted the changing global hydraulic cycle and the importance of quantifying health benefits to garner attention for water efficiency efforts.

Furthermore, Prof. Revi elaborated on the necessity of enhancing infrastructure resilience to cope with climate-induced challenges such as flooding and drought. He advocated for a change in planning frameworks to embed improved Water, Sanitation, and Hygiene (WASH) practices in the local water cycle and for addressing severe gaps in WASH climate evidence chains. In addressing mitigation strategies, he outlined key sectors such as energy and urban infrastructure, touching upon the feasibility and co-benefits of various approaches. He underscored the importance of behavioural change and the need to transcend traditional sectoral trade-offs to achieve sustainable development goals. By advocating for evidence-based approaches, Prof. Revi aimed to bridge the gap between science and policy to effectively address critical climate challenges and enhance climate resilience, particularly in urban areas.

Prof. Sinha thanked Prof. Revi for his presentation, starting from the larger context of the inter relationships between climate change and water, and coming down to the practicalities of climate resilient development.

During the interactive session, Prof. Revi addressed various pressing concerns raised by the audience. He responded to a question regarding the mismatching priorities in urban transport and land use planning, emphasising the importance of focusing on demand-side strategies to reduce emissions. Prof. Revi also discussed climate justice and the need to

address issues of access and control over capital assets. Additionally, he explored **the complexities surrounding water management, especially the need to shift societal perceptions from viewing water as a commodity to recognising it as a valuable**

**resource.** He acknowledged the challenges of areas with high population densities and limited water resources, stressing the need for ongoing innovation and adaptation in addressing water-related issues in the global South.

### Keynote address by Prof. Barbara Evans, Chair PHE, University of LEEDS

*Professor Evans' keynote address provided valuable insights into the complex relationship between climate change and sanitation. She elaborated the dynamic nature of greenhouse gas emissions along the sanitation service chain and also focused on the need for adaptive management approaches that respond to local contexts while ensuring resilient and equitable sanitation services in a changing climate.*

Mr. Darshan Parikh, Director, CRDF, introduced Prof. Barbara Evans as the third keynote speaker, highlighting her role as the Chair in Public Health Engineering at the University of Leeds. He described her focus on Sustainable Development Goal 6, and her initiatives in resilient and equitable sanitation with various institutions like the World Bank, UNICEF and WHO.



Prof. Evans delivered a keynote address focused on the intersection of climate change and sanitation, especially discussing the need for practical solutions to mitigate emissions while ensuring resilient and equitable sanitation services. She asserted the importance of viewing sanitation as a service with a focus on operation and maintenance rather than just as an infrastructure project.

Prof. Evans presented findings from a study conducted in Kampala, which revealed

significant GHG emissions from both onsite and offsite sanitation systems. Using a comprehensive analysis, the study identified three main sources of emissions in sanitation: direct emissions from excreta during chemical transformation, operational emissions from activities such as trucking and extensive use of energy, and embedded emissions from the production of sanitation assets.

Speaking about the dynamic and interconnected nature of greenhouse gas emissions along the sanitation chain, **Prof. Evans highlighted the need for holistic management approaches. She advocated for practical strategies such as improvements in managing excreta storage systems, capturing greenhouse gases at treatment plants, and optimising treatment processes based on market demand.** These strategies, she argued, are essential for reducing emissions while ensuring the resilience and equity of sanitation services.

**Prof. Evans also underscored the importance of understanding context-specific challenges in implementing emission mitigation strategies.** She encouraged WASH practitioners to consider factors such as local infrastructure, market demand, and waste management practices when devising

solutions for more effective and sustainable approaches to address the climate-sanitation nexus.

Moreover, Prof. Evans indicated the need to prioritise mitigation of methane emissions from anaerobic processes, such as in septic tanks, which represents a significant challenge for urban sanitation systems. She noted that reducing emissions requires a multifaceted approach that goes beyond specific technologies, thus underlining the importance of managing the entire sanitation system efficiently.

During the interactive session, in response to an audience inquiry, Prof. Evans clarified that, per their estimations, 40% of Kampala city's emissions emanate from sanitation. She added that their emissions accounting focused solely

on the sanitation chain without factoring in energy-related emissions from bringing in water to run the systems. With this, she outlined the issue's complexity, citing the current lack of evidence on differential water usage between households connected and unconnected to sewerage systems. Furthermore, she discussed the global underestimation of methane emissions from wastewater and efforts to raise awareness at various international platforms such as the COP. Responding to queries about the impact of regular desludging of the septic tanks and pits, she stressed the importance of managing waste quickly to capture methane efficiently. She acknowledged the significance of sanitation workers' roles and called for innovative, context-specific solutions to transition from interim to long-term solutions.

### Keynote address by Dr. Kalanithy Vairavamoorthy, Executive Director, IWA

*Dr. Vairavamoorthy discussed the transition towards off-grid and circular water management, emphasising the importance of decentralised systems in the global South. He commented on the sanitation sector's historical neglect, reframing it as a matter of self-preservation and urged greater politicisation. He proposed fostering a diverse market for innovative sanitation solutions and suggested that Governments should ensure equitable enforcement while leaving decision-making to local levels to unlock the potential of decentralisation.*

Prof. Ashwani Kumar from CEPT introduced Dr. Kala Vairavamoorthy, highlighting his esteemed reputation as an internationally recognised urban water resource management expert. Prof. Kumar noted Dr. Vairavamoorthy's significant contributions, including his collaborations with prestigious organisations such as the World Bank, UN-Habitat, UNESCO, GWP, SIWI, and the EU. Dr. Vairavamoorthy has held diverse positions, such as Deputy Director-General for Research at the IWMI, Founding Dean of the Patel College of Global Sustainability, and positions as a tenured professor in universities including the University of South Florida, University of Birmingham, and UNESCO-IHE.

Dr. Vairavamoorthy delivered the keynote address virtually. He introduced the IWA as a global network of professionals and spotlighted its specialist groups, as well as extensive publication and conference initiatives aimed at translating research into practical solutions.



Dr. Vairavamoorthy began by pointing out a major transition within the water and sanitation sector through various IWA events. He discussed the shift towards off-grid, circular approaches in water management and the potential for decentralised systems in the context of the new low-carbon economy. He noted that **the global North focuses on fine-tuning systems with universal access, while the global South faces challenges due to limited access. However, this presents an opportunity for the global South to innovate with energy-neutral systems, efficient water usage, and capture value from waste, shifting away from carbon-intensive infrastructure.** Dr. Vairavamoorthy indicated the need for leadership and innovation to navigate this shift effectively.

He discussed how sanitation has been pivotal in driving significant economic activity in the global North during its 19th-century Golden Age of Sanitation. However, it has been overshadowed in the global South, with delayed recognition and integration into global development agendas like the MDGs. Despite challenges, recent shifts indicate a departure from this historical neglect, with sanitation gaining prominence, particularly in the global South. This resurgence signifies the onset of a new era, where sanitation moves out of the shadow of water supply, marking what could be deemed as the next Golden Age of Sanitation, indicating substantial investments and attention, especially in regions facing sanitation challenges.

Dr. Vairavamoorthy advocated for a strategic shift in sanitation, stressing on the inadequacy of past tactics to elevate the issue on political agendas. He questioned the rate of progress in the sanitation sector, which lags behind other sectors such as telecommunications and energy. **Urging a narrative change, he pointed out that climate change is making sanitation everyone's problem without paying heed to**

**boundaries of systems or class. With this, he reframed sanitation as a matter of self-preservation rather than charity, drawing parallels to the collective response seen during the COVID-19 pandemic.** He further, called for greater politicisation of sanitation, targeting influential voices to drive urgent action and signalling a departure from conventional approaches in tackling the sanitation crisis.

Dr. Vairavamoorthy commented on the drawbacks of traditional centralised systems, highlighting their high costs and time-consuming implementation. In comparison, **decentralised systems offer advantages such as incremental growth matching population expansion, resource proximity, technological adaptability, and greater resilience against failure.** He advocated for a strategic shift towards decentralisation in the sanitation sector, as it can be particularly beneficial for the Global South due to its inclusive and micro-level functioning.

Drawing lessons from the decentralised energy and telecommunications sectors, Dr. Vairavamoorthy suggested that governments should facilitate change by creating a favourable marketplace for innovation in sanitation. **Fostering a diverse market and economy is crucial, as mandating one-size-fits-all sanitation solutions may not suit every community. Governments should ensure equitable enforcement and universal protection of human rights, leaving decision-making to local levels to unlock the potential of decentralisation and competitive sanitation.** People are willing to invest in solutions that address their specific requirements, and by appropriately incentivising, service providers and entrepreneurs, their demands can be met.

Dr. Vairavamoorthy concluded by questioning the feasibility of building new infrastructure

sustainably and in a low-carbon manner, underscoring the need for a paradigm shift in water utilities to deliver essential services while minimising environmental impact. He

expressed optimism about the conclave's potential to foster collaboration between academics and practitioners, shaping lasting change in the water and sanitation sector.

### Keynote address by Prof. Thamarat Koottatep, Co-Director of GWSC, AIT

*Prof. Koottatep addressed emerging challenges in sanitation management. He discussed climate issues, inclusive sanitation, and the need for profitable business models. Highlighting the importance of regenerative sanitation, he proposed revisiting terminology and considering the regeneration of existing systems.*

Prof. Ashwani Kumar from CEPT University introduced Prof. Thamarat Koottatep, who is a faculty member of the Department of Environmental Engineering Management at the Asian Institute of Technology (AIT) in Thailand and the Co-Director of the Global Water and Sanitation Center (GWSC) at AIT. His expertise spans various facets of sanitation, including faecal sludge Management, sanitation systems, and nature-based solutions for waste and wastewater management and marine plastic pollution. He has patented sanitation toilet technology and is actively involved in the development of other innovative solutions.

One of the primary challenges highlighted by Prof. Koottatep is rapid urbanisation observed in many developing countries, leading to the swift growth of second-tier cities. These burgeoning urban centres require robust sanitation infrastructure to meet the needs of their expanding populations. However, the rapid growth presents a significant problem in providing adequate sanitation services and infrastructure. He underscored the importance of proactive planning and investment to address this impending burden effectively.

In his address, Prof. Koottatep compared Thailand's performance on sanitation management with neighbouring countries like Myanmar and Laos, to show disparities in achieving safely managed sanitation. Despite

Thailand's relatively advanced infrastructure, there is a gap in achieving comprehensive sanitation coverage. This underlines the need for concerted efforts to bridge this gap and improve sanitation access across the nation.



Prof. Koottatep further delved into the financial implications of scaling up sanitation infrastructure, particularly in countries with large populations like India. He referred to the substantial investment required to enhance sanitation access and the challenges associated with securing funding for such projects. Additionally, **Prof. Koottatep**

**emphasised the important need to consider climate resilience and adaptation in sanitation infrastructure development. While this may entail additional costs, it is crucial for long-term sustainability.**

Prof. Koottatep described the challenges that may arise across various stages of sanitation management due to climate change. From container emptying to treatment and disposal, each phase presents increased difficulties and risks in ensuring safe sanitation practices. He **highlighted the importance of assessing and understanding the direct and indirect emissions associated with sanitation systems. He introduced the Energy Performance and Carbon Emissions Assessment and Monitoring Tool (ECAM Tool) as a promising means to estimate greenhouse gas emissions. Given the variations in system design, usage patterns, and regional conditions, tailored approaches are necessary for accurate assessments.** Collaborative efforts involving experts and stakeholders are crucial for refining methodologies and developing comprehensive emission inventories.

Additionally, Prof. Koottatep described the evaluation of the climate resilience of WASH technologies through a catalogue that provides valuable insights into their GHG emissions, climate resilience and adaptability. He advocated for integrating climate considerations into investment projects, ensuring that technologies deployed in developing countries are environmentally sustainable and resilient. Prof. Koottatep acknowledged that such efforts represent only a small step towards addressing the complex challenges posed by climate change in WASH.

**Prof. Koottatep advocated for a paradigm shift in approaching sanitation as a business opportunity rather than solely a public service.** He presented a case study from Thailand, where a private sector entity has

ventured into the sanitation business, leveraging innovative technologies and business models to generate profits while providing essential services. This example underscored the potential of profitable sanitation ventures to attract investment and foster sustainable development.

**Prof. Koottatep also discussed the role of technology in addressing sanitation challenges, especially the importance of leveraging advancements like Internet of Things (IoT) sensors and regenerative sanitation techniques.** He proposed the concept of regenerative sanitation, which entails not only preventing negative impacts but also creating positive environmental and social outcomes through sanitation interventions.

In conclusion, Prof. Koottatep outlined key takeaways concerning emerging challenges in FSSM, climate crises, and inclusive sanitation. These included the importance of integrating low-income communities effectively, addressing issues beyond black water, such as solid waste and grey water, and considering sustainable financing models. Prof. Koottatep proposed alternative methods of carbon sequestration such as biochar or reforestation. He concluded by urging a reconsideration of terminology and encouraging the adoption of regenerative principles in existing sanitation systems.

During the interactive session, Prof. Koottatep responded to several inquiries regarding sanitation and its links to climate change, the role of the private sector, generating demand for sanitation, and the interface between government and research. He discussed the complexity of safely managed sanitation and suggested focusing on achieving the current requirements before considering additional criteria such as reducing emissions. Prof. Koottatep reiterated the importance of

sanitation as a public good but also suggested exploring ways to make it more attractive and profitable to incentivise investment. He also touched on the challenges of implementing

projects in Sub-Saharan Africa, particularly regarding optimising emptying services and addressing technological constraints.

### Keynote address by Prof. Juliet Willets, Research Director, University of Technology Sydney

*Understanding risk and resilience in water and sanitation services is crucial for addressing challenges posed by climate change. Prof. Willets's presentation provided insights on the importance of considering social, ecological, and infrastructural factors in building resilience. Moving forward, collaborative efforts will be needed to develop inclusive frameworks and methodologies that could effectively address dynamic and uncertain environments.*

Prof. Purvi Chhadva, from CEPT, introduced Prof. Juliet Willets as the Research Director at the University of Technology, Sydney. She is a recognised expert in the field of water and sanitation in low- and middle-income country contexts and works on development themes like gender equality, the role of civil society, accountability in governance, monitoring and climate change.



Drawing from a spectrum of research work, Prof. Willets spoke about the **multidimensional nature of climate resilience, spanning ecological, technological, service provision and societal dimensions. She highlighted the need to consider resilience not as a singular concept but as a composite of various interconnected elements.** For instance, she advocated for a comprehensive approach to water resource management,

integrating tools and indicators to track environmental changes and inform adaptive responses.

In her presentation, **Prof. Willets presented a systematic approach for developing resilient sanitation technologies tailored to different climate hazards which balances various design features and trade-offs to enhance overall resilience.** She recommended using the IPCC 2020 definitions to inform ideas about risk and resilience, referencing their relevance in understanding the dynamic interactions between climate-related hazards and human systems.

Prof. Willets provided concrete examples to illustrate the application of resilience principles in real-world contexts, such as the examination of water and sanitation services in disaster-prone regions such as Indonesia. She outlined efforts to assess the vulnerability and resilience of rural water supply systems of Indonesia and the need for responsive funding mechanisms and improved disaster preparedness. Similarly, she discussed challenges faced by urban sanitation systems in the face of climate hazards, and the importance of community engagement, informed decision-making, and flexible infrastructure design to overcome them.

Finally, Prof. Willets touched on broader societal resilience, citing examples of global

initiatives and ongoing research on community resilience frameworks. **She emphasised the importance of inclusivity and community-centric approaches in shaping resilience strategies.** She concluded by prompting the audience to reflect on critical aspects of climate resilience in water and sanitation and their potential contributions to global discussions on the topic.

In the interactive session, Prof. Willets expressed the need for methodologies to

monitor trends in both ecosystems and urban development for climate risk estimation. Advocating for climate-resilient structures in developing countries such as Nepal, she proposed using cost-benefit analyses and adaptive planning. Prof. Willets acknowledged the gap between advanced risk definitions and traditional safety planning, advocating for inclusive frameworks and diverse expertise.

## HIGH LEVEL PANEL DISCUSSION ON POLICIES AND FINANCING

*The high-level panel discussion, moderated by Dr. Dinesh Mehta, aimed to explore the multifaceted challenges and innovative strategies surrounding the nexus of WASH, climate change impacts, and sustainable financing mechanisms. The distinguished panellists, each with diverse expertise and extensive professional journeys, collectively brought a wealth of insights and perspectives into the evolving landscape of governance, climate and finance.*

Dr. Dinesh Mehta welcomed and introduced all the panellists. The panel included i) Ms. Sheila Patel from SPARC, recognised for advocacy for the voice of the poor; ii) Dr. Roshan Shreshtha from the WASH team of BMGF, to provide insights into sanitation innovation and climate resilience; iii) Mr. Punit Lalbhai, executive director of Arvind Limited and board member of the CEPT University, to represent the private sector perspectives on water and climate; iv) Ms. Sujata Shrikumar from Powertech, with expertise in municipal finance and green bonds; vi) Prof. Barjor Mehta, President of the CEPT University, with extensive expertise in urban development and infrastructure at the World Bank, and v) Prof. Meera Mehta, Center head at CWAS, with a background in architecture, economics, as well as extensive experience in WASH financing.

Panellists discussed the intersection of climate action and development, particularly focusing on the role of communities, cities, and innovative financing mechanisms.

Ms. Patel highlighted the challenges in addressing the needs of poor communities, emphasising the necessity of integrating climate and development efforts. **She stressed on the inseparable link between climate action and inclusive development, advocating for a holistic approach that considers the needs of the most vulnerable populations.** She further discussed the implications of rapid urbanisation due to internal growth and economic opportunities in cities and expressed concerns about unmanaged urbanisation due

to a lack of strategic analysis of demographic shifts and migration patterns.



Mr. Lalbhai shared insights from the textile industry, illustrating how private enterprises can drive sustainability initiatives. By implementing innovative water recycling technologies and sustainable farming practices, his company, Arvind Limited, has not only reduced its environmental footprint but has also fostered partnerships to promote water stewardship beyond its own operations.

**He commented that community engagement, collective action and the right coalition for progress are necessary to enhance climate project bankability.** He cited examples from their business ecosystem where there is a strategic focus on community engagement in areas where the company has influence and stake. To enhance the bankability of climate projects, he also suggested blended finance as a strategy to reduce costs.



He further gave examples from Arvind's sanitation initiatives that focus on sewage water reuse for textile manufacturing but are exploring broader involvement through Arvind Envisol Ltd. In response to an audience query, he acknowledged the increase in energy usage and carbon footprint in wastewater treatment but emphasised the trade-off value for water sustainability. He also discussed their journey towards renewable energy and aiming for 100% carbon neutrality in future operations.



Dr. Shreshtha elaborated on the catalytic role of the Gates Foundation in promoting sanitation innovation and climate resilience. **Through strategic investments and partnerships, the foundation aims to mobilise resources for climate-resilient sanitation**

**infrastructure and promote inclusive planning approaches in climate-vulnerable regions.**

Drawing on his work, Dr. Shreshtha emphasised the significance of accurate data in municipal investments, particularly for understanding the real costs of implementing projects. He commented that capacity building is crucial, as municipalities often find that implementing projects themselves is cheaper than relying on external support. He stressed the need to convince municipalities about the cost-effectiveness of investing in projects by providing them with accurate data, and also the need for effective communication strategies to convince policymakers about the benefits of making sanitation products cheaper and greener.



Ms. Shrikumar provided valuable insights into municipal financing for water, sanitation, and climate projects. **Drawing from her experience with municipal bonds and green financing initiatives, she talked about the importance of financial sustainability and innovative financing mechanisms to support climate-resilient infrastructure development at the local level.** She discussed the challenges in legal compliance that cities face with green municipal bonds. These include third-party

verification and periodic reporting. She also noted the focus of such green financing instruments on renewable energy over crucial sectors like water and sanitation. She cited NIIF's initiatives in waste-to-energy projects and municipal bonds for solar ventures but expressed concerns about limited benefits for cities due to the high costs of such projects. She also pointed out the significance of ESG disclosures to lenders for ensuring that projects align with both local laws and societal concerns, and preventing any potential disruptions.



Prof. Barjor Mehta reflected on his experience with urban development projects and the evolving discourse on climate change at the World Bank. **He spoke about the need for integrated approaches to climate action and urban planning, acknowledging the challenges of mainstreaming climate considerations in development projects in areas lacking basic services such as water access.**

He emphasised the importance of redefining a "bankable" project, focusing on its viability and implementability. He stressed on the need to consider various factors beyond technical aspects, including political, administrative, financial, and community dynamics. He

highlighted the necessity for educational institutions to strengthen curricula to teach students about developing viable projects that align with real-world complexities. He urged for the establishment of platforms to showcase such projects and encourage faculty engagement in this endeavour.



Dr. Mehta discussed the critical importance of data systems in understanding and improving urban sanitation and water supply services. Furthermore, **Dr. Mehta discussed the lack of integration of water and sanitation issues into urban planning, stressing the need for greater focus on these aspects in urban development plans. She also addressed the challenges in climate finance, noting the absence of WASH from traditional climate finance mechanisms.** Building on this, Dr. Mehta advocated for "greening of urban investments" to ensure climate resilience and stressed the involvement of women in climate resilience activities.

She identified the need to build capacity for local governments and the private sector to ensure the financial viability of WASH projects, including small-scale initiatives like desludging. This would involve improving contract clauses, tendering strategies, contractor selection, billing systems, and monitoring systems

through a collaborative effort with local and state governments and appropriate policies. She introduced the innovative approach of assessing cities' ESG levels, a pioneering initiative by CWAS to drive improvements in urban sustainability.

The panel also discussed the disappearance of water bodies not only in metro cities but also in smaller cities and the subsequent after affects like water stress and flooding. Ms Patel talked about SPARC's work on the rejuvenation of water bodies in the Mumbai region by

involving women's networks and funding through government programmes. Dr. Mehta also spoke on the significance of preserving these water bodies, citing examples from the academic research of students at CEPT, where historical maps reveal a drastic reduction in local water resources.

Overall, the session highlighted the need for collaborative efforts, robust data systems, innovative financing models and community engagement to address water, sanitation and climate resilience challenges effectively.



## PANEL DISCUSSION ON EMERGING RESEARCH AREAS

*The panel discussion, moderated by Dr. Mona Iyer, aimed to collectively reflect on emerging research agendas in water and sanitation amidst climate change. Panellists with diverse backgrounds in research, practice, capacity building and academia shared insights on research trends tailored to the Global South. This was followed by discussions on challenges and opportunities in setting research agendas and integrating real-world issues.*

Prof. Mona Iyer warmly welcomed the panellists and introduced them to the audience. The panel included i) Prof. Thamarat Koottatep, Co-director of the Global Water and Sanitation Center at the Asian Institute of Technology, Thailand, specialising in sanitation and wastewater engineering; ii) Prof. Ligy Philip, Institute Chair Professor in Department of Civil Engineering IIT Madras, known for her contributions to advancing environmental engineering knowledge; iii) Prof. Praveena Gangadharan, Project Director of the Global Sanitation Center of Excellence at IIT Palakkad, focusing on research and mentoring in sanitation startups; iv) Prof. Tanvir Ahmed, Director of the Institute for Training Network at Bangladesh University of Engineering and Technology (ITN-BUET), specialising in capacity building platforms; and v) Prof. Celestin Defo, Associate Professor at the Institute of Agriculture, Forestry, Water, and Environment at the University of Ebolowa, Cameroon, with expertise in water, energy, and climate change.

Panellists discussed challenges in their regions and issues related to market and funding, as well as perception issues in sanitation research.

Prof. Philip talked about her research on climate resilience in coastal cities, notably Chennai, focusing on the impact of the 2015 floods on wastewater treatment plants. She highlighted the need to assess the vulnerability of both centralised and decentralised systems in terms of location. Chennai's water scarcity and flooding challenges reflect the importance and potential of water recycling for indirect

potable reuse. **She advocated for need-based, society-oriented, and innovative research, with stakeholder feedback and action-oriented training.**



She also discussed about her center's action-oriented research in sanitation in villages. **Prof. Philip argued that wastewater management is equally important to water source management for becoming water secure.** She also addressed the gap between technological inventions and societal needs, noting the importance of acknowledging research failures alongside successes.

Prof. Koottatep observed some of the emerging research areas in the sector, particularly focusing on innovative 'Reinvented Toilet' technologies. **He emphasised the need to reduce costs associated with this technology and explore processes for cost reduction. He also stressed the need to understand the environment to propose**

suitable processes and costs for innovative technological advancements.



Prof. Koottatep discussed the importance of market readiness for technology along with social readiness to ensure demand-based technology adoption and supported the utilisation of industrial pathways for innovation to accelerate market reach. This is needed as a key challenge lies in navigating market perceptions amid climate change uncertainties for sanitation systems. He also proposed the concept of regenerative sanitation, which involves revitalising or retrofitting existing sanitation infrastructure, whether centralised or decentralised, to adapt to addressing WASH challenges.

Prof. Gangadharan noted the industry emphasis on laboratory-stage research without consideration for scalability and the necessity for viable business models. She remarked that although research in India frequently remains confined to the laboratory phase, the Global Sanitation Center of Excellence aims to facilitate the transition of innovations to market-ready solutions. She envisioned the sanitation sector evolving into an industry with job opportunities, driven by viable technologies, business models, and strong policies.



Further, Prof. Gangadharan talked about her research on wastewater treatment and resource recovery using electrochemical systems. Her work focuses on recovering resources from urine and utilising them in the water, energy and agriculture sectors. Through innovative approaches like Forward Osmosis coupled with Electrochemical systems, her unit has developed the Osmotic Urine Fuel Cell (OsUFC) to produce water, electricity and concentrated nutrients from urine. She has also led an energy-positive project, converting source-separated urine into biofertiliser using an electrochemical phosphate recovery reactor, yielding both fertiliser and electricity. On the topic of circularity, she further discussed about reusing the electrode from e-waste for electrochemical applications in water and wastewater treatment. **Regulatory frameworks and robust business models were highlighted as crucial for technology application.**

Prof. Ahmed particularly focused on GHG emissions from FSSM systems. He cited the example of Bangladesh, where numerous pit latrines are prone to flood during the monsoon season, leading to significant differences in GHG emissions between wet and dry pit latrines. He stressed the need for life cycle analysis (LCA) for FSSM systems to assess their

environmental impact effectively. Research is needed to understand how existing infrastructure, such as large water and wastewater treatment plants, can be retrofitted and adapted to respond effectively to climate change-induced challenges. The challenges include increased salinity in water sources and sudden shock loads of sewage.



Prof. Ahmed highlighted the necessity of more research on the impacts on public health due to improper waste management especially with respect to diseases like dengue and malaria during monsoons. He shared research initiatives on climate-resilient water supply systems and resource circularity through the conversion of faecal sludge into biofuel while stressing the importance of social acceptance in implementing such systems. Here, he emphasised that the challenge lies in societal norms rather than compost quality, noting that the compost meets heavy metal and pathogen standards, but faces resistance from farmers due to its origin from faecal sludge. He also noted that the other challenge in Bangladesh is the absence of an enabling environment for research and market development and a disconnect with actual execution. **Prof. Ahmed stressed the importance of involving service providers from the initial stage of research to**

**ensure their participation in formulation, decision-making, data collection and through the entire research process to execution. He further** discussed ongoing efforts in public health research and urban sanitation empowerment for women, recognising the need for further work in addressing gender disparities and ensuring the effectiveness of sanitation interventions.

There was a suggestion to focus on menstrual hygiene, especially considering its importance from a social science perspective, and its relevance during events like flash floods, which may be exacerbated by climate change.



Prof. Defo shared his extensive experience in water, sanitation and climate variability in Central Africa, particularly Cameroon, on topics like community water supply, technology for groundwater exploration and monitoring applications for WASH services. He reflected on his involvement as the deputy coordinator of an advanced master's program in non-sewered sanitation systems, citing ongoing research on sanitation infrastructure assessment, cultural influences, and technology development for waste management. He emphasised the need for local norms in the quality of drinking water and

wastewater disposal. He also spoke about challenges in the technical capacity of authorities, financial constraints, innovation and sustainability issues, and adherence to construction norms. Further, he further discussed innovative technologies for faecal sludge treatment, such as microfiltration, hyperaccumulators and the use of local micrite to extract pollutants from the liquid fractions of faecal sludge waste. Lastly, he mentioned his research on computer applications and the

development of low-cost biofilters and hand pumps for rural and urban populations to address water quality issues.

These points underscored the need for research that aligns with practical needs, policy objectives, and community engagement while leveraging interdisciplinary collaboration and innovative approaches for effective sanitation solutions.



## TECHNICAL SESSIONS

*The technical sessions encompassed 47 presentations, covering a wide array of topics related to WASH policies, governance, financing, and climate resilience. Discussions ranged from water-sensitive frameworks and financial strategies to sanitation worker safety and climate-resilient interventions. Case studies showcased success stories, challenges, and innovative solutions, with an emphasis on proactive planning, nature-based approaches, and community engagement. Gender equity and social inclusion were focal points, highlighting initiatives to empower women and transgender groups, connect self-help groups, and address menstrual waste disposal behaviour. Additionally, critical aspects such as safe resource recovery, GHG emissions evaluation, and stormwater drainage design sensitivity analysis were explored, alongside discussions on digital adaptation strategies for climate-resilient water management in urban areas.*

### Technical Session 1: WASH Policies, Governance and Financing in Global South

The technical session on WASH policies, governance and financing covered various WASH policies and procedures implemented in different countries, states and cities to enhance financial sustainability and governance structures for smooth implementation. Topics varied from water-sensitive urban planning frameworks, policy environments, financial strategies, and sanitation worker safety.

A total of 10 presentations were delivered under the theme of "WASH Policies, Governance, and Financing in the Global South" over two days. Prof. Anil Roy, from CEPT, chaired the technical session on day 1, while Ms. Upasana Yadav, from CWAS, chaired the session on day 2. The focus was on policy integration, water-sensitive urban planning frameworks, innovative financing mechanisms, city prioritisation for creditworthiness and ESG readiness, schemes for sanitation workers, mechanised scavenging, emergency service provision and the promotion of sustainable climate-resilient services through practical implementation.

Ms. Anjali Sherpa from the University of Bristol discussed the policy environment in Nepal for addressing climate resilience in sanitation. She noted that existing policies are insufficient in prioritising sanitation within the climate change agenda and recommended integrating resilience into sanitation planning, policy reforms, investments, and capacity-building activities.

Mr. Depinder Kapur from Centre for Science and Environment (CSE) discussed the Global South Water Sensitive Cities Framework, aiming to achieve cities' commitment to "Just and Equitable Access, Use, Reuse" of water supply, sewerage/septage, and stormwater management. He presented the case study of Sangam Vihari in Delhi and explored the possibility of retrofitting solutions in dense, unplanned urban settlements.

Mr. Ricard Giné Garriga from the Stockholm International Water Institute (SIWI) discussed the WASH climate resilient framework and showcased a case study illustrating the climate rationale in Cambodia. He introduced climate rationale, a process to improve understanding in the WASH sector around climate risks and how to act upon them and bring WASH and climate actors together.

Ms. Elmira Bacatan from UNICEF, Philippines, provided insights and reflections on modelling blended financing with output-based aid to build climate-resilient toilets for entrepreneurial poor households. She

explored the role of the private sector and highlighted the policy environment as an opportunity for action.

Dr. Sanghmitra Acharya from Jawaharlal Nehru University (JNU), Delhi, discussed climate change adaptation strategies for WASH, focusing on the role of service providers. She noted the lack of consideration for service providers in the policy environment, globally and locally, and brought forward voices from the field, with a special focus on women workers in a few cities of India.

Mr. Jayant Bhagwan from the Water Research Commission (WRC), South Africa, talked about the introduction of non-sewered sanitation-sensitive spatial planning and design for climate adaptation. He noted that integrating non-sewered sanitation into spatial planning and design frameworks is crucial for climate adaptation. Through innovation, collaboration, and inclusivity, resilient and sustainable sanitation systems can be developed to withstand the uncertainties of a changing climate.

Ms Sayantani Sikdar from the Centre for Policy Research (CPR), Delhi, talked about the importance of robust statutory frameworks, regulatory mechanisms and administrative structures to facilitate Integrated Urban Water Management (IUWM) and build resilient, sustainable urban water systems. She called for a comprehensive approach to address challenges in water supply, sanitation, storm water management and wastewater treatment within Mumbai's complex water landscape.

Ms. Upasana Yadav and Ms. Saubiya Sarehwala from CWAS, presented innovative financing mechanisms for climate-resilient

WASH services, also underlining the need for cities to be creditworthy and ESG-ready to mobilise diverse funding sources. These mechanisms can expedite progress towards universal access to sustainable and climate-resilient WASH services.

Ms. Meghna Malhotra from Urban Management Centre (UMC) discussed the visionary government initiative NAMASTE, aiming to reshape the narrative by prioritising the safety and dignity of sanitation workers across urban India. She remarked that achieving this goal necessitates collective efforts from various stakeholders, including government agencies, employers, civil society organisations and the public. By advocating for their rights and actively improving working conditions, we can honour sanitation workers' contributions and foster a more equitable and inclusive society.

Mr. Habibur Rahman from Water and Sanitation for the Urban Poor (WSUP) presented financial strategies tailored to coastal primary schools in Bangladesh for sustainable, climate-resilient WASH services. Relevant strategies include increasing awareness, capacity building, providing information on WASH policies, training on financial mechanisms, and offering guidelines on operation and maintenance.

Practical case studies and initiatives were presented, illustrating the importance of policy and guidelines, planning, capacity building, and tailored financial strategies to ensure sustainable and climate-resilient WASH services.

## Technical Session 2: Mitigation and adaptation in WASH services for climate resilience

The technical session on mitigation and adaptation in WASH services for climate resilience featured case studies from various regions ranging from city to country level. It highlighted success stories, while also addressing challenges and proposing innovative solutions to tackle climate-induced vulnerabilities in water and sanitation services. Solutions included proactive planning, nature-based approaches, and community engagement to combat climate-induced challenges.

A total of 14 presentations were delivered under the theme of "Mitigation and adaptation in WASH services for climate resilience" over two days. Prof. Rutul Joshi chaired the technical session on day 1, while Prof. Ravi Sannabhadti chaired the session on day 2. The focus was on addressing climate-induced challenges in various regions, including vulnerability assessments, innovative approaches to sanitation and water management, climate-resilient WASH systems, community engagement, and the integration of climate resilience into existing programs and policies.

Mr. Clinson Chacko from CDD India discussed Kochi city's (India) vulnerability to climate change, outlining threats like sea-level rise and deficient urban drainage systems. Stakeholders in Kochi, including municipal bodies and water authorities, were engaged in proactive planning efforts, such as the "Sanitation in My Backyard" (SIMBY) project, to sensibly develop local sanitation.

Mr. Digbijoy Dey from IRC International Water and Sanitation Centre, Netherlands, presented about climate hotspots in Bangladesh and demonstrated a systematic approach to address WASH challenges, focusing on technology convergence, finance, and skill-building among local stakeholders.

Ms. Gautamee Sayamwar and Mr. Chirag Patel from CWAS presented innovative approaches from Maharashtra, India, to address faecal sludge management challenges. The presentation outlines nature-based solutions

and the state's commitment to sustainable urban development.

Mr. Ganga Datta from Bindo Nepal Smriti Foundation discussed Nepal's challenges, proposing climate-resilient WASH systems involving water source recharging and effective management to combat poor governance and limited participation.

Ms. Amita Pathria from WaterAid India highlighted the urgency in integrating climate resilience into coastal Odisha's (India) WASH services, emphasising proactive planning and crisis-responsive goals.

Mr. Subhagata Mukhopadhyay from Hiroshima University focused on Baruipur's (West Bengal, India) vulnerability to cyclones, proposing a multidimensional approach for a resilient water supply system to address challenges effectively.

Mr. Shirish Singh from IHE Delft Institute for Water Education, discussed flood-resilient sanitation solutions in Kabale Municipality, Uganda, offering adaptive approaches for peri-urban areas.

Dr. Anil Aryal from the International Water Management Institute (IWMI) Nepal presented efforts in addressing climate vulnerability in Nepal through resilient inclusive WASH systems (RES-WASH)," underscoring the importance of inclusivity and resilience in combating climate-induced challenges.

Mr. Sangarmjit Nayak from the HUD department, Govt. of Odisha, showcased the

remarkable progress of Odisha's Faecal Sludge and Septage Management (FSSM) initiatives, especially the adoption of climate-resilient interventions and community engagement.

Ms. Arwa Bharmal and Ms. Priyadarshini Choudhary from CWAS discussed climate-responsive WASH initiatives in small and medium towns of Maharashtra and Gujarat, India, highlighting the integration of WASH with clean energy and innovative water practices.

Dr. Yogesh Jadeja, Director of Arid Communities and Technologies, talked about the urgent need for geohydrological zoning and incorporating sustainable practices in urban water management to address climate challenges effectively.

Mr. Anthony Odili from the WASH R&D Centre, University of KwaZulu-Natal, presented on decentralised sanitation solutions in eThekweni Municipality, stressing the importance of climate-resilient strategies post-Durban floods.

Mr. Vishwanath S., Director of Biome Environmental Trust, discussed innovative water management practices in Bengaluru, focusing on wastewater reuse and circular economy principles.

The integration of climate resilience into community-managed water supply systems in Indonesia was discussed through the lens of the flagship rural water supply and sanitation program called as PAMSIMAS, presented by Mr Rioneli Ghaudenson from the University of Indonesia.

Overall, the session showcased a comprehensive range of topics and perspectives aimed at addressing challenges and promoting resilience in WASH systems amid a changing climate. It illustrated the critical importance of collaborative efforts, community engagement, and sustainable practices in building climate-resilient WASH systems.

### Technical Session 3: Last mile connectivity for WASH services in slums and low-income neighbourhoods for climate resilience.

The session covered climate-resilient interventions and challenges across diverse regions to achieve last mile connectivity of WASH services. A diverse range of topics was covered, including initiatives in urban slums and informal settlements, community-ULB connections, the impact of climate change on sanitation and resilient strategies.

A total of 11 presentations were delivered under the theme of "Last mile connectivity for WASH services in slums and low-income neighbourhoods for climate resilience" over two days. Prof. Melissa Smith chaired the technical session on Day 1, while Prof. Madhu Bharati chaired the session on Day 2. The focus was on diverse approaches to achieve last mile connectivity, addressing challenges such as assessment of access to services in vulnerable population, infrastructure assessment under changing climate conditions, technology tools

for FSSM, slum upgradation initiatives and community-led service delivery enhancements.

Mr. Rajib Das and Mr. Samir Ranjan Dash from the Centre for Advocacy and Research (CFAR), New Delhi, presented climate-resilient WASH interventions in urban slums, focusing on enhancing adaptive capacity and community well-being in Bhubaneswar, Odisha, India. Their approach focused on ward-level microplanning, active and inclusive

engagement, recognition of climate-resilient practices, participatory processes, and capacity building to comprehensively address climate impacts and improve WASH resilience.

Ms. Saubiya Sareshwala and Ms. Jigisha Jaiswal from CWAS discussed achieving climate resilience through last-mile connectivity in urban water supply services. Their approach included an assessment of water supply coverage, a review of household connection procedures and costs, an evaluation of connections in vulnerable areas, and recommendations for key policy interventions at both state and city levels.

Mr. Himanshu Satvi from Ernst and Young discussed analysing the impact of climate change on sanitation among Dal Lake dwellers in Srinagar, India. The study aimed to understand the relationship between climate change and sanitation practices among vulnerable communities, identify factors contributing to unsafe sanitation environments and unhygienic practices, and propose strategies to enhance climate resilience.

Dr. Celestin Defo from the Higher Institute of Agriculture, Forestry, Water, and Environment, University of Ebolowa, presented an assessment of water supply and sanitation infrastructures in urban environments of Cameroon and their prospects under changing climate conditions. He covered topics including water supply, sanitation issues, troubleshooting for pumps, water quality assessment, management of water infrastructure, challenges faced by water management committees, and recommendations for the city of Kumba in the Southwest region of Cameroon.

Mr. Hariprasad V. M. from IIT Bombay presented insights into navigating the nexus of sanitation services, fragile environments, and climate change in Alleppey town, Kerala. He

discussed preliminary insights based on qualitative research methods, focus group discussions and key informant interviews.

Mr. Chanda Mulundu from Lusaka Water Supply and Sanitation Company discussed various technology tools introduced to enhance efficiency in faecal sludge emptying services. They implemented a results-based financing scheme for FSSM projects, wherein private operators are compensated based on the number of pits emptied rather than receiving a fixed monthly revenue.

Ms. Anindita Mukherjee and Ms. Baisakhi Sarkar from SCIAI, GWSC, AIT talked about slum upgradation as a crucial building block for creating resilience to climate change. They presented the example of Odisha's Jaga mission, showing that additional policy interventions are needed in addition to crucial land rights to provide safe water and sanitation services.

Dr. Suresh Rohilla from the International Water Association discussed reframing the urban poor as the primary target for circular sanitation solutions. These hard-to-reach areas are characterised by poor water and sanitation coverage due to physical and technical constraints, adverse hydrological conditions, inadequate communication networks and complex site layouts, affecting both residents and those without fixed places of residence.

Ms. Manvita Baradi from Urban Management Centre (UMC) discussed the Community-ULB connection for last-mile service delivery in slums and low-income neighbourhoods. She gave examples from the Misaal community initiative, where women from these areas monitor municipal services, gather resident feedback, and communicate community needs to the Urban Local Body (ULB) to enhance service quality and address gaps in water and sanitation services.

Mr. Vidat Chaudhary from Manipal University discussed the challenges posed by undulating rainfall, frequent droughts, and climate change on water supply to the urban poor, focusing on the case study of Jaipur city. He described efforts to combat issues like water mafia activities through regulations on private tube wells and the promotion of rainwater harvesting and the Eastern Canal Project aimed at meeting future water demands in the region by 2050.

Ms. Umra Anees from CSE discussed a study focusing on informal unplanned settlements in WASH, using the Sangam Vihar area of Delhi as a case study. She described the challenges faced by corporations in providing water and

sanitation services in such areas and stressed the importance of effective planning in upgrading slums and delivering services to urban poor areas.

The session emphasised the importance of effective planning and capacity building in providing WASH services to slums and urban poor settlements. It illustrated the need for policy development to ensure access to water supply and sanitation services, in addition to land ownership schemes. Furthermore, it showcased the crucial involvement of women in tackling issues within slum areas and brought forward the importance of integrating multiple schemes to facilitate convenient access to WASH services post-slum upgrades.

#### Technical Session 4: Strengthening role of women in WASH - climate service delivery

The session covered various aspects of gender equity, social inclusion, and sustainable WASH practices in the context of climate change. Presentations discussed empowering women and transgender groups for decentralised faecal sludge management, connecting self-help groups for WASH sustainability, last-mile service delivery through women collectives, and women's roles in water management. Additionally, there was a focus on understanding menstrual waste disposal behaviour and the need for changing consumer behaviour and policy clarity in waste management.

Prof. Sejal Patel chaired the session titled "Strengthening the Role of Women in WASH Climate Service Delivery," which included 6 presentations. The session focused on the significance of women's federations in livelihood programs, self-help groups (SHGs) and highlighted how women's voices have contributed to advocacy, policy changes, and implementation in the WASH sector.

Ms. Anju Dwivedi and Mr. Abhinav Kumar from the Global Water and Sanitation Centre discussed a participatory study aimed at promoting gender equity and social inclusion in climate-resilient WASH through women-led community-based groups. The focus was on enhancing localised adaptive capacity in response to climate change, including natural disasters such as flooding, cyclones, droughts,

heatwaves, and the associated threat of pandemics, which poses significant challenges for resilient WASH in Odisha, India.

Ms. Kasturi Joshi and Ms. Jinal Chheda from CWAS presented examples of harnessing the strength of self-help groups (SHGs) for sustainable WASH in the face of climate change in Maharashtra. The presentation provided key insights on operational strategies for SHG engagement, such as exclusive tendering, SHG-friendly contract terms, punctual payments, proximity to work areas, and women-friendly workspaces, necessitating active participation from local stakeholders and sector partners.

Ms. Durgesh Nandini Sahoo from the HUD department, Govt of Odisha, discussed empowering women and transgender Self-

Help Groups (SHGs) through livelihood opportunities via a decentralised FSSM model. Currently, 108 Faecal Sludge Treatment Plants (FSTPs) in Odisha are managed by SHGs, including 8 by transgender SHGs. She described how members undergo extensive training covering various skills, with contracts outlining roles, salaries, and health checkups, while technical support is provided at FSTPs.

Mr. Xerxes Rao from Urban Management Centre (UMC) presented last-mile service delivery through the women collectives, detailing a systematic approach involving ecosystem strengthening, capacity building, and convergence of SBM and DAY-NULM initiatives. Additionally, he spotlighted the transformation seen in the engagement of sanitation workers by the local governments, resulting in formal contracts, dignified livelihoods, assured wages, regular payments, and enhanced working conditions.

Ms. Afreen Fatima and Ms. Sharayu Gangurde from SPA Bhopal discussed the role of women in Indian culture as nurturers, connectors, and custodians of water. Their presentation focused on acknowledging Indian knowledge systems and heritage, examining traditional water harvesting structures. They showcased women's roles in water management through case studies from Telangana, particularly talking about the restoration of Bansilalpet stepwell as a model for sustainable

development, with elements such as community involvement, interdisciplinary collaboration, and the revival of traditional knowledge systems.

Prof. Sandhya Sreekumar from MIT, Pune discussed about understanding menstrual waste disposal behaviour using smart PLS analysis and the theory of planned behaviour model. She spoke about the importance of changing consumer behaviour for both single-use and reusable menstrual products to reduce environmental impacts and stressed the need for conducive programs to promote responsible behaviour. Additionally, she pointed out the lack of health education programs in schools and the ambiguity in waste management policies regarding menstrual waste categorisation and treatment as significant challenges that must be addressed.

The session emphasised the importance of gender equity, social inclusion, and community engagement in achieving sustainable water, sanitation, and hygiene (WASH) practices, particularly in the face of climate change. It highlighted the pivotal roles of women and marginalised groups in WASH initiatives, the significance of community-based approaches, and the need for behaviour change and policy clarity to address environmental challenges effectively.

## Technical Session 5: Measuring WASH outcomes and their climate impacts

The session on measuring WASH outcomes and their climate impacts addressed critical aspects, including safe resource recovery from faecal sludge and solid waste, GHG emissions evaluation in non-sewered sanitation, and stormwater drainage design. Additionally, it delved into digital adaptation strategies for climate-resilient water management in urban areas, aiming to tackle the environmental impacts of WASH interventions while adapting to climate change.

Prof. Ashwani Kumar from CEPT chaired the session titled "Measuring WASH outcomes and their climate impacts," which included 6 presentations. This session showcased

environmentally sustainable waste management practices, focusing on co-composting, and underscored the importance of localised studies and nature-based solutions

to mitigate GHG emissions and build climate-resilient infrastructure.

Dr. Dhundi Raj Pathak from the Center of Research for Environment Energy and Water (CREEW) discussed the safe recovery of faecal sludge and municipal solid organic waste through co-composting in Gulariya, Nepal. He called this “shit to brown gold”. The presentation underscored the environmental risks posed by inadequate containment of FS and solid waste mismanagement and highlighted the potential of co-composting to produce high-quality compost, contribute to circular economies, and reduce GHG emissions. The research offers valuable insights for compost facility operators in urban areas with decentralised sanitation systems.

Mr. Ratan Budhathoki and Mr. Madan Bahadur from SNV Netherlands Development Organisation presented on strengthening the capacities of local governments in rural Nepal for climate-risk-informed WASH service provision. Drawing from the project "Towards Climate-Resilient Inclusive Water Supply Services in Rural Nepal", the presentation focused on key messages on governance, construction, service delivery, behaviour change, and the crucial involvement of women entrepreneurs in supply chains during extreme climate events.

Ms. Jigisha Jaiswal and Mr. Karan Patil from CWAS discussed the evaluation of GHG emissions across the non-sewered sanitation chain. The presentation addressed the challenges in precisely quantifying GHG emissions from non-sewered sanitation systems, especially septic tanks, advocating for localised studies and methodologies to enhance understanding and management of emissions, particularly in the Global South.

Ms. Dilruba Farzana from the Department of Public Health Engineering, Bangladesh, presented a sensitivity analysis of pit

characteristics for stormwater drainage design in South Australia, focusing on 21 residential plots in Village Green, Aldinga, City of Onkaparinga. The study utilised a quantitative case study-based modelling approach with DRAINS software, supplemented by data visualisation and statistical analysis. Key findings suggested that the pit design currently used for stormwater drainage design in the City of Onkaparinga are adequate, with size of pits identified as a sensitive parameter in designing for large storms. Recommendations were proposed for future studies to enhance design practices in high rainfall areas.

Mr. Nikhil Ravindra from Dayananda Sagar College of Architecture discussed digital adaptation strategies for a climate-smart Kochi, India. He focused on methods such as social media, web communication, literature review and stakeholder analysis. He highlighted the importance of combined efforts from civil society, political will, and bureaucratic commitment, alongside leveraging technology for inclusive governance and stronger partnerships to address climate change challenges in Kochi.

Mr. Ashish Dangi and Ms. Neelam Rana from IIT Bombay presented a framework to analyse WASH-climate interactions and the path ahead. They underscored the vicious cycle of WASH practices contributing to GHG emissions, exacerbating climate change impacts on WASH. Their study explored challenges with conventional WASH solutions and advocated for nature-based alternatives for climate mitigation and resilient infrastructure. They emphasised on the necessity of policy coherence and climate-proofing in the developing future WASH infrastructure and services.

The session underscored the critical need for innovative approaches, collaborative efforts, and policy coherence to address the complex challenges at the intersection of WASH,

climate change, and sustainable development. Through co-composting, strengthened capacities, GHG emission evaluation, enhanced design practice of pits, digital

adaptation strategies, and nature-based solutions, valuable insights were offered for building resilient and sustainable WASH systems in a changing climate.

## Poster Presentations

The session featured a variety of posters covering different aspects of WASH and climate resilience in India and other regions, including topics like water resource management, climate challenges, and the integration of robotics in WASH solutions. Presentations showcased innovative approaches, such as improving menstrual health services and empowering women in sanitation, alongside discussions on policy support for faecal sludge management and citywide sanitation initiatives. Chaired by Prof. Mansi Shah, Prof. Rutul Joshi, and Prof. Subhrangsu Goswami, the session included 25 posters from students and professionals across the Global South, with each participant delivering a 5-minute pitch presentation outlining their research goals, methodology, and impacts.

S.no.	Presenter	Organisation	Title of Poster
1	Karan K.	Environmental Design Solutions, Delhi	Water resource management towards achieving land degradation neutrality - A case of Belagavi district, Karnataka, India
2	Manish Kulkarni	CWAS, CRDF, CEPT University	Climate-Resilient Sanitation Infrastructure: Unravelling Linkages, Adaptation, and Mitigation Strategies in Maharashtra, India
3	Harshini Gumudavelly	School of Planning and Architecture, Vijayawada	Climate Challenges and Resilient WASH Services - A Study of Flood Susceptibility in South Goa
4	Navin Sharma	Arc Robotics (Driblet Private Limited)	Robotics adaption in WASH
5	Smita Hake	CEPT University	Water sensitive development plan - Case of Surat
6	Viraj Joshi	Environmental Management Centre Pvt. Ltd.	Action plan for FSSM: Testing CWIS plan in pilgrim town of Ambaji
7	Rohini Srivyshnavi Korlakunta	Kritsnam Technologies	Revitalizing water management - Assessing the state of water metering policies across Indian water utilities
8	Keshab Shrestha	Environment and Public Health Organization (ENPHO), Nepal	Strengthening women tailors for enhancing menstrual health and hygiene services
9	Tazrina Habib Ananya	International Training Network Centre -	Breaking barriers - Faridpur Municipality's transformative role in advancing women

		Bangladesh University of Engineering and Technology (ITN – BUET)	empowerment through City-wide Inclusive Sanitation.
10	Supriya Poduval Pal	Pandit Deendayal Energy University (PDEU)	Impact of commercial determinants in menstrual disposal practices in adolescent girls in rural areas of Gujarat
11	Ninad Deshpande, Omkar Kane, Jinal Chheda	CWAS, CRDF, CEPT University	Recognizing and empowering women for enhancing the urban environment by embracing an inclusive and climate resilient approach to sanitation
12	Sakshi Sahni	Guru Nanak Dev University, Amritsar	Reviewing climate resilience in water, sanitation and hygiene services - Mitigation and adaptation
13	Arjun K.	Water Aid India	Enhancing the monitoring mechanism for WASH in Institutions (focusing on schools) and communities with a specific emphasis on climate resilience in the coastal region of Odisha
14	Amita Bhakta	Hidden WASH	WASH experiences of older people living with incontinence in a changing climate - The case of Cyclone Idai, Malawi
15	Tuhin Palit	School of Planning and Architecture, Bhopal	City-Wide Inclusive Sanitation: Planning for an integrated sanitation system
16	Soomrit Chattopadhyay	Centre for Sustainable Development, Gokhale Institute, Pune	WASH and last mile connectivity in a net-zero village
17	Shaorya Sood	University School of Architecture & Planning, Delhi	Assessment of the usability of WASH facilities in state funded schools in Delhi
18	Suman Dhun Shrestha	Intellectuals Center, Nepal	Investigation of existing financial position of FSSM service in Charali town - Nepal
19	Mendy Zibuyile Shoji	BORDA, South Africa	Towards citywide inclusive sanitation for improved sanitation services in South Africa
20	Srijana Karki	Environment and Public Health Organization (ENPHO) / Fresh Water Action Network South Asia (FANSA), Nepal	Assessment of water sanitation and hygiene (WASH) policies program and guidelines of Hetauda Sub-Metropolitan city, Nepal

21	Buddha Bajracharya	Environment and Public Health Organization (ENPHO)	Assessing urban sanitation practices in municipalities of Nepal: A cross-sectional analysis of policy implementation, its gaps and challenges
22	Paresh Chhajer-Picha	Indian Institute of Technology, Bombay	Unpacking policy support for uptake of Faecal Sludge Management in Indian cities
23	Sapna Manjunath	BORDA	Chintamani Water Balance Comprehensive Tool for Climate Resilient Water Management in Small Town
24	Saman Jain	McKinsey & Co	Climate resilient WASH infrastructure in Chennai - Development vs water conservation
25	Shristy Kayastha	Kathmandu University	Assessment of wastewater treatment plant at Dhulikhel hospital
26	Hrushikesh Sandhe	Walter P Moore	Water sustainability and resilience using holistic approach
27	Abhishek Mendiratta	Amity University, Rajasthan	Amity University, Rajasthan - Model Campus
28	Anna S. Mremi	University of Dar-e-Salaam	Assessing climate change resilience on faecal sludge management services in unplanned settlements using participatory GIS

## REFLECTIONS AND VOTE OF THANKS

*The closing ceremony of the Global South Academic Conclave: WASH and Climate Linkages began with Dr. Dinesh Mehta commending the collective efforts of participants, organisers, and students for the success of the event, which included a comprehensive program comprising 100 presentations, panel discussions, and poster sessions. Ms. Sakshi Gudwani from BMGF provided key reflections from the conclave. The session concluded with acknowledgements to sponsors, volunteers, keynote speakers, and partners, along with announcing winners of the poster presentation, reflecting on the conclave's impact and fostering anticipation for future collaborations and events.*

The closing ceremony of the Global South Academic Conclave: WASH and Climate Linkages began with Dr Dinesh Mehta, Center Head of CWAS at CRDF, CEPT University, applauding the collaborative efforts of participants, organisers, and students in ensuring the success of the event. With an extensive program featuring 50 presentations, 6 keynote addresses, 2 panel discussions involving 11 panellists, and 25 poster presentations, the conclave provided a platform for insightful discussions and reflections on the intersection of WASH and climate issues. Participants shared their key takeaways, underscoring the importance of such forums in reshaping attitudes towards sanitation and water management globally.

Dr. Dinesh Mehta then invited Ms. Sakshi Gudwani from BMGF to deliver the concluding remarks. Ms. Gudwani thanked everyone for their participation, noting the significant number of attendees from diverse backgrounds. She recognised the importance of collaboration and cross-learning to achieve the ambitious SDGs, particularly in the context of the pandemic's challenges. **Ms. Gudwani emphasised the urgent need for governments to incorporate climate considerations into water, sanitation and infrastructure strategies, acknowledging the historical neglect of WASH in broader climate change discourse. She highlighted the critical role of innovative financing models, public-private partnerships, and technology adoption in addressing these challenges.**

Furthermore, Ms. Gudwani reiterated the importance of investments in innovation and technology especially for reaching vulnerable populations for effective climate resilience. She also stressed the necessity of data monitoring and high-quality service delivery. She thanked CEPT and CWAS for their efforts in organising the conclave and expressed hope that participants found the event enriching before concluding her remarks.

Dr. Dinesh Mehta extended appreciation to the entire BMGF leadership team for their support not only during the conclave but also during CWAS' decade-long work journey. He also acknowledged the hardworking students at the Faculty of Planning, CEPT University, who contributed immensely to the event's success. Similarly, expressions of appreciation were also extended to faculty members, partners, and CWAS team for their dedicated efforts in making the conclave a resounding success. Lastly, Dr. Mehta thanked the keynote speakers and panellists for their valuable insights and diverse perspectives on WASH and climate.

Next, Dr. Dinesh Mehta invited Prof. Subhrangsu Goswami and Prof. Mansi Shah, both from the Faculty of Planning at CEPT University, to announce the winners of the poster presentation session. Prof. Goswami elaborated on the selection process, noting that three winners were chosen based on qualities such as clarity of the idea, relevance in the current context, and potential impact on

the ground. The posters were categorised into three themes - Applied Research, Policy Research and Social Inclusion. The winners and special mentions for each category were as follows:

#### Applied Research

- Winner - Navin Sharma (Poster titled: Robotics Adaptation in WASH)
- Special Mention: Manish Kulkarni (Poster titled: Climate-resilient sanitation infrastructure: unravelling linkages, adaptation, and mitigation strategies in Maharashtra)

#### Policy Research

- Winner – Buddha Bhajracharya (Poster titled: Assessing Urban Sanitation Practices in Municipalities of Nepal: A Cross-Sectional Analysis of Policy Implementation, its gaps and Challenges)
- Special Mention: Paresh Chhajed (Poster titled: Unpacking Policy Support for Uptake of Faecal Sludge Management in Indian Cities)

#### Social Inclusion

- Winner - Tazrina Ananya (Poster titled: Breaking barriers: Faridpur Municipality's transformative role in advancing women

empowerment through city-wide inclusive sanitation)

- Special Mention: Amita Bhakta (Poster titled: WASH experiences of older people living with incontinence in a changing climate: the case of Cyclone Idai, Malawi).

Dr. Meera Mehta also reflected on the success of the past two days. She noted the happiness and satisfaction among participants, underscoring the value of their contributions, and expressing hope for impact on their future work. She commended the dedicated efforts of the young CWAS team, who played a crucial role in ensuring the event's success. Dr. Mehta expressed gratitude to the keynote speakers for promptly accepting the invitation and stressed the significance of their participation. Looking forward, Dr. Mehta aims to sustain the momentum and facilitate future collaborations. She concluded by thanking all attendees for their participation and expressing eagerness for future interactions and endeavours.

Lastly, the closing remarks also incorporated the environment-friendly ethos of the CEPT campus, encouraging participants to recycle conference materials such as notebooks, ID tags, pens posters responsibly.

# CONCLAVE AGENDA

## Day 1: 2<sup>nd</sup> February, 2024

Time (IST)	Sessions
8:00 – 9:00	Registration
9:00 – 9:45 Venue: BNB Hall	<p><b>Inaugural session</b></p> <ul style="list-style-type: none"> <li>• Dinesh Mehta, Center Head, CWAS, CRDF, CEPT University</li> <li>• Meera Mehta, Center Head, CWAS, CRDF, CEPT University</li> <li>• Mona Iyer, Dean, Faculty of Planning, CEPT University</li> <li>• Roshan Shrestha, Deputy Director-WASH, BMGF</li> <li>• Suren Vakil, Vice-Chairperson, CRDF, CEPT University</li> <li>• Barjor Mehta, President, CEPT University</li> </ul>
9:45 – 10:30 Venue: BNB Hall	<p><b>Keynote address 1</b></p> <p>Chair: Meera Mehta (CWAS, CRDF, CEPT University)</p> <ul style="list-style-type: none"> <li>• <b>Brian Arbogast (BMGF)</b></li> </ul>
10:30 – 11:00	Tea, networking and exhibition gallery
11:00 – 12:30 Venue: BNB Hall	<p><b>High level panel discussion on policies and financing</b></p> <p>Moderator: Dinesh Mehta (CWAS, CRDF, CEPT University)</p> <ul style="list-style-type: none"> <li>• Barjor Mehta (CEPT University)</li> <li>• Sheela Patel (SPARC)</li> <li>• Roshan Shrestha (BMGF)</li> <li>• Punit Lalbhai (Arvind Ltd)</li> <li>• Sujatha Srikumar (Powertech)</li> <li>• Meera Mehta (CWAS, CRDF, CEPT University)</li> </ul>
12:30 – 13:30	Lunch and exhibition gallery
13:30 – 15:00 Venue: BNB Hall	<p><b>Keynote address 2</b></p> <p>Chair: Shalini Sinha (Faculty of Planning, CEPT University)</p> <ul style="list-style-type: none"> <li>• <b>Aromar Revi (IIHS)</b></li> </ul> <p><b>Keynote address 3</b></p> <p>Chair: Darshan Parikh ( CRDF, CEPT University)</p> <ul style="list-style-type: none"> <li>• <b>Barbara Evans (LEEDS)</b></li> </ul>
15:15 – 17:00	<b>Technical sessions</b>
Technical Session 1	Chair: <b>Anil Roy ( Faculty of Planning, CEPT University)</b>
<b>WASH policies, Governance and Financing in Global South</b> Venue: CFP 202	<p><b>Policy environment in Nepal for building climate resilience in on-site sanitation</b>   Anjali Manandhar Sherpa   University of Bristol</p> <p><b>Global south water sensitive cities framework</b>   Depinder Kapur   Centre for Science and Environment (CSE)</p> <p><b>Developing the rationale for climate resilient WASH services through a multistakeholder dialogue (virtual)</b>   Ricard Giné Garriga   Stockholm International Water Institute (SIWI)</p> <p><b>Modeling blended financing with output-based aid to build climate-resilient toilets for entrepreneurial poor households</b>   Elmira Bacatan   UNICEF</p> <p><b>WASH as an adaptation strategy to climate change - role of service provider</b>   Sanghmitra Acharya   Jawaharlal Nehru University (JNU), New Delhi</p>

Time (IST)	Sessions
Technical Session 2	Chair: <b>Rutul Joshi (Faculty of Planning, CEPT University)</b>
Mitigation and adaption in WASH services for climate resilience Venue: CFP 203	<b>Climate resilient WASH infrastructure in indian cities- A case of Kochi, Kerala</b>   Clinson Chacko   CDD India
	<b>Identification of systemic challenges in sustainable WASH service delivery in 4 climate hotspots of Bangladesh</b>   Digbijoy Dey   IRC
	<b>Climate sensitive nature based solutions for faecal sludge management across Maharashtra</b>   Gautamee Sayamvar and Chirag Patel   CWAS, CRDF, CEPT University
	<b>Water sanitation and hygiene (WASH) services: climate change mitigation and adaptation practices in Nepal</b>   Ganga Datta Nepal   Bindo Nepal Smriti Foundation (BNSF)
	<b>Integrated climate resilience in WASH services: A comprehensive analysis of mitigation and adaptation strategies within government flagship programs- A case of coastal region of Odisha</b>   Amita Pathria   WaterAid India
	<b>Planning for cyclone resilient urban water supply system of Baruipur, West Bengal (virtual)</b>   Subhagata Mukhopadhyay   Hiroshima University
	<b>Investigating flood-resilient sanitation solutions for the northern division, Kabale municipality, Uganda. (Virtual)</b>   Shirish Singh   IHE Delft Institute for Water Education
Technical Session 3	Chair: <b>Melissa Smith (Faculty of Planning, CEPT University)</b>
Last mile connectivity for wash services in slums and low-income neighborhoods for climate resilience Venue: CFP 302	<b>Climate-resilient WASH interventions in urban slums: enhancing adaptive capacity and community well-being in Bhubaneswar, Odisha</b>   Rajib Das and Samir Ranjan Dash   Centre for Advocacy and Research (CFAR), New Delhi
	<b>Last mile connectivity for urban water supply services for achieving climate resilience</b>   Saubiya Sareshwala and Jigisha Jaiswal   CWAS, CRDF, CEPT University
	<b>Accelerating the climate resilient sanitation - A case of dal dwellers (Srinagar)</b>   Himanshu Satvi   Ernst And Young
	<b>Assessment of water supply and sanitation infrastructures in urban environment of cameroon and perspectives under looming climate conditions. Case study of the city of Kumba, Meme division, Southwest region of Cameroon</b>   Celestin Defo   Higher Institute of Agriculture, Forestry, Water and Environment, University of Ebolowa, Cameroon
	<b>Navigating the nexus: intersections of sanitation services, fragile environments, and climate change in Alleppey town, Kerala</b>   Hariprasad V M   IIT Bombay
Technical Session 4	Chair: <b>Sejal Patel (Faculty of Planning, CEPT University)</b>
Strengthening role of women in WASH - climate service delivery Venue: CFP 303	<b>Promoting gender equity and social inclusion in climate resilient WASH through women-led community based groups: A participatory study</b>   Anju Dwivedi   Global Water and Sanitation Centre
	<b>Harnessing the strength of self-help groups for sustainable WASH in the face of climate change</b>   Kasturi Joshi, Jinal Chheda and Arfat Attar   CWAS, CRDF, CEPT University
	<b>Empowerment of women and transgender SHGs through the provision of livelihood opportunities through decentralised FSSM model</b>   Durgesh Nandini Sahoo   HUD department, Govt of Odisha
	<b>Last mile service delivery through the women collectives</b>   Xerxes Rao   Urban Management Centre (UMC)
	<b>Women and water in Indian culture: nurturers, connectors, and custodians</b>   Afreen Fatima and Sharayu Gangurde   SPA Bhopal
	<b>Impact of commercial determinants in menstrual disposal practices in adolescent girls in rural areas of Gujarat</b>   Sandhya Shreekumar   MIT Pune
17:00 – 17:30	Tea, networking and exhibition gallery

Time (IST)	Sessions		
17:30 – 19:00	Partner Sessions		
<b>Partner Session 1</b>	<b>Partner Session 2</b>	<b>Partner Session 3</b>	<b>Technical poster session 1</b>
Concepts and perspectives: framework for water wise and sanitation secure resilient cities	Transformative tech: scaling success in sanitation workers' safety and dignity through digital innovations	Academia roundtable on WASH and climate linkages: content, pedagogy and its relevance to urban practice	
Venue: CFP 202 Session Partners: IWA-CWAS	Venue: CFP 203 Session Partners: Urban Management Center	Venue: CFP 303 Session Partners: Faculty of Planning, CEPT University	Venue: CFP Basement Chairs: Rutul Joshi, Subhrangsu Goswami and Mansi Shah

### Details of Technical Poster Session 1

- P1.1** Water resource management towards achieving land degradation neutrality - a case of Belagavi district, Karnataka | Karan K | Environmental design solutions, Delhi
- P1.2** Climate-resilient sanitation infrastructure: unravelling linkages, adaptation, and mitigation strategies in Maharashtra, India | Manish Kulkarni | Center for Water and Sanitation, CRDF, CEPT University
- P1.3** Climate challenges and resilient WASH services: A study of flood susceptibility in South Goa | Harshini Gumudavelly | School of Planning and Architecture, Vijayawada
- P1.4** Robotics adaption in WASH | Navin Sharma | Arc Robotics (Driblet Private Limited)
- P1.5** Water sensitive development plan- case of Surat | Smita Hake | CEPT University
- P1.6** Action plan for FSSM: testing CWIS plan in pilgrim town of Ambaji | Viraj Joshi | Environmental Management Centre Pvt. Ltd.
- P1.7** Revitalizing water management: assessing the state of water metering policies across Indian water utilities | Rohini Srivyshnavi Korlakunta | Kritsnam technologies
- P1.8** Strengthening women tailors for enhancing menstrual health and hygiene services | Keshab Shreshtha | Environment and Public Health Organization
- P1.9** Breaking barriers: Faridpur municipality's transformative role in advancing women empowerment through city-wide inclusive sanitation | Tazrina Ananya | International Training Network Centre Of Bangladesh University Of Engineering And Technology
- P1.10** Impact of commercial determinants in menstrual disposal practices in adolescent girls in rural areas of Gujarat | Supriya Poduval Pal | Pandit Deendayal Energy University
- P1.11** Recognizing and empowering women for enhancing the urban environment by embracing an inclusive and climate resilient approach to sanitation | Ninad Deshpande and Omkar Kane | Center for Water and Sanitation, CRDF, CEPT University
- P1.12** Reviewing climate resilience in water, sanitation and hygiene services- mitigation and adaptation | Sakshi Sahnii | Guru Nanak Dev University Amritsar
- P1.13** Smart review for smart solutions for sanitation revolution | Mansoor Fall | Bill and Melinda Gates Foundation
- P1.14** Enhancing the monitoring mechanism for WASH in institutions (focusing on schools) and communities with a specific emphasis on climate resilience in the coastal region of Odisha | Arjun K | Water Aid India
- P1.15** Chintamani water balance: comprehensive tool for climate-resilient water management in small town | Sapna Manjunath | BORDA

## Day 2: 3<sup>rd</sup> February, 2024

Time (IST)	Sessions
9:00 – 10:30	<p><b>Keynote address 4 &amp; Keynote address 5</b></p> <p>Chair: Jignesh Mehta (Faculty of Planning, CEPT University)</p> <ul style="list-style-type: none"> <li>• <b>Kala Vairavamoorthy (IWA)</b></li> <li>• <b>Thamarat Koottatep (AIT)</b></li> </ul>
10:30 – 10:45	<p><b>NFSSM Alliance</b></p> <p>Moderator: Parnasha Banerjee (Dasra)</p>
10:45 – 11:00	Tea, networking and exhibition gallery
11:00 – 12:45	<p><b>Technical sessions</b></p> <p>Chair: <b>Neelima Thota (BMGF)</b></p>
<p>Technical session 5</p> <p><b>WASH policies, governance and financing in global south</b></p> <p>Venue: CFP 202</p>	<p><b>Introducing non sewerred sanitation sensitive spatial planning and design towards climate adaptation</b>   Jayant Bhagwan   Water Research Commission</p> <p><b>Enabling integrated urban water management in Indian cities through statutory , regulatory and administrative frameworks case of Mumbai, Maharashtra</b>   Sayantani Sikdar   Centre for Policy Research</p> <p><b>Innovative financing mechanisms for climate resilient WASH services</b>   Upasana Yadav and Saubiya Sureshwala   CWAS, CRDF, CEPT University</p> <p><b>Driving safety and dignity of sanitation workers in urban India: NAMASTE's vision</b>   Meghna Malhotra   Urban Management Centre (UMC)</p> <p><b>Financial strategy for sustainable climate resilient WASH services in coastal primary schools in Bangladesh</b>   Md Habibur Rahman   Water &amp; Sanitation for the Urban Poor (WSUP)</p>
<p>Technical session 6</p> <p><b>Mitigation and adaption in WASH services for climate resilience</b></p> <p>Venue: CFP 203</p>	<p>Chair: <b>Ravi Sannabhadti (Faculty of Planning, CEPT University)</b></p> <p><b>Addressing climate vulnerability in Nepal through resilient inclusive WASH systems</b>   Anil Aryal   Water International Water Management Institute (IWMI)</p> <p><b>Positive environmental outcomes of Odisha's climate-resilient FSSM interventions</b>   Sangarmjit Nayak   HUD department, Govt of Odisha</p> <p><b>Climate responsive WASH initiatives in small and medium towns in India</b>   Arwa Bharmal and Priyadarshini Choudhary   CWAS, CRDF, CEPT University</p> <p><b>Participatory aquifer management and alternative approach to sustain urban water supply - case studies from cities of Gujarat, India</b>   Yogesh Jadeja   Arid Communities and Technologies</p> <p><b>Climate resilient approach to sanitation service delivery: A case study of the EtheKwini Municipality, Durban, South Africa</b>   Anthony Odili   WASH R&amp;D Centre, University of KwaZulu-Natal</p> <p><b>Wastewater reuse in circular economy</b>   Vishwanath S.   Biome Environmental Trust</p> <p><b>Integrating climate resilience to strengthen community-managed water supply systems in Indonesia</b>   Rioneli Ghaudenson   Universitas Indonesia</p>
<p>Technical session 7</p> <p><b>Last mile connectivity for WASH services in slums and low-income neighborhoods for climate resilience</b></p> <p>Venue: CFP 302</p>	<p>Chair: <b>Madhu Bharti (Faculty of Planning, CEPT University)</b></p> <p><b>Efficiencies in faecle sludge emptying using semi technology tools. The case study of the Pitvac</b>   Chanda Mulundu   Lusaka Water Supply and Sanitation Company</p> <p><b>Slum upgrading as a crucial building block for creating resilience to climate change</b>   Anindita Mukhrjee and Baisakhi Sarkar   SCIAI-GWSC-AIT</p> <p><b>Reframing â hard-to-reachâ urban poor as a â primary target â of circular sanitation solutions</b>   Suresh Rohilla   International Water Association</p>

Time (IST)	Sessions
Technical session 7	
<b>Last mile connectivity for WASH services in slums and low-income neighborhoods for climate resilience</b> Venue: CFP 302	<p><b>Community ULB connect for last mile service delivery in slums and low-income neighborhoods</b>   Manvita Baradi   Urban Management Centre (UMC)</p> <p><b>Undulated rainfall, frequent drought and the impact of climate change a major hurdle to supply water to thousands of urban poor: A case study of Jaipur city</b>   Vidat Choudhary and Anil Dutt Vyas   Manipal University Jaipur</p> <p><b>A study of informal unplanned settlements in WASH</b>   Umra Anees   Centre for Science and Environment (CSE)</p>
Technical session 8	Chair: <b>Ashwani Kumar (Faculty of Planning, CEPT University)</b>
<b>Measuring WASH outcomes and their climate impacts</b> Venue: CFP 303	<p><b>Shit to brown gold: safe recovery of faecal sludge and municipal solid organic waste through co-composting</b>   Dhundi Raj Pathak   Center of Research for Environment Energy and Water (CREEW)</p> <p><b>Strengthening capacities of local governments in rural Nepal in climate-risk informed WASH service provision</b>   Ratan Budhathoki and Madan Bahadur   SNV Netherlands Development Organisation</p> <p><b>Evaluating GHG emissions across non-sewered sanitation chain</b>   Jigisha Jaiswal and Karan Patil   CWAS, CRDF, CEPT University</p> <p><b>Sensitivity analysis of pit characteristics for stormwater drainage design in South Australia</b>   Dilruba Farzana   Department of Public Health Engineering, Bangladesh</p> <p><b>Digital adaptation strategies for a climate-smart Kochi</b>   Nikhil Ravindra   Dayananda Sagar College of Architecture</p> <p><b>A framework to analyse WASH-climate interactions and path ahead</b>   Ashish Dangi and Neelam Rana   IIT Bombay</p>
13:00 – 13:45 Venue: BNB Hall	<p><b>Keynote address 6</b></p> <p>Chair: Purvi Chhadva (Faculty of Planning, CEPT University)</p> <ul style="list-style-type: none"> <li>• <b>Juliet Willetts (UTS)</b></li> </ul>
13:45 – 14:30	Lunch and exhibition gallery
14:30 – 16:00 Venue: BNB Hall	<p><b>Panel discussion on emerging research areas</b></p> <p>Moderator: Mona Iyer (Faculty of Planning, CEPT University)</p> <ul style="list-style-type: none"> <li>• Ligy Philip (IIT Chennai)</li> <li>• Praveena G (IIT Palakkad)</li> <li>• NC Narayan (IIT Mumbai)</li> <li>• Thamarat Koottatep (AIT)</li> <li>• Tanvir Ahmed (ITN-BUET)</li> <li>• Celestin Defo (University of Ebolowa)</li> </ul>
16:00 – 16:30	Tea, networking and exhibition gallery

Time (IST)	Sessions		
16:30 – 18:00	Partner sessions		
<b>Partner Session 4</b>	<b>Partner Session 5</b>	<b>Partner Session 6</b>	<b>Technical poster session 2</b>
Academia roundtable on WASH and climate linkages sharing student experiences and learnings	Importance of capacity building in achieving SDG 6 - focusing on sanitation sector	Garbage-free cities in india: pathways for building resilience	
Venue: CFP 303 Session Partners: Faculty of Planning, CEPT University	Venue: CFP 203 Session Partner: ITN-BUET, IWA and ASCI	Venue: CFP 202 Session Partners: ClimateRise Alliance and Rainmatter Foundation	Venue: CFP Basement Chairs: Rutul Joshi, Subhrangsu Goswami and Mansi Shah

### Details of Technical Poster Session 2

- P2.1** WASH experiences of older people living with incontinence in a changing climate: the case of Cyclone Idai, Malawi | Amita Bhakta | Hidden WASH
- P2.2** City-wide inclusive sanitation: planning for an integrated sanitation system | Tuhin Palit | School of Planning and Architecture
- P2.3** WASH and last mile connectivity in a net zero village | Soomrit Chattopadhyay | Centre for Sustainable Development, Gokhale Institute, Pune
- P2.4** Assessment of the usability of wash facilities in state funded schools in Delhi | Shaorya Sood | University School of Architecture & Planning
- P2.5** Investigation of existing financial position of FSM service in Charali town – Nepal | Suman Dhun Shrestha | Intellectuals Center
- P2.6** Catalyzing climate-resilient WASH solutions: A blended finance approach in the global south | Boka Rochill | IPE Global, Delhi
- P2.7** Towards citywide inclusive sanitation for improved sanitation services in South Africa | Mendy Zibuyile Shozi | BORDA South Africa
- P2.8** Assessment of water sanitation and hygiene (WASH) policies program and guidelines of Hetauda sub-metropolitan city, Nepal | Srijana Karki | Environment and Public Health Organization (ENPHO) / Fresh Water Action Network South Asia (FANSA) Nepal
- P2.9** Assessing Urban Sanitation Practices in municipalities of Nepal: A Cross-Sectional Analysis of Policy Implementation, its gaps and Challenges | Buddha Bajracharya | Environment and Public Health Organization (ENPHO)
- P2.10** Unpacking Policy Support for Uptake of Faecal Sludge Management in Indian Cities | Paresh Chhajed-Picha | Indian Institute of Technology Bombay
- P2.11** Climate Resilient WASH Infrastructure in Chennai: Development Vs Water Conservation | Saman Jain | McKinsey & co
- P2.12** Assessment of Wastewater Treatment plant at Dhulikhel Hospital | Shrishti Kayastha | Kathmandu University

Time (IST)	Sessions
18:30 – 19:00 Venue: BNB Hall	Key reflections and vote of thanks
19:00 – 20:00 Venue: Kund	Cultural program
20:00 onwards Venue: CFP Basement & Kund	Gala dinner

## Day 3: 4th February, 2024 (Optional)

Time (IST)	Sessions
7:00 – 13:00	<p><b>Option 1:</b> Heritage walk of Ahmedabad – a UNESCO World Heritage City</p> <p><b>Option 2:</b> Slum improvement program - visit to selected slums</p> <p><b>Option 3:</b> Heritage structures - step wells of Ahmedabad</p>



# Global South Academic Conclave

WASH and Climate Linkages

