

The image shows a woman in a purple patterned shirt and blue skirt walking away from the camera on a wooden walkway with yellow safety railings. The walkway is elevated above a lush green area. In the background, there are several small, makeshift buildings with corrugated metal roofs and walls, some showing signs of wear and rust. Tall palm trees and other tropical vegetation are visible behind the buildings. A wooden utility pole stands to the right of the woman. The overall scene depicts an informal settlement in a tropical environment.

rise

REVITALISING INFORMAL
SETTLEMENTS AND
THEIR ENVIRONMENTS

Building a New Urban Future

RISE Annual Activity Report 2025



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1. OUR APPROACH

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The RISE approach

OUR PROGRAM

Informal settlements are home to more than one billion people worldwide. Residents experience some of the harshest living conditions, exposed to environmental contamination hazards affecting health and wellbeing, which are disproportionately exacerbated by climate change.

RISE is testing a community-scale approach to improving water management, sanitation and climate resilience. This is being done through a randomised controlled trial (RCT) in 12 informal settlements in Suva, Fiji, and 11 settlements in Makassar, Indonesia, as well as one pilot settlement in each city.

OUR VISION

Our vision is of thriving, resilient cities where informal settlements are no longer left behind; where poor sanitation, flooding, and climate pressures are overcome to secure health, dignity, and opportunity for all.

OUR APPROACH

RISE's integrated approach to service delivery aims to transform health and wellbeing in the world's urban informal settlements.

RISE brings people together to solve the complex challenges facing informal settlements. Our water sensitive, people-centred approach targets the harshest living conditions, and has been developed over a decade through delivery of community upgrades with rigorous research to assess the impacts.

At the heart of RISE is a **water sensitive cities approach**, which involves managing water holistically. With our communities and partners, we design systems that treat water as an integrated resource, rather than a discrete issue, while addressing the interconnected challenges of sanitation, flooding and public health.

The approach includes **nature-based solutions**, such as constructed wetlands and rainwater harvesting, which have been proven to deliver sustainable, cost-effective and environmental improvements in many developed countries.

Our framework is comprehensive, but not a one-size-fits-all approach. It is a suite of tried and tested social and technical solutions that can be tailored to local conditions for long-term impact.

Message from the Co-Directors



Diego Ramirez-Lovering
RISE Program Co-Director
Monash University Faculty of Art,
Design and Architecture



Karin Leder
RISE Program Co-Director
Monash University School of Public
Health and Preventive Medicine,
Faculty of Medicine, Nursing and
Health Sciences

By 2050, a staggering one in three people on the planet are expected to be living in informal settlements, often without access to safe water, sanitation, or basic services. These communities already bear the brunt of escalating climate impacts, alongside deepening urban inequality. RISE is responding to this urgent global challenge, demonstrating a new model that integrates water sensitive infrastructure delivery with rigorous scientific evaluation to understand how environmental improvements can transform health and wellbeing in at-risk communities.

We are delighted to share major milestones towards delivering robust evidence in this report, enabling sustainable stewardship and accelerating impact at scale.

In 2025, the post-intervention assessment (research) phase continued in Indonesia, while Fiji entered its final stages of infrastructure delivery, representing years of collaborative design, engineering, and community partnership. These milestones mark a significant transition to the critical phase of evidence generation in RISE's randomised controlled trial (RCT).

This year also provided powerful validation of the trial's design, established nearly nine years ago. From the outset, ours was to be one of the most ambitious and comprehensive RCTs ever undertaken in informal settlements. As RISE has progressed, data collection frameworks established early in the program have stood the test of time. The strength and foresight of our designed workplans ensure that we capture the environmental, health, and social data necessary to generate robust and credible evidence. Importantly, the flexibility built into the RCT has enabled us to incorporate new scientific advances, analytical tools, and emerging priorities, strengthening the scope and relevance of the research.

During 2025, we expanded advanced pathogen and genomic analyses, refined environmental sampling methodologies, and strengthened analytical pipelines capable of integrating complex environmental, microbial, behavioural, and health data. These advances significantly accelerate our ability to examine how environmental interventions influence microbial exposure, child health, and community resilience.

Each advance reflects the unique strength of RISE as a transdisciplinary program operating at the intersection of infrastructure delivery and scientific discovery.

The infrastructure is already delivering meaningful benefits for communities, demonstrating the truly transformative potential of integrated, water sensitive infrastructure in informal settlements. Residents have reported high satisfaction with the intervention. Through pathways and drainage, they are now no longer barricaded by flood water and are able to go to work and school. These improvements support safety, dignity, wellbeing, and resilience to climate-related risks.

Central to RISE's progress this year is the extraordinary trust and participation of communities. Participation rates remain exceptionally high across both intervention and control settlements, reflecting years of engagement, transparency, and partnership. Communities have played an essential role in shaping infrastructure design and supporting its operation and maintenance; their unwavering engagement is a testament to the strong relationship our teams have built with local residents.

We have also made important strides embedding RISE within government systems and building local capacity. In Indonesia, preparations are underway for government stewardship of infrastructure systems. In Fiji, national partnerships are creating pathways to scale the RISE approach to many more settlements through Government programs. Cross-country drone and laboratory training programs have strengthened technical capacity and fostered a growing community of practice, enabling teams in Indonesia and Fiji to lead environmental monitoring, infrastructure assessment, and scientific analyses with increasing independence and expertise. These enduring benefits extend far beyond RISE's original goals.

RISE was founded on the belief that infrastructure delivery, scientific evidence, and community partnerships must advance together. The progress achieved in 2025 affirms this integrated approach is working.

We extend our deepest gratitude - *terima kasih banyak, vinaka vakalevu* - to our funders, partners, supporters and communities - as well as to our global teams in Australia, Fiji, Indonesia, the US, and beyond, whose trust and commitment continue to make this important work possible. We could not do this without you.

RISE is now positioned to deliver robust scientific evidence, inform policy, and support governments and communities to implement climate-resilient infrastructure at scale in the future.



Our funders

RISE is only possible thanks to the deep partnership, collaboration, support and vision of our funders, and multiple institutional partners in Indonesia and Fiji. Our funders and partners are committed to ambitious and practical action on climate change, shared prosperity, and supporting resilient communities in the Indo-Pacific.



“ RISE offers a significant opportunity to understand how bespoke innovations co-designed with communities can improve human and environmental health in urban informal settlements. We are eager to see the scientific evidence produced by the randomised controlled trial ending in 2026 and how the findings will inform future policy and practice.

- **Madeleine Thomson**
Head of Climate Impacts, Wellcome Trust



“ The reason I'm so excited about RISE is it's very clear to see the direct benefit to the people of the area where it works. Always, it's the same information I get from the local community. “Thank you so much, this has changed our lives. The sanitation has improved, our access to water has improved.” I really hope this will be an example, not just for Makassar, actually, but for around the world.

- **Todd Dias**
Australian Consul-General in Makassar, Australian Department of Foreign Affairs and Trade



“ Through our partnership with RISE, New Zealand is contributing to upgrades that are improving daily living conditions for people in Suva's informal settlements. This work aligns with our priorities in climate adaptation, gender equality, and inclusive development, and helps ensure communities have the infrastructure and opportunities they need to thrive.

- **Jane Anderson**
First Secretary, New Zealand High Commission to Fiji, Ministry of Foreign Affairs and Trade



Wellcome Trust

The research components of RISE are funded by Wellcome under the 'Our Planet, Our Health' program, which is exploring what makes cities healthy and environmentally sustainable, and how water management can be built into urban design. The Wellcome Trust is also a key advisory body for the program.



Monash University

RISE is led by Monash University, Australia's largest university and a member of the 'Group of Eight'. Monash University is leading the interdisciplinary collaboration of expertise to generate robust scientific evidence determining the impact of water sensitive interventions on human, environmental and ecological health. RISE incorporates diverse expertise from across the University, including five faculties: Art, Design and Architecture (MADA); Science; Medicine, Nursing and Health Sciences (MNHS); Engineering; and Business and Economics.



Australian Department of Foreign Affairs and Trade (DFAT) and the Indonesia Australia Partnership for Infrastructure.

The Australian Government is funding the construction of settlement upgrades in Makassar via the Indonesia Australia Partnership for Infrastructure (KIAT) facility.



New Zealand Ministry of Foreign Affairs and Trade (MFAT)

The New Zealand aid and development program invests in sustainable development, climate change adaptation and resilience, gender equality and inclusive economic growth. The New Zealand Government is funding the construction of RISE's settlement upgrades in Suva.



Asian Development Bank (ADB)

The Asian Development Bank is a foundational partner of RISE and supported the design and construction of the demonstration projects in Fiji and Indonesia, as well as co-publishing RISE's knowledge product series on RISE co-design and implementation.



Australian National Health and Medical Research Council (NHMRC)

The National Health and Medical Research Council, Australia's peak body for health and medical research, funds a RISE sub-study of exposure pathways (GNT1183863). This research examines how children interact with their environment and identifies contamination sources to inform strategies that reduce gastrointestinal infections and improve child health outcomes.



Fiji Government Ministry of Housing

The Fiji Government, via the Ministry of Housing, is a core partner of RISE and the anchor point within the government for implementation of community upgrades. The Ministry of Housing is helping fund the settlement upgrades in Suva.

Our partners and collaborators



City of Makassar

As the largest city in Eastern Indonesia, Makassar has a vision to be a leading sustainable and thriving city in the region. With strong political partnership, the RISE infrastructure upgrades are led by the City of Makassar through a Project Management Unit that provides direct support to the program.



Indonesian Ministry of Public Works and Housing

The Ministry of Public Works and Housing (PUPR) of Indonesia supports RISE through its governance of water resources management, road management, housing provision and development, wastewater and solid waste management systems, environmental drainage, and construction service development.



Indonesian Ministry of National Development Planning

Along with other ministries, Indonesia's Ministry of National Development Planning (Bappenas) is a key supporter of RISE. Bappenas leads the development of Indonesia's National Development Plans, and it is essential that RISE fits into the vision and mission of the priority programs and targets within these plans.



CRC for Water Sensitive Cities

The CRC for Water Sensitive Cities is a national research partnership that brought together universities, governments, utilities, and industry to develop practical approaches for making cities more resilient, liveable, and sustainable through better water management.



Water Authority of Fiji (WAF)

The Water Authority of Fiji is a close working partner of RISE, responsible for the provision of safe, clean drinking water and sanitation to Fijians in urban and peri-urban areas. WAF is closely involved in the development of upgrade plans, and planning for the operation and maintenance of the built systems.



Hasanuddin University (UNHAS)

Hasanuddin University is one of the largest autonomous universities in Indonesia, with its main campus in Makassar. UNHAS, through the Faculty of Public Health, is a foundational partner of RISE, leading the local delivery of the RISE assessment program in Makassar and hosting the RISE laboratory.



Fiji National University (FNU)

Fiji National University's College of Medicine, Nursing and Health Sciences, through the Fiji Institute of Pacific Health Research, is a core foundational partner of RISE. FNU leads the local delivery of the RISE assessment program in Suva and hosts the RISE laboratory.



Stanford University

Stanford University's Woods Institute for the Environment is leading the human health study arm of RISE. The Woods Institute is focused on supporting sustainable and healthy communities and the provision of clean water and sanitation while stewarding the environment.



Emory University

Emory University leads RISE's policy and scaling up and also plays a key role in gender and social inclusion. Emory, a leading research university, focuses on confronting global challenges, educating the next generation, creating knowledge, advancing caring and healing, and transforming society.



The University of Melbourne

The University of Melbourne is providing support across the program on the statistical aspects of the research. One of Australia's leading universities, the University of Melbourne research contributes to solving social, economic and environmental challenges the world is facing today and into the future.



South East Water

South East Water has considerable experience in decentralised wastewater treatment solutions, new technologies and innovations that are cost-effective and offer alternatives to big-pipe solutions. Alongside its subsidiary, Iota Services, South East Water's role in the RISE program is technical support and advisory services, primarily for design and engagement.



Melbourne Water

Melbourne Water has extensive expertise in city-wide and city-region water sensitive design, implementation and maintenance. Its role with the RISE program includes technical support and advisory services, primarily for design and engagement. Melbourne Water is a leader in world class integrated water, sewerage, waterways and amenity management.



UN-Habitat

United Nations Human Settlements Programme (UN-Habitat) promotes socially and environmentally sustainable human settlements and adequate shelter for all. UN-Habitat and Monash University are strategically partnering to advance the Sustainable Development Goals in the Asia-Pacific through the RISE program.

Our Fiji team



“ RISE has rapidly become the reference program for informal settlement work and sanitation services in Fiji.

- Isoa Vakarewa
RISE Country Manager, Fiji

As we approach the conclusion of our randomised controlled trial, 2025 was a transformative year for RISE in Fiji. The most rewarding development has been witnessing the immediate socio-cultural impacts in our intervention sites.

Residents are now growing food along pathways and boardwalks that were once wet and muddy, demonstrating genuine ownership of their wellbeing and environment. This tangible change in daily life validates our community-centered approach.

Our engagement across government ministries has opened opportunities to integrate water sensitive approaches into their mandates, positioning RISE strategically within the Fiji Government Task Force for Informal Settlements through our newly established RISE Working Group.

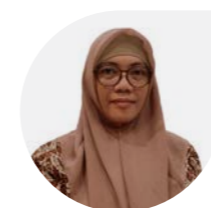
The urgency of our work cannot be overstated. With only 17 percent of Fiji's population accessing treated wastewater services, the country will not achieve its 2030 goals at the current rate. Our decentralised waste treatment systems

demonstrate a viable complement to traditional trunk infrastructure, particularly for informal settlements, peri-urban communities, and geographically isolated areas that may never receive conventional services.

As we commission these systems, we're documenting constructability, costs, and maintenance requirements, providing evidence-based solutions to sanitation challenges facing urban centers across low and middle income countries. The community co-design process, where residents actively participate in designing and building infrastructure that treats blackwater and manages flooding, represents the essential RISE approach that must continue beyond this trial.

Looking ahead, we're working toward incremental upgrades beyond intervention settlements, raising baseline standards through government and development partner support, ensuring services reach those who need them most.

Our Indonesia team



“ RISE has the potential to establish Makassar as a global model for sustainable informal settlement upgrading, creating healthier conditions, and addressing sanitation and flooding issues in affected areas.

- Fitriyanty Awaluddin
RISE Country Manager, Indonesia

Following the completion of our built infrastructure, 2025 was a pivotal year focused on system optimisation and rigorous data collection across our intervention sites in Makassar.

Through systematic monitoring and research activities, we're collecting evidence on how wetland waste treatment systems, drainage improvements, and pressurised sewer systems may help enhance human and environmental health, while addressing flooding, a persistent challenge in Makassar's flat topography.

The Makassar City Government has embraced RISE wholeheartedly, demonstrating commitment to continuing our efforts towards a cleaner, healthier, and more sustainable city. Our work directly supports the city's ambitious 'Smart, Healthy and Liveable City Plan' and 'Zero Slum' initiatives. Community participation has been central to our success. The RISE Community Engagement Committees (KePoLink)

now operate across RISE communities, actively engaging vulnerable groups including women and people with disabilities. Through intensive discussions and hands-on training, we're building capacity for long-term system management.

As we approach the end of our randomised controlled trial, future priorities include completing research data collection, asset transfers to government and communities, implementing the next phase of construction based on lessons learnt, and disseminating findings to city and central government.

We're securing continued support through government and private sector partnerships, with the vision of replication across other informal settlements throughout Indonesia and intervention sites serving as field laboratories for advancing knowledge.



Our 2025 journey

RISE collaborates with Fiji health authorities on Albendazole de-worming for children in informal settlements

World Wetlands Day celebrations and media blitz with Fiji Government Ministry of Waterways and Environment

Installation of HOBO temperature and humidity devices in Makassar and Suva

First face-to-face meeting of newly established RISE Data Monitoring Committee in Makassar

Collaborative workshop with the International Centre for Antimicrobial Resistance Solutions (ICARS) in Makassar

IATA certification for RISE laboratory team in Suva

Drone training in Suva

Module 1 training for Water and Sanitation Committee in Suva on "Understanding the Community Role and the System", along with joint community awareness session with Water Authority of Fiji (WAF)

Highest tier *My Green Lab* certification for RISE laboratories in Suva and Makassar

First meeting hosted by Unit Pelaksana Teknis Daerah Pengelolaan Air Limbah (UPTD-PAL) with community members on systems sustainability

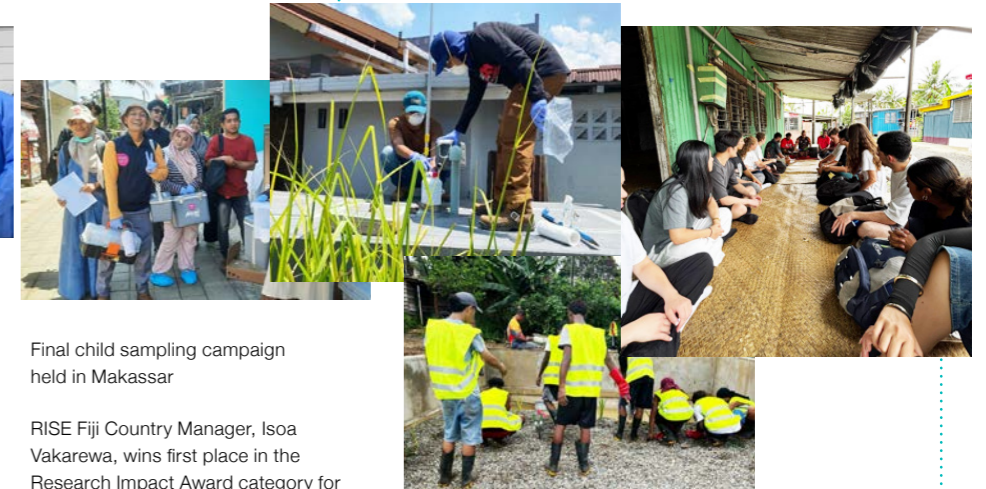
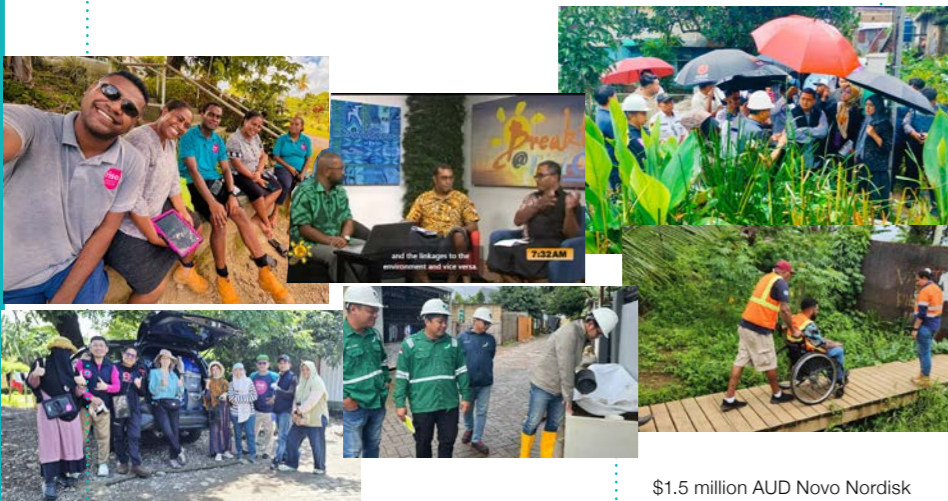
Workshop hosted by the Hasanuddin University Urban Planning Department and the International Academic Consortium for Sustainable Cities, featuring presentations from the RISE team in Makassar

First meeting of the RISE Working Group as part of the newly established Fiji Government Inter-Agency Taskforce on Informal Settlements

Commencement of wetland water quality sampling activities in Makassar

Delivery of 12 training and capacity-building modules by the RISE Indonesia team on water sensitive urban planning in Indonesia's new capital city, Nusantara

Launch of World Health Organization report "Taking a strategic approach to urban health: A guide for decision-makers", featuring RISE as a case study



RISE team members participate in Oceania Planetary Health Forum in Yanuca Island, including the launch the new virtual Pacific Planetary Health Centre housed at FNU

'PANRITA 3' community engagement with residents and the Public Works Department of Makassar City Government to ensure communities are prepared to take over operations and maintenance of RISE infrastructure in the short-term

\$1.5 million AUD Novo Nordisk Foundation grant is awarded to expand on RISE's nanopore sequencing work in Makassar

Meeting with newly inaugurated Mayor of Makassar, Munafri Arifuddin, and endorsement of medium term city development plans for 2025-29

Site visit from Spinal Injury Association of Fiji to settlements in Suva to provide feedback on the accessibility of RISE's infrastructure

Training and testing of Environmental Enteric Dysfunction (EED) markers in child faeces in Makassar

Cross-country laboratory skills exchange with RISE Fiji staff training Makassar staff in Kato Katz

Launch of part 4 of RISE mini-documentary series on World Environment Day

Training and testing of Environmental Enteric Dysfunction (EED) markers in child faeces in Suva

RISE presentation as part of an online forum hosted by Water-Aid Australia on Nature-Based Solutions for Climate-Resilient Water Security in Asia and the Pacific

Filming of ABC International TV Series featuring RISE as a case study

Final child sampling campaign held in Makassar

RISE Fiji Country Manager, Isoa Vakarewa, wins first place in the Research Impact Award category for his presentation at the Pacific Islands Health Research Symposium in Suva

RISE Fiji Laboratory Technician, Emily Lesione, also wins an award for best presentation on lessons learned from the *My Green Lab* certification process at the Fiji Institute of Medical Laboratory Science Seminar in Nadi

Monash Global Immersion Guarantee students visit RISE communities in Fiji

Cross-country skills exchange and drone training in Indonesia

Community and youth engagement for wetland planting in Fiji

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

2025 DATA COLLECTION CAMPAIGNS IN INDONESIA & FIJI, INDONESIA, FIJI

Activity	January	February	March	April	May	June
Ecology sampling (eg, temperature and humidity logging, mosquito traps (counts and species identification))	Green			Green		
Environmental sampling (eg, bootsocks, soil, water, and animal faeces)		Green			Pink	
Health & wellbeing (eg, household surveys)					Green	Green
Stool samples from children under 5 years		Green	Green			
Pathogen & genomics (eg, testing for pathogens and antimicrobial resistance (AMR))					Green	Green
EED (laboratory analysis of stool samples for biomarkers of environmental enteric dysfunction)						Pink
Exposure study (examination of children's exposure to faecal contamination in the environment)		Green	Green			

Activity	July	August	September	October	November	December
Ecology sampling (eg, temperature and humidity logging, mosquito traps (counts and species identification))	Green			Green		
Environmental sampling (eg, bootsocks, soil, water, and animal faeces)	Green			Green		
Health & wellbeing (eg, household surveys)					Green	Green
Blood & stool samples and anthropometric measures (eg, height, weight) from children under 5 years		Green	Green			
Pathogen & genomics (eg, testing for pathogens and antimicrobial resistance (AMR))					Green	Green
EED (laboratory analysis of stool samples for biomarkers of environmental enteric dysfunction)	Blue					
Exposure study (examination of children's exposure to faecal contamination in the environment)		Green	Green			



2. OUR FUTURE

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Scaling up the RISE approach



Tony Wong
RISE Director, Upscaling
Monash University
Faculty of Art, Design and Architecture

For more than two centuries, sanitation has underpinned public health progress, with civil engineering playing a decisive role in turning public health ambition into functioning systems. RISE builds on that legacy, combining engineering with community co-design and nature-based solutions to reach communities still left behind.

Global efforts toward Sustainable Development Goal 6 (SDG 6) – ensuring safe water and sanitation for all - have mobilised substantial investment to expand safely managed services. Yet progress remains uneven.

In 2025, only 58 percent of the world's population is afforded safely managed sanitation. Conventional sanitation practices are leaving the world's poor and vulnerable behind where the risks remain acute. Multiple sources of faecal contamination persist, as overflowing drains of upstream contaminants, unsafe water and inadequate toilets interact with low-lying, flood-prone environments to perpetuate disease and environmental degradation.

The randomised controlled trial, scheduled for completion in 2026, will provide much-anticipated data on improvements to the community and environmental health attributable to RISE. But the evidence of transformation is already visible, qualitative and anecdotal - functioning toilets and associated sewerage system, reduced community exposure to contaminated floodwater through improved access to their dwellings, improved drainage, community stewardship, cleaner local environments, pride of place, and institutional partnerships that have laid the foundation for further transformative change.

We observe that integrating water sensitive urban design with community co-design can be expected to deliver multiple, durable benefits beyond the randomised controlled trial metrics - gains in environmental health, community wellbeing and climate resilience. The program has built credible empirical and qualitative evidence of adaptability, constructability and beneficial outcomes across diverse contexts that set the scene for our future outlook.

The next phase is clear; to transition RISE from innovation to mainstream, government-led implementation, by consolidating Phase 1 outcomes and scaling across Makassar, Indonesia and Greater Suva in Fiji. Our ambition

goes beyond these cities. Fiji has over 250 informal settlements (approximately 77,000 people), while Indonesia's informal-settlement population is estimated to exceed 30 million, not including many "difficult-to-service" formal neighbourhoods facing similar risks.

In Makassar, across six settlements, RISE delivered 332 connected toilets, 66 pressure tanks and 32 septic tank-constructed wetland treatment systems; plus 304 rainwater tanks, 4,872 metres of drainage and 2,984 square metres of pathways, serving more than 1,530 residents. In Fiji, Phase 1 construction in Suva is scheduled for completion in early 2026, with infrastructure expected to serve more than 450 households and over 2,200 residents.

Post-construction feedback in Makassar indicates strong community confidence, with households reporting benefits from improved access, drainage and water supply, alongside unexpected gains such as improved safety and cost savings. In Fiji, the national Inter-Agency Taskforce on Informal Settlements and the inaugural RISE Working Group signal a shift from isolated projects to coordinated, incremental upgrading, prioritising phased delivery of essential services (sanitation, drainage and water supply) to reach more communities faster.

These achievements required daily problem solving in design and delivery over the last nine years. The lessons learnt and mitigations put in place will de-risk the next phase of upscaling, system optimisation and mainstreaming enabled by institutional and policy reform.

Now is the moment to convert what has been achieved into lasting systems change. For the RISE team, this means protecting the gains of Phase 1 through clear asset handover and shared ownership, dependable operation and maintenance, and sustained community stewardship, while strengthening partner capability to plan, fund and deliver replication.

By codifying what works, building local capacity and enabling blended financing, we will help Indonesia and Fiji move from pilots to programs, so healthier, safer and climate-resilient informal settlements become the expected standard, and every family can live with dignity and opportunity.



“ The Ministry of Housing continues to be a proud supporter of RISE. Together we are investigating opportunities for expanding the RISE approach through our newly established working group to the Fiji Government's Inter-Agency Taskforce on Informal Settlement Upgrading.

- **Manasa Lesuma**
Permanent Secretary, Fiji Government Ministry of Housing



“ Makassar needs a new approach to urban challenges. Through the RISE Project, we see tangible solutions through communal sanitation, green infrastructure, and community engagement. Our commitment is clear: to build Makassar as an inclusive, water sensitive city.

- **Munafri Arifuddin**
Mayor, Makassar City Government

Impact Dashboard

OUR APPROACH

- 1 global-first program trialling water sensitive revitalisation of informal settlements
- 2 implementing countries (Fiji and Indonesia)
- 9 years of operation (and counting)
- 7 funding organisations

13+
implementing partners and collaborators

\$50M+
funding through diverse sources

150+ 
people have worked with RISE globally


25 informal settlements participating, including 2 pilot sites

8,000+ 
informal settlement residents participating

1,600+ 
households

OUR FUTURE

1 
year remaining of the randomised controlled trial

7 
rounds of household sampling and surveying campaigns still to come

14 
rounds of outdoor sampling campaigns still to come

12 
informal settlements to upgrade after the trial



OUR RESEARCH

- 2 planetary health laboratories at Hasanuddin University and Fiji National University
- 28+ trained laboratory technicians in Fiji and Indonesia
- 25 rounds of household survey and sampling campaigns assessing health and wellbeing
- 66 rounds of outdoor sampling campaigns assessing environmental and ecological conditions
- 140,000+ human and environmental samples collected and processed
- 15,000+ household surveys completed
- 13 PhDs completed
- 6 PhDs underway
- 48 academic publications to date



OUR INFRASTRUCTURE

- 13 informal settlements upgraded 
- 31 constructed wetlands 
- 86 new toilets 
- >125 repaired existing toilets 
- 37 septic tanks 
- 320 rainwater tanks 
- 151 pressure tanks and OneBox® systems
- >6,900 m drainage 
- >4,815 m footpaths, boardwalks and bridges

OUR OUTREACH

- 52 countries represented amongst readers of our quarterly newsletter
- 2,530+ followers on social media
- 7,500+ new visitors to our website in 2025
- 100+ countries represented among visitors to our website
- 6,700+ views of our mini documentary series parts 1 to 4

Implementing Global Agendas

RISE embodies Monash University and our key partners' commitment to addressing the most pressing challenges articulated in the 2030 Agenda and the United Nations Sustainable Development Goals (SDGs). RISE directly confronts multiple interconnected SDGs through testing innovative interventions to create an evidence base that can transform human and environmental health.

We exemplify SDG 17's call for global partnerships, bringing together expertise from universities, governments, development banks, and communities. By examining how localised, community-driven solutions can transform lives while protecting planetary health, RISE provides a replicable blueprint for achieving sustainable development across the Asia-Pacific region and beyond.

Our work also operationalises commitments made in the United Nations New Urban Agenda, in particular the call for universal access to safe and affordable drinking water and sanitation, and infrastructure responsive to vulnerable populations in informal settlements. RISE is delivering in-situ upgrading that preserves community

ties and social networks whilst progressively integrating informal neighbourhoods into formal urban systems through participatory co-design processes.

RISE's rigorous randomised controlled trial addresses critical evidence gaps identified in global agendas. By documenting health, environmental, and social outcomes of participatory upgrading, we're providing the scientific foundation for scaling water sensitive infrastructure across the Indo-Pacific's rapidly urbanising cities. The program's knowledge products, co-produced with the Asian Development Bank, translate research findings into actionable guidance for policy-makers and practitioners seeking to implement similar interventions.

Spanning health equity, climate adaptation, gender-responsive design, and institutional capacity-building, RISE's integrated approach demonstrates how localised interventions can simultaneously advance multiple global development agendas whilst remaining feasible for low- and middle-income country contexts.



“ The growing scale and complexity of challenges demands a more strategic approach to urban health. Through its comprehensive approach to co-design, institutional engagement, architectural innovation, and randomised controlled trial implementation, RISE remains a laudatory example of the work called for by WHO and others in this space.

- Jose Siri
Founder and Principal, Urban and Planetary Health Specialist HCx Global



“ RISE exemplifies alignment with priorities of the Asian Development Bank to scale up impact on resilience and empowerment. Since delivering the Batua demonstration site in 2019 with funding from the ADB's Urban Climate Change Resilience Trust Fund, RISE has continued to demonstrate replicable solutions to pressing challenges in informal settlement communities in Indonesia.

- Joris van Etten
Country Operations Head, Asian Development Bank
Member, RISE International Development Advisory Board

ALIGNMENT WITH THE SDGS

- 

1 NO POVERTY RISE aims to reduce poverty by improving living conditions, health outcomes, and climate resilience in informal settlements, enabling communities to access economic opportunities.
- 

3 GOOD HEALTH AND WELL-BEING RISE is evaluating how integrated water sensitive infrastructure can reduce infectious disease burden, improve child health, and create healthier environments.
- 

5 GENDER EQUALITY RISE ensures participation of women and girls in co-design processes, recognising their expertise in water management and creating infrastructure that addresses their specific safety and dignity needs.
- 

6 CLEAN WATER AND SANITATION RISE is testing a blueprint for how to improve health and sanitation in informal settlements through decentralised nature-based solutions, moving beyond traditional WASH approaches.
- 

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE RISE is building local capabilities around water sensitive infrastructure design, construction and maintenance to help solve one of the most urgent global issues.
- 

10 REDUCED INEQUALITIES RISE is reducing inequality by delivering upgraded infrastructure to marginalised communities without displacing residents, ensuring the urban poor have access to services typically reserved for formalised settlements.
- 

11 SUSTAINABLE CITIES AND COMMUNITIES RISE is transforming informal settlements into sustainable neighbourhoods through participatory upgrading approaches that integrate climate resilient nature-based solutions.
- 

13 CLIMATE ACTION RISE aims to help communities adapt to climate change through improved drainage systems and green infrastructure that reduce flooding risks whilst simultaneously improving environmental health.
- 

14 LIFE BELOW WATER RISE is treating blackwater from informal settlement households, meaning higher quality water re-enters local waterways.
- 

17 PARTNERSHIPS FOR THE GOALS RISE is forging new partnerships between governments, communities, universities, and other institutions to deliver benefits to informal settlements.

IMPACT HIGHLIGHT: WHO CASE STUDY



The World Health Organization (WHO) highlighted RISE in an initiative supporting global decision-makers to develop healthier and more resilient cities. RISE features in the WHO guidelines *Taking a Strategic Approach to Urban Health* and in a standalone case study, recognised for addressing complex health, environmental and climate challenges through practical infrastructure, strong community engagement and rigorous research.

Published on World Cities Day, RISE is a leading example of growing international interest in the evidence the program is generating to inform urban policy and decision-making.

The WHO write-up describes RISE as an integrative model that links health, environment and infrastructure sectors, grounded in local governance and community priorities, and responds to diverse social, cultural, hydrological and political contexts.

The case study also highlights how RISE embeds capacity-building within implementation, strengthening institutional systems and supporting sustained collaboration across sectors. Beyond delivering immediate improvements for residents, RISE is contributing to policy pathways that enable national and city governments to adopt and scale similar approaches.

The RISE program is helping to inform emerging standards for decentralised sanitation and settlement upgrading, demonstrating how scientific collaboration with communities can deliver practical and scalable urban health solutions.



Partnering with governments

RISE's work in informal settlements cannot succeed in isolation. Over the past year, we have deepened our engagement with government partners in both Indonesia and Fiji, transforming research insights into institutional capacity and policy commitments that will outlast our direct implementation period.

In Indonesia, 2025 marked a significant transition with the appointment of a new Mayor of Makassar. Rather than disrupting progress, this transition created new momentum. Mayor Munafri Arifuddin visited two of our sites in March and subsequently instructed all municipal departments to provide full support for our program.

Most significantly, the policy process for drafting a Mayoral Regulation on green infrastructure under RISE is now underway, with the Regional Development Planning Agency (Bappeda) overseeing budget allocation for the regulation's preparation. This represents a fundamental shift from project-based intervention to institutionalised policy.

Our collaborative support has strengthened capacity building for municipal government staff, beneficiary communities, and the general public in areas of green infrastructure implementation, environmental health, and maintenance systems. The enhanced understanding of environmental health within urban areas has contributed to Makassar achieving certification as a National Healthy City in 2025.

Beyond Makassar, our water sensitive cities expertise is now informing national-level planning. We are collaborating with the National Capital Authority (NCA) of Indonesia in knowledge sharing and capacity building for the implementation of water sensitive urban design in the new capital city of Nusantara. The knowledge sharing include a public seminar and a number of field-based mentoring of NCA practitioners around a number of infrastructure projects throughout the Government Precinct of Nusantara. A 4-day design training workshop was also delivered by our Makassar team. This project was funded by the Australian Government through the Asian Development Bank. Our work

at Nusantara demonstrates how our water sensitive concepts and their response to site context, along with our experience and learnings from informal settlements, can be adapted to influence the design of entirely new urban environments.

In Fiji, we have formalised our relationship with the national government through the newly established Informal Settlement Taskforce and the RISE Working Group operating within it. Our Technical Coordination Committee meetings throughout the year have also provided a platform for solving implementation challenges collaboratively. One notable outcome was the Department of Town and Country Planning issuing a directive to local councils to assess development applications from informal settlement residents under the Public Health Act, using permits for RISE infrastructure as a test case.

The Ministry of Housing has announced that the Informal Settlement Upgrading Program will adopt the RISE approach as a complementary incremental upgrading pathway, helping raise the baseline level of services across a greater number of settlements while full upgrades are progressively delivered.

We are seeing genuine institutional buy-in across Fiji. The Water Authority of Fiji's (WAF) Strategy 2050 plan encourages the use of the RISE sanitation approach treatment systems for out-of-sequence development, and four of the RISE communities are now directly connected to WAF's municipal sewer via local a local pressure sewer network.

Looking ahead to 2026 and beyond, our focus shifts to scaling and replication. In Indonesia, we are working to position our program as a flagship model requiring central government endorsement and international financial support for nationwide replication. In Fiji, the Taskforce and Working Group provide pathways to pool surplus budget allocations from different ministries to fund our work across government portfolios.

Both countries are exploring how our approach can extend beyond current boundaries into rural villages and formal communities, making water sensitive solutions accessible to a broader population.



“ RISE's water sensitive cities approach requires robust national-level endorsement to facilitate replication across regions. Through central government leadership, support from international financial institutions and philanthropic organisations can serve as key enablers for nationwide replication.

- Ihsan Latief
Build Team Leader and Chief Investigator RISE Indonesia

IMPACT HIGHLIGHT: INAUGURAL RISE WORKING GROUP TO FIJI GOVERNMENT TASKFORCE ON INFORMAL SETTLEMENTS

In October 2025, our team collaborated with the Fiji Government on the establishment of the 'RISE Working Group', a new technical body operating under Fiji's national Inter-Agency Taskforce on Informal Settlements. This development marks a major milestone in our research-to-impact pathway, as we move from the randomised controlled trial to scale-up of the RISE approach, supported through institutional and policy reform.

Our program has provided a powerful proof-of-concept for incremental upgrading. By implementing water sensitive solutions in seven informal settlements in Greater Suva, we demonstrated how to concurrently address poor sanitation, contaminated flood inundation, and inadequate drainage. Our model focuses on interrupting pathways of faecal contamination, directly tackling root causes of health issues including diarrhoeal diseases that contribute to child mortality and stunting.

The Working Group now champions this incremental approach as national policy, prioritising delivery of essential services like clean water, sanitation, and drainage to larger numbers of communities. Rather than waiting for resources needed for full-scale revitalisation, this strategy delivers foundational infrastructure in phases, ensuring more families receive critical health improvements in shorter time frames.

Our Fiji team now provides secretariat support to the Working Group, embedding lessons and insights from our program into respective government agencies' programs and policies.

The skills and knowledge our in-country team gained through RISE directly strengthen the Working Group's capacity to drive meaningful, community-led change across Fiji's informal settlements, creating a sustainable pathway for healthier, more resilient communities nationwide.



“ RISE does community and government engagement very well. Forming the committees within settlements, and showcasing how it contributes to the success of RISE at community level, demonstrates how RISE as a project utilises co-design and co-funding in new alliances with government ministries.

- Mere Naulumatua
Senior Engagement Specialist and Urban Planner RISE Fiji



Engaging with local communities

At the heart of the RISE program lies a fundamental principle: we work with communities, not for them. Our approach to community engagement has proven that when residents become active partners in research and infrastructure interventions, rather than passive recipients, transformation becomes sustainable and meaningful.

What makes our community engagement distinctive is our commitment to balance research rigour with genuine human connection. We maintain strong rapport with communities while upholding research procedures and ethics, treating residents as active subjects in the research journey rather than passive objects of study.

This approach requires deep knowledge of each community. Our field teams carefully map physical infrastructure and social dynamics, understanding household compositions, daily routines, livelihoods, and cultural practices. This detailed understanding helps our teams engage with even the most hesitant households, and maintain very high levels of voluntary participation over many years.

Our engagement philosophy centres on listening to local voices, respecting culture and everyday realities, and building on the strengths that already exist within communities. Rather than bringing in fixed solutions, we take time to build trust,

form relationships, and support people to shape the changes themselves. This patient, respectful approach has proven essential to creating meaningful and lasting impact.

This year brought remarkable examples of community-led action demonstrating the success of this approach. In Suva, we witnessed residents who were initially hesitant about new sanitation and wetland systems transform into confident advocates, explaining the systems to visitors and taking pride in its maintenance. Most powerfully, women who were once quiet in meetings now confidently lead discussions around maintenance, safety, and community wellbeing.

In Makassar, communities have embraced behavioural changes around greywater management and sanitation. Households no longer allow wastewater to contaminate shared spaces or water sources. Small practical changes have had significant cumulative impact on daily life, building confidence and motivation within communities to continue improving their environments.

As we move beyond the randomised controlled trial period at the end of 2026, our focus shifts to ensuring communities sustain these changes.

We hope the program is not seen as an endpoint, but as a starting point and a foundation for the future.



“ RISE listens to local voices, respects culture and everyday realities, and builds on the strengths that already exist in the community. Instead of bringing in fixed solutions, we take time to build trust, form relationships, and support people to shape the changes themselves.

- Savu Nofimuli
Safeguards and Engagement Manager, RISE Fiji



“ Maintaining strong rapport with the community is what makes RISE special. We do not treat the communities merely as research objects, but as key partners who are critical to the success of the project.

- Syaidah Syamsul
Research Field Assistant RISE Indonesia

IMPACT HIGHLIGHT: BUILDING COMMUNITY OWNERSHIP OF RISE INFRASTRUCTURE

As our infrastructure in Makassar's informal settlements transitions to the maintenance phase, this marks a new chapter of collaboration between our communities and local authorities. This phase is critical, as the sustainability of the RISE systems depends on the ongoing involvement of both groups.

Community members and local authorities play distinct but equally important roles in maintaining the infrastructure. While communities are the primary beneficiaries, local authorities provide vital policy support. As responsibility from RISE is handed over, ensuring the long-term functionality of the RISE sanitation systems requires both groups to take ownership and work together on sustainability.

Our team's operations and maintenance (O&M) activities are designed to keep the infrastructure functioning well and to prevent damage. Our key focus is empowering residents to incorporate best practices into their daily routines and to learn from their experiences. For example, in maintaining constructed wetlands, residents have shared insights on plant pruning and using clippings for compost.

Similarly, residents are helping prevent pipe blockages by avoiding the disposal of harmful items like plastic waste, wet wipes, and hair, which can obstruct pressure tanks. Our team complements this local knowledge by advising against over-use of chemical cleaners, which can harm wetland plants.

Collective responsibility is vital for maintenance. Residents are discussing potential strategies like organising monthly contributions to cover electricity costs for pressure tanks and desludging septic tanks. Local authorities, such as the Public Works Department, are also learning how to monitor key infrastructure components and manage repairs effectively.

Empowering communities to take responsibility takes time. Our O&M engagement program started with activities like transect walks and community wetland planting activities to create strong memories for residents about the infrastructure connected to their homes. Big gatherings and cluster meetings followed, which combined discussions, reflections, hands-on practice, and competitions for various age groups to make the experience fun and inclusive.

The involvement of KePoLink (Community Engagement Council) members and community champions has been crucial, helping to manage events to ensure widespread participation. Creative tools like illustrations, presentations and instruction booklets were developed and tested based on community behaviour, and short videos featuring local influencers raised awareness about the benefits of the RISE systems.

Inclusive involvement at every stage - planning, construction, and ongoing maintenance - is essential for long-term sustainability. When communities take ownership, projects are more likely to thrive and overcome challenges, ensuring long-term success.



IMPACT HIGHLIGHT: VISIT FROM INDONESIAN DEPUTY MINISTER OF HIGHER EDUCATION, SCIENCE AND TECHNOLOGY



Professor Stella Christie, Indonesia's Deputy Minister of Higher Education, Science and Technology, saw the RISE approach in Makassar first-hand during a 75-minute tour of the intervention sites, followed by a stop at the RISE Laboratory at Universitas Hasanuddin (UNHAS).

Professor Christie observed key components of the RISE water and sanitation system, including the constructed wetlands, upgraded pathways, local drainage solutions, and household toilets. She asked detailed questions about the system's engineering and reach, reflecting a strong interest in how research translates into scalable, real-world solutions.

At UNHAS, Professor Christie praised the RISE approach. "I really appreciate how UNHAS combines

research with real action in the field," she said. "Programs like RISE show that research does not stop in the laboratory, but truly addresses real societal issues."

Local residents expressed pride in hosting a national-level visitor, with one resident sharing that she was pleased to know representatives from the central government were taking an interest in her community.

The Deputy Minister noted that the central government is already engaged with the RISE program. She added that should the research findings prove significant, the RISE approach could be considered by central authorities as a model for scaling to other informal settlements nationwide.



What's next?

AN OPPORTUNITY TO SCALE AND TRANSFORM

RISE is now ready to scale. Building on proven design and delivery, Phase 2 plans to upgrade 12 more informal settlements in Fiji and Indonesia, reaching more than 4,000 people across nearly 1,000 households.

With Phase 1 construction and the randomised controlled trial nearing completion, RISE is well placed to:

- Act on community momentum and trust
- Leverage operational hubs and partnerships in Fiji and Indonesia
- Contribute to multiple SDGs
- Deliver timely climate-adaptive services in increasingly fragile urban environments



OBJECTIVES

- Deliver resilient, decentralised infrastructure in 12 control communities
- Improve sanitation, water security, and public amenity
- Strengthen climate resilience, flood and drought tolerance
- Generate global evidence on how to cost-effectively scale inclusive urban upgrading

EXPECTED OUTPUTS

- Co-designed, community-endorsed infrastructure plans
- Physical construction of water sensitive infrastructure
- Strengthened local and institutional capacity for urban service delivery

JOIN US

Help scale RISE to deliver essential services, climate resilience and dignity, while building the evidence and partnerships to transform urban settlements across the region. Get in touch with us at info@rise-program.org

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Subscribe to our quarterly newsletter





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Our Infrastructure



Kerrie Burge
RISE Deputy Director Intervention
Monash University
Faculty of Art, Design and Architecture

As construction nears completion across all RISE intervention communities, the focus shifts from what has been delivered to what has been learned through the process of delivery. The infrastructure completed in 2025 represents more than physical assets such as pipes, pathways, tanks and constructed wetlands. It reflects a tested approach to delivering integrated, water sensitive infrastructure in complex informal settlement contexts, and demonstrates how alternative models of service delivery can achieve both technical and social outcomes.

In Fiji, the Build team reached a significant milestone by delivering safely managed sanitation and associated basic services across Phase 1 informal settlements in Suva. Retrofitting infrastructure into established neighbourhoods, while residents continued to live, work and care for families, required more than technical solutions. It necessitated close collaboration with communities and partners, flexibility in sequencing and design, and adaptive responses to constraints such as material shortages, cyclone-related delays and multi-layered permitting processes. Despite these challenges, construction was completed safely and in a manner that maintained community access and participation throughout.

In Makassar, post-construction engagement and early feedback illustrate how integrated infrastructure has translated into tangible improvements in daily life. Residents have reported benefits extending beyond sanitation outcomes, including improved access for people and goods, new public spaces that support social interactions and improved safety. The co-delivery of drainage, pathways, wetlands and communal areas has enabled neighbourhood-scale improvements, with infrastructure functioning as part of

a broader system that aims to improve liveability and climate resilience. These outcomes have been underpinned by the expertise and commitment of local teams in both countries. Their role extended beyond construction delivery to include community engagement, coordination with government counterparts, and capacity building for operation and maintenance.

A defining feature of the RISE approach has been sustained community engagement across all stages of design and construction. Design decisions were made collaboratively, with plans adapted in response to community priorities, site constraints and evolving circumstances.

The integration of grey infrastructure, smart monitoring technologies and nature-based solutions has enabled infrastructure to deliver multiple functions - sanitation, drainage, access, amenity and climate resilience - within limited space and dense urban environments.

Looking ahead to 2026, the program emphasis shifts toward sustainability, handover and legacy. While infrastructure delivery in both countries is nearing completion, long-term outcomes depend on effective operation and maintenance arrangements. RISE is therefore prioritising training and support for communities and local partners, alongside formalising asset handover and exit strategies. These efforts are guided by the same principles that have shaped delivery to date: collaboration, local ownership and capacity building.

As RISE transitions into this next phase, the core elements of the program remain central: integrated solutions, strong partnerships, and a commitment to delivering infrastructure that not only meets basic service needs, but contributes to healthier, more resilient informal settlement communities.

A WATER SENSITIVE CITIES APPROACH

RISE harnesses the water sensitive city approach to address urban challenges in some of the world's harshest and most complex environments - informal settlements.

A water sensitive city is one that treats water as a valuable resource to be managed in harmony with people and nature. Water sensitive cities view water as integral to health, safety, and liveability.

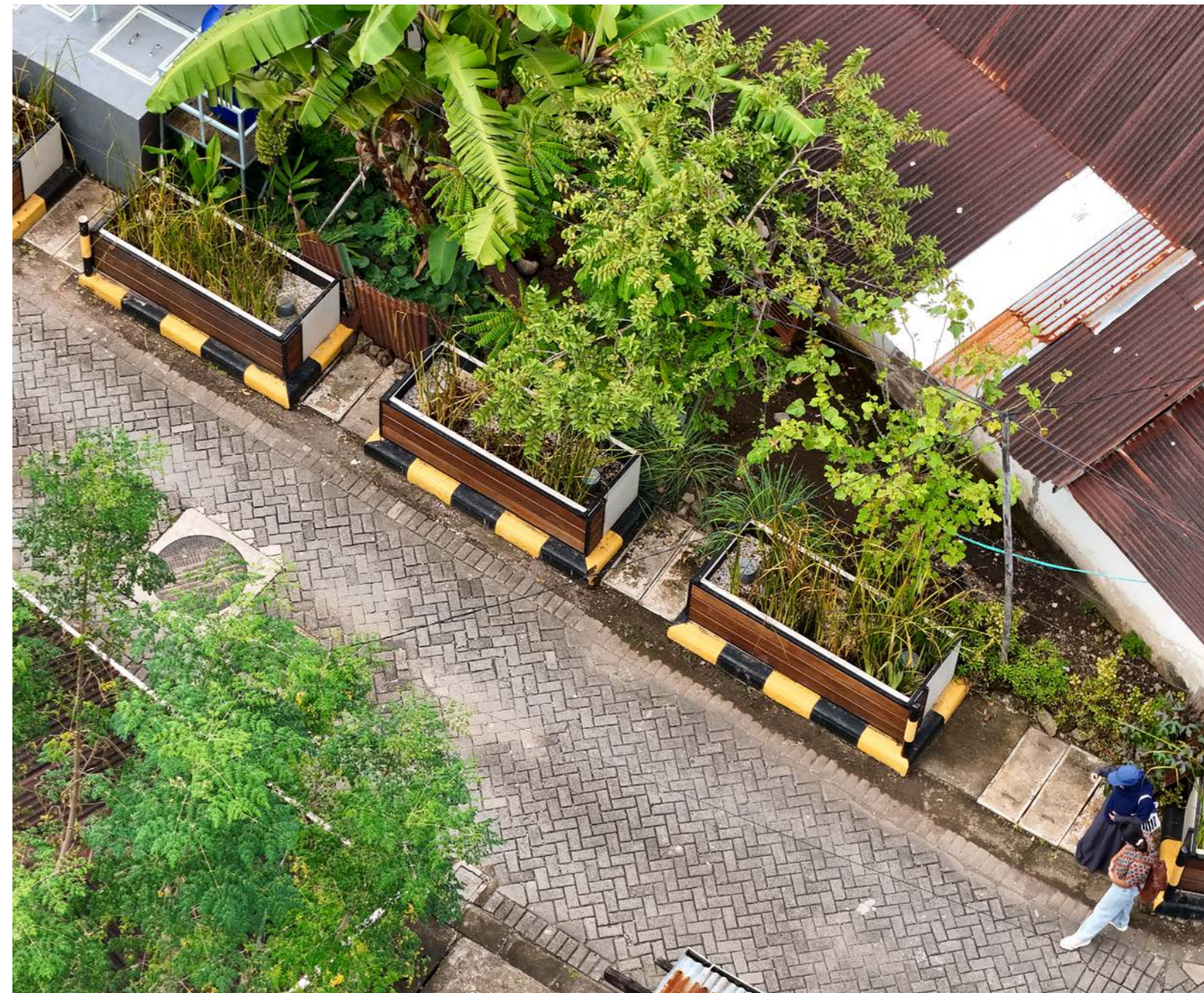
This approach looks at the entire urban water cycle: rainfall, stormwater, groundwater, drinking water, wastewater, and manages it in ways that deliver multiple benefits.

Wetlands, green spaces, and other nature-based solutions can filter and recycle water while also cooling cities, reducing flood risks, and creating healthier urban environments. At the same time, careful planning and design ensure that communities have safe, reliable water supplies, even as climate pressures intensify.

By working across scales, from neighbourhoods to whole river basins, water sensitive cities strengthen ecosystems, improve resilience to climate extremes, and create attractive, productive places for people to live and work.

Designed together with residents, our community-informed transformations address:

- **Sanitation** – through provision of toilets, septic tanks, pressure sewers and constructed wetlands
- **Drainage** – to reduce flood risks
- **Water supply** – to improve drinking water access
- **Access and pathways** – for safer community movement
- **Community spaces** – for enhanced public amenity



Community transformations in Fiji

Fiji is among the most urbanised Pacific nations, with nearly two thirds of its population living in towns and cities. Suva, the country's largest and fastest growing urban centre, faces mounting challenges as housing supply fails to keep pace with demand.

Nearly one quarter of Fiji's urban residents live in informal settlements, which are expanding in both number and density. Most settlements lack connections to central sewage networks and are located in flood-prone areas, exposing residents to serious environmental and health risks from inadequate sanitation, poor drainage, seasonal flooding, and unsafe access to homes.

Urban growth has outpaced essential services, leaving only about half of urban residents with access to safely managed sanitation. Suva's geology and climate make septic systems ineffective, as marl (clay) soils and high rainfall cause effluent to seep into waterways.

Informal settlements, often on high groundwater tables near drains and estuaries, face greater risks, with many households using makeshift tanks that do not safely manage wastewater. These conditions result in increased exposure to faecal contamination, highlighting the urgent need for improved wastewater solutions to protect health and the environment.

In 2025, the Suva Build team steamed ahead with construction of the RISE water sensitive sanitation systems, nearing practical completion in all intervention communities. This work is scheduled for completion in early 2026, as RISE moves into the post-construction assessment phase until the end of the randomised controlled trial.



“Completing the commissioning phase for three sites was the biggest highlight for the Fiji Build team in 2025. This required working collaboratively with communities to navigate challenges and share ideas to make construction more efficient. In 2026, we are looking forward to completing construction in Suva and seeing how this infrastructure improves lives and environments.”

- Senitiki Roqara
RISE Fiji Build Project Manager

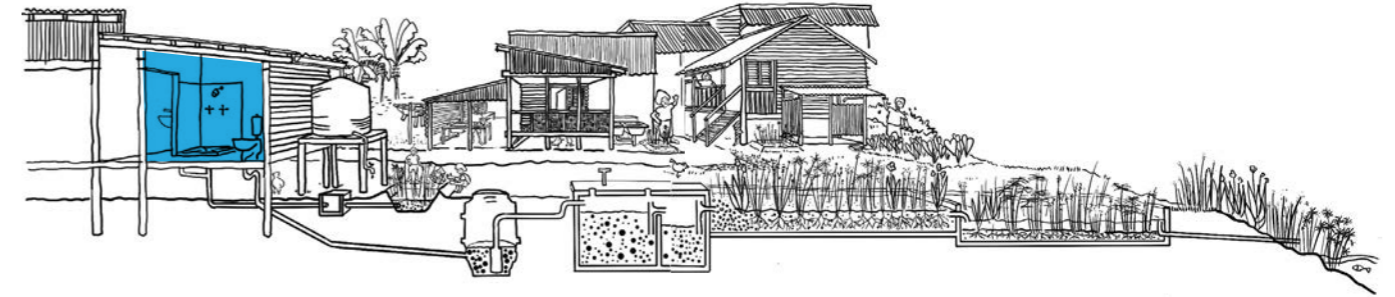
UPGRADES TO-DATE

- 2,500+ residents
- 355+ dwellings connected
- 16 rainwater tanks
- 33 new toilets
- 20+ repairs to existing toilets
- 85 pressure sewers and OneBox® systems
- 4 septic tanks
- 7 wetlands
- 2,030+ m drainage
- 1,830+ m footpaths, boardwalks and bridges

TOILETS

Prior to commencing the RISE intervention in Suva, residents in some of our participating informal settlements did not have access to a private toilet or were sharing a toilet with another household.

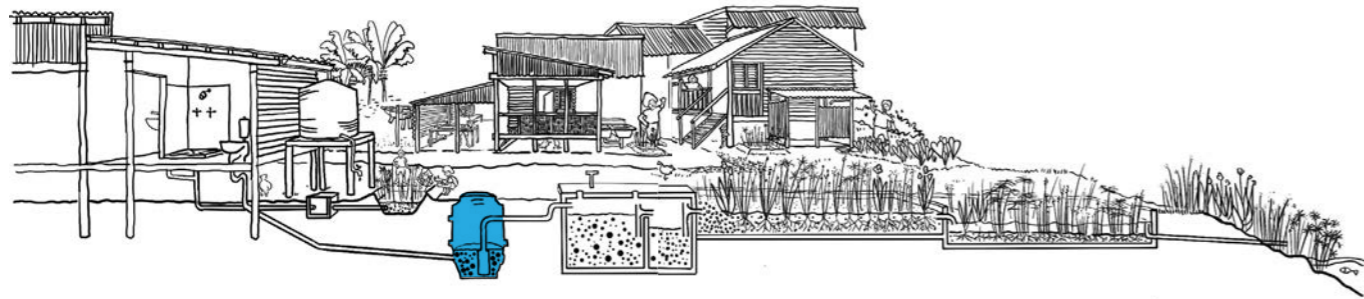
Newly installed toilets are now providing household sanitation, located above flood level to prevent floodwaters from entering and contaminating the system. Toilets represent the first step in our intervention *treatment train*, helping to prevent faecal matter from entering directly into public space and the surrounding environment.



PRESSURE SEWER AND ONEBOX®

Many informal settlements in Suva are located on low-lying terrain where sewage cannot be easily removed by gravity, resulting in stagnation of sewage around homes. The installation of pressure sewers allows blackwater to be pumped away from toilets in homes, transporting it to a communal septic tank and constructed wetlands for treatment, or directly into the central city-wide sewage network.

This process is monitored by OneBox® systems. These devices regulate wastewater flow, optimise treatment performance, and provide real-time data for maintenance and management. RISE is running training with community residents and the Water Authority of Fiji (WAF) on the operation and maintenance of these smart systems.

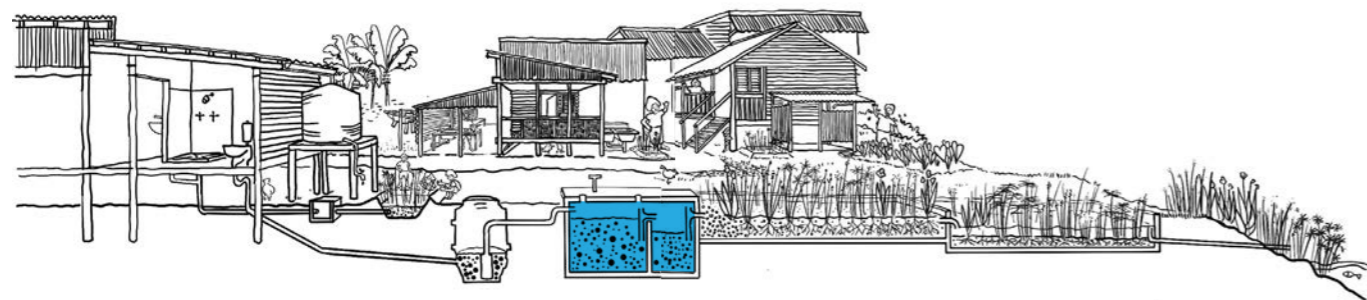


SEPTIC TANKS

Existing septic tanks in Suva's informal settlements pose serious environmental and health risks due to poor soil drainage, high rainfall, and proximity to waterways. While septic systems are intended as an alternative to sewerage, Suva's marl (clay) soils and high groundwater prevent proper effluent absorption, causing seepage into streams and contamination of aquifers.

Overloaded systems and makeshift tanks, often improvised from drums or old fridges, worsen pollution and expose communities to faecal contamination. These conditions highlight the urgent need for improved wastewater management in vulnerable areas.

Septic tanks installed by RISE are designed in line with international standards and are fully lined so no liquid can infiltrate into the environment. They are typically constructed from reinforced concrete, brick or plastic, depending on the availability and cost of materials and local construction methods.

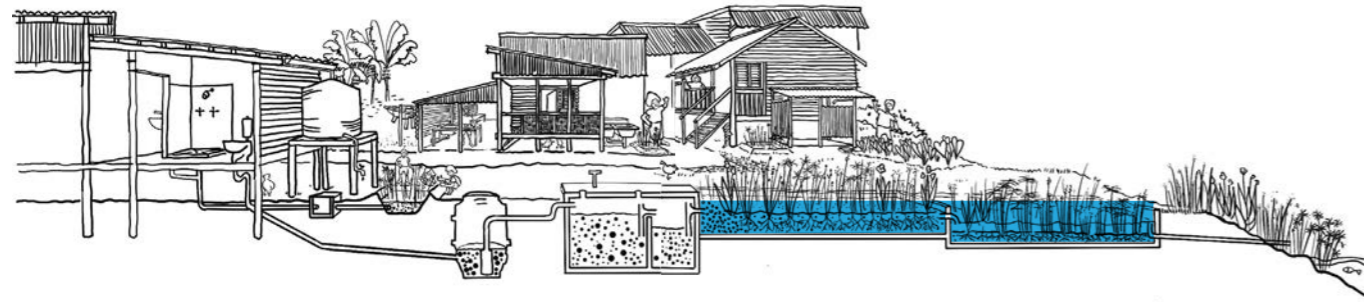


CONSTRUCTED WETLANDS

Where toilets cannot be connected to the centralised city-wide sewer network in Suva, a *treatment train* approach to wastewater management has been used. In RISE, the *treatment train* typically consists of a pressure sewer network (or gravity sewer, where possible) that pumps to a septic tank. After treatment in the septic tank, effluent then flows to a series of constructed wetlands.

Constructed wetlands are a critical part of the *treatment train*. These nature-based systems treat wastewater using natural filtration processes, where plants and gravel filter out contaminants, and treated water can be safely released into the environment. Our wetlands are designed to be fully sub-surface, with water flowing beneath the surface of the gravel media. This minimises the risk of community exposure to wastewater, mosquito breeding, and the mobilisation of waste during flooding events.

Each set of wetlands differs in size, depending on the number of homes being serviced and the location, to best integrate the system into available community space. Residents have been coming together to prune and maintain plants in the newly built wetlands. This collective effort and pride in keeping the environment clean highlights the importance of working hand-in-hand with communities for their buy-in and sense of ownership.



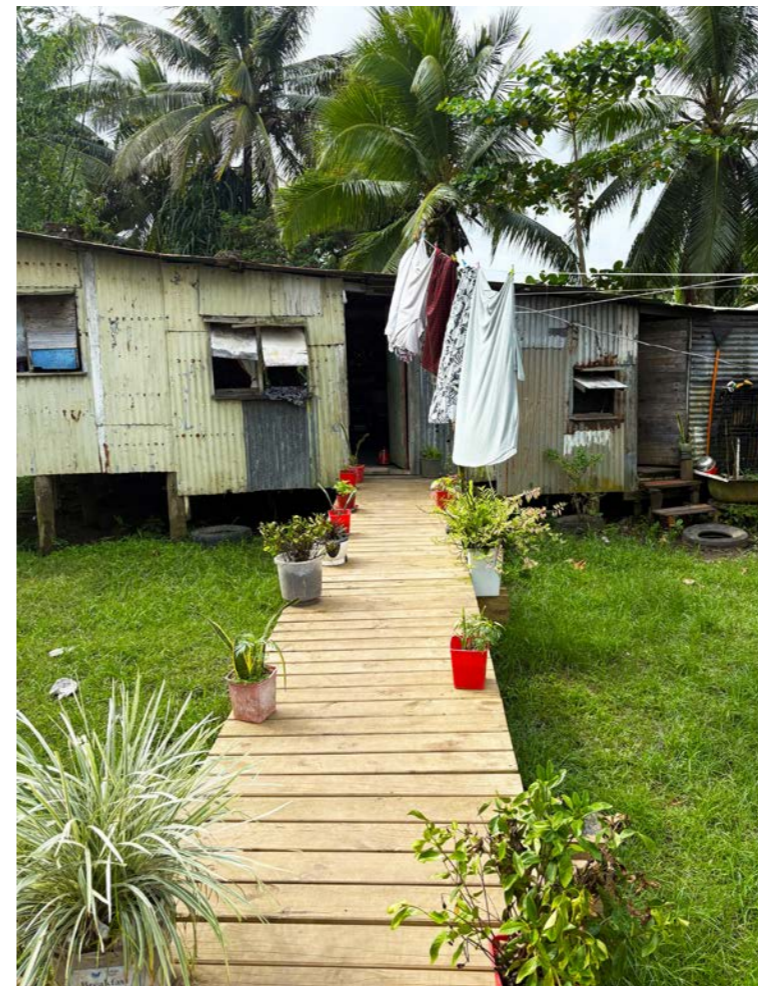
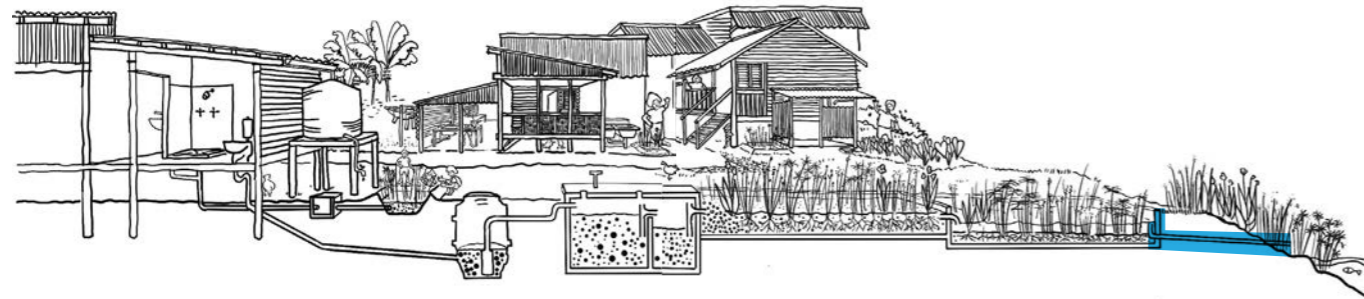
DRAINAGE AND ACCESS

Flooding in informal settlements around Suva poses serious health and safety risks, as floodwaters spread contaminated soil and water, and often block access to homes. Many settlements lack adequate drainage and safe pathways, leaving residents vulnerable during heavy rain and flood events.

Poor wastewater management compounds these risks, as untreated sewage and greywater often discharge directly into drains and waterways. Informal settlements typically rely on unimproved sanitation facilities or makeshift septic tanks, which fail in areas with high groundwater and heavy clay soils.

During floods, these systems overflow, contaminating stormwater and increasing health hazards. Combined with inadequate drainage, these conditions highlight the urgent need for integrated solutions that improve both flood resilience and safe access for at-risk communities.

RISE has constructed drainage systems, raised boardwalks, gravel and concrete pathways, and pedestrian bridges to reduce exposure to floodwaters and maintain access. In Suva, boardwalks elevated above flood levels now connect households to main roads, improving mobility and living conditions during extreme weather events.



Community transformations in Indonesia

Makassar is one of Indonesia's fastest-growing cities. A coastal hub of 1.5 million people, around one third of Makassar's residents live in informal settlements. These settlements often face compounding challenges: inadequate sanitation services; frequent flooding; and insecure land tenure, all magnified by rapid urban growth and climate change.

Since 2017, RISE has been working alongside local residents to co-design and deliver locally adapted solutions that improve sanitation services and strengthen community resilience. With active government leadership and strong

community participation, the program has piloted new approaches to tackle flooding, inadequate sanitation, and water contamination to improve daily living conditions for more than 1,300 residents.

In 2025, the Indonesia Build team continued their work with communities and government to monitor and maintain the decentralised sanitation systems constructed by RISE. This work is critical to ensuring the sustainability and long-term operation of the infrastructure, well after the end of the randomised controlled trial.



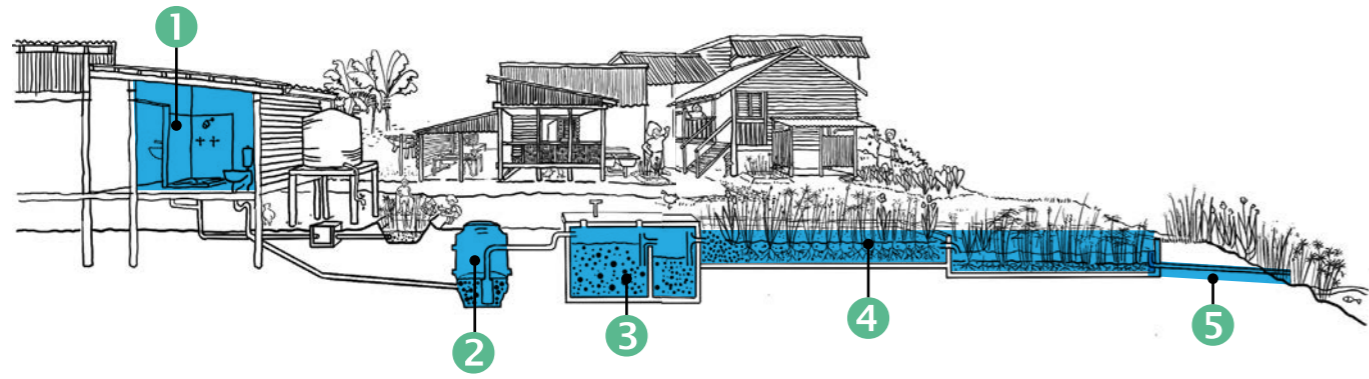
“ Our biggest highlight for 2025 was completing the ‘PANRITA3’ engagement activities, which underscored the importance of trust, patience, and meaningful community participation. Seeing communities embrace and maintain the RISE infrastructure has demonstrated that complex systems can be successfully delivered in dense informal settlements. Strong collaboration with local government to jointly address emerging issues has also reinforced the long-term sustainability of the project.

- Nur Intan Putri
RISE Indonesia Build Project Coordinator



UPGRADES TO-DATE

- 1,300+ residents
- 310+ dwellings connected
- 304 rainwater tanks
- 53 new toilets
- 100+ repairs to existing toilets
- 66 pressure sewers and OneBox® systems
- 33 septic tanks
- 24 wetlands
- 4,860+ m drainage
- 2,980+ m footpaths, boardwalks and bridges



1 TOILETS AND RAINWATER TANKS



2 PRESSURE SEWER AND ONEBOX®



3 SEPTIC TANKS



4 CONSTRUCTED WETLANDS



5 DRAINAGE AND ACCESS



System sustainability

The long term sustainability of development-funded infrastructure depends on the operation and maintenance (O&M) of systems established during the life of the project. Effective O&M in informal settlements requires more than technical expertise. It demands deep community and government partnerships, adaptive problem-solving, and a genuine commitment to building local capacity for the long haul.

In Fiji, the commissioning of 74 additional pressure sewer pods in 2025 (each consisting of a tank, pump, sensors and control unit) brought the total to 85 across six settlements in Suva. This milestone highlighted the operational demands of maintaining infrastructure at scale with a small team. In response, a dedicated workstation was established to allow pumps to be repaired and tested in a controlled environment. By developing local pump repair capacity, the team reduced reliance on external suppliers and strengthened the reliability and sustainability of our systems.

The team demonstrated that repairs can be undertaken locally, providing confidence to funders and stakeholders that this technology, while new to the Pacific region, can be supported by local expertise. This approach enabled multiple pumps to be repaired rather than replaced, reducing costs, maintaining worker safety standards, and strengthening long-term local capacity for O&M.

The Fiji team also delivered Module 1 training to some of the recently established Water and Sanitation Committees, with a focus on residents' role in leading the safeguarding and maintenance of the RISE systems into the future.

In Indonesia, the sanitation systems operated reliably throughout 2025, with issues identified and resolved swiftly. The team's success lay in prioritising critical issues, employing cost-effective solutions, and fostering open communication with residents to build shared responsibility.

Community awareness and curiosity about system sustainability grew through structured workshops that addressed everything from plant maintenance to electricity fee collection and desludging arrangements.

The Indonesia team also facilitated socialisation sessions with the Regional Technical Implementation Unit for Wastewater Management (UPTD PAL) in August, ensuring communities understand system operation and maintenance. In November, the Community Engagement Committee (KePoLink) gathering brought together residents from six settlements to share learning and best practices, strengthening peer-to-peer knowledge exchange.

Teams in both countries faced persistent challenges, including foreign objects flushed into pressure tanks, damaged pumps, limited staffing, and budget constraints. The response in each context reflected RISE's adaptive approach. Teams combined technical interventions with community education, using visual evidence to demonstrate the impacts of misuse, and to maintain a clear dialogue about system requirements.

Critically, 2025 saw significant progress in engaging government partners. In Fiji, regular Technical Coordination Committee meetings kept stakeholders updated on progress and challenges. In Indonesia, despite recent leadership changes in local government, the team maintained effective collaboration through on-site outreach and technical guidance from the Public Works Department. This early engagement of government agencies in O&M strengthens the foundation for long-term sustainability. Looking to 2026, both teams are focused on capacity building and handover preparation. Documentation, training materials, and locally appropriate O&M manuals are being developed to support knowledge transfer to communities and technical partners. The goal is to ensure RISE's infrastructure continues to serve communities long after the program concludes.



“ RISE adopts a participatory approach, starting with residents' aspirations and a systematic assessment of their needs. This ensures the infrastructure is context-specific and socially accepted. The use of smart technology in informal settlements is a significant innovation – it builds community openness to technology and positions RISE as a potential model for advancing sustainable sanitation practices at a broader scale.

- **Adrianto Hidayat**
RISE Indonesia Systems Sustainability Manager



“ What is special about the RISE approach is that our designs are community led. We work with our communities so they can tell us what the best use of space is. That way, the system is more appreciated, and they feel more willing to work with us to help maintain it.

- **Meagan Zoing**
RISE Fiji Systems Sustainability Manager





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Our research



Karin Leder
RISE Program Co-Director
Monash University
School of Public Health and
Preventive Medicine
Faculty of Medicine, Nursing
and Health Sciences

Complex challenges rarely fit neatly within disciplinary boundaries. Where environmental degradation, public health risk, climate stressors and social inequity intersect, solutions cannot be found through science alone, nor through community action in isolation. Solutions emerge from collaboration, by bringing together different forms of knowledge to understand problems, to design interventions, and to test if the interventions work as expected in practice. This is the space in which RISE operates.

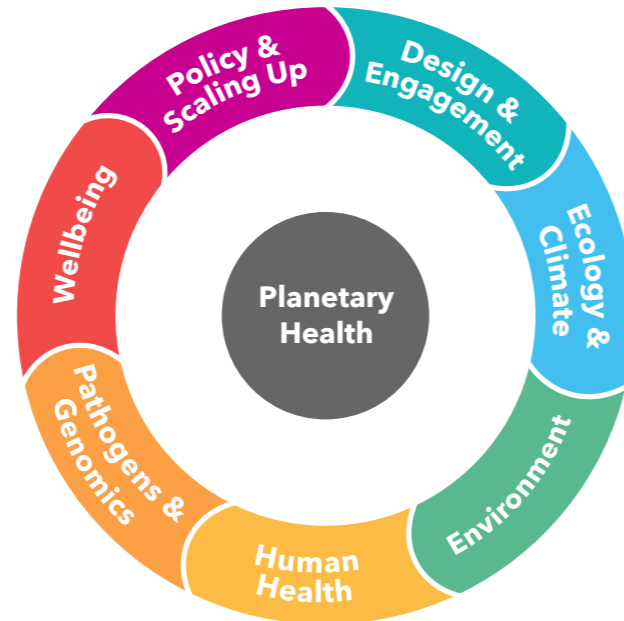
RISE's focus on transdisciplinary, place-based action-research is an exemplar programmatic approach for addressing the inherent complexity of testing a solution for a fundamental and urgent challenge: how to reduce exposure to faecal contamination, improve health and wellbeing, and strengthen environmental resilience in settings where conventional water and sanitation systems are unavailable or have failed, particularly when these same settings are also facing climate-related hazards that exacerbate long-standing difficulties.

From the outset, we recognised challenges in informal settlements cannot be understood or tackled through a single disciplinary lens. Contamination pathways are shaped by infrastructure design, hydrology, climate variables, governance, behaviour, and daily lived experience. Health outcomes are influenced by housing conditions, ecological quality, environmental contaminations and other socio-economic determinants.

Our approach brings together expertise from science, engineering, public health, architecture, urban design, sociology and development, alongside the knowledge of our research partners, communities and decision-makers.

RISE takes a real-world, challenge-driven focus. Research begins with the realities faced by people living in informal settlements. Interventions are bespoke, responding to local environmental conditions, settlement layouts, cultural preferences and practices, and governance contexts. The RISE infrastructure is designed to offer multiple health and environmental benefits, and by being embedded within a randomised controlled trial, we have the opportunity to rigorously measure impacts and outcomes.

Co-production of knowledge is central to how RISE works. Under the leadership of our teams in Fiji and



Indonesia, we are actively engaging community residents and local institutions, particularly Fiji National University and Hasanuddin University, in data collection and knowledge creation. This shared ownership strengthens long-term viability of solutions, while also building local capacity for research, implementation and engagement. Local knowledge sits alongside development of new field and laboratory methods, fostering both well-grounded and scientifically innovative research findings.

RISE operates within a planetary health framework. Impacts are measured not only through reduced pathogen prevalence and improved wellbeing, but through healthier, cleaner environments, and greater resilience to climate impacts, particularly flooding. By integrating social, environmental, technical and health data, RISE will help identify interconnections that impact health and quality of life for residents in informal settlements.

Crucially, RISE is action-oriented. It moves deliberately from discovery research to real-world implementation, followed by outcomes evaluation through the randomised controlled trial. Methods are adaptive, evolving in response to uncertainty, feasibility, priority focus, and on-the-ground learnings. This flexibility is essential for working in a dynamic nine-year project during a time of changes in urban contexts.

Given accelerating climate challenges, growing urbanisation, and persistent inequities in access to water and sanitation, transdisciplinary research is essential, not optional. RISE demonstrates how this approach can generate data that is both scientifically robust and practically usable, and that support context-specific solutions.

This annual report tells the story of that work: a program grounded in collaboration, shaped by complexity, responsive to change and committed to improving lives through knowledge that leads to action.



“ At its core, RISE represents Monash’s transdisciplinary approach to research – uniting expertise in engineering, ecology, public health, and social health with community leaders to advance healthier, more equitable cities. By centering the voices of those most affected and translating evidence into practice and policy, RISE demonstrates our belief that impactful science emerges when innovation, inclusion and lived experience come together.

- **Sharon Pickering**
Vice-Chancellor and President, Monash University



“ RISE continues to strengthen Fiji National University’s research leadership through its home within the Fiji Institute of Pacific Health Research. The program has pioneered new methods for data collection and analysis, which will ensure a lasting benefit to Fiji’s public research capabilities for years to come.

- **Unaisi Nabobo Baba**
Vice-Chancellor, Fiji National University



“ RISE reflects Hasanuddin University’s strong commitment to research that delivers real benefits for vulnerable communities in Indonesia. Through new partnerships exploring antimicrobial resistance and the impacts of climate change in informal settlements, we are advancing the planetary health evidence base needed to shape more resilient and equitable urban futures.

- **Jamaluddin Jompa**
Rector, Universitas Hasanuddin

Our research leads



Karin Leder
RISE Program
Co-Director
Monash University

Delivers robust research methodology across scientific disciplines

Responsible for the overall integration of the randomised controlled trial measuring the impact of community-supported water and sanitation upgrades on human and environmental health, in particular in young children.



Diego Ramirez-Lovering
RISE Program
Co-Director
Monash University

Delivers community-supported sanitation and water infrastructure and develops co-design and engagement processes

Responsible for delivering customised water sensitive revitalisation of informal settlements, through onsite participatory design processes that reflect community perspectives and site contexts.



Steven Chown
Ecology and
Climate Lead
Monash University

Understands and tracks ecological and climate changes in settlements that impact human health

Ecology and Climate tracks changing environmental conditions in settlements before and after interventions. Researchers monitor climate-related variables such as rainfall, temperature and humidity, as well as abundance and diversity of zoonotic disease vectors (mosquitoes) to understand ecological change and risks to human health.



Brandon Winfrey
Environment Lead
Monash University

Understands and tracks environmental contamination pathways that impact human health

Environmental monitoring tracks water and soil quality, biodiversity (through animal faecal samples), and maps localised flood risk to understand the impact of targeted interventions on the physical environment, including exposure to environmental contaminants.



Steve Luby
Human Health Lead
Stanford University

Measures human health impacts of the infrastructure

A crucial hypothesis is that the environmental benefits of the intervention are accompanied by health improvements. The impact of the altered environment on the health of residents is being assessed through physical measures, health surveys and biological evaluation of gastrointestinal health of children under 5 years of age.



Rebekah Henry
Pathogens and
Genomics Lead
Monash University

Uses genomic techniques to better understand pathogens and antimicrobial resistance

The Pathogens and Genomics (P&G) team applies a multi-method genomic approach to study human, animal and environmental health in informal settlements, to help understand how water and sanitation interventions can disrupt enteric disease transmission and improve health outcomes.



David Johnston
Wellbeing Lead
Monash University

Measures wellbeing impacts of the infrastructure

The physical environment is a significant structural determinant of wellbeing. Environmental change can affect how people live and work and how they feel about themselves, their lives, their community, and their safety. By design, RISE will improve housing stock, physical layout, and green spaces. We monitor the effects of physical structural change on individual and community wellbeing.



Thomas Clasen
Policy and Scale
Up Lead
Emory University

Evaluates policy-relevant outcomes of the program

The Policy and Scale Up team evaluates evidence and outcomes from across RISE, of relevance to governments, NGOs, communities and professionals who will determine future uptake and scaling of the RISE approach.



Fiona Barker
Data Lead
Deputy Director
Assessment
Monash University

Maintains research data integrity

High quality data underpins all RISE research objectives. The Data team provides leadership and support across data, analytics, and research (assessment) programs, overseeing data governance, quality, and integration. This work supports RISE's broad, multidisciplinary teams and helps ensure that all research outputs align with RISE's goals, ethics, and impact priorities.



Maghfira Saifuddaolah
Indonesia Assessment
Project Manager

Leads the research program in Indonesia

The Assessment team in Makassar is responsible for managing the collection of data and samples from RISE communities, as well as the processing and storage of specimens in our lab at Hasanuddin University.



Autiko Tela
Fiji Assessment
Project Manager
Fiji National
University

Leads the research program in Fiji

The Assessment team in Suva is responsible for managing the collection of data and samples from RISE communities, as well as the processing and storage of specimens in our lab at Fiji National University.

Transdisciplinary theme 1

Pre-intervention outcomes: linking health and environmental data to understand exposure pathways

RISE takes a deeply transdisciplinary approach, integrating environmental health, public health, ecology, and microbiology, to examine the impacts of environmental conditions on human health. This approach enables RISE to build an understanding of contamination sources, exposure pathways, and climate-driven risk for residents, particularly children, living in informal settlements.

Our team collects detailed environmental data, including indoor and outdoor temperature and humidity, drone-derived topography patterns and mosquito species abundance. Together, these datasets are helping researchers to understand the relationship between high-risk zones, such as flood-prone lowlands, climatic events like heavy rainfall, and spikes in environmental contamination.

Additionally, we collect data to examine where pathogens (microbes) are present and to trace how they spread and persist in complex, dynamic ecosystems. By integrating environmental monitoring with advanced microbial analyses, RISE can directly examine relationships between harmful pathogens detected in children's stool samples and those present in surrounding environmental samples. The Pathogens and Genomics (P&G) team detects pathogens in samples

as well as identifies microbial sources and antimicrobial resistance (AMR) profiles. Through genetic sequencing, this work moves beyond traditional indicator organisms, allowing precise identification of pathogens and better mapping of transmission routes.

The purpose of this detailed data is to generate novel insights into real-world exposure to faecal contaminants, and to establish a robust platform for assessing intervention impact at the end of the randomised controlled trial.

Our integrated approach has already revealed that water supply and climate are major drivers of mosquito abundance, increasing the risk of infectious disease outbreaks and reinforcing the connection between environmental conditions and health outcomes.

Collecting detailed, relevant data to measure intervention outcomes will inform whether settlement upgrades reduce exposure to microbial contamination. More broadly, the findings will generate actionable evidence for targeted interventions, helping to set a new standard for protecting communities from contamination and climate-related health risks.

Citation: Ramsay, E.E., Faber, P.A., Fleming, G.M., *et al.* Causal drivers of mosquito abundance in urban informal settlements. *Environ Res Lett* 20(6):064028, 2025. | [Link](#)



“ Our recent publication demonstrating variation in key drivers of mosquito abundance has confirmed water supply and climate as key risk factors in informal settlements. We have now enhanced our capacity to further evaluate these risks in the post-intervention phase by reinstalling microclimate sensors that will allow us to detect change relative to the pre-intervention environment and its relationship to post-intervention human outcomes.

- **Steven Chown**
Ecology and Climate Lead



“ Our research seeks to better understand pathogen transmission dynamics, leveraging environmental and population surveillance, microbiological analysis, molecular and genomic data integration to understand and inform the next generation of targeted interventions that reduce the burden of enteric infections and curb the spread of anti-microbial resistance.

- **Rebekah Henry**
Pathogens and Genomics Lead



RESEARCH HIGHLIGHT: CAUSAL DRIVERS OF MOSQUITO ABUNDANCE

Mosquito-borne diseases pose a significant and ongoing risk for people living in urban informal settlements, yet there is limited evidence on what drives mosquito abundance in these environments or how those drivers vary across contexts. From a research perspective, understanding these dynamics is essential to inform settlement upgrading and resilience programs that improve health outcomes without unintentionally increasing disease risk.

We set out to identify the key climatic, environmental and socioeconomic drivers shaping mosquito populations in informal settlements. We developed a causal framework of mosquito risk and tested it in two contrasting geographic settings: Makassar, Indonesia and Suva, Fiji. Between 2018 and 2024, we conducted longitudinal mosquito trapping surveys across 24 informal settlements, completing more than 2,700 successful trap sets and collecting over 90,000 mosquitoes.

Our analysis focused on two mosquito species of major public health importance: *Aedes aegypti*, the primary vector of dengue, and *Culex quinquefasciatus*, which transmits a range of other mosquito-borne diseases, such as Japanese Encephalitis. Using causal modelling approaches, we examined how temperature, rainfall, environmental conditions and access to water influenced mosquito abundance over time.

We found that water supply, temperature and precipitation were consistent drivers of mosquito

numbers in both countries, but their effects differed by species. Access to piped water within settlements was associated with lower abundance of *Aedes aegypti*, likely reflecting reduced reliance on household water storage, but higher abundance of *Culex quinquefasciatus*. Higher temperatures and increased rainfall were consistently linked to greater *Aedes aegypti* abundance across both locations.

The integration of environmental, climatic and socioeconomic data provides a robust, site-specific picture of mosquito dynamics within informal settlements. Our findings show that changes to informal settlement environments, including infrastructure upgrades, can shift mosquito risks in complex and sometimes unexpected ways. By identifying the pathways through which environmental and service improvements influence mosquito populations, this research provides critical evidence to guide healthier, safer settlement upgrading and resilience strategies for at-risk communities.

Citation: Ramsay, E.E., Faber, P.A., Fleming, G.M., *et al.* Causal drivers of mosquito abundance in urban informal settlements. *Environ Res Lett* 20(6):064028, 2025. | [Link](#)



RESEARCH HIGHLIGHT: UNDERSTANDING ANTI-MICROBIAL RESISTANCE IN INFORMAL SETTLEMENTS

Antimicrobial resistance (AMR) represents one of the most serious global health challenges. Urban informal settlements, where poor sanitation, overcrowding, and high antibiotic use create ideal conditions for resistance to spread, remain largely invisible in mainstream AMR research. RISE is addressing this critical gap through an integrated approach that combines infrastructure improvements with cutting-edge genomic research and advanced epidemiological modelling.

In both Makassar and Suva, we are undertaking laboratory analyses to examine enteric pathogens and AMR genes in human and environmental samples collected from informal settlement communities. In 2025, our capabilities in this space were augmented by two add-on projects – BRACC (Building Resilience to the intersecting global threats of AMR and Climate Change) and DisAMR (Disruption of AMR transmission in urban informal settlements: pathways for policy action).

The BRACC initiative, funded by the Novo Nordisk Foundation, brings together Australian, Indonesian, and Swiss researchers to investigate how AMR evolves across environmental, animal, and human reservoirs. Using Nanopore technology for long-read whole genome sequencing, the team is generating unprecedented insights into bacterial resistance evolution. RISE PhD candidate, Andi Zulkifli Agussalim, is analysing thousands of samples from RISE settlements, tracing how resistant bacteria and genes travel through wastewater, soil, animals, and humans.

Advanced machine learning models developed by University of Zurich's Professor Adrian Egli and Monash's Dr Nenad Macesic, simulate how climate factors, such as temperature shifts and rainfall patterns, affect AMR transmission dynamics, helping predict intervention impacts under changing conditions.

The DisAMR program, co-designed with the International Centre for Antimicrobial Resistance Solutions, enhances community and government capacity to disrupt AMR transmission through infrastructure maintenance and community-led prevention initiatives, generating evidence to support policy development.

By building research capacity in regions where it's most needed and filling critical data gaps, RISE, BRACC and DisAMR are co-developing practical solutions for communities worldwide facing the intersecting challenges of AMR and climate change.



Transdisciplinary theme 2

Post-intervention outcomes: assessing infrastructure efficacy and climate resilience through transdisciplinary indicators

Over the past year, RISE has advanced its transdisciplinary approach to evaluating infrastructure efficacy and climate resilience, integrating environmental science, engineering, public health, social science, and community knowledge. By sharing indicators and iterative feedback across these domains, we are capturing a comprehensive picture of how nature-based solutions addressing water and sanitation challenges perform under real-world conditions.

Our evaluation framework intentionally goes beyond residents' physical symptom outcomes, to encompass psychological stress, financial strain, social connections, and life satisfaction. This broader lens situates human health within environmental and social contexts, reflecting the complex interplay between climate, infrastructure, gender, wellbeing, and community resilience.

We have re-installed microclimate sensor networks in Makassar and Suva to track post-intervention temperature and humidity conditions. These data, when analysed

against pre-intervention baselines, will help identify environmental drivers of heat stress and disease risk.

In parallel, engineers in our team have created high-resolution flood models for Fiji using drone-derived digital elevation data, linking hydrological risk with health, housing, and infrastructure performance to evaluate resilience under changing climate conditions.

Social scientists and public health researchers have collaborated to strengthen measurement of social resilience, developing and validating scales that assess households' capacity to absorb, adapt to, and recover from environmental shocks. These tools capture the broader social impact of resilience-building interventions, which will provide insight into how infrastructure improvements might translate into meaningful wellbeing outcomes.

Prioritising robust, unbiased findings across physical health, psychological wellbeing, and environmental quality, RISE is examining the impacts of different intervention components. This transdisciplinary assessment not only strengthens the evidence base for resilient, equitable infrastructure design, but also demonstrates how integrated, community-informed research can guide policy and practice in the face of climate change.



“ Understanding how the RISE water sensitive cities approach affects faecal contamination and flooding is going to be key for determining which parts of the intervention deliver the best outcomes. Our work aims to improve our understanding of how environmental conditions impact health and how water sensitive upgrades change those conditions. The environmental quality analysis and flood modelling give us the evidence base for how contamination moves, where water goes, and which types of interventions produce the best outcomes for reducing exposure to faecal contamination.

- **Brandon Winfrey**
Environment Lead



“ For me, a special thing about RISE is the way it treats informal settlements as whole, complex systems rather than as places to drop in a single piece of infrastructure.

- **David Johnston**
Wellbeing Lead



“ The main focus of our team in the last year was on building the evidence of the effect of the RISE intervention on two outcomes – climate resilience and women's empowerment. We regard these as not only contributing to the health and wellbeing of the RISE study participants, but also likely to be advanced by the intervention.

- **Thomas Clasen**
Policy and Scale Up Lead



RESEARCH HIGHLIGHT: DRONE IMAGING AND FLOOD MODELLING CAPABILITIES

People living in informal settlements face disproportionate flood risk due to hazardous locations on low-lying land and riverbanks, limited drainage and sanitation infrastructure, and constrained access to services. These conditions heighten exposure to climate-related hazards and undermine long-term resilience. Accurately assessing where and how flooding occurs is therefore essential for evaluating climate resilience and guiding effective, place-based infrastructure and health interventions.

RISE identified flood risk in informal settlements as a transdisciplinary indicator of climate resilience, integrating engineering, environmental science, climate modelling, public health, and community knowledge. Conventional flood models often fail in informal settlements, where narrow pathways, uneven terrain, and dense, informal structures obscure localised risk. RISE's approach responds to this complexity by generating high-resolution, settlement-scale evidence that reflects real-world conditions.

Led by Brandon Winfrey (Monash University), the program established detailed digital terrain and elevation models for six RISE settlements in Fiji using drone-based photogrammetry. These models capture both natural topography and built infrastructure, enabling precise simulation of water movement through complex urban environments. Local RISE data officers led drone deployment and image processing, strengthening local technical capability while ensuring contextual accuracy.

The elevation data feed directly into hydrological models that simulate storm events using satellite-derived rainfall estimates. Initial results indicate flood depths exceeding one metre in some areas following moderate rainfall, underscoring the scale of exposure faced by residents. Flood modelling outputs are now being validated through post-event drone surveys and household-level flood reporting, linking physical hazard data with lived experience.

As a transdisciplinary indicator, flood modelling connects environmental risk with infrastructure performance, health exposure pathways, and community resilience.

Our work expanded into Indonesia, incorporating additional climate scenarios, that will inform evidence-based decisions on climate-resilient infrastructure, health protection, and equitable urban upgrading.



RESEARCH HIGHLIGHT: COMMUNITY RESILIENCE MEASUREMENT TOOLS

Our research addresses the need for valid, practical tools for measuring household resilience in low- and middle-income countries, particularly within urban informal settlements facing increasing climate and environmental risks.

Using data from 882 households from RISE informal settlements in Makassar, Indonesia, and Suva, Fiji, the study developed and internally validated household economic and social resilience measurement scales. These scales were grounded in resilience theory and tested using rigorous psychometric methods.

The main findings demonstrate that household resilience can be reliably measured as a latent, multi-dimensional construct rather than inferred from observable assets or proxy indicators.

This work aligns with the work of the RISE Policy and Scaling Up team and the Wellbeing team by providing tools that enable evaluation of interventions which have the potential to improve household resilience.

What makes this research distinctive is its interdisciplinary approach, integrating public health,

environmental health, and psychometric methods, such as factor analysis and item response theory.

By conceptualizing resilience as a latent construct, the study moves beyond traditional asset-based or indicator-driven approaches that may not capture the complex dimensions of resilience.

The broader implications of this research may be significant for practitioners, researchers, and policy-makers. The validated economic and social resilience scales offer practical tools for identifying resilience gaps, designing targeted interventions, and evaluating program impact over time.

Citation: Oza, H. H., Salinger, A. P., Taruc, R., Tela, A., et al. Resilience measurement for environmental shocks and stressors: Scale development and psychometric assessment for coastal urban informal settlements in Fiji and Indonesia. *BMC Global and Public Health* 3(1), 61, 2025. | [Link](#)



Transdisciplinary theme 3

Community participation in transdisciplinary research and infrastructure design

At the heart of RISE is genuine community participation, which shapes both the infrastructure design and delivery as well as the conduct of research. Our participatory approach engages communities across multiple dimensions, from household surveys and behavioural assessments to stool sample collection and environmental monitoring. Residents actively contribute knowledge that informs our approach, ensuring research is grounded in local realities, and technical solutions are tailored to community needs.

RISE recognises that infrastructure and daily life are inseparable; water, sanitation, and environmental systems respond to community practices and reshape them over time. Through workshops, focus groups, and iterative prototyping, our team has collaborated with residents, engineers, health researchers, and social scientists to co-create solutions such as decentralised sewage systems, constructed wetlands, access and drainage improvements, and enhanced public spaces. These processes ensure interventions are context-specific, technically feasible, socially acceptable, and fully compatible with the strict requirements of our contemporaneous randomised controlled trial.

Research from RISE has explored who participates in co-design processes and how engagement influences social cohesion, trust, and the sustainability of interventions. Findings show that participation is not uniform. Diverse voices strengthen both social outcomes and the long-term success of infrastructure solutions. Long-term engagement in Makassar, Indonesia, and Suva, Fiji, has been essential for building interventions that are accepted, meaningful, and effective. Genuine participatory design requires skilled facilitation, patience, and sustained commitment. It is not quick or easy, but the investment is vital for success.

Beyond disease prevention, community participation provides insights into daily routines, household practices, social networks, and wellbeing, while fostering ownership, trust, and resilience. By visiting sites, listening, and working alongside communities, RISE ensures that transdisciplinary research is scientifically rigorous and socially relevant to deliver outcomes that truly reflect the needs of people they are designed to serve.

Citation: Mink, T. L., Salinger, A. P., Francis, N., et al. Who participates in 'participatory design' of WASH infrastructure: A mixed-methods process evaluation. *PLOS Global Public Health* 5(6), e0003430, 2025. | [Link](#)



“Community participation in transdisciplinary research and infrastructure design has fundamentally shaped how RISE operates. Community insights have informed scalable design priorities in informal settlements while, at the same time, community participation in the randomised controlled trial is generating critical scientific evidence about the impacts our urban design practices have on residents' quality of life.

- **Diego Ramirez-Lovering**
Design and Engagement Lead



“In contrast to traditional water and sanitation interventions, RISE considers a water sensitive cities approach. This broader approach combined with community co-design and engagement offers a range of benefits beyond the prevention of enteric disease. Engaging and capturing these broader components seems crucial to secure support for broader replication. However, genuine co-design requires high level skill and commitment. It is not fast and it does not easily scale.

- **Stephen Luby**
Human Health Lead



“Central to RISE is the long-term, co-designed engagement with communities in Makassar and Suva. That work has been critical to getting the intervention built and to making the research acceptable and meaningful locally.

- **David Johnston**
Wellbeing Lead



RESEARCH HIGHLIGHT: WHO PARTICIPATES IN 'PARTICIPATORY DESIGN' OF WASH INFRASTRUCTURE: A MIXED-METHODS PROCESS EVALUATION

Participatory approaches are increasingly used to tailor interventions to the priorities, contexts, and preferences of communities. These methods can strengthen community ownership and management, and when diverse groups are intentionally included in water and sanitation programming, their distinct needs are more likely to be recognised and addressed.

Despite their growing use, participatory approaches are rarely evaluated with attention to how different groups experience and engage in the process, particularly within water and sanitation intervention design.

We conducted a process evaluation of the RISE participatory design phase to examine both participation and participants' satisfaction, with a specific focus on gender and social inclusion. Such evaluations are helpful for understanding whether participatory processes are implemented as intended and for informing future programmatic decisions.



Overall, RISE's participatory design activities demonstrated good overall participation and high levels of satisfaction. In both Makassar and Suva, most respondents took part in at least one participatory design activity, and the majority felt satisfied with their influence over RISE decision-making.

However, our study also revealed important gender and social inequities. In both sites, certain groups were more likely to participate than others, and in Suva, satisfaction varied by gender, religion, and marital status. For example, women were more likely to report wanting more influence over RISE-related decision making compared to men, despite having high participation in participatory design activities.

These findings highlight the need for future participatory design efforts to cultivate more meaningful engagement with communities and local organisations to ensure that all groups of interest are effectively included. Our process evaluation also provides an example of how programs that aim for an inclusive participatory approach can evaluate their success in engaging diverse community members.

Citation: Mink, T. L., Salinger, A. P., Francis, N., et al. Who participates in 'participatory design' of WASH infrastructure: A mixed-methods process evaluation. *PLOS Global Public Health* 5(6), e0003430, 2025. | [Link](#)



RESEARCH HIGHLIGHT: COMMUNITY SATISFACTION SURVEY OUTCOMES

Following the completion of upgrades in five Indonesian settlements, almost 90 percent of households are likely, or very likely to recommend RISE sanitation infrastructure to other people, according to a recent survey of more than 250 households in Makassar. This is the first snapshot of resident satisfaction with the RISE program.

A breakdown of the benefits reported by households point to what matters to the community. Improved access and pathways (81 percent of households), rainwater tanks (81 percent) and drainage (77 percent) were identified as beneficial by most households, followed by new or upgraded toilets (50 percent), new gutters (40 percent), sanitation infrastructure and constructed wetlands (36 percent), improved water supply (19 percent), and broader neighbourhood improvements (16 percent).

Sustaining these benefits is equally important. Households highlighted a range of effective and engaging channels for learning how to maintain wetlands and septic tanks, including cluster meetings (63 percent), practical and easy-to-use booklets (63 percent), hands-on practice sessions (56 percent), community posters (52 percent), instructional videos (48 percent), and larger community gatherings (26 percent).

Among households who participated in these learning activities, confidence in maintaining the RISE sanitation infrastructure shifted from 'slightly sure/moderately sure' before construction to 'moderately sure/very

sure' after completion of the upgrades. This mix of learning approaches supported different preferences and reinforced shared understanding, while growing confidence reflects a community ready for long-term care of the infrastructure after RISE concludes.

These early findings support RISE's participatory design approach. By partnering with communities to design and shape bespoke sanitation and water solutions, RISE is helping create systems that fit local needs, build strong community ownership, and deliver improvements that residents say make everyday life easier.



Transdisciplinary theme 4

Methodological innovation across disciplines

RISE is continuing its commitment to methodological innovation, harnessing expertise across disciplines to tackle the complex interrelationships between human and environmental health in informal settlements. By integrating microbiology, environmental science, engineering, and social research, RISE is developing new assessment tools that are both scientifically robust and practically useful for optimising efficiency and scientific outputs.

One of our key innovations has been the use of boot socks for microbiological sampling, enabling more accurate mapping of exposure hazards across entire communities. Complementing this, RISE published guidance on choosing analytical approaches for faecal contamination monitoring, providing clarity and consistency for researchers and practitioners working on other projects.

At the molecular level, RISE is refining markers of faecal contamination to be more context-sensitive and reliable, while genomics will provide high-resolution profiling of

pathogens and antimicrobial resistance genes, helping to uncover transmission routes and environmental reservoirs.

By continually refining and developing new research methods for unique urban contexts, we have been deepening our understanding of health risks related to environmental contaminant exposure in informal settlements. This strengthens the capacity of researchers, governments and communities to build healthier, more resilient communities in the future.

Citations: Barrett, L.R., Beasy, P., Palacios Delgado, Y.M., *et al.* Beyond borders: A systematic review and meta-analysis of human-specific faecal markers across geographical settings. *Critical Reviews in Environmental Science and Technology* 55(7), pp.447-464, 2025. | [Link](#)

Bata, L., Henry, R., Barker, F., *et al.* Assessing E. coli levels in surface soils of informal settlements using boot sock and standard grab methods. *Sci Adv* 11, 2025. | [Link](#)



“ RISE has instantiated thorough environmental testing based on pathogen identification, rather than the standard practice for decades which has been to rely on indicator organisms. In addition, the assessment of human faecal samples suggests that the pathogens commonly seen in the environment are also identified in children’s faeces. Taken together this sets up RISE as an early example of the use of modern molecular techniques to identify pathogens and thereby better understand transmission pathways than indicator organisms have allowed.

- **Stephen Luby**
Human Health Lead



“ We believe our work has contributed significantly to the methodology for rigorously measuring climate resilience and women’s empowerment. That in itself is a useful accomplishment.

- **Thomas Clasen**
Policy and Scale Up Lead



“ Much of our focus has been on method development, designing robust assays, improving environmental monitoring and exploring how genomics can be used to better understand complex urban ecosystems. We’ve learned a great deal about what works, what doesn’t, and where innovation is needed.

- **Rebekah Henry**
Pathogens and Genomics Lead



RESEARCH HIGHLIGHT: ADVANCING MICROBIAL MONITORING METHODS ACROSS OUTDOOR AND INDOOR SETTINGS

Reducing exposure to enteric pathogens requires understanding how microbes move through everyday environments and how people interact with those environments.

In informal settlements, contamination often arises from multiple sources and persists across highly interconnected household spaces, with exposure risks shaped by daily activities and movement across indoor and outdoor settings.

Many studies in these settings consider behaviours, environments, and domestic settings separately or rely on a limited range of sample types and non-specific faecal indicator organisms as proxies for risk. This obscures complex transmission dynamics and makes exposure at the scale of the home difficult to interpret.

Within RISE, this challenge sits at the heart of evaluating sanitation interventions. While infrastructure upgrades are intended to reduce environmental contamination, it is far less straightforward to determine whether these changes translate into reduced pathogen exposure within homes.

Our work in the Exposure Pathways sub-study focused on collecting detailed microbial data from household environments, alongside rich contextual information on housing characteristics, children's activities, and everyday practices. Together, these data allow exposure risks to be interpreted more holistically, linking where faecal contamination persists with how children move through and interact with their home environments.

A central methodological innovation in our work was the emphasis on consistency and comparability across sampling and laboratory workflows. Building on the

bootsock method developed within RISE to capture contamination along outdoor pathways, we extended the same contact-based sampling logic into household settings by applying bootsocks to porches and indoor floors.

The technique was also adapted for food preparation surfaces and tested against gold-standard swab methods. Together with child hand rinses, food, and drinking water sampling, this enabled contamination to be assessed across key household interfaces using a common framework.

That consistency was maintained through harmonised sample handling and processing, followed by analyses using established environmental methods for faecal indicator testing alongside molecular approaches more commonly used in clinical settings. This allowed general indicators to be interpreted alongside more specific human faecal markers and pathogens.

The opportunities for repeated sampling within the same communities also allowed us to trial, refine, and adapt our approach to real-world conditions in contextually relevant ways.

Looking ahead, we aim to link microbial findings with indoor floorplans of homes to visually model contamination and exposure hazards and add deeper microbial sequencing of samples to identify potential sources of contamination and specific pathogen risks.

These efforts help expand the environmental exposure research toolkit, challenge assumptions embedded in standard monitoring practices, strengthen sanitation-intervention evaluation, and help bridge infrastructure delivery to health outcomes.



RESEARCH HIGHLIGHT: MIXED METHODS APPROACHES TO CHILDREN'S EXPOSURE PATHWAYS

Children living in informal settlements often navigate challenging environmental conditions that may increase their risk of exposure to potentially infectious pathogens. Understanding how this exposure occurs requires examining the everyday ways residents, especially young children, interact with their living environments, both indoors and outdoors. However, measuring faecal pathogen exposure is inherently complex, as children may encounter pathogens through multiple, overlapping transmission pathways.

To better understand how this exposure happens, our team used three complementary methods: video observations (videography), surveys, and GPS tracking to study the everyday behaviours of young children in RISE communities. This layered approach allowed us to capture not only what children touched or put in their mouths, but also where they spent time and the types of activities they engaged in across the community.

Mouthing behaviours represent a key pathway for pathogen exposure. Videography provided a more objective and detailed way to measure how often these behaviours occurred and which objects were involved. Unlike traditional field observations, video footage can be reviewed repeatedly, coded independently by multiple researchers, and quality-checked. This offers a richer and more reliable picture of children's interactions with their surroundings.

By layering behavioural data with information about environmental conditions, we were able to identify when children were indoors or outdoors, if they were mouthing objects while in high-risk settings, such as near animals or faeces, or when they were exposed to environmental water. We found that children frequently spent time outdoors or in these higher-risk areas, and their mouthing behaviour remained consistent across settings. These findings highlight that understanding exposure requires looking beyond mouthing behaviour. It involves recognising the interconnected roles of children's actions, the presence of animals, and the broader environmental context in which children live and play.

Additionally, these methods can be used to understand and quantify infection transmission pathways, each capturing different aspects of exposure while also involving important trade-offs. As the real-world performance of these methods in field settings is not well-documented, we conducted a comparative performance analysis of surveys, videography and GPS tracking,

informed by both quantitative data and qualitative insights from field staff. We also adapted a conceptual framework to classify WASH-related activities into micro-, meso- and macro-level behaviours.

Rather than identifying a single 'best' method, our analysis highlights the practical trade-offs involved, including time, participant burden, field logistics and the types of behaviours that can be captured. Our findings show that no single method provides a complete picture of children's exposure patterns, but instead, each method contributes distinct and complementary insights.



Transdisciplinary theme 5

Local capacity building in research practice and delivery

RISE builds local research capacity, ensuring that technical expertise, data collection, and analyses are driven by our Fiji and Indonesia teams. Over the past year, team members from both countries have expanded their skills in drone piloting, image processing, and spatial analysis, enabling locally led data collection and interpretation. This strengthens the accuracy, relevance, and timeliness of research while reducing reliance on external support.

Regional knowledge exchange has been a key part of this work. A Fijian team member travelled to Makassar to provide hands-on training to the Indonesian team, fostering collaboration and reinforcing regional capability. At the same time, a working group on flood modelling brought together researchers from Fiji, Indonesia, and Australia, and strengthened technical expertise across sites. As these skills develop, more flood modelling and remote sensing analyses are now conducted locally, empowering teams to take ownership of data collection and decision-making.

A key aim of RISE is for the Fiji and Indonesia teams to evolve into independent and self-sustaining enterprises, with expertise in sampling, modelling, and environmental monitoring that extends beyond the randomised controlled trial. Investments in training, mentorship, and diverse technical capabilities create real opportunities for team members to continue working in RISE communities or expand their work to new locations, ensuring knowledge and skills remain embedded locally.

Skills in sustainability are a key component of our capacity building approach, with both the Fiji and Indonesia laboratories achieving My Green Lab certification, demonstrating that rigorous research can coexist with environmentally responsible practices. Local teams regularly present RISE research both within and between countries, sharing findings, exchanging lessons, and strengthening regional expertise.

Through training, collaboration, and hands-on technical experience, RISE demonstrates that investing in local capacity is essential to effective research delivery. Putting skills and knowledge in the hands of teams on-the-ground ensures that research, insights, and interventions are not only scientifically rigorous but sustainable, locally driven, and capable of long-term impact.



“ A big highlight of 2025 was building capacity within our in-country teams. We were able to support training in drone piloting and image processing, and one of the Fijian team members travelled to Makassar to train the Indonesia group. Strengthening that regional capability sets us up well for more locally driven data collection and analysis in the years ahead.

- **Brandon Winfrey**
Environment Lead



“ 2025 was a challenging period for the Fiji Assessment team. Key achievements included the successful completion of complex, multi-faceted field campaigns within the planned timelines and the attainment of 100 percent household survey coverage. Looking ahead, 2026 is expected to be more demanding with the commencement of rigorous post-intervention assessments across 12 sites. The team remains well prepared, supported by strong teamwork, shared commitment, clear communication, and continuous engagement and trust with the communities.

- **Autiko Tela**
Fiji Assessment Project Manager



“ 2025 was one of the most crucial periods for assessment activities in Makassar, as we entered the post-intervention monitoring phase. In addition to regular campaigns, we conducted intensive training on a range of new activities such as new survey questions for the field team, new analytical methods for the laboratory team, and drone training for the data team. As we enter into the final monitoring phase in 2026, we aim to maintain the quality of our work and ensure the integrity of data collected.

- **Maghfira Saifuddaolah**
Indonesia Assessment Project Manager



“ What is special about RISE is the genuinely interdisciplinary way of working across engineering, medicine, ecology and social science. It wasn't always smooth, and no doubt there are things we would do differently next time, but working across disciplines meant we learnt from each other's perspectives in ways that improved both the intervention and the way we are assessing it.

- **David Johnston**
Wellbeing Lead

RESEARCH HIGHLIGHT: CROSS-COUNTRY TRAINING AND CAPACITY BUILDING

In 2025, RISE continued to strengthen local technical capabilities across the Asia-Pacific through targeted cross-country knowledge exchanges between our Fiji and Indonesia-based teams. A leading example of this comes from our development of high-resolution flood models using drone imagery, digital elevation data, and climate simulation tools. In November, RISE Fiji Data Officer, Waisale Rakusa, travelled to Makassar to train the RISE Indonesia team in drone mapping and image processing.

Through practical, hands-on training - from preparing flight paths and capturing aerial images to stitching thousands of photos into detailed surface models and aerial imagery - the teams are now jointly developing refined flood simulations and climate-risk scenarios tailored to local settlement conditions. This exciting exchange marks the first cross-country skills transfer for the RISE data team and represents an important step in supporting locally informed climate adaptation strategies and infrastructure planning.

RISE is also expanding cross-country capacity building in areas such as laboratory processing, sample storage, and DNA extraction. In June, RISE Fiji Laboratory Technician, Revoni Vamosi, travelled from Fiji to Indonesia to exchange technical skills and strengthen RISE's laboratory capacity across the Asia-Pacific.

During the visit, Revoni participated in MinION Nanopore sequencing training, enhancing their skills in

DNA extraction and sequencing under the guidance of Indonesian counterpart, Andi Zulkifli. The exchange also included a refresher session on the Kato-Katz diagnostic method for detecting soil-transmitted helminth eggs, along with an Occupational Health and Safety audit conducted jointly with the Indonesian research team.

Beyond its research activities, RISE is also strengthening cross-country capacity across its construction teams. In January, RISE Indonesia CAD Technician, Firman Alamsyah, spent a month in Suva delivering specialised technical support and training to enhance design and modelling capabilities across sites.

These collaborative opportunities enable teams based in different parts of the region to share insights and findings, align practices and strengthen their collective expertise. They also reinforce RISE's commitment to building sustainable, locally led scientific capacity across the Asia-Pacific.



Looking ahead

We are about to enter one of the most exciting and defining periods in the history of the RISE program. With infrastructure largely complete, 2026 marks the final stage of ecological monitoring, environmental and human sampling, and health and wellbeing surveys. After nine years of close partnership with communities in Suva and Makassar, we will complete all fieldwork activities and collate the biggest transdisciplinary, longitudinal dataset ever undertaken in informal settlements.

Analyses of the data will enable us to answer the fundamental questions of the RISE program. We will examine how interventions might reduce exposure to harmful pathogens (microbes) and improve environmental conditions. We will assess impacts of the infrastructure upgrades on the physical and mental health of residents, household stability, and life satisfaction, as well as changes in community behaviours towards long-term stewardship.

By bringing together environmental, microbiological, health, social, and climate data, we will begin to uncover how these systems interact in informal settlements, generating scientific evidence that will shape the next generation of urban health and infrastructure investment.

Our goal has always been to improve human and environmental health in informal settlements through understanding and sharing our knowledge with the global community. While we prepare to share the main findings of the RCT in 2027, we expect a surge of publications in 2026,

including understanding child health risks and environmental exposures; breakthrough findings from innovative pathogen detection methods developed through RISE; evidence of impacts on household resilience; and genomic insights into how pathogens move between people, animals, and environments.

At the same time, we will continue to work closely with communities and government partners to strengthen long-term operation and maintenance systems, ensuring the infrastructure continues to deliver for decades to come. We will share lessons learned to inform future policy, investment, and scale-up, and deepen engagement with governments and funders seeking effective solutions for informal settlements.

We are also embracing new frontiers in science and innovation. RISE is exploring how artificial intelligence and machine learning can help analyse complex datasets, identify risk patterns, and improve predictive planning. These tools have the potential to accelerate discovery, enhance decision-making, and support more targeted, cost-effective interventions in the future.

The future of RISE is one of evidence, action, and expansion. We are excited to share these discoveries, translate them into policy and practice, and work with partners around the world to bring the benefits of this model to the communities who need it most.



Data



Fiona Barker
RISE Deputy Director Research and Data Lead
Faculty of Medicine, Nursing and Health Sciences
Monash University

In 2025, our teams undertook an ambitious and highly productive year of data collection, marking a significant transition into post-intervention monitoring. This period saw the ramp-up of sampling campaigns, with data collection activities moving to quarterly schedules to capture seasonal and intervention-related dynamics.

We successfully reinstalled HOBO sensors for temperature and humidity to strengthen environmental monitoring, and launched dual campaigns combining NHMRC-funded environmental and child sampling with full child health assessments (including bloods, anthropometry and faeces collection). This was a massive achievement of planning, logistics, and creative solutions to complex challenges encountered in the field and the lab.

Innovation was a key theme throughout the year. We introduced new analytical methods, including Enterolert for rapid detection of enterococci and biomarkers to deepen insights into environmental enteric dysfunction.

Wetland sampling across all intervention sites in Indonesia commenced for the first time, adding an important dimension to our understanding of nature-based solutions.

In Fiji, mass drug administration (MDA) of albendazole was completed with very high coverage: a true collaboration between the Ministry of Health and Human Services, CDC

and RISE, with success being a reflection of the deep relationships our team have fostered within communities.

Beyond traditional sampling, we advanced our use of technology through drone-based surveys, providing foundational data for upcoming flood modelling work and providing high-resolution mapping of RISE sites.

2026 will be the final year of data collection and the conclusion of the randomised controlled trial, marking a critical milestone as we consolidate findings and prepare for comprehensive analysis and dissemination.



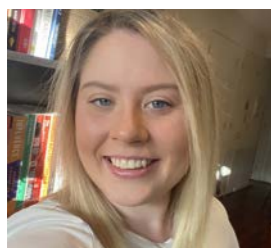
DATA COLLECTION (TO 31 DECEMBER 2025)

Objective	Data collected	Fiji		Indonesia	
		# samples	# campaigns	# samples	# campaigns
O2a (ecology)	Bioacoustics	samples half-hourly across campaigns of approx 3 weeks	4; Aug 19 – Nov 20	samples half-hourly across campaigns of approx 3 weeks	6; Oct 18 – Nov 20
	Temperature	Continuous logging	Aug 19 – Jul 22; restart Apr 25 - present	Continuous	Oct 18 – Aug 22; restart Jan 25 - present
	Mosquitos (# mosquitos)	10,596	16	120,600	18
	Rainfall	n/a	n/a	Continuous	From Jun 19
O2b (environment)	Water	782	14	982	18
	Animal faeces	350	14	634	18
	Sediment	839	14	784	18
	Boot-socks	718	14	613	18
O3 (health) and O4 (wellbeing)	Household surveys	9,609	12	7,628	13
	Human faeces (# children)	2,455	9	2,012	12
	Blood samples (# children)	1062	4	787	5
P&G	TAC (targeted PCR)	1,280	13	1,778	13
	16s rRNA amplicon sequencing	1,542	6	2,290	5
	18s rRNA amplicon sequencingNHS amplicon	907	1	1,696	2
	Metagenome	881	5	1,066	4

PhD students

PHD HIGHLIGHT: FROM POO TO PATHOGEN - UNDERSTANDING FAECAL CONTAMINATION IN INFORMAL SETTLEMENTS

By Leah Barrett, Monash University,
Faculty of Engineering



Diarrhoeal diseases, caused by exposure to faecal microbes, claim over 1.2 million lives each year, disproportionately affecting low- and middle-income communities. My

PhD focused on understanding faecal contamination in tropical informal settlements and assessing and improving the tools we use to identify if this contamination is present and where it comes from.

This research is highly interdisciplinary: combining soil, bootsocks, and animal faeces sampling (environmental samples), with human health survey data and human stool samples, and analysis of genetic material from microorganisms (pathogens and genomics data). Additionally, I incorporated contextual information on flooding, climate, and local conditions from across the RISE program into my research. By integrating these diverse sources of data, it was possible to see how different detection methods perform, how human and environmental microbiomes are shaped by factors like climate, geography, and demographics, and how the conditions in tropical informal settlements shape contamination patterns.

When I joined RISE in 2022, I realised that many common methods used to identify faecal contamination were likely to struggle in the unique, chronically polluted conditions of informal settlements. I set out to test what we currently use and suggest better alternatives.

One key discovery is that *E. coli*, the standard global indicator of faecal contamination, is not a reliable indicator in these settings, as it can be present in the environment with or without recent contamination and it does not always reflect human health risks. In response, I developed a framework to help researchers select microbial source tracking (MST) markers appropriate to different environments. My research also built on previous RISE research that found bootsocks detect higher microbial contamination loads than traditional grab samples.

These findings directly support RISE's mission by enabling more precise identification of contamination presence and sources, enabling targeted interventions designed to reduce diarrhoeal disease. Working closely with communities in Suva and collaborating across RISE in Melbourne, Fiji, and Indonesia has highlighted the human impact of this work, reminding us that science is ultimately about improving lives.

With climate change increasing temperatures, humidity, and flooding around the globe, understanding environmental microbiomes and applying context-appropriate monitoring tools will become ever more important. This research encourages holistic, locally informed approaches that guide policymakers and help protect vulnerable communities.

Leah's thesis will become publicly available in 2026.

Citation: Barrett, L.R., Beasy, P., Palacios Delgado, Y.M., et al. Beyond borders: A systematic review and meta-analysis of human-specific faecal markers across geographical settings. *Critical Reviews in Environmental Science and Technology* 55(7), pp.447-464, 2025. | [Link](#)



NEW PHD STUDENTS



“ My PhD explores how antimicrobial resistance (AMR) spreads in informal settlements, using a One Health lens across humans, animals, and the environment. I'm particularly interested in how nature-based solutions like constructed wetlands, combined with metagenomic sequencing, can help interrupt AMR transmission in communities facing major health and sanitation challenges.

- Andi Zulkifli “Zul” Agussalim
Universitas Hasanuddin Faculty of Public Health



“ My research explores how individual and community behaviours influence engagement with environmental and climate resilience interventions, focusing on long-term behaviour change and sustainability across the communities participating in RISE. With a background in psychology, behavioural science, and marketing, I'm passionate about supporting people-centred solutions for healthier environments and stronger communities.

- Sophia Iwao
Monash University Faculty of Medicine, Nursing and Health Sciences



“ As a joint PhD candidate with Monash University and the University of Zurich, my research explores how climate change influences the spread of drug-resistant bacteria. Using AI and machine learning, I aim to develop tools that forecast antimicrobial resistance (AMR) risks and support evidence-based public health strategies in vulnerable communities.

- Gianna La Regina
Monash University Faculty of Medicine, Nursing and Health Sciences
University of Zurich Institute of Medical Microbiology



“ I'm interested in how local and contextual factors shape RISE's implementation in Indonesia. I believe that insights from lived experience, and our teams working directly with communities, as well as local policy and cultural practices, are essential to inform and enrich the interpretation of RISE's findings, and help guide future intervention scale-up.

- Ruzka Taruc
Monash University Faculty of Medicine, Nursing and Health Sciences

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