



rise

REVITALISING INFORMAL  
SETTLEMENTS AND  
THEIR ENVIRONMENTS

# Breaking new ground

RISE Annual Activity Report 2022

# Value that is collectively created sees the rewards shared.

*Na veika e kunekunetaki mai na lewe levu ena dau kunei na vuana ni wasei.*



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*Cover: The Tamavua-i-Wai demonstration project in Suva, Fiji is the first showcase of RISE's water-sensitive upgrade model in the Pacific.*

*Left: From left, Iliesa Wise (RISE), New Zealand High Commissioner to Fiji Charlotte Darlow, Tamavua-i-Wai community leader Maciu Turagavou, Ministry of Public Works, Transport and Meteorological Services Permanent Secretary Taitusi Vakadravuyaca and Reverend Ledua Tamani.*

# What is RISE?

Informal settlements are home to more than one billion people worldwide who face adverse living conditions and suffer from poor health and wellbeing as a result of inadequate water and sanitation services, and environmental exposure to pathogens, pollutants and disease vectors.

Our vision is to improve the health and wellbeing of residents of urban informal settlement across the developing world by improving the environment in which these communities live. To achieve this, RISE is trialling a holistic water-sensitive approach to upgrading sanitation, drainage and climate resilience through a randomised control trial (RCT) involving 12 informal settlements in Suva, Fiji, and 12 settlements in Makassar, Indonesia – half of which are being upgraded as ‘intervention’ settlements under the RCT, and the other dozen ‘control’ settlements to receive upgrades following completion of the RCT.

## THE INTERVENTION

RISE utilises a water-sensitive cities (WSC) approach to upgrade informal settlements, co-designed at the household- and neighbourhood-scale with the community to ensure that the upgrades meet community needs and respect existing land uses, tenure, livelihoods and community dynamics. The upgrades are a holistic combination of drainage and flood mitigation measures, pathways and access, and smart, green, nature-based approaches for sanitation and pollution management – such as constructed wetlands for wastewater treatment, rainwater harvesting, and biofiltration. This approach delivers critical water and sanitation services while also improving climate resilience to transform the health and wellbeing of the community and restore the natural environment and the productive capacity of lands and waters.



The elements of the RISE approach, implemented at the Batua demonstration project in Makassar, Indonesia

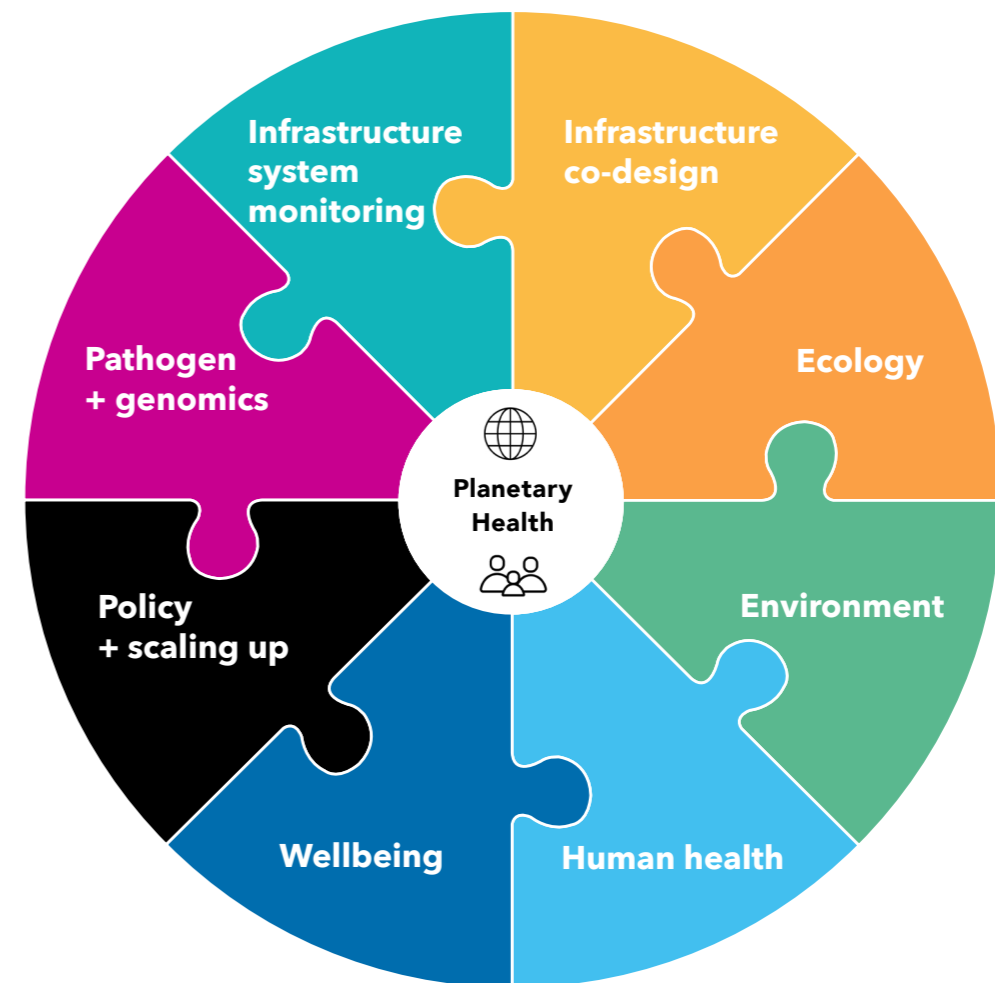
## OUR PLANETARY HEALTH RESEARCH

RISE aims to collect the first-ever rigorous scientific evidence of the human and environmental impacts of a water-sensitive revitalisation approach in urban informal settlements.

Through the RCT, RISE is generating evidence across a range of disciplines on the complex links between human health and the natural systems on which it depends, including assessment of human health and wellbeing, ecological changes,

environmental contamination, pathogen microbiology and genomics, co-design, and treatment system performance and water quality, as well as the socio-economic evidence that policymakers will find most compelling to scale up the water-sensitive approach.

RISE recognises that the problem and its solution are multi-disciplinary and multi-dimensional, and that a planetary health approach is needed to inform policies and investments to improve living conditions for residents of informal settlements around the world. ■



# From the Director

## How can we ensure we are not just fixing old problems, but shaping new solutions to meet society's grand challenges?

Since the birth of RISE, we have made it our mission to not just help solve problems that are fundamentally important to people, but to bring science to bear on policy and practice in innovative and experimental ways to realise systemic change at a global scale.

As we stood at the precipice of 2022 – our 'restart' year after the challenges of the pandemic – it was important to reflect on our work and how it mapped out into the future to meet ever-growing global urban development challenges.

This has been our guiding principle from the start of RISE. Not only are we thinking now about the long-term scale-up and impact of RISE, we are also striving to break free of the conventions and existing systems and frameworks that have held back progress on meeting these challenges.

In 2022 we got our assessment teams back into the field and our construction program back on track. We completed our first large-scale settlement upgrade in Fiji in the community of Tamavua-i-Wai, reaching more than 40 households, and we began building the co-designed upgrades in our first tranche of communities in Fiji and Indonesia.

Getting to this stage has involved developing new ways of working with partners and stakeholders to create real change. It has been vital that each partner take ownership of their own unique contribution to the RISE endeavour, and it is these partnerships, and the willingness of partners to challenge convention for the benefit of informal settlement communities, that has made RISE possible.

We also made great strides in breaking further from the traps of conventional international research and development practice by re-thinking roles and re-investing resources into Indonesia and Fiji to foster knowledge creation, learning and creativity. RISE now hosts more Fijian and Indonesian Chief Investigators, skilled laboratory technicians, and leading development practitioners than ever before, proving that experts are everywhere and demonstrating the tangible, long-term benefits of promoting leadership positions outside of established institutions in



wealthier countries. Yet our work here is still not done, and we will continue to do more of this into the future.

Importantly, we are now producing evidence that will support longer-term problem-solving of development challenges – publishing impactful, open access research papers and resources at the intersections of health, environment, water and sanitation, and climate. For policymakers ready to take heed, our scientific evidence is mounting: water-sensitive revitalisation is a promising solution in challenging urban contexts.

With bold thinking and experimentation comes risk. We accept that not every part of our program will work as originally envisioned. But our aim is not to get things perfect, it is to stimulate as many different ideas and routes to solutions as possible, and to take local partners on that journey with us. As we embark on this next phase of building and testing life-changing infrastructure in informal settlements across two countries, we know it is not just about doing our best – it is about challenging the status quo and enacting lasting change. ■

**Professor Rebekah Brown**  
RISE Program Director  
Deputy Vice-Chancellor (Research) and Senior Vice-President, Monash University



**RISE is boundary-pushing in its transdisciplinarity. But it is also built on the understanding that purely scientific solutions cannot solve the challenges of the age. By breaking down walls between scientific disciplines and sectors, and providing a platform for citizen participation, we are contributing to creating a better, fairer future for all. ʘ**

*Professor Margaret Gardner AC*  
President and Vice-Chancellor, Monash University



**The Australian Government is proud to partner with Indonesia on innovative solutions that improve access to climate-resilient water and sanitation systems for informal settlement residents, while improving human health and wellbeing. ʘ**

*Bronwyn Robbins*  
Australian Consul-General in Makassar



**Innovating to address complex challenges, by necessity, takes longer than travelling roads already well-trodden. By carving new paths, trialling new approaches and taking new learnings that can transform the ways research and development is conducted, new opportunities open up. The time taken is worth it. ʘ**

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



**Projects are resilient and sustainable when communities play a role beyond being beneficiaries – but as co-designers of the work. RISE's water-sensitive upgrades make the program's partner communities centres of knowledge, the impacts and learnings of which will benefit not just Fiji, but will ripple out to the Pacific and the wider world. ʘ**

*Charlotte Darlow*  
New Zealand High Commissioner to Fiji

# The year in review

**Despite facing challenges more daunting than anything we could have imagined, RISE's mission and impact-research ecosystem compels us to succeed.**

This year will be remembered as the one where RISE got back on track after the tumultuous times of the pandemic. We righted the ship, tidied the deck and got on with the remarkable work of the program.

With COVID cases surging during the end-of-year holiday period in 2021, our teams began 2022 still working in COVID-safe bubbles, with government-enforced gathering caps.

Despite heavy rains, cyclone scares and pandemic bumps, our determined teams returned with COVID-safe measures in place to our partner settlements to collect our first samples of the year. Door to door, settlement by settlement, our teams reconnected with residents, heard their stories of hardship, grief and hope, and collected environmental samples that will provide a much-anticipated snapshot of our communities after a tough and tumultuous few years.

As sampling activities settled into a steady rhythm, high-level delegation visits brought fresh eyes and energy to efforts. Aotearoa New Zealand Foreign Minister the Hon. Nanaia Mahuta's visit to our Fiji demonstration site, and Australian Foreign Minister the Hon. Penny Wong's tour of our Indonesia demonstration site were thrilling for our teams and communities alike, a testament to the value placed on our work by policy-makers at the highest levels.

The connections between research and policy continued, with the completion of our Water for Women study. The mid-year launch of powerful new research and practice outputs drew international attendance from global WASH practitioners and media. The global interest was a heartening sign of a growing research movement that is shifting away from papers and publications accessible only to academics and universities. A movement where research is focused on creating real, lasting and

inclusive change on the ground for communities, with communities.

As one area of work concluded, another lifted off. Our Exposure Pathways study, investigating the mechanistic ways in which children are exposed to pathogens in their environments, drew out new creative processes, with our Fijian and Indonesian colleagues conducting videography observation and coding of children's activities. This work will continue in 2023, and the prospects for such rich data to further illuminate the relationship between children and their environments is incredibly exciting.

As the research arm of RISE hummed with activity, the build teams were gathering momentum in the lead-up to all-important program milestones. Following weeks of intensive engagement preparing our communities for what to expect in our construction phase, the anticipation felt from all sides finally culminated in a tremendous groundbreaking ceremony launching construction of the RISE infrastructure in Indonesia. Joined by the City of Makassar and our funding partner the Australian Department of Foreign Affairs and Trade (DFAT), the air was electric, with more than 250 people gathered from the communities, government representatives and academic partners, for the ceremony at one of the sites being upgraded.

Just one month later, there was more excitement, this time in the Pacific, with the handover of our Fiji demonstration site at the historic settlement of Tamavua-i-Wai to the community. Fijian Government representatives, program partners, and residents from RISE's 12 participating communities gathered for a traditional handover ceremony. As Fijian Government representatives talked of the role water-sensitive revitalisation could play to help meet

national development targets, a Tamavua-i-Wai resident touched hearts on the day, speaking through tears about the ownership his community felt for the new wetlands and treatment systems, and their commitment to make their community a better place.

And finally, our Annual Workshop to close out the year. A chance to reunite as a global unit in Melbourne to share experiences and learnings from the year, and to look ahead at what we are set up to achieve in the next phase of our program. While deeply celebratory, the multi-day summit was also an invaluable opportunity to reflect on the more challenging aspects of our endeavour, and what we can do better – from stepping up mental health support for our community fieldworkers who often face challenging situations in the field, to smoothing procurement processes for our teams to function efficiently with the right equipment.

We ended 2022 with construction underway in Indonesia and Fiji not far behind, and a clear line of sight to completion of the randomised control trial (RCT) – a truly proud achievement given the uncertainty and challenge of the past few years under the cloud of COVID.

RISE's strength has always been our people. And as the program has found its place in the world, each colleague has found their place in RISE. With this confidence comes conviction. A sense that our people have the ability to deliver and succeed, even when faced with extraordinary adversity.

Looking ahead to 2023, there is an unshakable belief that whatever unexpected issues present themselves, the RISE community – our staff, partners, funders and communities – will pull together, find solutions, and ultimately deliver on our mission, together. ■



**“We are a diverse team in our experience, educational backgrounds and cultures; this diversity is our strength.**

**After long days in the laboratory, or in the settlements, or construction planning, getting together as a team to share a meal and reflect on our days is how we reconnect, relax and recharge. We make sure to celebrate our achievements, as well as the smaller moments together. ”**

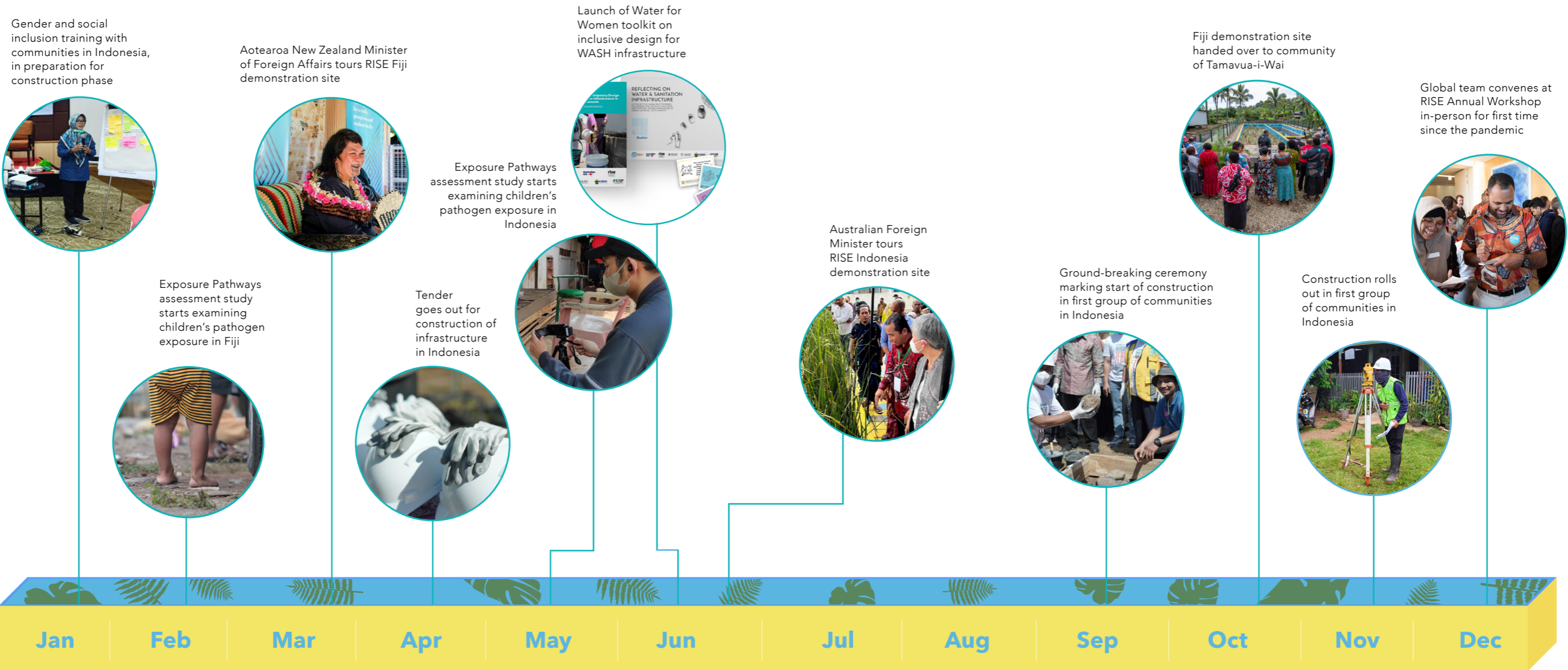
*Fitriyanty Awaluddin*  
RISE Country Manager Indonesia



**“We've always been a close team built on a culture of praying together, celebrating achievements together, and supporting each other – at work and at home when needed. People are also eager to learn and help build each other's experience. 2022 has been tough at times, but as with all previous challenges, we process things together and support each other through. ”**

*Isoa Vakarewa*  
RISE Country Manager Fiji

# Our 2022 journey



Data collection campaigns



## INDONESIA

## FIJI

# Our built infrastructure and co-design approach



The informal settlements of today are the middle-class communities of tomorrow. And they are continuing to grow at an extraordinary rate. Rather than thinking they must be eradicated, these are the places that need to be supported in order to thrive and flourish. By innovating in the ways we plan sustainable urban infrastructure, we

can make impact in these communities, and we can also affect practice and research more broadly.

The process of taking a water-sensitive approach and trialling green infrastructure in informal settlements is charting a new path in sustainable urban development. Beyond the novel infrastructure itself, one of the elements of the RISE approach which I believe to be the most paradigm-changing, is our intensive co-design process with residents. This is reflective of the need to transition away from a top-down, command and control approach, often helmed by white, wealthy institutions and actors, to much more democratic and diversified responses – where communities play a much more significant role in developing solutions and building resilience in the process.

RISE has now completed two demonstration sites – tangible examples of the ways in which water-sensitive infrastructure functions in two distinct geographical locations. These will be invaluable ‘live’ learning sites, and our Fiji and Indonesia teams are, rightly, front and centre of these design, engagement and construction achievements.

As we build in our next tranche of sites, it has been remarkable to see the enduring and trusting relationships with our partners flourish. From our communities to our academic partners, governments and more, it is clear this is a joint endeavour in which everyone is invested in the outcome. And it is proof that this endeavour is as much about infrastructure as it is about the people who plan, build, care for, and ultimately share in its benefits.

What we are seeing through RISE is that when we come together – as implementers, as researchers, as funders, as partners, as communities – in this collective endeavour, we will be able to better respond to other issues as they arise. ■

**Professor Diego Ramirez-Lovering**  
**RISE Director, Intervention**  
**Monash University**  
**Faculty of Art, Design and Architecture**

# Fiji demonstration project

## Tamavua-i-Wai settlement, Suva



**In 2022 we completed construction of our second of two demonstration sites, in the community of Tamavua-i-Wai in Fiji.**

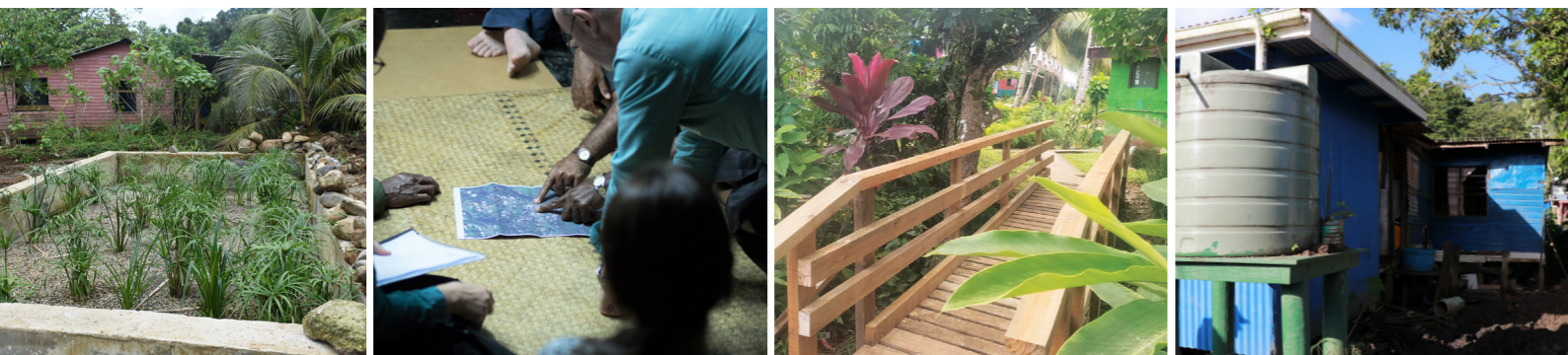
The informal settlement derives its name from its location adjacent to the Tamavua River – a water body flowing from the city’s main harbour down to a low-lying inland channel. Nestled in this tidal zone sits Tamavua-i-Wai. Due to its location at the bottom of a steep hill, the community is vulnerable to both tidal influx and runoff from rainfall, which brings contaminants and waste from upper catchments.

RISE began engaging with residents and local authorities in 2017, with a vision to provide decentralised wastewater treatment that could bring critical water and sanitation services to this

difficult-to-reach location.

Working over months to co-design and iterate together, with delays through COVID-19 shutdowns and disruptions, 40 households are now serviced with infrastructure that addresses the settlement’s specific sanitation needs, contamination exposure pathways, and climate vulnerabilities.

The generous spirit with which Tamavua-i-Wai first welcomed RISE has been followed by deep, sustained engagement over the past five years. Residents across all age groups, genders and abilities played a vital role in design, and are set to take this ownership forward in the operations and maintenance of the infrastructure, supported by RISE and local authorities. ■



**Together we have built:**

**205 m<sup>2</sup>** of nature-based constructed wetlands for wastewater treatment

**1** nature-based stormwater and greywater wetland treatment system

**7** smart pressure sewer tanks with OneBox™ control systems, allowing real-time remote water level monitoring

**450 m<sup>2</sup>** of paved pathways

**4** drainage systems and new culverts to address flood events

**2** drain crossings upgraded

**2** types of biofilters trialled for greywater treatment

**16** bathroom units with rainwater tanks

**New** landscaping and public spaces around wetlands



**“The ability to remotely monitor and control pressure sewer systems could be a game-changer in providing essential services to communities that to-date have been challenging to service. ”**

*Dan Sullivan,  
RISE International Development Advisory Board  
CEO, Iota Services*



*Community leader  
Maciu Turagavou*

### AN ITAUKEI HANDOVER CEREMONY

Community leader Maciu Turagavou (above) has seen much change over the 50 years he has lived at Tamavua-i-Wai. ‘RISE coming in 2017 is one of the biggest changes.’

In October Mr Turagavou and his successor accepted a tabua (whale’s tooth) from RISE – a ceremonial gift in Pacific tradition – symbolising the handover of the infrastructure. The new infrastructure clearly reflects his advocacy on his community’s behalf: ‘now you can see people walking along footpaths, not walking around in muddy areas from here to there.’

Maraia Aitcheson (below) grew up in the nearby town of Lami in Suva. Floods have been frequent since she moved to Tamavua-i-Wai almost a decade ago. ‘When the rain comes, the front of the house always floods. For the children, if the flood waters are high the current outside can sometimes be strong, so we try to keep them inside.’

She and Samisoni Ratou (below) represented the community’s youth in infrastructure planning sessions, and were involved in the landscaping around the main wetlands.



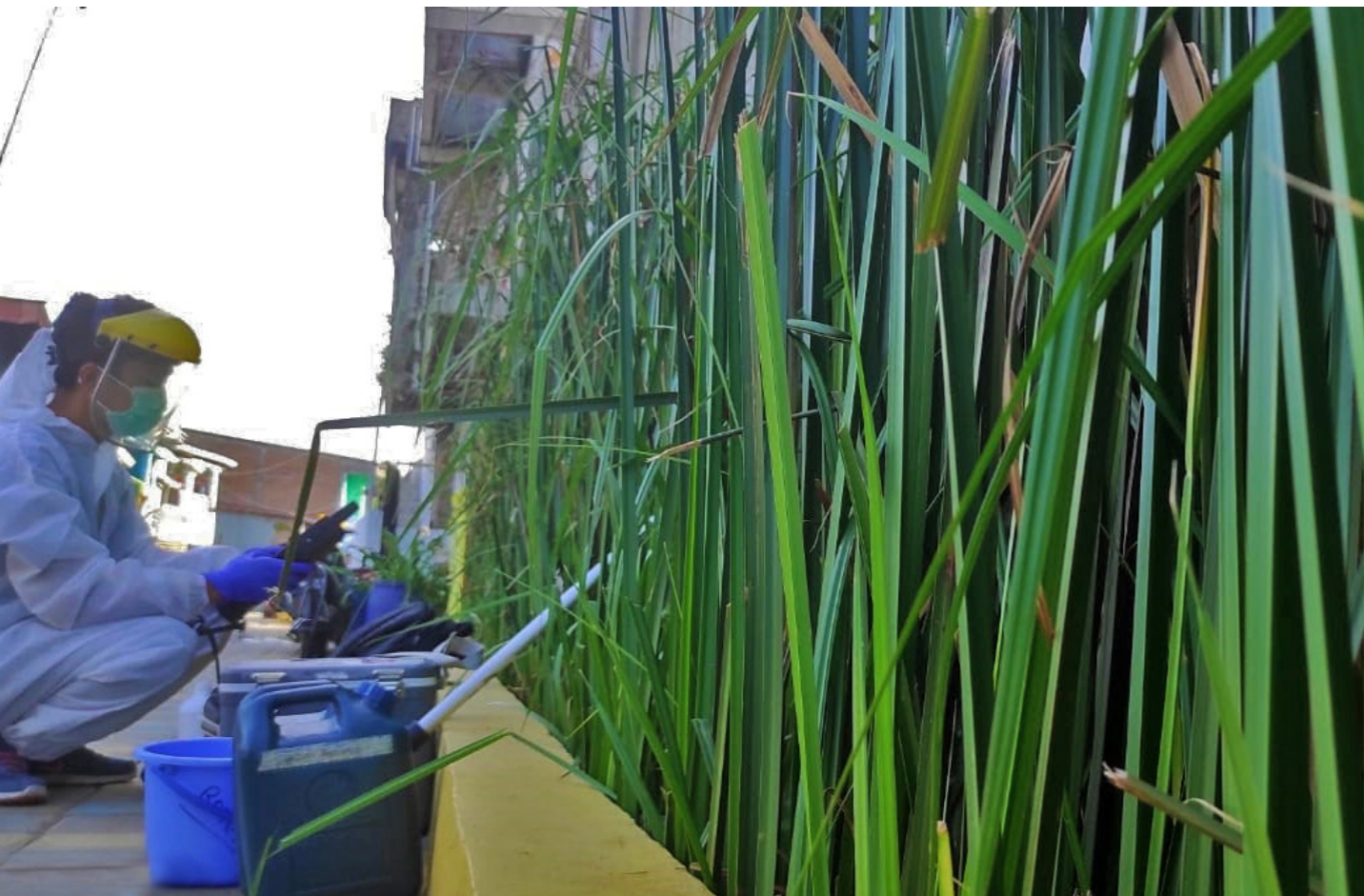
*Tamavua-i-Wai Youth  
Representatives Maraia Aitcheson  
(right) and Samisoni Ratou (left).*

### IN THE MEDIA:

**Tamavua-i-Wai on  
the ABC**

# Indonesia demonstration project

## Batua settlement, Makassar



**Since commissioning our infrastructure in late 2020, Batua continues to demonstrate what can be achieved through community engagement, co-ownership and partnerships to bring life-changing settlement improvements.**

The opportunity to observe and monitor infrastructure in-situ is providing invaluable learnings. Remote smart monitoring systems are enabling team members to get to site and rectify aspects of the sanitation system as we fine-tune the treatment system. Weekly sampling and analysis of water from the wetland also indicates that the system is working to treat wastewater, as designed.

In 2022, our Indonesian team held monthly workshops with residents to openly communicate about what aspects of operations and maintenance

are working, where more support is needed, and for which systems.

Through Batua, RISE is continuing to refine the best local construction methods – methods that are being taken into design and construction in our first group of intervention settlements – and improving our operations and maintenance model, which is strongly community led.

None of this ongoing learning, testing and refinement would be possible without the graciousness of Batua residents. We problem-solve collaboratively, while striving to remain unobtrusive in their daily life. RISE is ever-cognisant and appreciative of their continued support and custodianship as the pilot site for this new type of infrastructure in the city of Makassar. ■



**“Our monthly meetings have been a great way to communicate about how infrastructure can be maintained by the community, with the support of RISE and local authorities. Everyone understands the need for operations and maintenance, and we look forward to more ideas about how to make this process go smoothly, especially for residents. ”**

*Liza (Icha) Marzaman, Architect / Community Facilitator (Safeguards focal point)*



## A TRIGGER FOR FURTHER INVESTMENT

RISE upgrades have triggered further investments for the Batua neighbourhood. The City Government has installed lighting, provided rubbish bins and waste collection services, and installed hydroponic vegetable seedlings for residents to grow and sell.

Thanks to improved access, commerce is also reaching into the neighbourhood more freely. An improved main access road is allowing vendors to come into the community to sell goods, making it faster and easier for women to do household shopping.



## MONITORING NEW TYPES OF INFRASTRUCTURE

As well as monitoring total coliforms (colony-forming bacteria) in our wetland system, which gives a general indication of water quality, we have also begun assessing faecal coliforms as the main indicators of human waste. This is because in nature-based systems, total coliforms also include environmental bacteria that may not represent a risk to human or environmental health. For the RISE infrastructure, analysis of faecal coliforms by our highly trained lab staff is expected to provide a better indication of the performance of our wastewater treatment system.



# Galvanising political support

**For policy-makers and decision-makers, RISE's demonstration projects showcase how innovations can be implemented and aligned with policy and planning programs.**

This year Australian Foreign Minister the Hon. Penny Wong visited our Indonesia demonstration site, meeting community members and seeing how climate-adaptive and -resilient systems are addressing the community's needs and vulnerabilities. A core partner and funder of the intervention in Indonesia, the Australian Government

sees the potential for this approach to improve living conditions for millions in the Indo-Pacific.

In Fiji, Aotearoa New Zealand Foreign Minister the Hon. Nanaia Mahuta visited our Tamavua-i-Wai demonstration site. Mahuta spoke with residents about their experiences co-designing infrastructure, and the journey to create climate-resilient futures. A core partner, and co-funding our intervention in Fiji, New Zealand's strategy for development aligns with RISE's goal to improve water and sanitation for vulnerable communities in the region. ■



**“Australia is committed to expanding our cooperation with Indonesia on climate change action and resilience – projects like this show the incredible impact we can have when we work together.”**

*Hon. Penny Wong  
Australian Minister for Foreign Affairs*

**“The RISE program has improved Tamavua-i-Wai's drainage and sanitation, strengthened homes' water resilience, and reduced vulnerability to flooding and the effects of climate change.”**

*Hon. Nanaia Mahuta  
Aotearoa New Zealand Minister for Foreign Affairs*



**“We have a vision to be a sustainable, thriving city with innovation at our heart, which is why we are rolling out this water-sensitive approach in our city's settlements.”**

*Mohammad Ramdhan Pomanto  
Mayor of Makassar*



**“RISE's infrastructure is meeting peoples' needs today, and addresses future challenges. Innovative programs like this enable Fiji to manage our land sector through sustainable and transformative policies and practice.”**

*Filimoni Vosarogo  
Fiji Minister for Lands and Mineral Resources*



**“Tamavua-i-Wai becomes a centre of knowledge – the impacts of which will benefit not just Fiji, but will ripple out to the Pacific and the wider world.”**

*Charlotte Darlow  
Aotearoa New Zealand High Commissioner to Fiji*

# Our intervention begins



**Through RISE, a water-sensitive cities approach to urban revitalisation – which deals with the entire water cycle in a holistic, multi-dimensional and sustainable way – is for the first time being applied in urban informal settlement contexts in developing countries.**

It is an approach that has been proven over the past 30 years to deliver sustainable, cost-effective health and environmental improvements in many developed countries, and holds much promise as an innovative way to upgrade informal settlements.

RISE is now constructing water-sensitive upgrades for over 700 households in Indonesia and Fiji, consisting of improved drainage and flood mitigation, pathways and access, and smart nature-based treatment systems – a combination of constructed wetlands for treating wastewater and a smart pressure sewer system to transfer wastewater from low-lying homes for treatment.

These systems have been co-designed over many months in partnership with residents to address each settlement's unique contamination challenges.

Building in these dynamic, evolving settings brings new challenges not otherwise experienced by 'traditional' infrastructure projects: Suva's hilly terrain will test machinery access, bustling Makassar streets will dictate daily construction activities, and construction activities are always ultimately at the mercy of cyclones and flooding events. It is these tricky circumstances that have hampered essential services from reaching the people most in need, which is exactly why RISE is there.

The next phase of construction will be a game-changing demonstration of how sanitation and climate resilience can be delivered for informal settlement communities – backed by the first-ever scientific evidence of its impacts to support scale up throughout the Indo-Pacific. ■



## TAKING GREEN INFRASTRUCTURE TO INFORMAL SETTLEMENTS

The city of Melbourne is a rich showcase of sustainable water management in action. In preparation for construction, our Fiji and Indonesia teams toured urban design landmarks to see how green infrastructure can be translated across contexts, and help Suva and Makassar adapt to the impacts of climate change.

Makassar City Government representatives also joined training sessions on smart pressure sewers to gain a better understanding of the waste treatment systems RISE is rolling out in Makassar's settlements.



**Starting major construction during Fiji's cyclone season is an early reminder of the adverse conditions our communities live in and the challenges that poses for construction. But I am confident that through constant communication and teamwork we can deliver. ■**

*Meagan Volau*  
RISE Fiji Engineering Design Manager



**Despite heavy rains, warehouses and site offices are set up, concrete casting on slab foundations and excavations for wetlands has begun, and bathroom units are going up. Our contractors have made exciting progress so far. ■**

*Geminingsih Nastiti*  
RISE Indonesia Build Project Manager



## DESIGNED BY COMMUNITIES, FOR COMMUNITIES

RISE's participatory design is rooted in involving everyone who will be affected by emerging design. The systems being built are the result of months of collaboration between community and local stakeholders to materialise their needs and wants around infrastructure, and the future development of their natural and built environment.

Ibu Merry is one of those people. She has been an instrumental representative bridging RISE with her community. [Watch Ibu Merry's story.](#)

# Our implementing teams



## RISE FIJI

- |                      |                       |                    |
|----------------------|-----------------------|--------------------|
| Dr Amelia Turagabeci | Revoni Vamosi         | Meagan Volau       |
| Isoa Vakarewa        | Silvia Rosova Vilsoni | Sailosi Nasaroa    |
| Mere Naulumatua      | Vinaina Waqa          | Ilaitia Ravonokula |
| Autiko Tela          | Jannifer Filipe       | Aminiasi Lailai    |
| Mere Jane Sawailau   | Iliesa Wise           | Alexandria Rounds  |
| Nirai Ravulo         | Alex Wilson           | Daiana Bola        |
| Pita Tamani          | Savu Nofomuli         | Peni Qauqau        |
| Filise Volavola      | Losalini Malumu       | Neumi Tuisinu      |
| Meiva Setoka         | Josaia Thaggard       | Mosese Walesi      |
| Jonati Kitekitoga    | Raniyah Muhammed      | Samuela Dau        |
|                      | Bulou Ratulevu        | Maika Nativa       |

RISE could not be delivered without our skilled and dedicated local teams. Our Fiji and Indonesia Country Offices lead implementation of both the research and the built intervention as the local experts and practitioners of the RISE approach and planetary health research. Coming back with renewed energy from over two years of COVID shutdowns and restrictions, our teams reconnected in-person with residents, resumed

collection of human and environmental samples in communities, and iterated and refined construction plans to reflect the many changes that had occurred in settlements over the course of the pandemic.

We are immensely proud of our lab, build, assessment, data, and program management teams in Indonesia and Fiji. Their passion, expertise and resilience is what makes RISE possible. ■



## RISE INDONESIA

- |                      |                       |                         |
|----------------------|-----------------------|-------------------------|
| Ansariadi, Ph.D.     | Adrianto Hidayat      | Andi Zulkifli AS        |
| Fitriyanty Awaluddin | Liza (Icha) Marzaman  | Triani Putri Jati       |
| Ruzka Taruc          | Hamdan Habsji         | Uhwan Subhan            |
| Muhamad Faisol       | Syaidah Syamsul       | Mohammad Afif Fikriaraz |
| Dr Ihsan Latief      | Rosnaena              | Ikram                   |
| Geminingsih Nastiti  | Mohammad Hatta        | Nurul Inayah            |
| Sakka Pati           | Ina Rahlina           | Zainal                  |
| Noor Ilhamsyah       | Herlina               | Akhnan Rizaldy          |
| Nur Intan Putri      | Maghfira Saifuddaolah | Indra Dwinata           |
|                      | Khaerul Anam Hattas   | Fais Achmad             |

## Our transdisciplinary research



Transforming health in informal settlements demands new, creative solutions. Recent decades have seen a rise in well-intentioned upgrading programs aimed at reducing illness and morbidity, but rigorous evidence is needed to assess the impacts and to better understand the effects of interventions on

health, wellbeing and livelihoods.

Developing the first-ever rigorous scientific evidence of a water-sensitive intervention in informal settlements is a critical step in addressing urban challenges with new solutions. And RISE is making an exciting start: we have the first-ever continuous data set that cuts across the many complex dimensions of informal settlement life. We are measuring the impacts of the intervention on peoples' health and wellbeing, household prosperity, water quality, faecal and environmental pathogens, mosquito type and prevalence, educational opportunities, and so much more. These diverse data sets are encouraged to collide, bringing new knowledge that reflects the interconnectedness between people and their environments.

The rigour of RISE's research platform is complemented by its flexibility. As we continue pursuing our core research questions, we have also incorporated new areas of scientific enquiry, such as assessing peoples' resilience in the face of climate change, and the impacts of COVID-19. Critically, we are able to assess the impacts of the RISE intervention while accounting for new confounding factors in peoples' lives.

It is a robust research platform, re-emerged from the pandemic as an unstoppable, humming machine confidently steered by our Fijian and Indonesian colleagues. From collecting samples, to rolling out surveys and laboratory analysis, each team member has found their place in the machine, and has their strengths nurtured.

By supporting co-design and research participation, the RISE approach puts communities at the centre of realising solutions. Concurrent delivery of interventions and capture of rigorous scientific data in a real-world setting is challenging, but has the potential to lead to a better future for millions of people. I couldn't be more optimistic about the potential for impact from our program. ■

**Professor Karin Leder**  
**RISE Director, Assessment**  
**Monash University**  
**School of Public Health and Preventive Medicine**  
**Faculty of Medicine, Nursing and Health Sciences**

# Research focus areas



**“For research to unleash its full impact, it must be locally anchored and driven. As RISE’s academic anchor in Indonesia, UnHas’s investment in cutting-edge planetary health research will bring lasting benefits to the Indo-Pacific region.”**

*Professor Jamaluddin Jompa, Rector, Hasanuddin University (UnHas)*

## DESIGN AND ENGAGEMENT

This year our experts produced important research on inclusive participatory design of water and sanitation infrastructure. Marking the completion of the Water for Women project in 2022, more than 100 practitioners, policy makers, donors and government officials in the global water, sanitation and hygiene (WASH) space convened for the launch of a toolkit which unlocks ways to inclusively design water and sanitation infrastructure with diverse members of informal settlement communities.

A complementary policy brief was also launched in English and Bahasa Indonesia to help governments, decision-makers and funders make policy decisions that support inclusive participatory design of these projects.

Our PhD students continue undertaking exciting impact-oriented research around design and engagement. Two new doctors were minted in 2022: Dr Erich Wolff, whose research advocates for expanded use of ‘citizen science’ where communities play a more active role in data collection by drawing on their lived experience at the coalface of climate change, and Dr Mahsa Mesgar, whose research explores the complex ways in which residents negotiate land use to better retro-fit infrastructure into challenging spaces. ■

## ECOLOGY

We continue to develop a rich understanding of the interplay between people and nature within informal settlements through our ecological and biophysical research.

We better understand the development and variation of urban heat stress in such settings and factors for mitigating heat stress. Our work has produced detailed profiles of acoustic environments in Fiji and Indonesia, capturing complex mixtures of human-generated and natural sounds that vary through time (diurnally, seasonally) and space (some settlements are richer in natural sounds). The data also illuminate differences between Fiji and Indonesia in mosquito dynamics.

We have celebrated the submission of Emma Ramsay’s PhD thesis on heat stress in informal settlements, the completion of Dr Peter Faber’s work with us, and the continued enthusiasm of our Fijian and Indonesian field teams – whose dedication to quality data collection and curation lies at the heart of our endeavour to reveal ways we can harmonise people and nature to provide a better life for all. ■

## ENVIRONMENT

This year our researchers set out to grow our dataset and understanding of environmental contamination in informal settlements.

Collection and analysis of outdoor water, soil and bootsock samples is now well-integrated into our research activities. In 2022, for the first time, our researchers and fieldworkers expanded sampling to indoor spaces, conducting a small-scale pilot in Fijian settlements to quantify *E. coli* and pathogens in communal areas. This data will be vital to help uncover the pathways through which children become exposed to illness-causing pathogens (see pg 32).

In our laboratories, our Fijian and Indonesian technicians successfully began rolling out optimised protocols for surface-soil sampling (bootsocks) to improve sample capture and downstream genomic analysis. Cross-program collaboration on data validation has been crucial to ensure samples are of the highest quality, from field collection through to analysis and storage, as part of our ISO-9001 quality management system.

The strengthened connections between Fijian, Indonesian and global colleagues have propelled this year’s progress, and will enable this high-quality, impact-oriented environmental research to continue into 2023. ■

## HUMAN HEALTH

Our understanding of health and wellbeing in our partner communities is deepening as we continue collecting health data and analysing samples in our humming Makassar and Suva laboratories.

This year, despite pandemic fatigue, residents in our partner communities graciously opened up their homes to our teams once more to reboot our regular field campaigns. Our field staff were able to collect hundreds of stool samples, and complete hundreds of health and wellbeing surveys with residents, as well as track COVID cases and vaccination coverage in the settlements. Participation and response rates remain heart-warmingly high, testament to the trusted relationships our local teams have developed with each household and the shared vision for a better future for each community. This vital ongoing data collection is only possible thanks to the devotion and energy of our Fiji and Indonesia teams who have maintained rapport and trust with residents throughout the pandemic.

In 2023 our analysis of blood samples will expand to include monitoring for dengue, chikungunya and zika viruses. ■



**Pasifika perspectives are critical in research and policy that promotes resilient communities. Through RISE, our elite researchers are being elevated to the global stage to have their perspectives and voices heard. »**

*Dr William May*

*Dean, College of Medicine, Nursing and Health Sciences, Fiji National University*



## WELLBEING

Since November 2018 we have routinely measured the wellbeing of adults and children living in RISE's partner settlements. We have collected information on children's emotional health in Makassar on seven occasions, and in Suva on six occasions at roughly 6-month intervals, including snapshots over the course of the pandemic.

This data collection means we now have a unique longitudinal dataset providing ongoing insights into how residents' lives are influenced by environmental, social, and economic events, and the factors that help promote family and community resilience.

Again, these research insights would not be possible without the incredible efforts of the RISE Fiji and Indonesia teams in maintaining positive engagement with the settlement residents, and their commitment to high-quality interviewing practices.

A particular aim for 2023 is to increase trans-disciplinary research collaborations by linking wellbeing survey data with information on the urban landscape, environmental quality, and biomedical measurements of children's physical health. ■

## PATHOGENS AND GENOMICS

RISE's Fijian and Indonesian laboratories and technical staff are now leading our pathogen analysis program and extracting samples for genomic sequencing. It is one of RISE's proudest examples of capacity building.

RISE's cross-country training program for molecular analysis is setting up our lab teams as regional leaders in pathogen detection and environmental contamination analysis, supported by state-of-the-art TaqMan Array Card (TAC) machines in both the Suva and Makassar laboratories.

Using human, animal and environmental samples collected in both wet and dry seasons across all of our communities in both countries, our lab teams are able to screen dozens of samples for more than 30 different pathogens at once, revealing a wide variety of enteric pathogens and extensive faecal contamination in informal settlements.

This analytical work will continue and ramp up in 2023 as our Pathogen and Genomics Team work through our extensive biobank of samples and correlate pathogen results with genomic sequencing to be conducted at Monash University. ■

## POLICY AND SCALING UP

Our research on communities' experiences with RISE is yielding rich insights that can inform future policies and program activities. We have learned a great deal about communities' experiences with the participatory design approach in RISE.

In particular, we have studied the impact of RISE co-design activities on social capital among women and men in both Makassar and Suva to better understand the essential elements of the RISE process for future scale-up. Co-design is in itself a fascinating process that can build collective efficacy and community empowerment by bringing community members together, sometimes for the first time, resulting in complex social processes and new community dynamics.

We have also learned about the lived experiences of women in urban informal settlements, a population that is often neglected. We observed that among women living in RISE settlements in Makassar, those who experienced both water insecurity and food insecurity were at higher risk of depression – a finding with important implications for how we address food and water insecurity moving forward. ■

## SYSTEM MONITORING

Monitoring the performance of our nature-based treatment systems is vital to confirm that the systems are working as designed and to pick up anomalies that might hint at some element not functioning correctly or requiring a performance tweak.

At our Batua demonstration project in Makassar, our local team led by Maghfira has been taking weekly water samples since the treatment system was commissioned in 2020, even through the pandemic, to ensure we understand the nuances of how these systems work in an informal settlement context.

With the Tamavua-i-Wai demonstration project now operational in Suva, Maghfira travelled to Fiji to train the local team there on how to collect samples and monitor water quality in the field, and what to look for to gauge performance and spot potential issues. Another example of RISE's locally led model for research, practice and capacity development. ■

*Above: Batua Monitoring Lead and Laboratory Technician Maghfira (left) shares system monitoring learnings from the Indonesia demonstration site with Fijian colleagues now doing monitoring at the Fiji demonstration site.*



## Batua case study

**The Batua demonstration site, now operational for over two years, offers the first ever insight into the feasibility, efficacy, cost-effectiveness and acceptability of a water-sensitive cities approach to revitalising urban informal settlements in the Indo-Pacific.**

The water-sensitive cities (WSC) approach has been successfully implemented in places like Australia, Singapore and China, but has not been attempted in urban informal settlements. The RISE pilot projects provide an opportunity to understand how the WSC approach could

be best translated to deal with the design constraints of densely populated, low-lying informal settlements. Ongoing monitoring in the Indonesian pilot site of Batua has allowed RISE researchers to answer a few key questions about how well the infrastructure is working and what it has meant for the lives of residents.

First, we needed to assess whether the wastewater treatment system – the main sanitation component of the intervention – was effectively treating sewage. We saw a marked decrease in almost all contaminants from the ‘start’ of the treatment system to the ‘end’ or outlet, meaning the nature-based technologies

were doing their job to treat the sewage. For those contaminants that were not quite meeting national effluent standards, we are trialling tweaks to the system that could be promising solutions for the pilot site and lessons learned to take with us in designing and operating the remaining intervention sites.

When we compared cost per household of constructing the pilot site to that of a ‘conventional’ wastewater treatment system in Indonesia, we found that the pilot site costs were lower and offered multiple additional co-benefits in the form of drainage, flood mitigation, water supply, climate resilience and a

**“Even when it only rained once, we couldn’t directly go out to the road because it would be inundated with water, there would be grasses, rubbish scattered everywhere. Wood from other people, remaining from their building work, all scattered everywhere [...] [Now] when we wake up in the morning, even though it may be raining, there is no rubbish outside. The road is wide open and the breeze is blowing.”**

*Female resident*



range of socio-economic benefits, such as better year-round access to employment, education and food vendors.

We also wanted to hear from residents’ own perspectives what they perceived were the main benefits and consequences of the intervention. Interviews with residents of the pilot site revealed that the road – built to provide flood-safe access to the community while housing key elements of the treatment system – had a number of positive externalities: it facilitated transport of construction materials for housing improvements, enabled social gatherings, and freed up time for women by making it

**“The children would be exposed to the pollution while playing. That was the negative impact. Now it’s good because there is a storage for the wastewater to go to so it’s managed.”**

*Male resident*

easier to get to the market and allowing vendors to come into the community for the first time. While drainage and flooding prevention infrastructure helped to reduce frequency and severity of flooding, residents reported that the road did still become inundated during major floods, but that it was still trafficable.

The RISE demonstration project in Indonesia constitutes the first evidence, to our knowledge, that the WSC approach is feasible, effective, economically competitive and acceptable to the local community in the context of urban informal settlements, offering an innovative solution for policymakers and program designers.

## Revealing contamination pathways in informal settlements

**Globally, about half a million young children die from diarrhoea each year. Children below five years living in low-income, high-density settings like informal settlements have the highest risk of developing diarrhoea and other gastrointestinal illnesses due to their exposure to environmental contamination.**

While there are no easy solutions, RISE is undertaking research with the program's participating informal settlement communities to better understand precisely how children become exposed to contamination in their environments, and to assess the impacts of the program's water and sanitation intervention on these exposure pathways.

The research is investigating how children living in informal settlements interact with their environments in order to unravel the different physical mechanisms of contamination transfer from environment to gut as the principle pathway by which children are exposed to gastrointestinal pathogens. This involves a combination of observing children's interactions with their environment, and testing for faecal contamination and enteropathogens in the environment.

One of the main goals is to generate a model that maps children's exposure and their likely risk of illness, which will provide essential evidence on how interventions aimed at improving water and sanitation infrastructure should be designed and implemented in order for health improvements to be optimised.

Risk models have long been used to understand the likelihood of children getting sick. However, many rely on assumptions on the ways that children become exposed to contamination or examine surrogates of enteropathogens. RISE is investigating current uncertainties by systematically examining a range of faecal transmission pathways and by testing for a range of specific pathogens.

RISE teams in Fiji and Indonesia are conducting videography observation, coding of children's activities, and surveying of caregivers on their children's day-to-day habits. Data will be overlaid with environmental samples that have been tested for faecal pathogens, as well as spatial information including mapping of the areas where children spend most of their time.

The process of capturing these comprehensive risk variables comes with challenges. Videoing children over the course of a normal day of activity is physical work demanded over many hours. Children also naturally tend to want to perform for the camera and try to interact with videographers, despite our attempts to observe from

a distance, necessitating some creative subterfuge to remain inconspicuous.

The videos are subsequently coded using a software that has been customised for second-by-second recording of what a child touches and places in the mouth, as well as location, surfaces and other behaviours of interest. Developing a consistent palette for coders to log the innumerable, unpredictable actions by children takes endless fine-tuning, workshoping and re-trialling in the field, as well as cross-checking and quality control.

Perhaps most importantly, great care and support is provided to caregivers and teams to feel comfortable working so closely with children and their families. RISE field teams undertook child protection training in advance of the videography campaigns. They then visited households to explain the research, gave reassurance of maintaining privacy and data security, and kept communication lines open for questions to be asked at any stage. Our Fijian and Indonesian colleagues have guided these research activities, ensuring they are culturally appropriate.

Two videography campaigns have now been completed in Fiji and Indonesia, with surface contamination sampling and analysis beginning in 2023. Researchers are hopeful that the rich amalgamation of data will tell a more comprehensive story of the relationship between children and their environments, so that interventions can be further optimised for improved health outcomes. ■



**It is thrilling for Hasanuddin University's laboratory technicians to be skilled in identification**

**of pathogens and markers of antimicrobial resistance, and recognised as leading researchers uncovering links between environments and human health. »**

*Dr Ansariadi*

*RISE Indonesia Leader and Chief Investigator  
Director, Partnerships, Hasanuddin University*



**Many types of pathogens and contamination pathways contribute to disease emergence in informal settlements.**

**This research has the potential to transform the way we consider interactions of pathogens between people, animals, and their shared environment. »**

*Dr Amelia Turagabeci*

*RISE Fiji Leader and Chief Investigator,  
Head of Epidemiology and Environmental Health, Fiji National University*



## New resources set to make WASH infrastructure design more inclusive

More than 100 practitioners, policy makers, donors and government officials around the world in the water, sanitation and hygiene (WASH) space came together in June for the launch of a new set of resources unlocking more inclusive ways to design water and sanitation infrastructure with informal settlement communities.

Based on data from the RISE experience of co-designing WASH infrastructure with Indonesian and Fijian communities, comes the [Reflecting on water and sanitation infrastructure toolkit](#). The toolkit presents practical ways WASH practitioners can deliver a gender- and socially-inclusive participatory approach to designing water and sanitation infrastructure in urban informal settlements, so that no-one gets left behind in the process.

Complementing the practical toolkit, a [policy brief](#) also distills years of RISE evidence to help governments, decision-makers and funders make policy decisions that support inclusive

participatory design of water and sanitation infrastructure projects.

Fadiyah Machmud, Chair of the Child Protection Institute in South Sulawesi, Indonesia, has more than a decade of experience advocating on child protection and gender mainstreaming. She explained how a lack of essential services disproportionately impacts the most vulnerable members of communities.

‘One in four people globally lack access to safe drinking water in their homes. The impacts are mostly felt by women, children and other vulnerable groups, many of whom have to collect water late at night,’ Machmud said.

‘So, it’s very important for us to be informed, empathise with and deeply understand each of the different needs and abilities in order to design WASH initiatives and policies that involve all people with diverse differences.

‘This toolkit provides recognition, respect and room, that every individual and group actually has the knowledge, experience and creative suggestions if given the space and opportunity [to contribute to infrastructure design].’

Shirleen Ali, Pacific Gender and Inclusion Senior Advisor at CARE Australia based in Fiji, agreed that women and girls bear the greatest burden of WASH, but are often excluded from planning, delivering and monitoring WASH activities.

‘Providing access to clean

water close to the home can dramatically reduce women’s workloads,’ Ali said. ‘It can not only free up time for other activities, but it can also enhance women’s roles and contributions to agricultural production, food security and business opportunities.

‘So access to WASH is crucial for poverty reduction, and also for achieving gender equality and social inclusion.’

Dr Dasha Moschonas, a doctoral graduate of RISE from Monash University’s Faculty of Art, Design & Architecture, led the production of the toolkit with RISE’s international teams – the culmination of four years of her PhD research on the RISE program.

An architect and expert in participatory design approaches, Moschonas designed the toolkit to be flexible, revolving around reflective questions for WASH teams to ask themselves, to make sure they are considering values of equality and inclusivity when embarking on designing infrastructure with communities and within interdisciplinary teams.

‘Much of the water and sanitation infrastructure or technologies installed during “humanitarian” or “development” projects come from high-resource settings and is often – mistakenly – seen by implementers as “neutral” or “apolitical”,’ Moschonas points out.

‘But when individuals or groups with certain identities are left out

of the design process, practitioners run the risk of designing solutions that don’t work for everyone – and may actually cause harm.

‘The point of these resources is to bring diverse teams and diverse ideas together to genuinely reflect on inclusivity when designing WASH projects. That is the only way they can be successful.’ ■

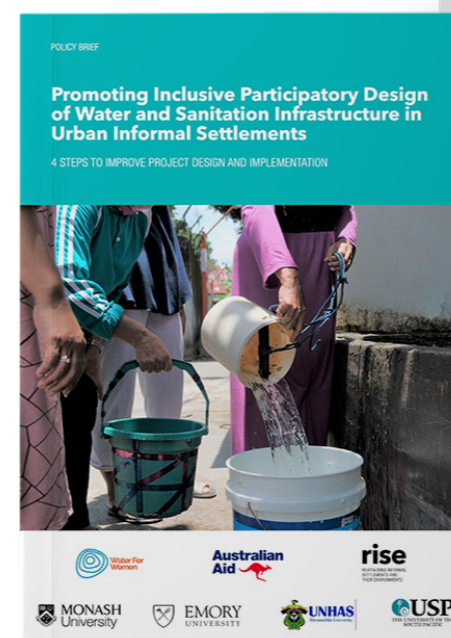
Visit [www.reflect-on.org](http://www.reflect-on.org) to learn how you can put these tools into action in your next WASH project.



**‘RISE’s water-sensitive approach shows itself to be highly inclusive and adaptable to different local contexts – thanks to its model of engaging deeply with communities of all ages, genders and abilities.’**

Alison Baker

RISE International Development Advisory Board  
Technical Director, International Development Assistance,  
GHD





## Enabling transdisciplinary research collaboration for planetary health

### Making space for diverse knowledge and perspectives to unleash transformative action on sustainable development.

Transdisciplinary collaboration aims to bridge academic, government, community and private sectors to accelerate collective action on the United Nations Sustainable Development Goals.

However, different value sets, perspectives and interests can present challenges to implementation and coordination. PhD researcher Jane Wardani seeks to understand the essence of collaboration across these diverse stakeholder groups, and design processes that better enable collaborative practice for sustainable development.

“Leaving no one behind” in the pursuit of the 2030 Agenda for Sustainable Development, means we have an ethical obligation to be inclusive in defining challenges, developing potential solutions, and ensuring equitable outcomes,” explains Wardani. “Recent decades have seen unprecedented

globalisation and deepening North-South inequalities. This work is about deepening our collective understanding of the process of transdisciplinary collaboration in these changing global contexts, and seeing how we might address challenges of integration amidst diverse knowledge systems.”

A literature review conducted by Wardani and colleagues from the Monash Sustainable Development Institute and Monash Faculty of Art, Design & Architecture, synthesises lessons learned from 36 transdisciplinary research projects over two decades across the fields of environment sustainability, public health and development.

“We found structural factors to be the most constraining on collaboration. This includes academia’s deeply entrenched disciplinary traditions, shaping the perception of interdisciplinary research as a risk and potential delay to getting research published; as well as the local contexts where the research is conducted, presenting differences in languages, cultural nuances, and power dynamics,” says Wardani.

In this sense, funders have a unique opportunity to positively influence collaboration through dynamic project design, building capacity for individual researchers, and serving as incubators for research and development practice that break down silos and transcend diverse knowledge systems.

To truly embrace its potential for transformative action, Wardani says transdisciplinary collaboration must equally value diverse systems of knowledge – including scientific knowledge, local knowledge, Indigenous knowledge, and others. “Some of these knowledge systems have been tried and tested over thousands of years – from Traditional Chinese Medicine to Ayurveda from the Indian sub-continent. Recent scientific inquiry has mounted good evidence supporting their myriad benefits. The biggest societal challenges of the age may require solutions from unexpected sources beyond our generation’s capacity”.

Findings further suggest that successful collaboration relies on relational work, such as interpersonal communication, relationships and trust building. To encourage inclusion, actors

*A Torajan woman participating in RISE. Interweaving diverse perspectives could transform the way we co-create effective and equitable solutions to global challenges.*



should reflect on potential power imbalances to ensure all knowledge and voices are considered.

“Regardless of our disciplines, experiences and cultural backgrounds, we can each bring something to the table. It is through recognising our common humanity that we can remain open, curious, and appreciate different perspectives.” ■

### Read more →

Wardani, J., Bos, J., Ramirez-Lovering, D., et al. [Enabling transdisciplinary research collaboration for planetary health: Insights from practice at the environment-health-development nexus](#). *Sustainable Development* 30, 375–392 (2022).



Informal settlement residents are on the frontlines of climate change impacts, disproportionately impacted by flooding, sea level rise and extreme weather.



## Flood disasters and health among the urban poor

### Understanding community vulnerabilities to floods and their health impacts, to support better risk reduction measures.

Floods are the single most common type of disaster in Indonesia, and their frequency and intensity is set to increase

over time under the influence of climate change. Despite recognition that the people at highest risk of flooding tend to be extremely poor, little is known about how these frequent shocks impact on their health, especially their mental health. RISE PhD researcher Michelle Escobar Carías and her team at Monash University's Centre for Health Economics shed new light on the health burden following flood exposure.

'While floods are the most common type of disaster in Indonesia, there is a lot we don't know, such as whether floods

affect urban poor living in formal housing differently from those in informal settlements, or what the effects are on child mental health,' explains Escobar. 'Our research shows that each flood event further depletes the physical and mental health of Indonesian adults and children, but especially the poorest of the poor.'

The research uses two longitudinal datasets of low-income groups. The Indonesia Family Life Survey allowed the study of the impacts of flood events on the urban poor living in formal neighbourhoods; while RISE survey data allowed examination

amongst the poor living in informal settlements.

'We measured changes in physical and mental health status following a flood, while controlling for other events and policies that could have occurred at the provincial or settlement level. We found that not only do the urban poor experience significant increases in acute morbidities and depressive symptoms following floods, but that these negative mental health effects are detectable for up to five years post-flood.'

The team found that children's mental health is even more affected than adults, with a 78

per cent increase in emotional difficulties almost one-year post-shock.

The urban poor have the lowest means to cope with disasters, while at the same time being the most vulnerable and having limited access to mental health services.

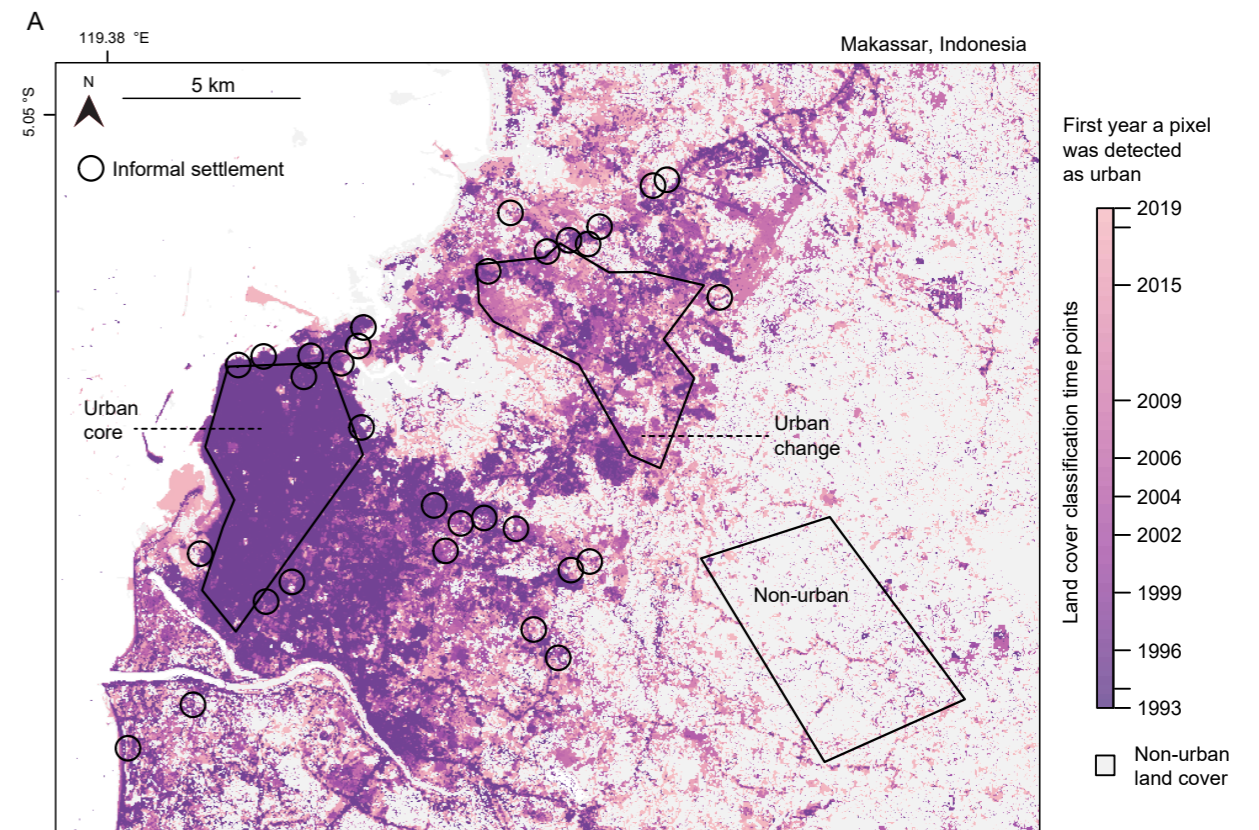
'We find that part of the lasting mental health effects could be caused by financial stress caused by floods, through higher medical bills, the acquisition of debt, and the depletion of household assets.'

For Escobar, the findings are a useful tool for public health

authorities to improve the surge capacity of health centres post-flood. She also points out, 'the connection between the financial burden caused by flood exposure and the mental health effects point to the need for financial aid instruments that local authorities could consider to reduce or prevent these negative health effects.' ■

### Read more →

Escobar, M., Johnston, D., Knott, R., et al. [Flood disasters and health among the urban poor](#). *Health Economics* 31, 2072–2089 (2022).



Urban growth in Makassar, Indonesia, from remote-sensed satellite data.

## Urbanisation drives urban heat islands, threatens liveability

### The case for nature-based solutions to keep cities cool.

The city of Makassar in Indonesia has nearly tripled in size over the past 30 years. This growth has been accompanied by the expansion of urban heat islands – where a city experiences much warmer temperatures than nearby rural areas. While urbanisation

shows no signs of slowing, RISE PhD researcher Emma Ramsay and colleagues at Monash University's Faculty of Science are investigating how urban heat can be mitigated.

'Across the city of Makassar, informal settlements are exposed to large urban heat islands. And ongoing expansion of informal settlements will only exacerbate hot and humid conditions in these communities,' Ramsay explains. 'But informal settlements are rarely considered in urban heat island analyses, partly due to a lack of spatial data. Weather stations are also often located on the outskirts

of cities, making it difficult to compare data from urban and non-urban locations.

'Our research sets out to explore past trends of urbanisation so that we might understand how urban heat islands could continue to develop with ongoing urbanisation and climate change.'

The research uses 30 years of NASA Landsat satellite imagery going back to the 1990s. This allowed the team to 'look back in time' and track urbanisation and the accompanying urban heat islands over the past three decades. Satellite data also helped provide a continuous picture across space. Local

temperature monitoring in RISE informal settlements corroborated the remote-sensing approach, showing that the surface temperature is, in fact, representative of conditions that people experience on the ground.

'We know that heat stress is chronic in the RISE informal settlements, and that residents have little capacity to adapt,' Ramsay says. 'And while informal settlements are exposed to large urban heat islands, we found that thanks to their proximity to green and blue space, they are protected from the worst heat in the urban core.'

Characterising the magnitude and spatio-temporal patterns of urban heat islands in informal settlements is essential. The findings highlight the importance of maintaining green space in cities through sustainable urban design to mitigate the health and economic burdens of heat exposure.

'Nature-based solutions, such as those being trialled by RISE, represent a solution to maintaining this green and blue space in communities, while delivering much-needed water and sanitation services,' Ramsay says. ■

### Read more →

Ramsay, E., Duffy, G., Burge, K., et al. [Spatio-temporal development of the urban heat island in a socioeconomically diverse tropical city.](#) *Environmental Pollution* 316, 120443 (2022).



## Accounting for local flood knowledge in citizen science: Discussing resilience and adaptation to the effects of climate change through a flood-monitoring project

PhD thesis by Dr Erich Wolff, Monash University, Faculty of Art, Design & Architecture

**As floods increasingly impact urban areas globally, it is important that engineers and urban planners review the ways in which disaster mitigation has been conducted in the past.**

My research uses citizen science to advance the argument that communities can play a key role in monitoring the effects of climate change and informing the adaptation of cities to floods.

Within the RISE program, my research partnered with members of the participating communities to study floods in Indonesia and Fiji. Collaborating with our teams in Makassar and Suva, I managed a citizen science project that received more than 5,000 photos of floods taken by residents of settlements participating in RISE between 2018 and 2020.

Based on these photos, we assessed the risk of flooding in the settlements which, in turn, helped us design RISE wetland systems. This process was key to designing the wetland systems, as it provided scientists with valuable flood data, while also creating opportunities for communities to be continuously involved in the design of the program.

My research also used interviews with community members to further understand how the residents of Makassar, Indonesia, have developed local knowledge and adapted to live in flood-prone sites. The interviews showed that the communities have a deep knowledge of floods based on lived experiences, which was further expanded through the participation in the citizen science flood-monitoring project.

Our research, therefore, points to important strategies that can be used to create platforms for collaboration between local communities and decision-makers. These collaborations are essential to allow for residents to voice their concerns, and influence disaster risk reduction strategies.

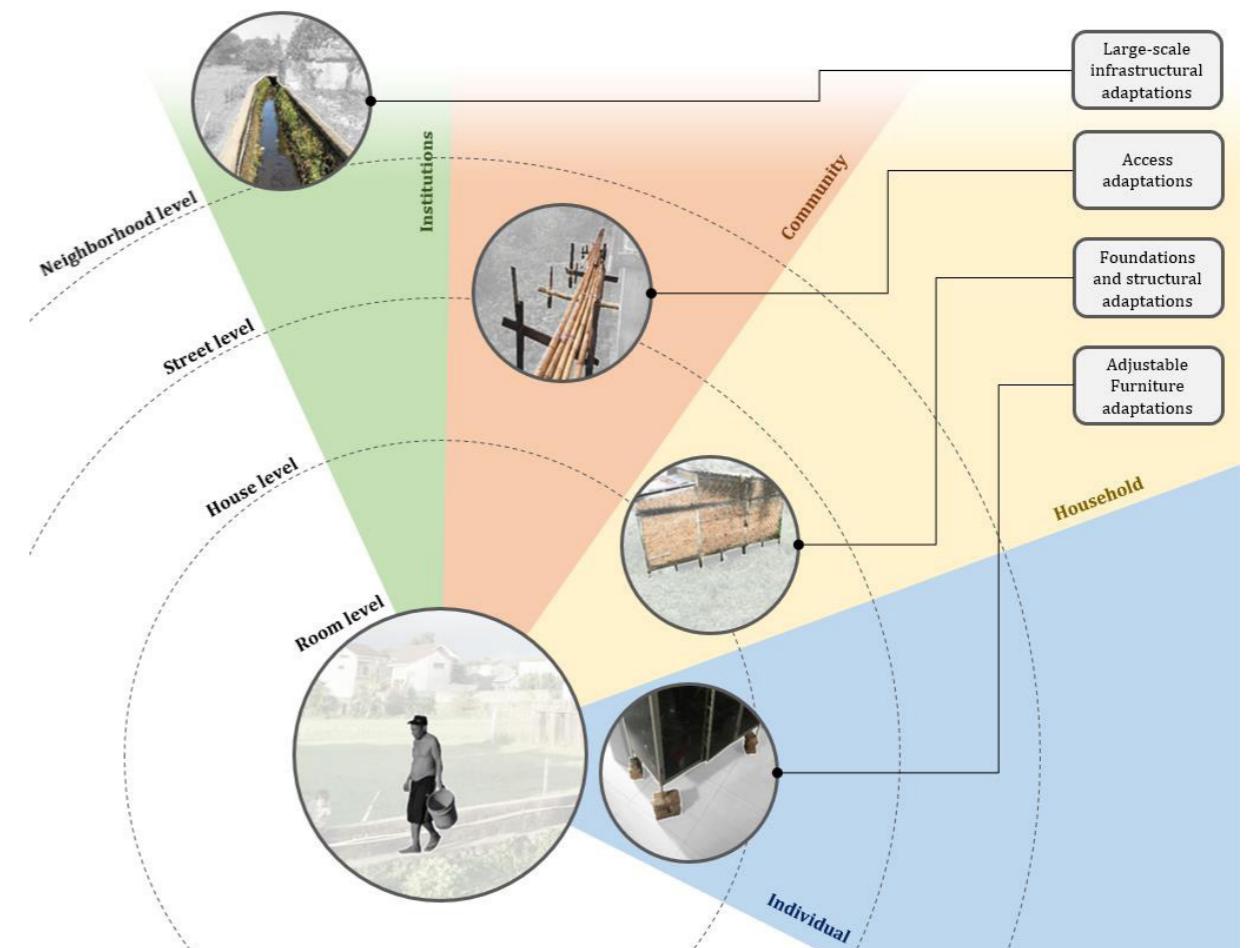
This work provided insights into how communities can meaningfully participate in the implementation of resilience-building and climate adaptation plans through participatory research methods. This collaboration can happen through mobile applications, social media or research projects using community-based

approaches, such as citizen science and participatory mapping, which draw on local flood knowledge and collaborative action.

This is significant because it offers opportunities to reshape fields such as infrastructure design and flood modelling, which are often considered technocratic and inaccessible to the general public. These participatory approaches can offer important ways forward to ensure the fair and equitable implementation of nature-based solutions and water-sensitive options, such as RISE's wetland systems. ■

*Since completing his doctoral studies in 2022, Erich has joined the Asian School of the Environment and the Earth Observatory of Singapore, where he continues to research nature-based solutions in the region including projects in Indonesia, Thailand and the Solomon Islands.*

[Read the thesis →](#)



Framework to classify adaptation measures in Makassar. The four colours in the diagram represent the different agents involved in adaptations to floods in the Batua (RISE demonstration site) canal area.

[Read more →](#)

Wolff, E., French, M., Ilhamsyah, N., et al. [Collaborating With Communities: Citizen Science Flood Monitoring in Urban Informal Settlements](#). *Urban Planning* 6, 351-364 (2021).

[Read more →](#)

Wolff, E. [The promise of a "people-centred" approach to floods: Types of participation in the global literature of citizen science and community-based flood risk reduction in the context of the Sendai Framework](#). *Progress in Disaster Resilience* 10, 100171 (2021).



Residents and first-response teams work together to help neighbours evacuate houses during flooding in 2019.



## Mainstreaming children's participation in urban planning processes for vulnerable settings

PhD thesis by Dr Robyn Mansfield,  
Monash Sustainable Development Institute

**Vulnerability to hazards is a global problem, drastically impacting the ability to achieve the Sustainable Development Goals (SDGs).**

Progress reports towards achieving the Sustainable Development Goals call for a participatory approach to human settlement planning. Despite this, the population group of children is one of the most vulnerable and excluded groups, disproportionately affected by extreme poverty and disasters, and perpetually excluded from urban planning processes.

Achieving participatory and inclusive structures in planning and decision-making requires the voices of children to be incorporated into our systems. While SDG target 11.3 calls for 'inclusive and sustainable urbanization and capacities for participatory, integrated and sustainable human settlement planning and management in all countries', children are systematically excluded from decision-making in urban planning structures. Children's lived experiences vary considerably to that of adults, and they are greatly impacted by the governance and decision-making systems that impact the built environment. Yet their knowledge is systematically

ignored or misunderstood. The causes of this exclusion and understanding of how to mainstream their participation is limited, particularly in the most vulnerable of settings.

The aim of my research was to identify the core problem leading to children's exclusion from urban planning processes for vulnerable settings. I examined this through a series of empirical case studies, which included RISE Fiji as a key case study. The RISE case study used an institutional logics framework to determine the barriers and enablers to children's participation in RISE Fiji. The impact of children's participation in RISE Fiji was also explored.

The findings provide insight into the role of individuals in creating a participatory culture, the impacts of organisational factors on children's participation, and expands knowledge on types of participation and their impacts. The findings also demonstrate that inclusion or exclusion of children from urban planning processes impacts whole communities, and the implications of exclusion or poor participation can be extremely detrimental, with the potential to last generations.

Overall, the findings provide practical opportunities for

practitioners working in urban planning processes to overcome barriers to participation and influence organisational change to support mainstreaming of children's participation.

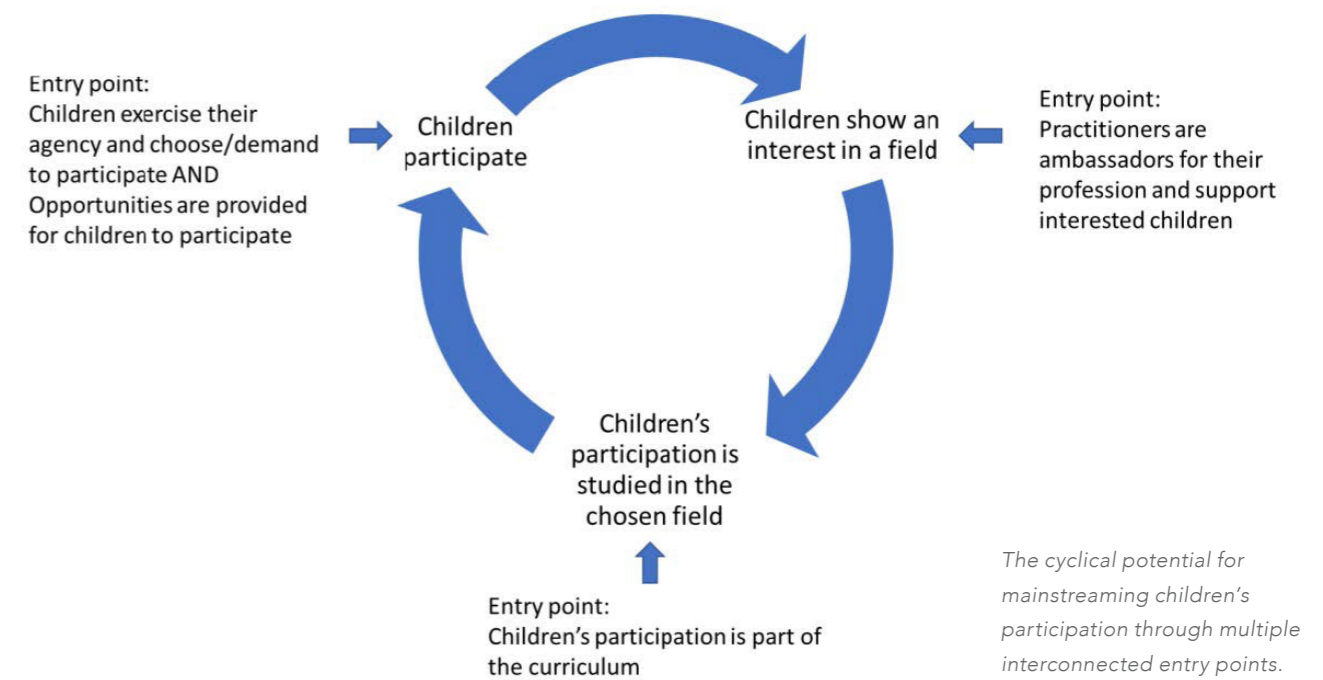
This research presents a way forward that challenges our existing approaches to participation, demonstrating how practitioners, academics, policy-makers and civil society can challenge and transform existing systems to tap into the transformative potential that children can offer towards achieving SDG 11.

I'm most proud that I have been able to use my research throughout the thesis to help organisations strengthen their inclusion of children in their processes, and I hope to continue this influence with upcoming presentations and consultancy work. ■

[Read the thesis →](#)

[Read more →](#)

Mansfield, R., Batagol, B., Raven, R. "Critical agents of change?" *Opportunities and Limits to Children's Participation in Urban Planning*. *Journal of Planning Literature* 36, 170-186 (2021)





### Leah Barrett, Faculty of Engineering

My research focuses on the potential use of microbial source tracking (MST) within informal settlements, and how this may be used to inform a quantitative microbial risk assessment. I will be looking into the sensitivity of MST methods when exposed to conditions typical of informal settlements, such as tropical weather and frequent flooding. I will also be exploring the variation in local microbiomes and potential species overlap of host-specific markers, to establish specificity of methods, with the aim of understanding the geographic scale that MST methods must be designed and implemented in order to be successful.

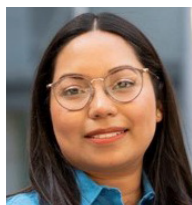
I am in the first year of my PhD. And I hope to use a multidisciplinary approach to combine data collected through many of the RISE objectives to address my research questions. I'm optimistic that this research will be of use in environmental faecal contamination monitoring and risk assessment in under-studied environments.



### Lamiya Bata, Faculty of Engineering

My PhD is testing and validating alternative methods to sampling novel and composite soil and surfaces, to better understand the risk of diarrhoeal pathogen transmission through these pathways. My research aims to capture pathogen data from contexts like high-touch indoor and outdoor surfaces frequently accessed by young children, providing insights on their exposure risks. This will be followed by the opportunity to develop mitigation strategies that work to reduce the burden of disease in vulnerable populations.

This year I tested and validated surface sampling methods in indoor settings. After months of laboratory experiments I travelled to Fiji, where informal settlement residents kindly opened their communities for me to validate my lab work in the field. Field trips are always a valuable learning experience. I cannot overstate my appreciation for the RISE Fiji and Indonesia teams for their support, and for the communities who continue to welcome researchers into their world. These learnings provide invaluable real-world context to pathogen transmission in peoples' environments.



### Michelle Escobar Carías, Faculty of Business and Economics

I am a PhD candidate at Monash University's Centre for Health Economics, and my thesis focuses on the effects of environmental shocks on the health and economic preferences of people in developing countries.

The first paper of my thesis studies the effects of floods on morbidities, adult depression and child emotional functioning of the Indonesian urban poor. This work has been published in the journal 'Health Economics' under the title "[Flood Disasters and Health among the Urban Poor](#)".

My [second paper](#) studies how temperature influences the rationality, risk aversion and impatience of Indonesian adults, and what are the mechanisms behind this relationship. This work is currently under review in one of the leading economics journals.

My third paper studies how heat stress affects the health and vitality of informal settlement residents, and how effective are the mechanisms they use to protect their homes from high indoor temperature.

My findings have been presented at 18 international conferences in the areas of development, health and environmental economics.



### Brendan Josey, Faculty of Art, Design & Architecture

My PhD documents the evolution of form within the built environment in informal settlements participating in RISE in Makassar, Indonesia. I am exploring household-led construction practices, and the ways in which they interact with RISE's implementation of water and sanitation infrastructure. In particular, my research seeks to understand how rapid incremental urban changes may affect the applicability and implementation of in-situ urban upgrading and revitalisation of vulnerable communities, particularly through a water-sensitive approach.

My book chapter ([Temporary Appropriation \(of Space\), Makassar, and Urban Kampung](#)) explores how, the ways in which people temporarily claim space may inform the design and implementation of in-situ informal settlement upgrading projects, by giving a greater contextual understanding of existing urban dynamics, and spatial use patterns. With my final milestone complete, I am just about to successfully complete my doctorate.



### Emma Ramsay, Faculty of Science

I am a PhD Researcher working with RISE's ecology and environment team. I am proud to have submitted my PhD thesis this year and am extremely grateful for the support and collaborations I have had across all parts of RISE. My research focuses on the impacts of local and global climate warming for people living in informal settlements throughout the tropics. I am interested in both the direct impacts of heat stress on people's health and wellbeing, as well as the indirect impacts of altered patterns of mosquito disease vectors.

The first two chapters of my thesis have been published, [quantifying urban heat islands](#), and [heat stress exposure in Makassar, Indonesia](#). I am finalising my last piece of work which looks at how thermal and environmental variation affects the abundance of mosquito disease vectors across cities.



### Hannah Turner, Monash Sustainable Development Institute

My PhD explores the behaviours and practices that residents in informal urban settlements adopt to protect themselves from flood impacts in Suva, Fiji. I have worked closely with the RISE Fiji team, training them in my research framework, and collaborating to pilot, and then roll out my data collection methodology across communities participating in RISE.

I am now in the process of data analysis, having collected interviews and photovoice data (photographs) from 42 households at risk of flooding across 10 RISE settlements. I anticipate the empirical data will reveal new understandings of the key factors that influence the ways in which informal settlement residents protect themselves, their families and their communities from flood impacts.



### Jane Wardani, Monash Sustainable Development Institute

My PhD aims to deepen understanding of the process of collaboration in transdisciplinary research for planetary health. My first academic paper is a literature review of lessons learned from transdisciplinary research practices at the environment-health-development nexus, which has been accepted for publication in *Sustainable Development* (see pg 36).

RISE has offered a truly unique context as a case study, combining a vast variety of knowledge stakeholders: from built environment and health disciplines, academic, government, community and private sectors, and a number of high-income and low- and middle-income countries. I am currently in the data analysis stage of the research, which has been inspiring in its richness and complexity. With deepened theoretical and empirical understanding, I hope to develop suggestions and strategies for the practice of transdisciplinary collaboration that can help optimise process design and outcomes for all stakeholders.

## Maintaining excellence in research and infrastructure delivery

### International Scientific Advisory Panel

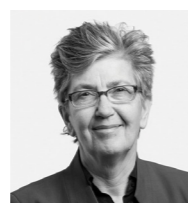
RISE's International Scientific Advisory Panel comprises seven distinguished experts from a range of fields and institutions, who provide independent advice on the scientific integrity of the program.

This year, convening in-person for the first time since November 2019, the Panel dug into discussions on the realities of implementing the built intervention, and how real-world events can be dealt with within a randomised control trial (RCT) framework.

Acknowledging the dedication and perseverance of the RISE team over recent years to overcome the challenges and impacts of COVID-19, invaluable insights continue to be shared and debated in order to maintain the rigour of the RCT. ■



**Ted Bianco** (Chair)  
Independent Advisor; Honorary Professor, Monash Sustainable Development Institute; former Director of Innovations & Acting Director, Wellcome Trust



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



**Karen Coelho**  
Associate Professor, Madras Institute for Development Studies



**Diana Wall**  
University Distinguished Professor, Department of Biology; and Director, School of Global Environmental Sustainability, Colorado State University



**Christopher Dye**  
Visiting Professor of Zoology, Oxford University; Former Director of Strategy, Office of the Director General, World Health Organization



**Sarah Bell**  
City of Melbourne Chair in Urban Resilience and Innovation



**Paul Hunter**  
Professor in Medicine, Norwich Medical School, University of East Anglia

### International Development Advisory Board

RISE's International Development Advisory Board provides strategic oversight to the construction implementation of the program's water and sanitation infrastructure. Members bring a range of expertise at the intersections of international development, construction oversight and management.

At this year's meeting, the Board discussed the important role RISE's evidence will play in evaluating the success of the program, and opportunities to upscale the intervention.

RISE's nature-positive approach to protecting community health and wellbeing is seen as promising. And showcasing how the RISE approach is replicable, adaptable and can maximise local conditions will continue to be a priority. ■



**Matthew French** (Chair)  
Director, Research Missions and Global Impact, Monash University



**Alison Baker**  
Technical Director, International Development Assistance, GHD



**Sumila Gulyani**  
Program Leader for Infrastructure and Sustainable Development, India, World Bank



**Anthea Spinks**  
Director of Programs, Oxfam Australia



**Sarah Mecartney**  
Principal Strategy Advisor, Pacific Community (SPC)



**Joris Van Etten**  
Senior Urban Development Specialist, Southeast Urban Development and Water Division, Asian Development Bank



**Christian Nielsen**  
Executive Director, Live & Learn Environmental Education



**Dan Sullivan**  
Chief Executive Officer, Iota Services

# Global partnerships



MONASH  
SUSTAINABLE  
DEVELOPMENT  
INSTITUTE



RISE is led by Monash University which is Australia's largest university and a member of the 'Group of Eight'. RISE incorporates diverse expertise from across the University, including six faculties: Art, Design and Architecture (MADA); Science; Medicine, Nursing and Health Sciences (MNHS); Engineering; Business and Economics; and Law.

RISE is anchored within the Monash Sustainable Development Institute (MSDI). As one of the leading research and education institutes for sustainable development in the Asia-Pacific region, MSDI is driven to find real solutions to some of the most significant challenges facing our world today. MSDI provides a cross-faculty, interdisciplinary platform to bring diverse partners together to collaborate, to educate, to take action — and to make a real difference.



## Wellcome Trust

Wellcome Trust is funding the research components of RISE 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.



## New Zealand Ministry of Foreign Affairs and Trade

The New Zealand aid program invests in sustainable development, climate change mitigation and adaptation, and poverty reduction. The New Zealand Government is co-funding the revitalisation projects for RISE's informal settlements in Suva.



## Australian Department of Foreign Affairs and Trade

Australia's aid program focuses on sustainable economic growth and poverty reduction. Through its Water for Women fund, the Australian Government is funding a sub-study within RISE to generate evidence on how women and girls are engaged when designing water and sanitation services. The Australian Government is funding the construction of settlement upgrades in Makassar via the KIAT facility.



## Hasanuddin University (UnHas)

UnHas is a foundational partner of RISE through the Faculty of Public Health. UnHas leads the local delivery of the RISE assessment program in Makassar across all 12 settlements, and hosts the RISE laboratory. RISE also partners with the Faculty of Engineering to support implementation of design and engagement. UnHas, located in Makassar, is one of the largest autonomous universities in Indonesia.



## City of Makassar

With a population of more than 1 million, and the largest city in Eastern Indonesia, Makassar has a vision to be a leading sustainable, thriving city in the region. With strong political partnership, the RISE intervention is led by the City of Makassar through a Project Management Unit that provides direct support to the program.



## 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.



## Ministry of National Planning

Along with other ministries, the Ministry of National Planning (BAPPENAS) of Indonesia is a key supporter of RISE. As the institution leading Indonesia's national development plans, it is essential that RISE fits into the President's vision and mission into development priority programs and targets, for the country's sustainable development, based on evidence and new knowledge.



## Indonesia Australia Partnership for Infrastructure

The Indonesia Australia Partnership for Infrastructure (KIAT) is a partnership between the governments of Australia and Indonesia to support sustainable and inclusive economic growth through improved access to infrastructure for all people. Through KIAT, the Australian Government is supporting upgrades in RISE's first tranche of settlements in Makassar.



## Fiji National University (FNU)

The FNU College of Medicine, Nursing and Health Sciences, through the Fiji Institute of Pacific Health Research, is a core foundational partner of the RISE program, hosting the RISE laboratory and leading the implementation of the research program in Fiji across all 12 settlements.



## Water Authority of Fiji

The Water Authority of Fiji (WAF) 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 operation and maintenance of the built interventions.



## Ministry of Housing and Community Development

The Fiji Government, via the Ministry of Housing and Community Development (MHCD), is a core partner of RISE and the anchor point within the government for implementation of community upgrades.



## The University of the South Pacific (USP)

RISE is partnering with the USP School of Geography to support design and engagement research and the qualitative components of wellbeing studies, as well as supporting the implementation of RISE's Water for Women study.



### **Live & Learn Environmental Education**

Live & Learn Environmental Education (LLEE) has been a core delivery partner for RISE in Fiji since 2018 as the home of our local team and a local anchor point for the program. With strong community engagement practice and deep experience localising international development projects, LLEE is translating RISE's global work for the Fijian context.



### **Stanford University, Woods Institute for the Environment**

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 study 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. As Australia's leading comprehensive research-intensive university and host to some of the world's most distinguished medical researchers, the University of Melbourne strives to make a distinctive contribution to society.



### **University of Cambridge**

Working closely with the Wellcome Trust Sanger Institute, University of Cambridge is partnering with RISE to support the genomics work of the human and environmental research. Cambridge is committed to achieving excellence in research and scholarship, and to ensuring its research contributes to the wellbeing of society.



### **Wellcome Trust Sanger Institute**

Alongside University of Cambridge, the Wellcome Trust Sanger Institute is supporting the genomics work on human and environmental samples for the RISE program. The Wellcome Trust Sanger Institute is a non-profit British genomics and genetics research institute, primarily funded by the Wellcome Trust.



### **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.



### **Iota Services**

Iota Services, a commercial subsidiary of South East Water, supplies RISE's pressure sewers and OneBox systems as well as training for staff and informal settlement residents. Integral to the 'smart' infrastructure of the RISE intervention, the unit allows remote near real-time monitoring of RISE's pressure sewers.



### **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.



### **United Nations Human Settlements Programme**

UN-Habitat is the United Nations program which 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. With RISE a key vehicle to progressing a number of the Global Goals, the partnership is particularly focused on advancing urban planning, housing and land, water and climate change (SDGs 11, 6, 10 and 17).



### **United Nations University International Institute for Global Health (UNU-IIGH)**

The strategic partnership with UNU-IIGH will assist with translating RISE lessons and findings into global policy dialogues. The partnership will focus on the human health and wellbeing dimensions of RISE, particularly qualitative research in wellbeing. UNU-IIGH was established by the United Nations University and the World Health Organization in 2000 to address issues of global health and public health delivery systems.



### **WaterAid**

WaterAid is a global leader in water, sanitation and hygiene challenges, joining the RISE program as a strategic partner, End-User Advisory Panel member and strategic support provider. WaterAid is working towards getting water, toilets and hygiene to the millions of people still living without these basic human rights.



### **Oxfam**

Oxfam is a global leader in poverty reduction, disaster response and development. Oxfam supports the strategic direction of RISE, both at global and country levels, specifically as a member of the End-User Advisory Panel, and the Fiji In-Country Stakeholder Advisory Panel.



### **Asian Development Bank (ADB)**

The ADB 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.







**Together, we can transform human and environmental health.**

Thank you to the people and organisations who are supporting our ambitious program. As a global community, we can be part of ground-breaking research to transform human and environmental health in informal settlements across the world.

[rise-program.org/get-involved](http://rise-program.org/get-involved)

## CONTACT US

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**rise**  
REVITALISING INFORMAL  
SETTLEMENTS AND  
THEIR ENVIRONMENTS