Brief 1

Accelerating progress on climate resilient urban sanitation:

Three models of scale-up linking technological innovation and systems change

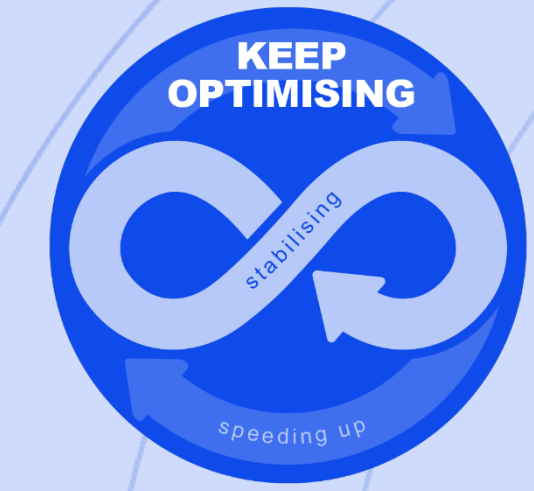
Key messages

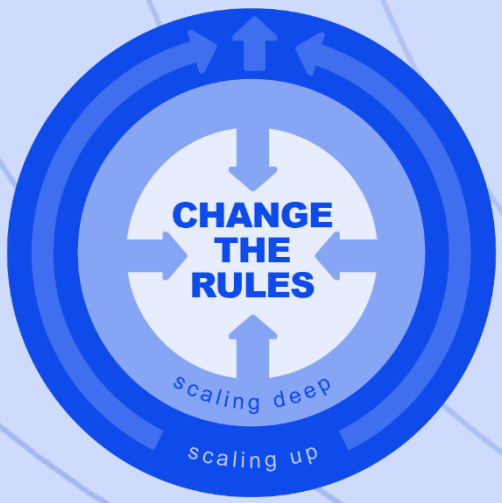
1. Accelerating progress on climate-resilient urban sanitation is urgently needed as climate events increasingly impact sanitation systems in low- and middle- income countries, disproportionately affecting vulnerable populations.
2. Conceptualising scale-up processes can help to make strategic choices that connect technological innovation with wider system transformation.
3. Three models of scale-up or amplification processes - 'Keep Optimising', 'Reach Further' and 'Change the Rules' - articulate deliberate pathways to scale technological innovations for climate-resilient sanitation.
4. Each model has individual considerations, enablers and evidence requirements, and awareness of the different models and their complementarity provides new insights and opportunities to accelerate change.

Climate resilient sanitation: Definition

Climate-resilient sanitation services **anticipate, respond to, cope with, recover from, adapt to or transform** based on climate-related events, trends and disturbances, all while striving to achieve and maintain universal and equitable access to **safely managed services,** even in the face of an unstable and uncertain climate, where possible and appropriate, **minimising emissions,** and paying **special attention to the most exposed vulnerable groups.**

Drawn from SWA (2024) Definition of climate-resilient water sanitation and hygiene ser





Introduction

Given the pace of climate change and its widespread disruption to sanitation services, awaiting passive diffusion of new technological innovations is insufficient. Models of scale-up or amplification articulate deliberate strategies that can be used by sanitation stakeholders to scale technological innovation. In this brief we introduce three models that can accelerate, amplify and scale-up technological innovation and systems change for climate-resilient urban sanitation.

By understanding these distinct but complementary models for scaling innovation, sanitation professionals can make more strategic decisions about the where to invest resources in the face of climate change. The models can inform how to move from technological innovation to wider systems change and evidence needed to support such pathways. Whether you fund technological innovations, develop research solutions, or shape policy environments, these models offer a structured way to guide and direct your efforts for greatest impact.

Background of the brief

This work aims to drive increased access to climate-resilient sanitation across low- and middle- income countries by identifying critical evidence priorities to guide action. Building on a landscape study on the current state of thinking and action on urban sanitation and climate change (2022)[1] and wider efforts of the global Climate Resilient Sanitation Coalition for Action [2], this series of briefs have been developed with a specific focus on the intersection of technological innovations and wider social and systems change needed to accelerate progress. This brief is one of three that document insights from six online participatory workshops run in late 2024 with three groups: global funders, global south researchers, and national stakeholders from three selected case study countries in Asia and the Pacific - Bangladesh, Fiji and Vietnam. This work is funded by the New Ventures Fund/ Bill and Melinda Gates Foundation.

The three briefs are:

- Models of scale-up linking technological innovation and systems change (Brief 1)
- How and why to invest in climate resilient sanitation research and relevant evidence priorities (Brief 2)
- Technological innovation and systems change to address flooding in three countries (Brief 3)

These briefs are intended for a wide range of sanitation professionals. This includes national and city-level actors, civil society organisations, private sector implementors, funders, industry associations, research organisations, as well as climate actors and urban development actors. The briefs focus on change pathways and scaling processes rather than specific technological innovations themselves.

Models of technological innovation scale-up

The three scale-up models presented here draw from research on amplifying sustainability initiatives. A review of literature on methods to broaden the impact of sustainability projects in both urban and rural settings identified eight amplification pathways, which were grouped the eight into a three-category framework: amplifying within, amplifying out, and amplifying beyond.[3] Applying these concepts to the context of accelerating climate resilient urban sanitation initiatives, we articulate them as three distinct and complementary models using terminology relevant to the sanitation sector:

1. **Keep Optimising**
2. **Reach Further**
3. **Change the Rules**

These models were shared and discussed with workshop participants during the six workshops, and the insights presented below draw on participants interpretations and examples based on these models – including how they can be leveraged separately or together to drive systems change.

[1] UTS-ISF (2022) Urban sanitation and climate change: A public service at risk – Landscape study. Prepared for the Bill and Melinda Gates Foundation by University of Technology Sydney - Institute for Sustainable Futures. Authors: J. Willetts, A. Kumar and F. Mills.
[2] See here: https://www.susana.org/community/themes/climate-resilient-sanitation-coalition.
[3] Lam, D.P.M., Martín-López, B., et al. Scaling the impact of sustainability initiatives: a typology of amplification processes. Urban Transform 2, 3 (2020). https://doi.org/10.1186/s42854-020-00007-9

‘Keep Optimising’ model

What is the ‘Keep Optimising’ model?

The ‘Keep Optimising’ model focuses on making existing technologies for urban sanitation and their adoption processes more climate resilient and efficient. This includes strengthening existing efforts to expand sanitation access in relevant contexts, adjusting technologies to ensure they withstand and adapt to climate shocks and stresses, and removing barriers that may be reducing their progress and impact.

Keep Optimising encompasses ideas of ‘stabilising’ and ‘speeding up’ initiatives,[4] and focuses on optimising existing technologies and systems for their use at scale.

To achieve climate resilience, Keep Optimising is likely to involve modifications to existing technologies to render them more resilient to relevant climate hazards, such as increasing robustness, enhancing operational flexibility and responsiveness and increasing redundancy. The Keep Optimising model allows existing institutional processes, skills and capacities to continue to be efficiently deployed on existing technical solutions. Keep Optimising is defined by its continuous pursuit of steady improvement and internal growth.

Illustrations of the ‘Keep Optimising’ model

Many technologies that are already implemented in low- and middle-income countries (LMIC) can be modified to be more climate resilient with minor additions and changes, and improving quality of construction of existing technologies provides important pathways to improve resilience without necessarily shifting to new technologies.

Design modifications to increase climate resilience of treatment plants

In Bangladesh, numerous Faecal Sludge and Septage Treatment Plants (FSTPs) are under construction. Simple design modifications to account for climate-related challenges are important, based on climate risk analysis for each location. In several parts of Bangladesh, flooding, inundation and overflow are potential issues that require attention to ensure resilience, efficacy and mitigate health risks. Modifications could include careful siting, construction of flood barriers, adding roofing over sludge drying beds, as well as other related solutions. Technical modifications must be paired with programs that strengthen Faecal Sludge Management (FSM) such as formalising desludging services, supporting their operation before and during climate events, diversifying providers and ensuring all-weather access routes to FSTPs. Advancing these areas can be done within the context of existing processes, skills and capacities in Bangladesh to build and run FSTPs, with a focus on speeding up and refining their implementation.

"We have technology and FSM, but the technology could be updated to reduce operation and maintenance requirements and make it more effective given climate change"

[government official – Bangladesh].

[4] See Lam, D.P.M., Martín-López, B., Wiek, A. et al. Scaling the impact of sustainability initiatives: a typology of amplification processes. Urban Transform 2, 3 (2020). https://doi.org/10.1186/s42854-020-00007-9.

‘Keep Optimising’ model

Quality construction and effective monitoring of household containment systems

Ensuring existing technologies such as septic tanks are built to standard and that construction quality is effectively monitored is a pathway to strengthen existing systems. For example, inspections of on-site sanitation can ensure septic tanks do not discharge to drains or pit latrines have a solid slab, as well as identifying potential hazards and mitigation solutions or employing alternative technologies depending on the predicted climate hazards. In addition, simple modifications such as adding non-return valves could go beyond current design standards to increase climate resilience.

In Fiji, a problem is posed by septic tanks that are not built to standard combined with little long-term monitoring:

“Some are built to standard, some are not. Some are deteriorated and surcharging, with soak pits that are overloaded. Material leaches into the environment and rivers, which then bring large volumes of faecal contamination into the bay.”

[government official – Fiji].

This circumstance is not unique to Fiji, and hence adhering to minimum standards is critical to ensure they have the best chance to protect public health. In some areas it is unfortunately common for septic tank systems to be built without an infiltration or soak pit, or they are used in conditions unfavourable for their function (i.e. shallow groundwater or impermeable soils).[5,6]

When is this model most relevant?

One Vietnamese sanitation actor described Keep Optimising as the most "realistic" scaling model for less-dense peri-urban areas, appreciating its focus on existing approaches rather than introducing new technological innovations that might unnecessarily complicate or delay service access. It’s important to “*start by working with existing conditions rather than leading with a new technological innovation*” [*government official - Vietnam*].

In some cases, to remove barriers to the full-scale application of existing technologies with climate resilience modifications, may require changes to underlying rules or institutional frameworks. Activities in line with the Keep Optimising model may need to be paired with those seeking to Change the Rules (the third model introduced below); progress may require multiple strategies that draw on all three models.

[5] Mills, F., Foster, T., Kome, A. et al. Indicators to complement global monitoring of safely managed on-site sanitation to understand health risks. npj Clean Water 7, 58 (2024). https://doi.org/10.1038/s41545-024-00353-2

[6] Mills, F., Willetts, J., Evans, B., Carrard, N. & Kohlitz, J. Costs, Climate and Contamination: Three Drivers for Citywide Sanitation Investment Decisions. *Frontiers in Environmental Science*, 8(2020). https://doi.org/10.3389/fenvs.2020.00130

‘Keep Optimising’ model

Enablers

The Keep Optimising model requires modifications of existing technologies to ensure improved climate resilience, so tools and resources to support the identification of such modifications are important. For example, the UTS-ISF ClimateFIRST tool can enable the assessment of climate resilience, considering hazards and potential design features that would support greater resilience.[7] Exposure to or awareness of alternative solutions such as through knowledge sharing broadens perspective on adaptation possibilities.

What evidence that is needed to support the model?

To scale innovation in line with the Keep Optimising model, evidence is needed to demonstrate the effectiveness of an innovation to progress safely managed and climate resilient sanitation, its ability to reach climate-vulnerable populations, and strategies for faster or more stable rollout. Additionally, evidence on cost-effective modifications, approaches to professionalise services, increase user engagement in current solutions, and supportive regulatory arrangements are central, requiring diverse research approaches including social, technical, market, and governance research. See *Brief 2: ‘Why and how to invest in research for climate-resilient urban sanitation and technological innovation scaling’* for more details.

Opportunities and risks

Opportunities:

- Progress faster towards climate-resilient urban sanitation using existing skills, infrastructure, systems and capacities.
- No need to wait since the solutions are known, therefore efforts can immediately focus on climate-vulnerable populations and climate resilient solutions in their roll-out .
- or management practices can improve climate resilience or support rapid recovery.

Risks:

- Designing adaptations based on current approaches may be unable to achieve necessary levels of climate resilience to protect service continuity and public health
- Missed opportunity for innovative approaches that support co-benefits and circularity, such as integrated water-cycle solutions or sanitation options that are not water-based
- Some existing sanitation solutions are not fit-for purpose in certain contexts – e.g. unsealed onsite systems in dense urban areas that flood.
- Over-reliance on existing systems and structures could limit innovation.

[7] The Climate Framework to Improve the Resilience of Sanitation Technologies ‘Climate FIRST’: https://www.uts.edu.au/case-studies/climatefirst-outputs

‘Reach Further’ model

What is the Reach Further model?

Reach Further is a model focused on proven technological innovations for climate resilient sanitation that are ready to be extended and adapted to new contexts or geographical locations. It focuses on broadening the reach and coverage of innovations by involving more people and places.

The ‘Reach Further model encompasses ideas of growing, transferring, replicating and spreading initiatives across similar and different contexts, as described by Lam et al., while accounting for local variabilities.

Reach Further requires adapting climate resilient sanitation innovations where required to ensure contextual relevance and appropriateness, based on a sound understanding of the expected climate hazards and other aspects.

The Reach Further model is aligned to typical sanitation sector conceptions of ‘scaling’ or ‘scale-up’ of technological innovations.

Illustrations of the ‘Reach Further’ model

Technological and other innovations for climate resilient sanitation services need to be supported to reach more people and places, given the pace of climate change, and inadequacy of current services.

Rolling out SWWP across Bangladesh

The SWEEP innovation addresses a lack of safe collection and treatment of excreta from onsite sanitation in cities across Bangladesh and emerged to address a gap in FSM services. It is an example of Reach Further as the innovation scaled from a pilot at a single location in Dhaka in 2015 to larger-scale implementation across Bangladesh through adaptation and replication of a proven partnership model. Beyond Dhaka, it was progressively launched in the cities of Chattogram and Rangpur and five other municipalities. SWEEP provides a low-cost sanitation emptying and transport service by private providers. As noted by Water and Sanitation for the Urban Poor (WSUP) that led this innovation:

"we worked with the [large-scale] government departments but couldn't add it immediately [to that project]. We needed to pilot and see if this model can add value, conduct it at small-scale to see if it works or not."

While not initially intended as a climate resilient innovation, this innovation will need to be tested and adapted in the context of climate events, such as refining approaches to early-warning messaging to private sector providers, potentially introducing pre-emptive emptying services ahead of wet season, and/or ensuring availability of multiple providers.

Wide uptake of SATO toilet pans

SATO toilet pans are an innovation that provide an affordable and accessible sanitation solution with low water-use, mentioned by several participants as an important technological innovation relevant for climate resilient sanitation. Relevant enablers of the wide uptake of this technology into urban areas, beyond its original design context in rural areas with water scarcity, noted by participants included: heavy efforts from private sector and government to integrate the technology within the wider market system, it being “low-tech” simple technology that can be locally produced, as well the innovation having high social acceptability and fitting the aspirational values of the user. These enablers provide insight into important factors for replication in Reach Further.

‘Reach Further’ model

Replicating Net Zero Toilets across Viet Nam

In the Mekong Delta region of Viet Nam, UNICEF partnered with the private sector to pilot **a net-zero toilet** (‘The Net Zero Aquonic toilet’). This innovation addresses climate challenges posed by drought, and uses solar energy to convert wastewater into treated water suitable for irrigation or toilet flushing. The primary application context for the Net Zero Aquonic toilet is currently in schools, where it can improve water conservation awareness and sanitation practices.

In Vietnam, UNICEF supported a pilot of this technology, and are taking steps to support wider replication and large-scale deployment, including monitoring performance and effluent, assessing operation and maintenance requirements, and developing a social business that can cross-subsidise support for schools in remote areas. Beyond this, the technology is now also being tested in contexts beyond schools. The Net Zero Aquonic toilet was originally developed by SCG Chemicals and Asian Institute of Technology Thailand, with support from the Bill and Melinda Gates Foundation.

A private corporation and local manufacturer produced the Aquonic tanks in Viet Nam with a substantial cost reduction when compared with the original product.

Building a strong evidence base for WWTPs

An innovation with potential for complex wastewater produced in hospitals is compact onsite wastewater treatment plants. A membrane bioreactor (MBR) has been installed in a hospital in Dhaka Bangladesh as a pilot demonstration. This technology treats wastewater to a high standard and offers climate resilience benefits. The system is built vertically inside a sealed container not susceptible to flooding. It produces recycled water that can be used for non-potable uses, useful for water scarcity. Evidence shows high pathogen, carbon and nitrogen removal. Replication and transferring the technology to other contexts is pending, and requires further communication of evidence of its success and consideration of similar contexts in which it is likely applicable.

When is this model most relevant?

Reach Further is a widely used approach among development actors involved in trialling, generating evidence, and supporting replication through enabling conditions or financing. For example, workshop participants noted World Bank often applied this model, whereby once a new approach is proven effective, it is integrated into future investment projects in other locations.

Reach Further was seen as familiar and useful by many workshop participants, with one participant noting it was the right model for “practitioners and realistic people” (research - Vietnam). It was noted that advancing progress does not always require changing the rules, but about working effectively within existing rules where there is space to do this.

A key insight was that innovations must be proven to then be scaled in Reach Further: “*Scaling is contingent on the success of an innovation - if you can demonstrate improved sanitation, then social acceptance and government support will begin*.”

‘Reach Further’ model

The enablers relevant to each model

A set of generalised enablers identified by participants as important for Reach Further based on experiences with previous innovations and replication included:

- A ‘need’ or problem is clear, such that there is demand for a new technology, and it fits user aspirations and needs
- ‘Scaling is contingent on success of an innovation’, including collecting and sharing evidence of success, or what participants referred to as ‘positive feedback loops’
- Technology is available, feasible and proven to be fit-for-purpose
- Able to demonstrate economic benefits, cost-effectiveness and affordability
- Availability and support of a network of partners at the relevant scale (e.g., global, national, local level)
- Financing to support replication processes
- Community or user involvement in the process of technology development, planning, construction or replications
- Integration of a new technology within wider market system
- Existence of international or national standards

What evidence is needed to support the model?

To scale innovation according to the Reach Further model, evidence needs to demonstrate an innovation’s effectiveness under relevant climate conditions, readiness for transfer, and provide insights into enabling pre-conditions for its suitability and success. Additional evidence is needed to understand costs, economies of scale, governance and regulatory context, sanitation user experiences and preferences, and local environmental conditions to ensure successful adaptation and implementation, requiring place-based research, governance research, economic and financial analysis, political economy research and social research. See *Brief 2: ‘Why and how to invest in research for climate-resilient urban sanitation and technological innovation scaling’* for more details.

Opportunities and risks

Opportunities:

- Allows risk to be managed, by starting small and then advancing
- Widely understood pathway to scaling
- Logical progression: build evidence to prove the innovation, then replicate
- Facilitates private sector engagement and a more diverse sanitation support ecosystem
- Promotes learning and knowledge exchange across different geographical contexts

Risks:

- Uptake and replication can be slow
- Replication can be inhibited by broader systemic barriers
- Potential for inequities, as pilots often require conducive environments and available resources
- Limited understanding of climate risks and uncertainties in different contexts may impact successful replication

‘Change the Rules’ model

What is the Change the Rules model?

Change the Rules is about influencing the institutions and beliefs that drive urban sanitation systems and support their climate resilience.

Change the Rules encompasses ideas of *scaling up* and *scaling deep* described by Lam et al., drawing strongly from Moore et al.’s (2015) work on scaling social innovation.[8] *Scaling up* is about changing rules and regulations including laws and policies that might enable or constrain innovation uptake. *Scaling deep* is about shifting the values, norms and mindsets of those implicated in sanitation systems change, such as planners, funders and users. A notable example of influencing norms in sanitation is the citywide inclusive sanitation movement shifting discourse to emphasise sanitation as a public service, rather than a private concern.[9]

Given the urgency to achieve climate resilient sanitation, this model focuses on providing an enabling environment for wider use and rapid scaling of both existing and new technologies in support of climate resilience.

Examples

Scaling-up through changed rules, both formal and informal, is one way to achieve a step-change towards climate resilient sanitation. As noted by one participant: the Reach Further model

“is not working fast enough and we need this model to change the rules”. The Change the Rules model is important "not only the sanitation technology, but [we need to address] every area - we have to see the picture as a whole. If we treat the whole, we can find the suitable solution"

[government official - Vietnam].

Existing regulations can limit innovation

Existing rules and regulations may limit innovation, particularly if they are prescriptive rather outcomes-based. One participant from Bangladesh reflected that

"while sanitation is part of the national building code, it only includes septic tanks - we need to be able to change rules to allow for new innovations"

[implementor – Bangladesh].

Moreover, for an innovation like Container Based Sanitation (CBS), which has demonstrated its capacity to provide a climate-resilient, cost-effective and inclusive service for urban poor populations (such as in Cape Town and Manila), a lack of regulation or restrictive regulations on what “safe” sanitation comprises is limiting government buy-in and scale.

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[8] Moore, M.-L., Riddell, D., & Vocisano, D. (2015). Scaling Out, Scaling Up, Scaling Deep: Strategies of Non-profits in Advancing Systemic Social Innovation. *The Journal of Corporate Citizenship*, *58*, 67–84. http://www.jstor.org/stable/jcorpciti.58.67

[9] Gambrill, Martin, Rebecca J. Gilsdorf, and Nandita Kotwal. 2020. “Citywide Inclusive Sanitation—Business as Unusual: Shifting the Paradigm by Shifting Minds.” *Frontiers in Environmental Science* 7 (February): 1–10. https://doi.org/10.3389/fenvs.2019.00201; Schrecongost, Alyse, Danielle Pedi, Jan Willem Rosenboom, Roshan Shrestha, and Radu Ban. 2020. “Citywide Inclusive Sanitation: A Public Service Approach for Reaching the Urban Sanitation SDGs.” *Frontiers in Environmental Science* 8 (February): 19. https://doi.org/10.3389/FENVS.2020.00019.

‘Change the Rules’ model

Change the Rules model can also improve the enabling environment for private sector innovation in climate resilient sanitation. A participant from Bangladesh reflected that

"The policies don't give the private sector the authority [to operate]" [implementor – Bangladesh] and "Private sector engagement is needed but funding is a problem. If government could offer some subsidies for the technology and the operation and maintenance [then private sector could participate]"

[government official - Bangladesh].

Additional funding and new financial models

Additionally, changing the rules to support incorporation of additional costs of climate resilience to service provision is important. In Fiji, participants from the Fiji Water Authority reflected that regulatory changes were needed to increase available financing for climate-resilient sanitation activities. For example, a revision to the current water tariff structure would support financial sustainability of service providers, as low tariffs prevent cost recovery, particularly with the additional costs required to strengthen climate resilience. Adjustments to sewerage systems through sealing pump stations and other flood-prevention efforts require additional funding.

Standards to drive improved technologies

Rules and regulations might instead enable innovation. The recently developed ISO 30500:2018 standard for non-sewered sanitation systems is a voluntary international product standard that allows for diverse technologies. It covers aspects such as safety, functionality, usability, reliability, and maintainability of the system and could also incorporate aspects of climate resilience to guide use in contexts exposed to diverse climate events. However, its testing procedures are rigorous and require resources, however the idea of setting the outcomes to be achieved via different technologies is important to facilitate innovation. Equally, the enabling environment for market-based sanitation solutions is critical for scaling up. The Sanitation Hygiene Fund is developing a tool to assess the market maturity for the sanitation economy

“geared towards changing the way investors think about sanitation- based on a Change the Rules model”

[donor].

Innovative and flexible financing

Flexible funding models can catalyse innovation, but may need wider systems change to enable sustainable revenue **streams.**

For container-based sanitation (CBS), insufficient financing is a challenge to reach scale.

A lack of access to public funding to implement CBS limits providers to scale their services, which has potential to create a dependency on private donor support,[10] when in fact it is the wider service system that requires reconfiguration and associated regulatory reform.

"Our role is flexible funding to catalyse innovation…. changing the rules is critical for creating an enabling environment for some innovations to work, especially in informal settlements. There should be public provision of a service with an enabling environment by government and regulation to support that"

[donor].

[10] https://cbsa.global/mainstreaming

‘Change the Rules’ model

Beyond *scaling up,* **Change the Rules model also emphasises *scaling deep*,** which speaks to the importance of shifting values, norms and mindsets of those implicated in sanitation systems change and the ability of systems to address climate change. In Fiji, the Revitalising Informal Settlements and their Environments (RISE) project applies this approach by building trust and partnership that resulted in changing mindsets, including negotiating with local actors on arrangements for operation and maintenance of the new technology.

“Connecting on a personal level can help projects move and scale faster” [implementer – Fiji].

In Fiji, RISE have also advocated to government and forged strong partnerships such that they shaped values and mindsets. For example:

"The RISE approach to upgrading water and sanitation involves not just local council and regulatory approvals, but also social and environment safeguards to protect the rights and livelihoods of participating communities" [government official - Fiji].

Community engagement and incentivizing

Several participants mentioned the importance of engaging users of climate resilient sanitation services, and the criticality of bringing them on board. In this context, Change the Rules is important as community demand needs to be incentivized. In talking about community demand, one participant suggested that we need to find a way to make sanitation a trending topic through greater advocacy, including on the cost of inaction. Another participant described challenges in achieving household connections to a wastewater system:

"We have all the technology and pushed for increases in access. But the foundational context needs to change, regulations don't support one another, community demand is difficult" [donor]

When is this model most relevant?

Workshop participants predominately favoured the Change the Rules model as the preferred pathways for scaling innovation. But the model was also thought to be unrealistic or too slow depending on the broader political operating context. This sentiment is reflected in the examples shared by workshop participants, which might be better understood as *ideas* of what could become examples, rather than exemplary examples in and of themselves. For example, in Vietnam, ‘changing the rules’ was considered particularly challenging in the Vietnamese governance context: "*Working in this sector for a long time, I find that it is hard to change the policy or the rules*" *[implementer – Vietnam]*

There are some new technology solutions, but changes are needed in rules (e.g., norms, standards) and values to enable their uptake and use. And it is important to note that values speaks to both users of sanitation services, and also critically to the people working in government or those in positions of power.

The Change the Rules model is important "*not only for sanitation technology, but for every area - we have to see the picture as a whole. If we treat the whole, we can find the suitable solution*" *[government official - Vietnam].*

‘Change the Rules’ model

Enablers

A set of generalised enablers identified by participants for Change the Rules based on experiences with influencing the institutions and beliefs that drive urban sanitation systems and support their climate resilience:

- Supportive policy environment at local, national and international level e.g., international standards, national government targets, regulatory framework that align direction and affirm action towards greater climate resilience
- Government engagement and support at every level (e.g. CLTS)
- Centring partnership in any innovation through cultivating trust, open communication and buy-in from all actors
- Strategic framing of value of an innovation to leverage existing priorities (e.g., for RISE Fiji, linking a project to health and wellbeing outcomes fostered greater buy-in from community members and enabled faster scaling (Fiji RISE)
- Support from larger funders rather than small funding from private donors
- Participatory design and construction of an initiative (Fiji RISE)
- Institutional support from development partners and a network of knowledge partners at the national and international level

What evidence is needed to support the model?

To scale innovation according to the Change the Rules model, evidence is needed of how certain social norms and institutions enable or constrain innovations, as well as identifying the necessary changes and suitable leverage points for driving those changes. Additionally, evidence on shifting financing systems, structuring finance effectively, investment case studies, user mindsets and values, and political economy and institutional analysis is helpful, requiring diverse research approaches including social science, finance, and governance studies.

Opportunities and risks

Opportunities:

- Potential for a step-change in technology adoption
- Accesses deeper leverage points for systems change such as mind-set change

Risks:

- Changing mindsets and values requires different skill sets to those that may be available
- Resistance to change, bureaucracy and vested interests that are difficult to change
- Slow and complex process
- Financial support may be limited to technology investment and not institutional change

Stakeholder pathways

MODEL			
GOVERNMENT	• Allocate budget to assess the climate resilience of sanitation technologies and develop improved models • Expand and speed-up implementation of existing programs and initiatives to improve sanitation, particularly in areas with highest exposure to climate events	• Create an enabling environment for replication of effective climate-resilient technologies through financing and capacity building • Collaborate with funders to build evidence on the effectiveness of new technologies in addressing climate challenges • Provide institutional support to share across different locations	• Update existing sanitation standards to support climate resilient urban sanitation. • Introduce regulatory reforms that mandate the integration of climate-resilient technologies within national and urban development planning frameworks • Develop context-specific, sustainable subsidy and incentive mechanisms to promote the adoption of climate-resilient sanitation technologies
FUNDERS	• Convene actors involved in current initiatives to identify opportunities to strengthen them, including to support climate resilience	• Support landscape studies of potential technologies, their applicability, cost and climate resilience • De-risk investments to upscale proven technologies and interventions • Provide funding for long-term impact assessments of scaled-up technologies.	• Provide funding and strategic support for policy initiatives that drive government adoption of climate-resilient measures in national sanitation strategies.
RESEARCHERS	• Conduct studies to assess and adapt climate-resilient modifications of existing sanitation technologies • Collaborate on joint action research with governments to provide rapid feedback on elements to optimise	• Conduct studies to demonstrate economic benefits, cost-effectiveness (including the cost of inaction) and affordability of new climate-resilient technologies • Place-based research to understanding similarities and differences across contexts that impact suitability of technologies to different locations	• Collaborate with government and funders to produce evidence relevant to systems-change, using economic, social, political and behavioural research approaches and methods
IMPLEMENTERS AND NGOS	• Trial approaches to integrate climate resilience into ongoing programmes and investments	• Facilitate user-feedback on climate-resilient solutions • Build networks and support effective communications to inform broader adoption	• Generate and share field-based evidence to inform regulatory reforms • Support learning and exchange through multi-stakeholder platforms

Critically thinking within and across the three models

Participant views on the relevance of each model to their particular work and context was elicited in each workshop. Across all workshops, the Reach Further model was chosen as the most important and relevant scale-up process to the participants' working context. The exception were researchers and some funders who identified most with Change the Rules. The Keep Optimising model was consistently considered the least relevant scale-up process among workshop participants. Similarly, across more than 100 participants at the Toilet Conference in Dhaka, Bangladesh, participants noted that Keep Optimising was the current dominant model to achieve climate resilient sanitation, but that instead looking forward to the future, their organisations should focus more on Change the Rules.

- **Which model are you following? Building awareness of which model underlies your current work**: Realising which model might implicitly be informing your or your organisation's strategies, actions and investments is key to being more purposeful in accelerating change towards climate resilient sanitation. Each model provides a different pathway or approach towards that goal, and hence making conscious choices, and weighing up opportunities and risks can guide strategic action. Equally, each model has very different requirements for the type of evidence that will benefit that pathway (see Brief 2).
- **Importance of all three models to achieving climate resilient sanitation**: In laying out these three models, we propose them as useful for building awareness of the different change pathways, with work on multiple models needed to achieve the scale of change required. As one participant said: *"We need all three models, not just one of them"* (government official from Bangladesh). Effective scaling of climate-resilient WASH innovation requires working across all three models, either consecutively or simultaneously - stabilising existing approaches while speeding up new innovations through appropriate technology, supportive policy environments, and sustainable financing mechanisms. Participants noted that there are certain contexts and points in time within a project or initiative where one approach will be more helpful than another. For example, RISE Fiji and UNICEF Vietnam mentioned that they work across all three models, with varying focus at different times.

Brief prepared by Georgina Robinson, Naomi Carrard, Nabeela Nasim, Freya Mills and Juliet Willetts of UTS-ISF. Design: Jeffrey Kaster (UTS-ISF).

Citation: UTS-ISF (2025) Accelerating progress on climate resilient urban sanitation: Three models of scale-up linking technological innovation and systems change. Prepared for the Bill and Melinda Gates Foundation by University of Technology Sydney - Institute for Sustainable Futures. Authors: Georgina Robinson, Naomi Carrard, Nabeela Nasim, Freya Mills and Juliet Willetts.
doi.org/10.71741/4pyxmbnjaq.30326686

Acknowledgements: The authors would like to thank the following people for providing their input: Najib Bateganya, Kelly Latham, and participants from 54 organisations who contributed in workshops.