Brief 2

Investing in climate resilient sanitation research

Evidence priorities to support scaling technological innovation and systems change

Key messages

1. **Evidence can catalyse systems change.** When designed and done well, research can simultaneously generate evidence and catalyse action in climate resilient urban sanitation, supporting progress from innovation to systems change.
2. **Research can take many forms.** It can be practical or conceptual, relevant for policy or implementation, based on local knowledge or leverage disciplinary expertise. There is an art to defining the appropriate type to meet different evidence needs at different times, and models of scaling can can inform research design.
3. **Applying a systems change lens helps clarify the purpose and users of research.** Using scaling models to think through research purpose and research users will ensure research is relevant, credible and useful for sanitation decision makers.
4. **Climate change demands two dimensions of research integration.** Deeply embedding research in the urban sanitation sector will ensure closer connection between evidence and action, as well as rapid adaptation when needed. And integration of different knowledge types is essential to leverage all wisdom and evidence available in support of climate resilience.

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 services

Introduction

This brief is for those involved in designing, commissioning and overseeing climate-resilient urban sanitation research, as well as researchers, implementers, and policymakers who undertake, engage with or prioritise such research. It addresses:

1. **Why?** The contribution of research of different types in both generating evidence and driving action.
2. **How?** Strategies for commissioning and delivering research that drives improvements in climate resilient urban sanitation.

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 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 focuses on the intersection of technological innovations and wider social and systems change needed to accelerate progress. This brief is one of three documenting insights from six online participatory workshops run in late 2024 with global funders, global south researchers, and national stakeholders from three countries - Bangladesh, Fiji and Vietnam. This work is funded by the New Ventures Fund/ Bill and Melinda Gates Foundation. The three briefs are:

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

Why fund research?

Research provides invaluable signposts to navigate the complex challenge of climate change, urban development and inclusive sanitation. As we pursue climate resilient urban sanitation, research contributes to more complete understanding of the challenges, provides signals about which solutions and pathways to invest in, and guides evidence-based course correction as situations unfold in unpredictable ways. The value of development research has been well-established in terms of return on investment[3] and making catalytic contributions to development outcomes.[4].

The role of research in technological innovation is clear with established modes of research and development involving scientific, engineering and design methodologies. As we seek to modify existing approaches to make them more climate resilient, and to connect disruptive innovations with wider system change, the role of research becomes more varied and potentially more transformative. Research can generate evidence, facilitate learning and motivate action as we work to amplify promising technologies and approaches. Different research types and approaches support distinct, complementary change pathways.

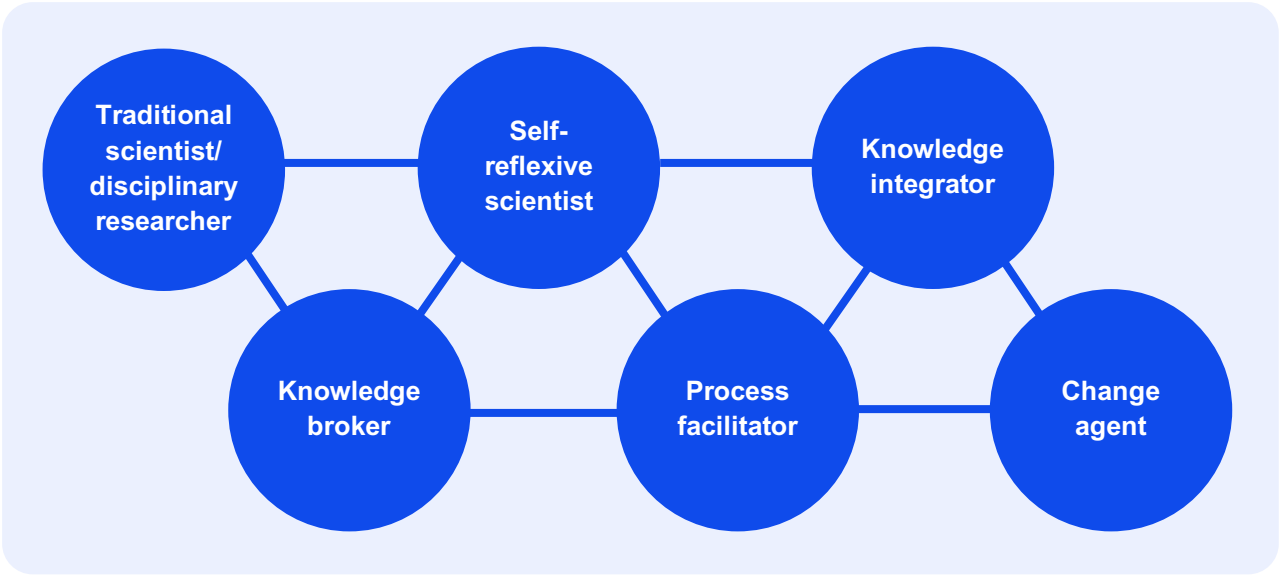
[1] UTS-ISF (2022) Urban sanitation and climate change: A public service at risk – Landscape study. Prepared for the BMGF by University of Technology Sydney - Institute for Sustainable Futures. Authors: J. Willetts, A. Kumar, F. Mills.
[2] See Climate Resilient Sanitation website
[3] Centre for International Economics (2022) 'Impact of ACIAR work in agricultural research for development 1982–2022: quantifying returns on investment', ACIAR 100 Vol 1, ACIAR.
[4] Water for Women. (2024). Learning Brief: The Value and Contribution of Research: Water for Women 2018-2024. https://www.waterforwomenfund.org/ en/news/the-value-and-contribution-of-research-water-for-women-2018-2024. Aspx; RDI Network (2017) From Evidence to Impact: Development contribution of Australian Aid funded research: A study based on research undertaken through the Australian Development Research Awards Scheme 2007–2016. Authored by Debbie Muirhead with Juliet Willetts, Joanne Crawford, Jane Hutchison and Philippa Smales.

Research types and researcher roles

Research can meet diverse purposes including discovery, innovation, integration, application and evaluation. Previous work on climate resilient sanitation articulated its many facets, including to facilitate knowledge sharing, generate evidence for policy-makers, integrate learning with implementation, assess or monitor local conditions, or address complex questions through more traditional academic modes[5]. In the journey from technological innovation to systems change for climate resilient urban sanitation, all types of research offer value. The critical question is what types of research to support, and when.

As well as recognising different research *types*, it is helpful to recognise different researcher *roles*. Researchers play a range of roles from single-discipline specialists through to knowledge integration, brokering and change facilitation. Applied research is most successful when these diverse roles are recognised and supported.

A review[6] identified six discrete, complementary roles that researchers play:



The different types of research, and different researcher roles, can support action across all three models to scale-up technological innovations in climate resilient sanitation.

With the scaling models as a guiding framework, there is opportunity to more fully capitalise on the potential for research to inform and accelerate wider systems change for climate resilient urban sanitation. Table 1 details key questions for each scaling model and illustrative examples of evidence needs, and researcher roles, that are most relevant.

[5] 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: Juliet Willetts, Avni Kumar and Freya Mills

[6] Hofmann, B., Salomon, H., & Hoffmann, S. (2025). Roles of researchers in inter-and transdisciplinary sustainability research: a reflection tool. *Sustainability Science*, 1-16.

Table 1: What kind of evidence is needed to facilitate different types of scaling and systems change? What kinds of research, and researcher roles, can support this evidence generation?

		
Keep Optimising	**Reach Further**	**Change the Rules**
Is the innovation achieving safely managed sanitation and climate resilience needs? Is it reaching climate-vulnerable populations? How can it be more effective, or rolled out more quickly? Evidence related to barriers to implementing current solutions, and on promising strategies for facilitating faster or more stable rollout of current solutions. Evidence of the effectiveness and cost-effectiveness of modifications to technologies to improve their climate resilience. Evidence about how to professionalise the roles and processes that support current technology solutions to improve climate resilience and ensure long term effective management. Evidence on ways to engage more users, or more widespread support, for current solutions to improve their climate resilience and embed them more strongly. Evidence on supportive regulatory and institutional arrangements. **Evidence to ensure appropriate operation and maintenance practices are in place to ensure ongoing effectiveness of innovation?** **The above types of evidence variously require social research, technical and scientific research, social practice and market research and legal and governance research.**	**When does the innovation work? Where does it work? How can we influence pre-conditions to enable successful replication?** Evidence that an innovation is effective, including under relevant climate conditions, and ready to transfer or replicate. Understanding enabling pre-conditions is key. Evaluative research can generate insights about what has (and has not worked), and formative research can generate evidence about whether enabling pre-conditions exist in different contexts (and how to shape them). Evidence on the costs and potential for economies of scale in larger-scale replication, including integrating sanitation technologies into market systems. Evidence about the governance situation, legal and policy considerations, regulatory context for new locations or situations where an innovation will be applied (and capacity to influence it). Evidence about sanitation user experiences and preferences, and local environmental and climatic conditions, is foundational for assessing the appropriateness of rolling out an innovation in a new context. **The above types of evidence variously require place-based/geographical research, governance research, economic and financial analysis, political economy research and social research.**	**How are social norms and institutions enabling or constraining innovations in climate resilient urban sanitation? What are the leverage points for driving necessary changes? What disruptive approaches to financing, governance or service delivery could accelerate systems transformation?** Evidence on how to shift financing systems to catalyse progress and remove constraints to new models and approaches (e.g. CBS) Evidence about what finance is needed and how it can be effectively structured across tariffs, taxes and transfers and different system actors. Evidence on investment case studies can inform re-design of finance systems. Evidence about the mindsets and values driving sanitation behaviours of users and the perspectives of decision makers, which can be generated through social science studies and engagement processes. Political economy and institutional analysis can generate insights about 'the rules' enabling or constraining climate resilient sanitation, including formal laws, policies and regulations as well as informal norms that drive decision making and behaviour. **The above types of evidence variously require financial and economic research, social research and behavioural research, political economy research and institutional analysis.**
"Something good in the past can become a challenge in the future."	**"Evidence to convince policymakers is important, however needs to be contextualised"**	**"We need to support systems change not just technological change. New evidence is needed to support systems change."**

For Policymakers & Regulators:

Evidence priorities include regulatory frameworks that enable innovation while ensuring safety, policy instruments that incentivise climate resilience, and governance models that can adapt to emerging technologies and climate risks.

How? Strategies for maximising research engagement and impact

The climate crisis is game changing for our economies, societies and environments, and also demands a rethink of standard modes of research to better engage with complexity and uncertainty. Research, innovation and action need to be more strongly integrated, responsive to evolving circumstances, and capable of generating evidence that signposts the best possible pathways for adapting technologies, practices and policies in rapidly shifting situations. This section is about how to invest in research in ways that catalyse its potential to accelerate systems change for climate resilient urban sanitation. Enablers for research impact – drawn from reviews of research impact and the workshops held for this study – require focusing on research purpose and users, as well as research integration.

Apply a systems change lens to clarify the purpose and users of research

Being clear about the purpose of research with reference to the wider system of climate resilient urban sanitation is foundational for generated evidence to be used. The three scaling models can be a helpful framework for articulating research purpose and engaging research users.

For example, Keep Optimising research might have a purpose of testing how established sanitation technologies perform under different climate hazards, and innovating modifications or new management modes to strengthen climate resilience. Frameworks such as ClimateFIRST can guide systematic consideration of such technological modifications. Users of this research might be manufacturers, policy and regulatory actors, or service providers supporting their constituents to upgrade and adapt.

Reach Further research might have a purpose of assessing and enabling the potential large-scale rollout of a piloted technology or faecal sludge management ke (including the inevitable need for problem-solving alongapproach. In this case, research can both analyse contextual enablers and barriers while simultaneously engaging stakeholders to build readiness and prepare for upta the way). One example of this kind of research shared in workshops was a sanitation economy maturity assessment tool, which would enable assessment of market maturity for sanitation including environmental and climate change indicators. Users of this kind of research include planners and policymakers, donors working in partnership with governments, or program implementation teams.

Change the Rules research might have a purpose to influence the financing landscape by both identifying institutional barriers and enablers of investment, and shifting mindsets of decision makers to prioritise sanitation as a core public service. Research to inform and advocate for more effective financing was a strong theme in workshops, with participants identifying a need for evidence on what works, when, how to make outcomes equitable, and to better articulate the cost of inaction. Users of this research might be investors, donors, planners and policymakers or advocacy groups.

> **"Financing is critical…It is not the type of technology, [climate resilient sanitation] needs investment…We need investment cases to policymakers to attract more funding."**
>
> [Government official - Fiji]

Across the three models of scaling, being clear about the research purpose and users ultimately means more effective planning for impact. Having a clear idea of what practical changes the research hopes to influence, how these changes are most likely to occur, and who might enact them, sets as strong foundation for design and delivery that can match evidence generation to the realities of climate resilient urban sanitation.

For Funders & Donors:

Your role extends beyond financial support to convening diverse stakeholders, breaking down silos between sectors, and creating funding mechanisms that reward integration and long-term thinking over short-term outputs.

For Implementers:

Research partnerships can strengthen your work by providing real-time feedback on what's working, helping you adapt approaches based on evidence, and building your case for sustained funding and policy support.

Research integration across two dimensions

Integration means two things in the context of research to inform climate resilient urban sanitation:

1. **Embedding research** within the broader climate resilient urban sanitation system of actors and activities (not as an external input or add on). Climate change means deep integration is necessary. Integrated research enables closer engagement between research producers and users, and between evidence and action. Such connection provides a stronger foundation for rapid adaptation to evolving situations and priorities.
2. **Integrating different knowledge types** (e.g. local, traditional, practical, academic) and expertise from different disciplines. The complexity of climate change demands leveraging knowledge and wisdom from the full breadth of knowledge types and disciplinary lenses.

Both forms of integration are essential for research about and for systems change. Research needs to be deeply integrated within broader climate resilient urban sanitation sector activities to be relevant, credible and aligned with user needs. Engagement between researchers and research users must be meaningful and based on principles of partnership, informed by research user needs, motivations, culture and decision-making processes.[6] Examples of integrated research include research co-design and knowledge co-production.

A particular need, as expressed in workshops, is use cases where evidence has been brought to bear on decisions – such use cases can highlight positive cases of research engagement and integration. Workshops also emphasised the importance of 'translating' evidence for funders and decision makers, ensuring insights are expressed in ways meaningful for a range of research users.

"Researchers need to work with policymakers. We need integration. Government respect scientists. They need think tanks. I realised over many years of experience, researchers need to break through to connect with policymakers."
[researcher – Vietnam]

And evidence that integrates different disciplinary perspective and knowledge types will lead to richer, more complete, and more useful insights. Both researchers and funders can support integration of diverse knowledge types by convening, facilitating and incentivising collaboration.

A key role of funders is "to bring people together, break silos, for instance lack of coordination and communication between national and local governance"
[donor]

[6] RDI Network (2017) From Evidence to Impact: Development contribution of Australian Aid funded research: A study based on research undertaken through the Australian Development Research Awards Scheme 2007–2016. Authored by Debbie Muirhead with Juliet Willetts, Joanne Crawford, Jane Hutchison and Philippa Smales.

For Research Institutions:

Success requires moving beyond traditional academic outputs to embrace co-design, embedded research approaches, and knowledge translation that serves diverse user needs and timelines.

A research investment framework for funders

If you are a funder looking to maximise impact in climate resilient sanitation, consider diversifying your research portfolio across complementary investment types:

This portfolio approach ensures research investment supports the full pipeline from innovation to systems change while building the research ecosystem needed for ongoing adaptation.

Conclusion: final tips for research funders

In addition to the insights shared in this brief about 'why' and 'how' to invest in research in support of climate resilient urban sanitation, tips shared in workshops identified practical ways funders can most effectively leverage the benefits of research for evidence-informed action.

1. **Consider a spectrum of funding modalities including flexible options for complex questions**. What funding modalities will support the kind of research needed to achieve the systems change purpose? Is it clear and possible to plan in detail, or will design need to allow for flexibility and be responsive to emerging findings?
2. **Invest in partnership building and deep integration**. How much will be needed to invest in partnership building and engagement to ensure the research has local validity and credibility? This aspect of evidence generation and use is often overlooked and underfunded.
3. **Match research to users**. Local level data needs are different to policy level evidence needs.
4. **Research can optimise innovations**. Funders in workshops noted the important and often overlooked role that research plays in optimising an innovation, as well as taking it to scale through convincing evidence generation. Some described that funds would have to be subtly allocated toward it, as it is not often formally prioritised in sanitation budgets.

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