WATER & WASH FUTURES 2022

Water, WASH and Climate Virtual Symposium

Welcome to the session

Nature-based and other sustainable WASH solutions to Climate Change

Australian WASH Reference Group

LEAD PARTNERS

Australian Aid

IWC International WaterCentre

Griffith UNIVERSITY Queensland, Australia

Water For Women

ADB

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THE AUSTRALIAN WATER PARTNERSHIP

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UTS Institute for Sustainable Futures

engineers without borders australia

The University Of Queensland AUSTRALIA

WCS

rise REVITALISING INFORMAL SETTLEMENTS AND THEIR ENVIRONMENTS

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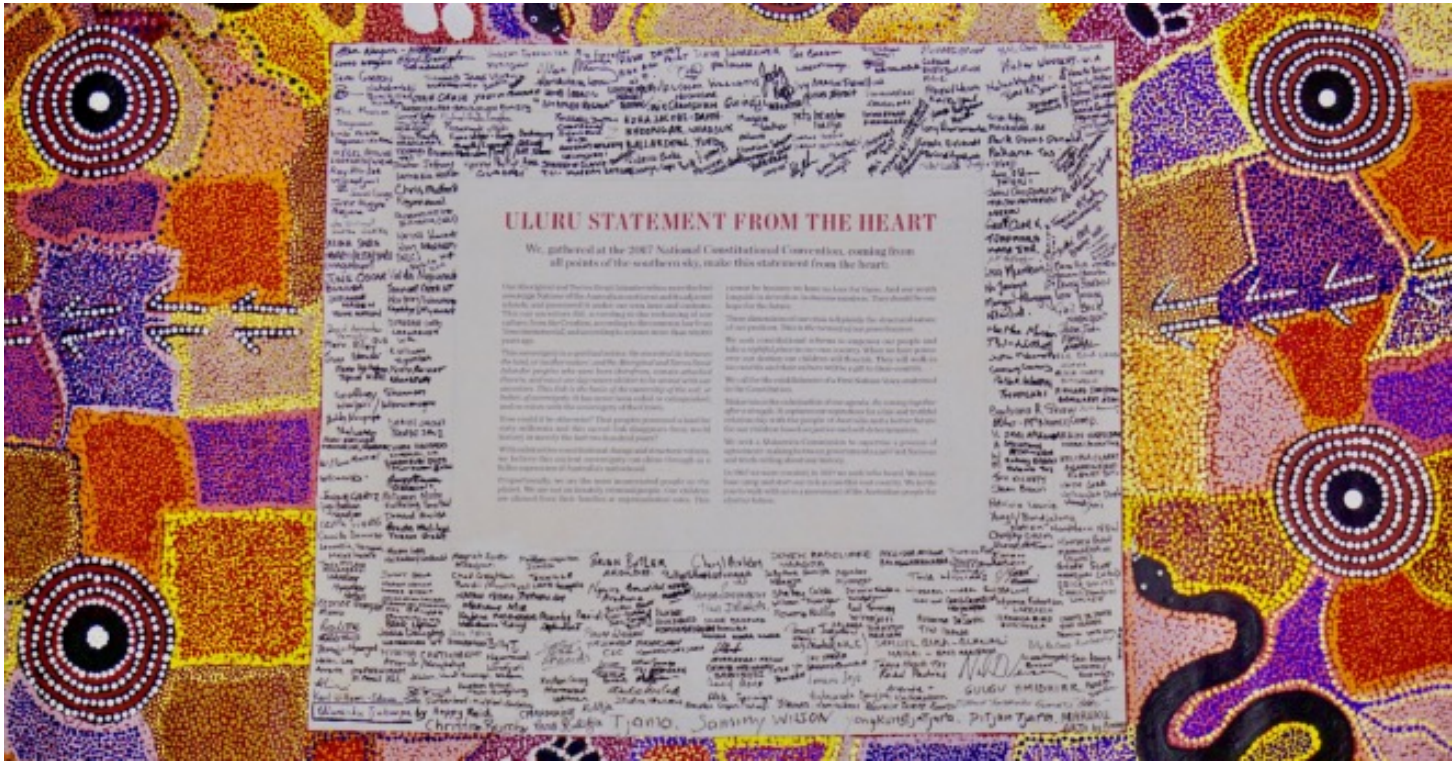
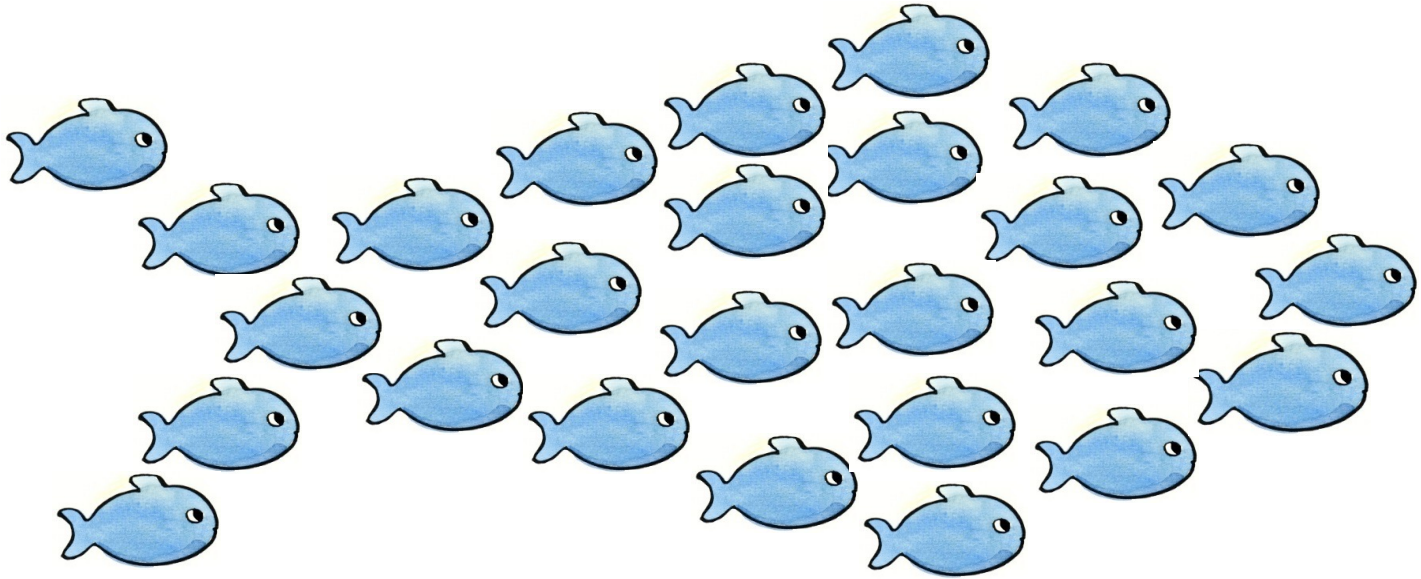
Uluru Statement from the Heart



The sum is more than the parts….



The Australian Water, Sanitation and Hygiene (WASH)

Reference Group

Background: WASH Reference Group (WRG)

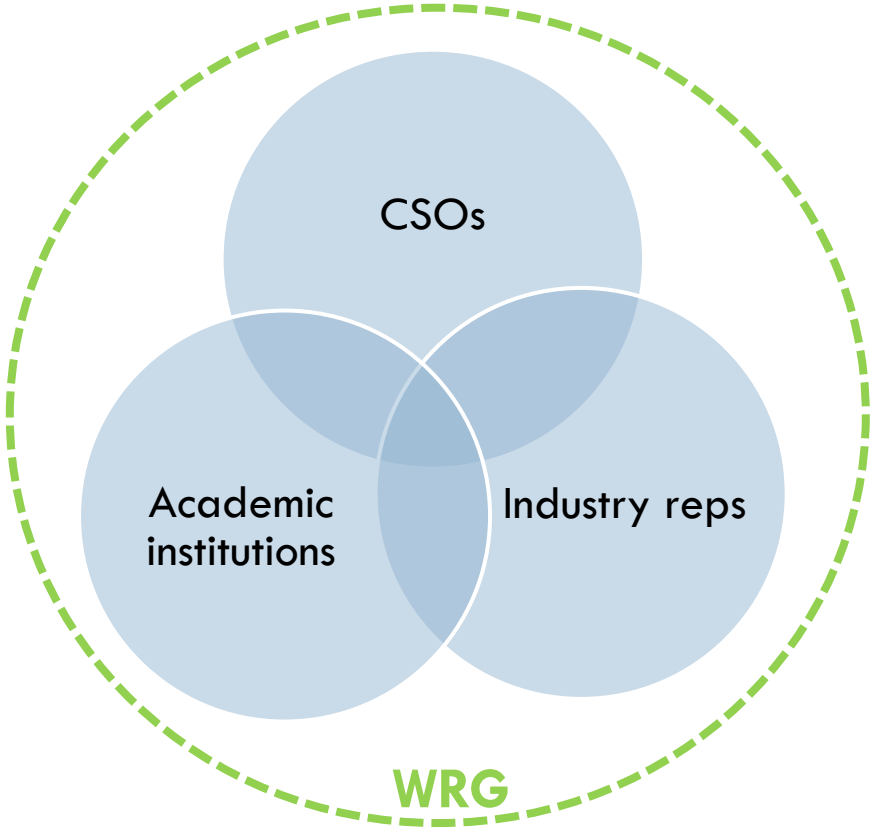
- The Australian WASH Reference Group is **15 years old** was formed in 2007 as an informal network of organisations working on water, sanitation and hygiene (WASH) in developing countries.
- As of 2022 the WRG has **38 members** from **27 organisations**, including non-government organisations, academic institutions and private consultants
- The WRG is led by an **Executive Committee** with representatives from: ISF-UTS, Plan, EWB, WaterAid, IWC, Live and Learn, Essential Need, Habitat for Humanity and UWA.

WRG Overall Aims

The long term aim of the group is to "*improve Australia's response to the global sanitation, hygiene and water crisis*" by seeking to:

1. Make water, sanitation and hygiene (WASH) a **priority for Australian Government** and development agencies.
2. **Mainstream WASH** within the Australian Government's aid and development policy and program.
3. Improve the **quality and volume** of Australia's foreign aid for WASH.
4. Strengthen the efforts and **improve the quality of WASH work of Australian NGOs, academic institutions and the private sector** through a Community of Practice, and facilitate learning and sharing amongst this group.

Ways of working



Advocacy
Evidence-based WASH

Linkages
Information sharing

- Parliamentarians
- DFAT
- Broader WASH and International Development Sector

Importance of this partnership model

- Collective voices are a stronger
- Strengthening of WASH policy and practice
- Leveraging skills, strengths and resources across the membership
- Provide DFAT with a direct connection point to CSOs and knowledge and research organisations working in WASH

Australian WASH Reference Group

What are our plans for 2022?

1) **New Government WASH briefing** – the importance of WASH in Australia's approach to foreign affairs, aid and diplomacy

Some key asks:

- Percentage of Australia's aid being spent on WASH is insufficient = **need more investment**
- Sanitation targets in particular will not be met with current models = **need more coherent and evidence-based approaches**
- Regional health security cannot be achieved without investment in WASH = **WASH prioritised in health security programs**
- WASH is a critical ingredient to climate resilience = **WASH prioritised in climate adaptation policy and practice**

What are our plans for 2022?

1. **Climate Change Learning event** (February 2022)
2. **WASH Symposium** (June 2022)
3. **Resources and information sharing**
4. **Monthly meetings with WRG**
5. **Regular meetings with DFAT**
6. Planning for longer-term **advocacy and sector leadership**
7. **Interested in joining?** Email Melita Grant or John Kelleher

Australian WASH Reference Group

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Leah Sertorio

engineers without borders australia

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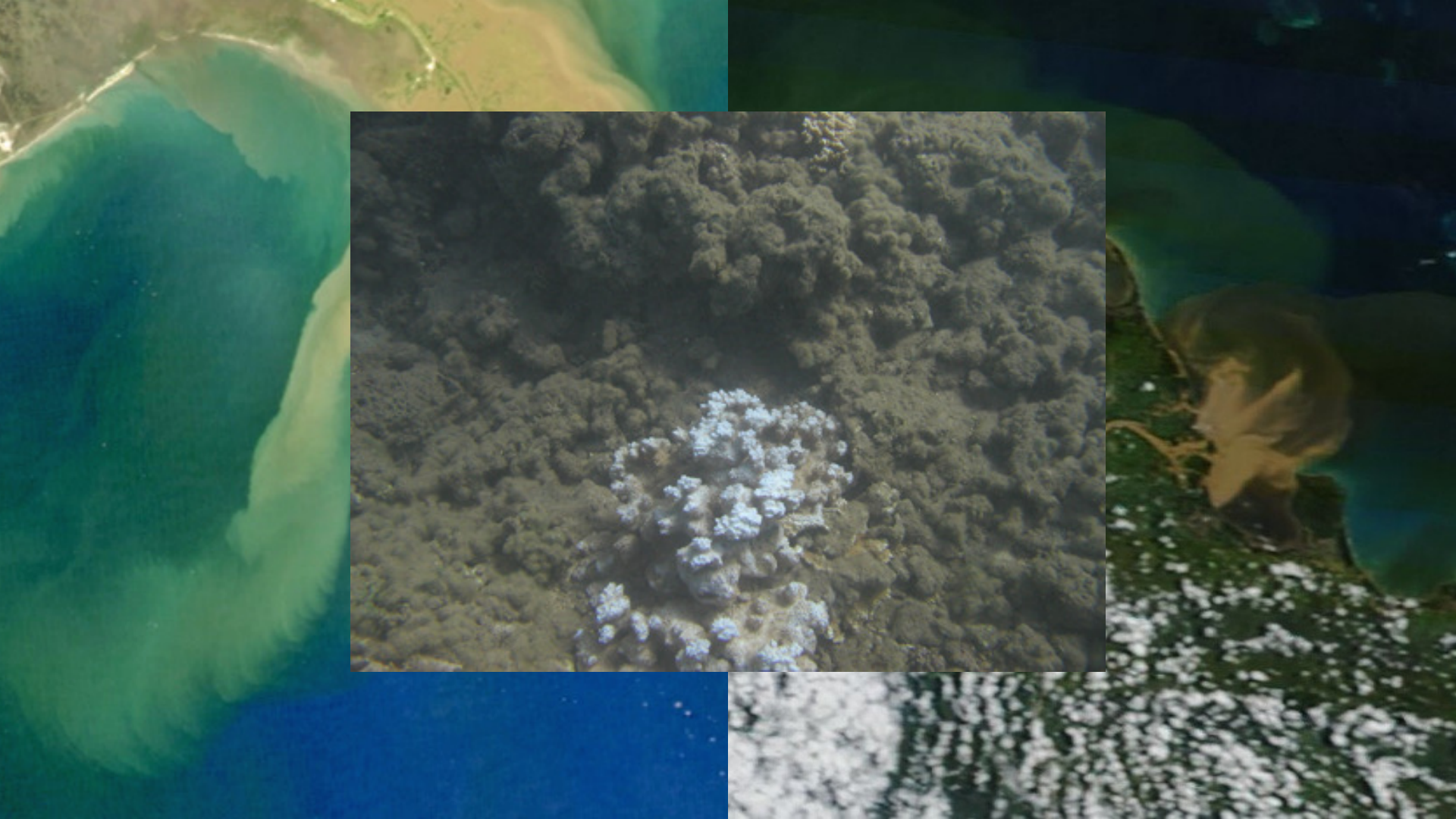
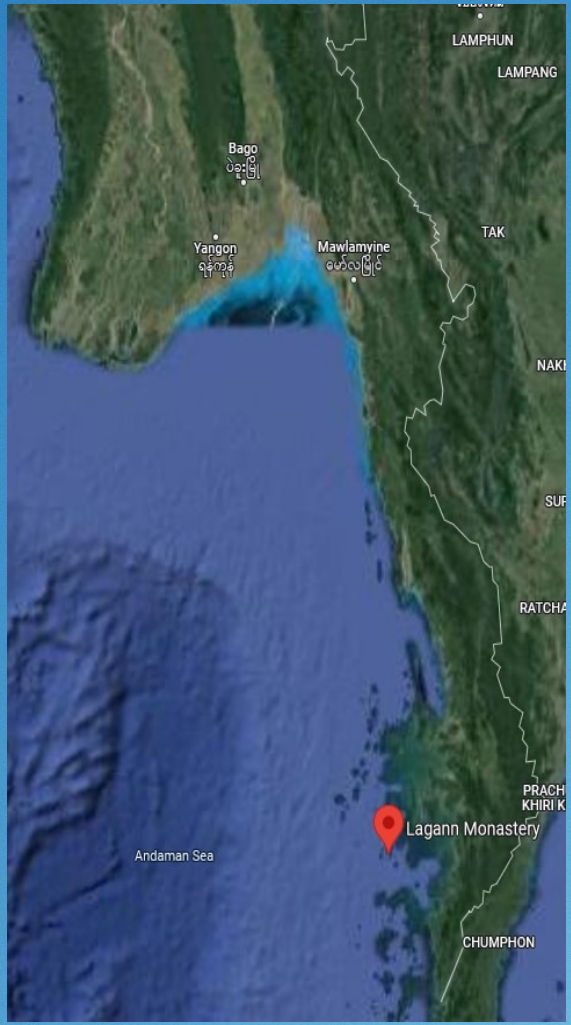
Managing Watersheds for Coral Reefs and Public Health

Dr Amelia Wenger
Associate Conservation Scientist, WCS;
Research Fellow, University of Queensland


probe

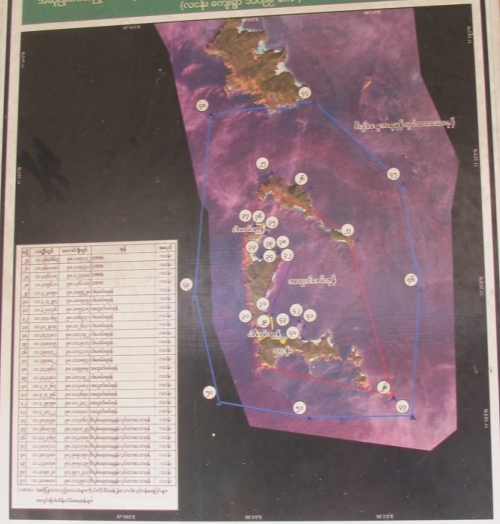


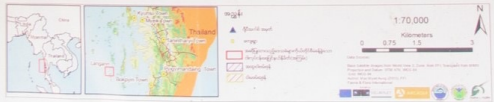

LAMPHUN
LAMPANG
Bago
ပဲခူး
Yangon
ရန်ကုန်
Mawlamyine
မော်လမြိုင်
TAK
NAKI
SUR
RATCHA
PRACH
KHIRI K
Lagann Monastery
Andaman Sea
CHUMPHON

ဘုတ်ပြင်းဖြို့နယ်၊ အလယ်မန်ကျေးရွာအုပ်စု၊
လင်နီးကျေးရွာ၏
ဒေသခံများကိုယ်တိုင်စီမံခန့်ခွဲသော ငါးလုပ်ငန်းရေပြင်ဧရိယာပြမြေပုံ

(Locally-managed Marine Areas)

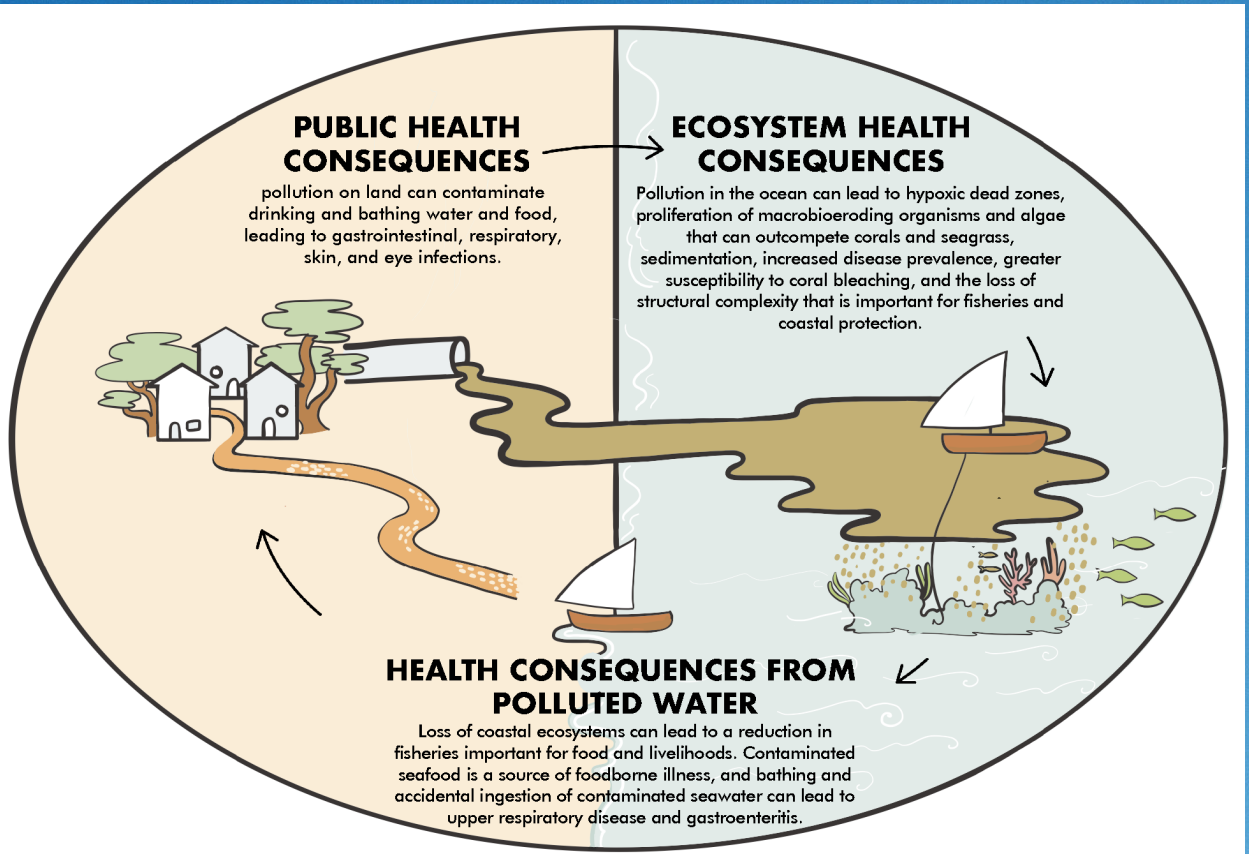
အဆိုပြုထားသည့်ဒေသခံများကိုယ်တိုင်စီမံခန့်ခွဲသောငါးလုပ်ငန်းရေပြင်များအတွင်းရှိ ငါးဖမ်းခွင့်ပြုထားသော/ကန့်သတ်ထားသောနေရာများ
(လင်နီး ကျေးရွာ ဘဝတွင် ဧကာ)

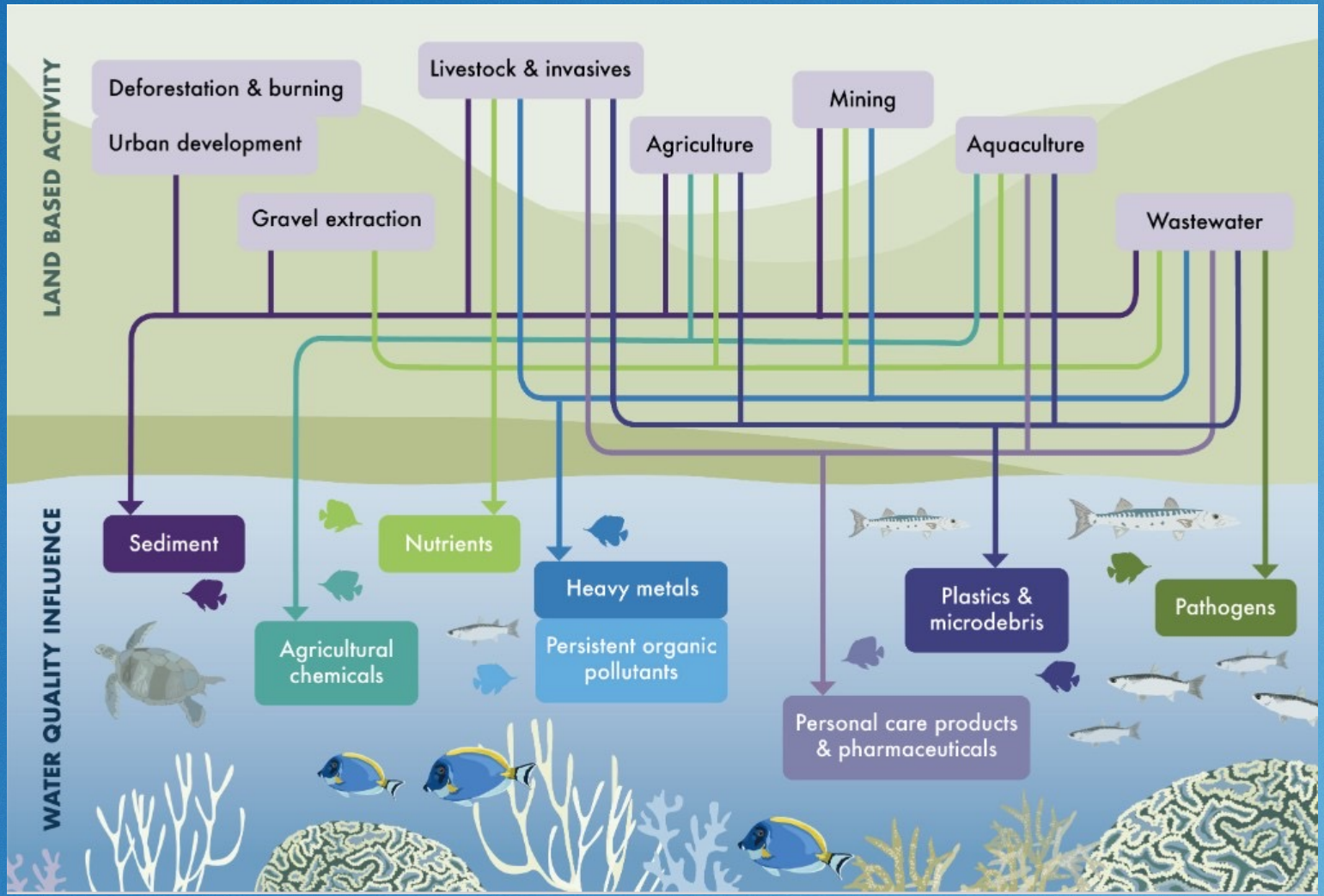


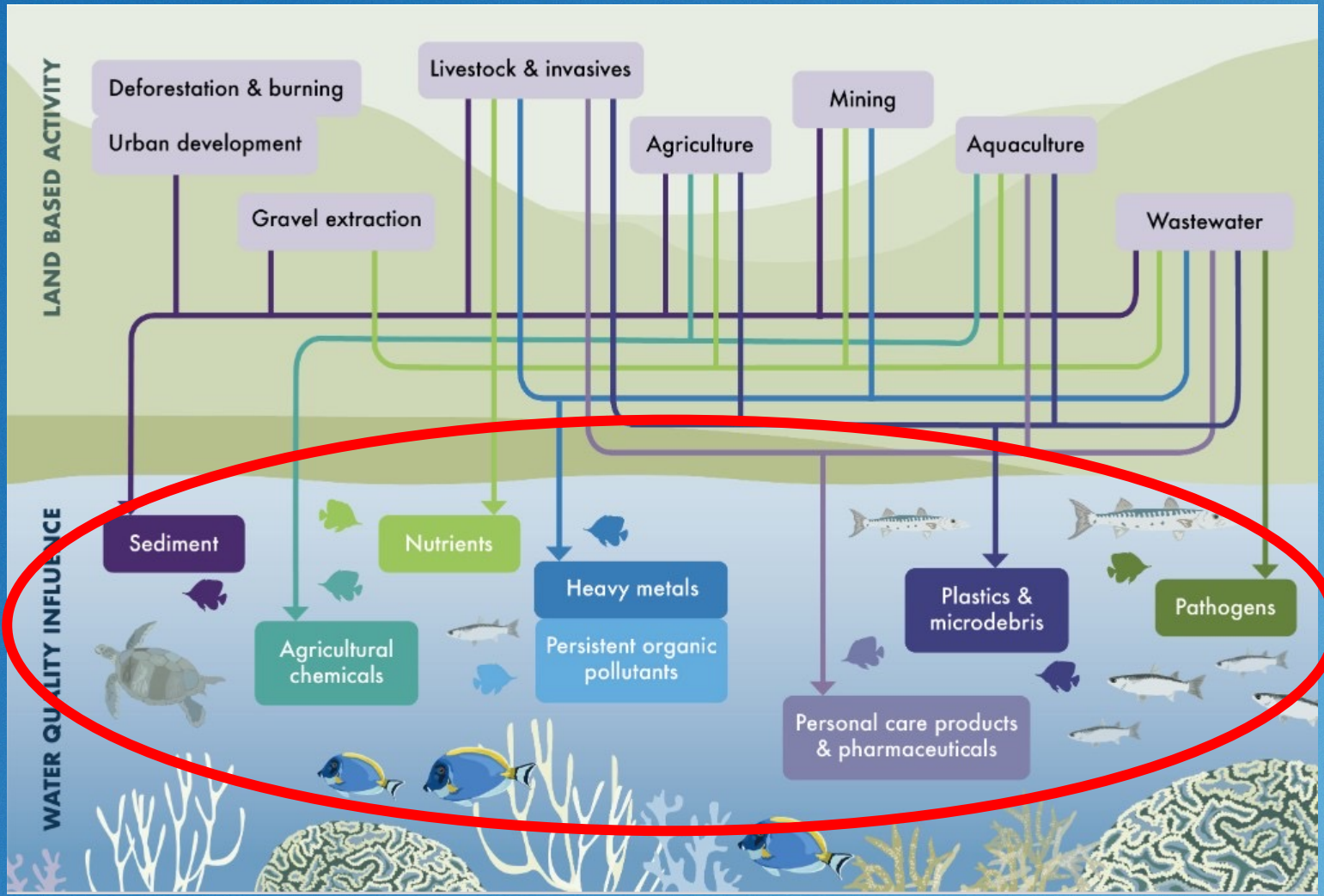


ARCADIA

HELMSLEY


PUBLIC HEALTH CONSEQUENCES
pollution on land can contaminate drinking and bathing water and food, leading to gastrointestinal, respiratory, skin, and eye infections.
ECOSYSTEM HEALTH CONSEQUENCES
Pollution in the ocean can lead to hypoxic dead zones, proliferation of macrobioeroding organisms and algae that can outcompete corals and seagrass, sedimentation, increased disease prevalence, greater susceptibility to coral bleaching, and the loss of structural complexity that is important for fisheries and coastal protection.
HEALTH CONSEQUENCES FROM POLLUTED WATER
Loss of coastal ecosystems can lead to a reduction in fisheries important for food and livelihoods. Contaminated seafood is a source of foodborne illness, and bathing and accidental ingestion of contaminated seawater can lead to upper respiratory disease and gastroenteritis.


LAND BASED ACTIVITY
Deforestation & burning
Urban development
Gravel extraction
Livestock & invasives
Agriculture
Mining
Aquaculture
Wastewater
WATER QUALITY INFLUENCE
Sediment
Nutrients
Agricultural chemicals
Heavy metals
Persistent organic pollutants
Plastics & microdebris
Pathogens
Personal care products & pharmaceuticals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Nutrients
Agricultural chemicals
Heavy metals
Persistent organic pollutants
Plastics & microdebris
Pathogens
Personal care products & pharmaceuticals

© Rebecca Weeks

ECOSYSTEM-BASED MANAGEMENT PLAN

Kubulau District, Bua Province, Fiji

4/30/2012
Wildlife Conservation Society

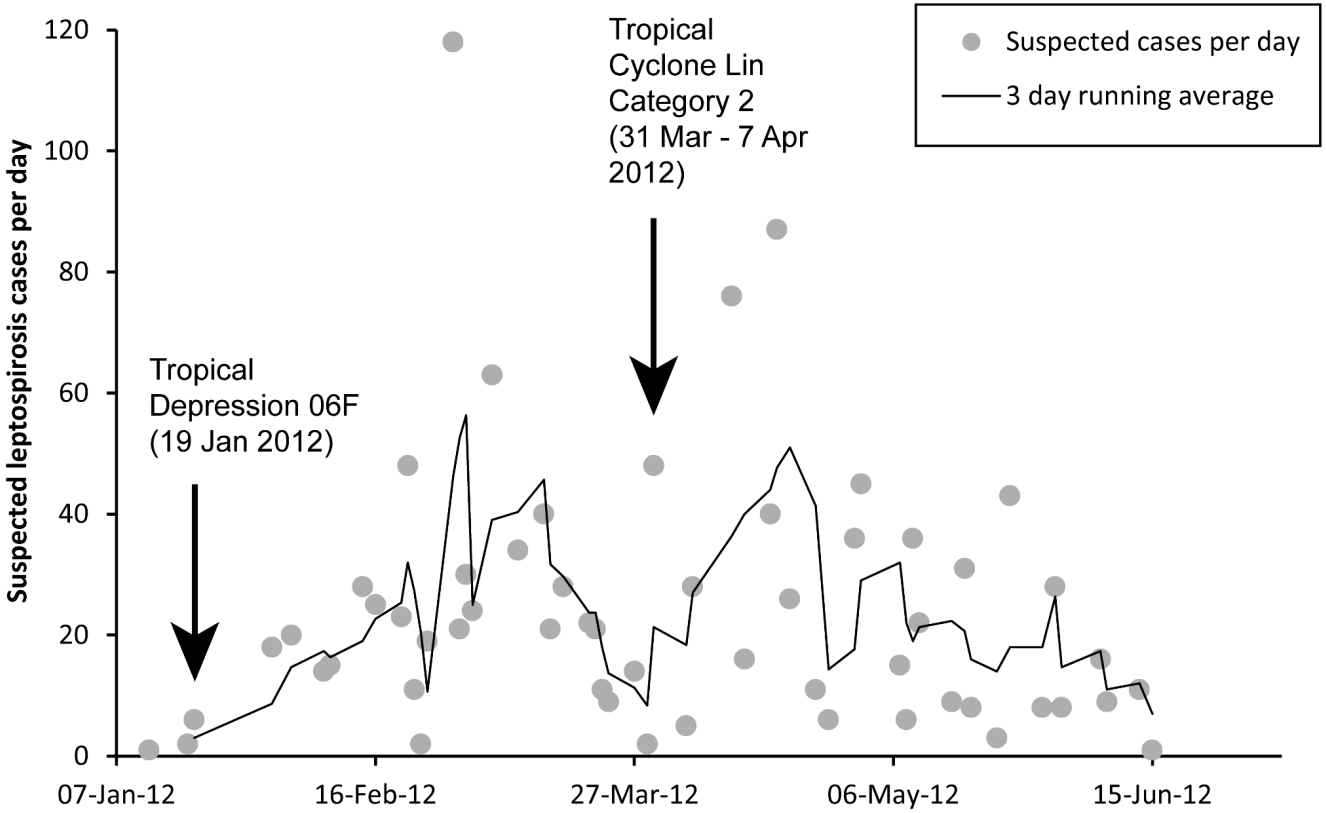
WILDLIFE CONSERVATION SOCIETY

KUBULAU MANAGEMENT RESOURCE COMMITTEE

KBDC Kubulau Business Development Committee

CORAL THE CORAL REEF ALLIANCE

Clarke & Jupiter (2010) Environmental Conservation
Weeks & Jupiter (2013) Conservation Biology



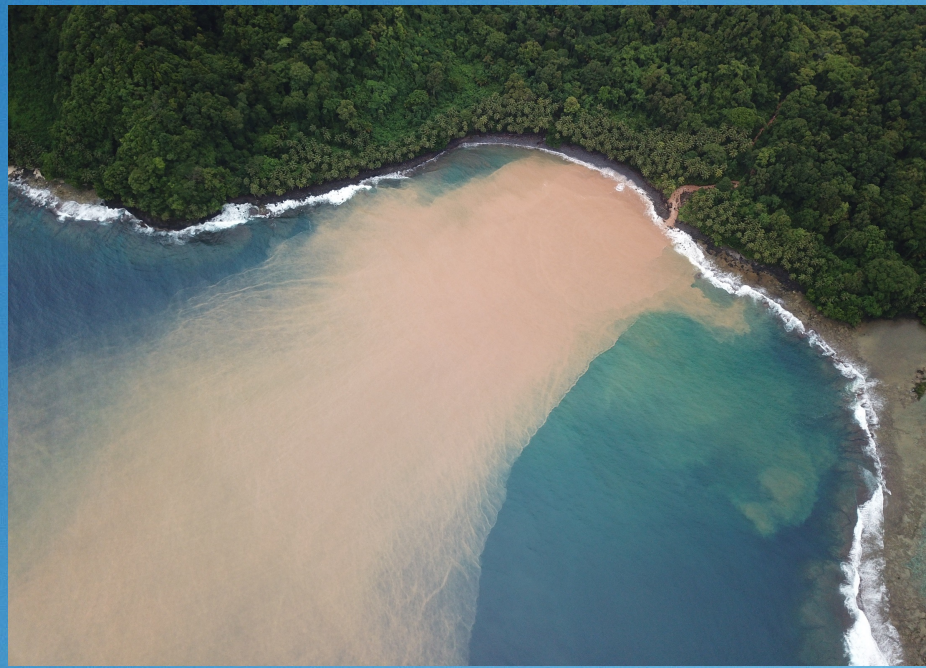
Jenkins & Jupiter (2015) Natural Disasters, Health & Wetlands. In: Finlayson et al. (eds) Wetlands and Human Health

ARTICLE

DOI: 10.1038/s41467-017-00775-2 OPEN

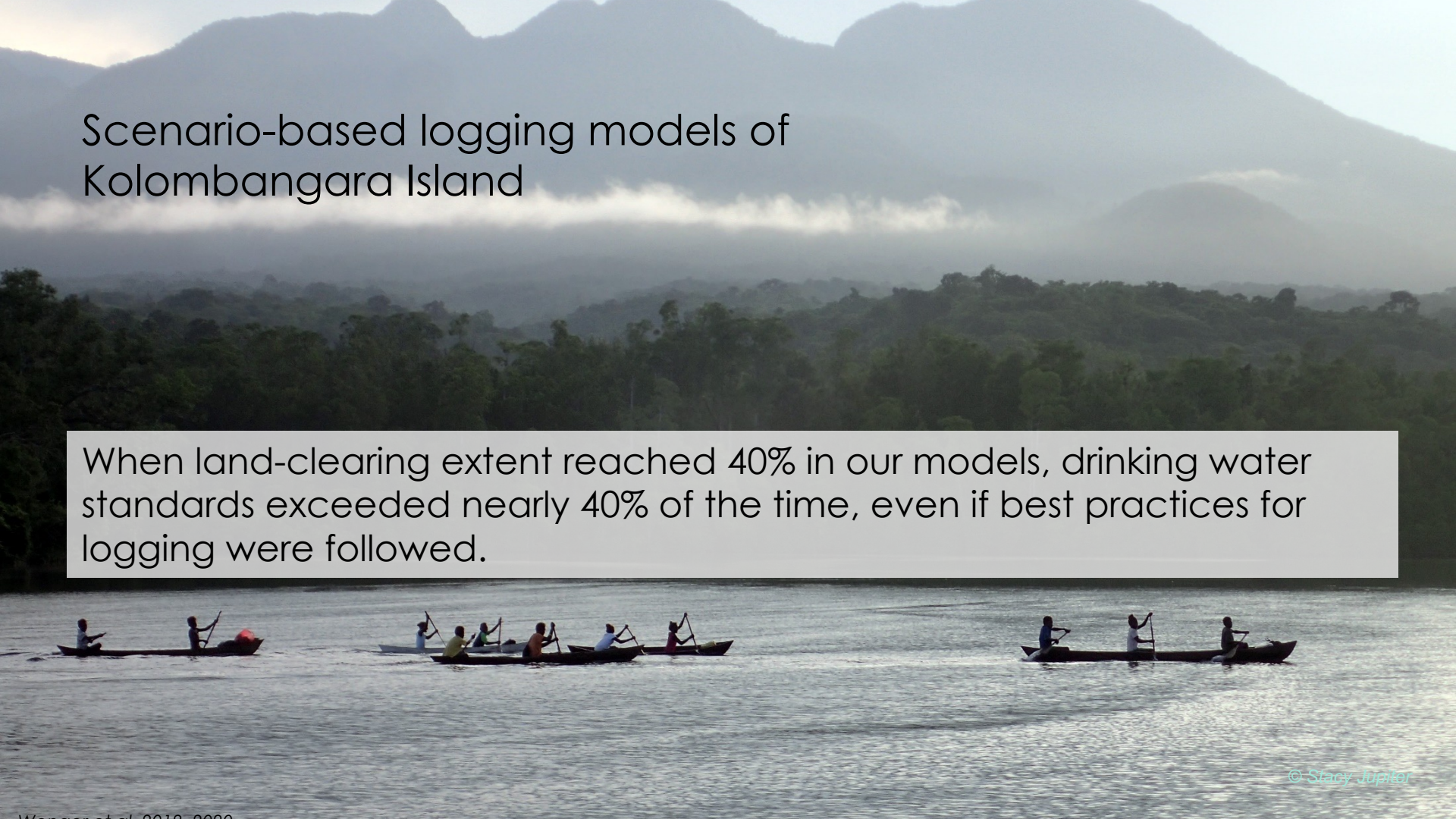
Upstream watershed condition predicts rural children's health across 35 developing countries

Diego Herrera[1,2,9], Alicia Ellis[3], Brendan Fisher[1,2], Christopher D. Golden[4], Kiersten Johnson[5], Mark Mulligan[6], Alexander Pfaff[7], Timothy Treuer[8] & Taylor H. Ricketts[1,2]



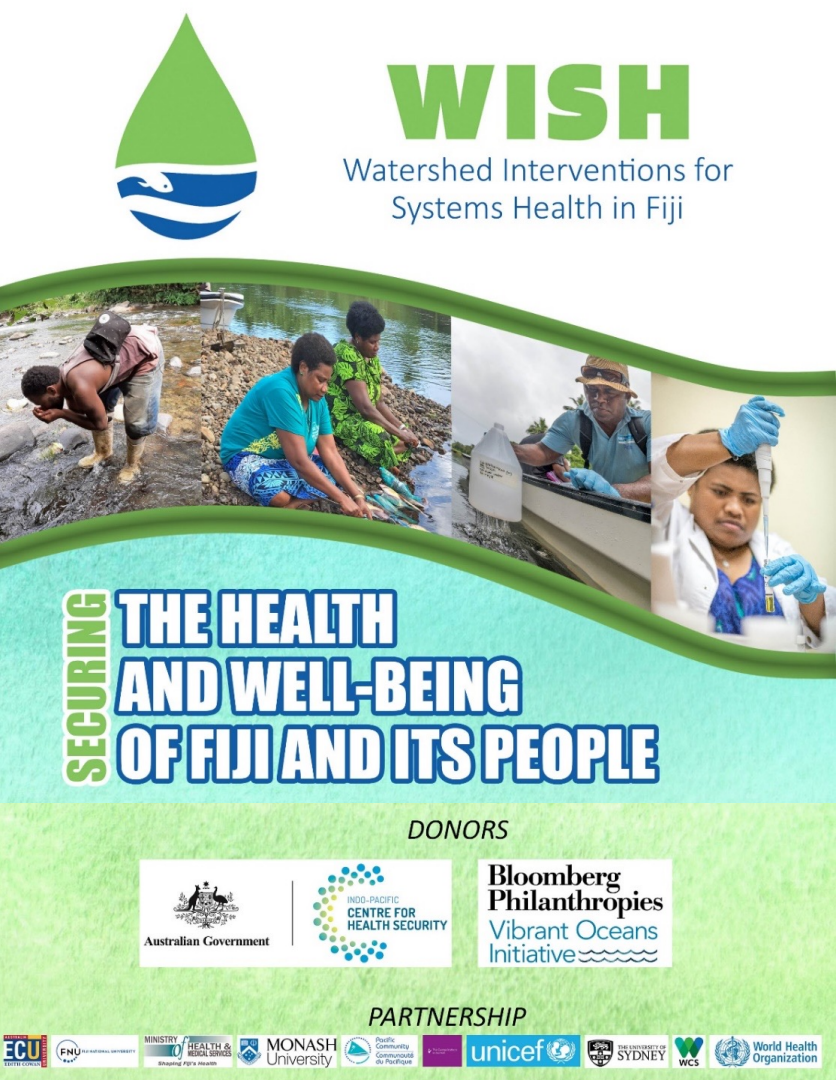
Scenario-based logging models of Kolombangara Island

When land-clearing extent reached 40% in our models, drinking water standards exceeded nearly 40% of the time, even if best practices for logging were followed.



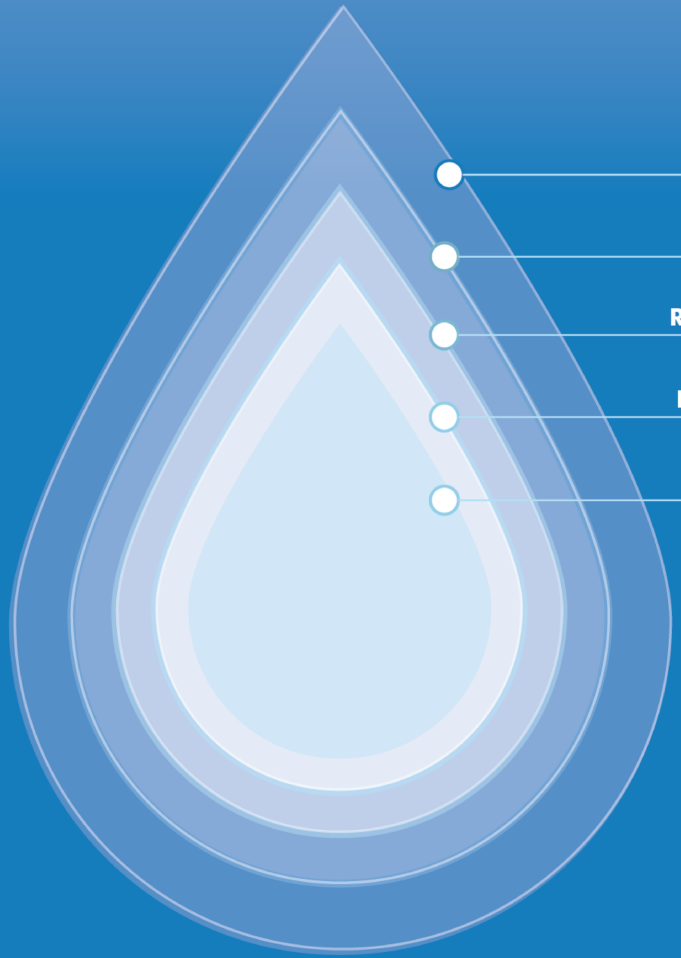
WISH

Watershed Interventions
for Systems Health



GOALS:

- Reduce the incidence of water-related diseases in people and coral reefs
- Empower communities to access fundamental right to clean water
- Strengthen connections to place
- Develop a coordinated mechanism for systems health governance
- Facilitate approaches to sustainably finance and scale interventions nationally



GLOBAL:
Impact: Climate-induced extreme weather events
Intervention: Climate negotiations to reduce emissions

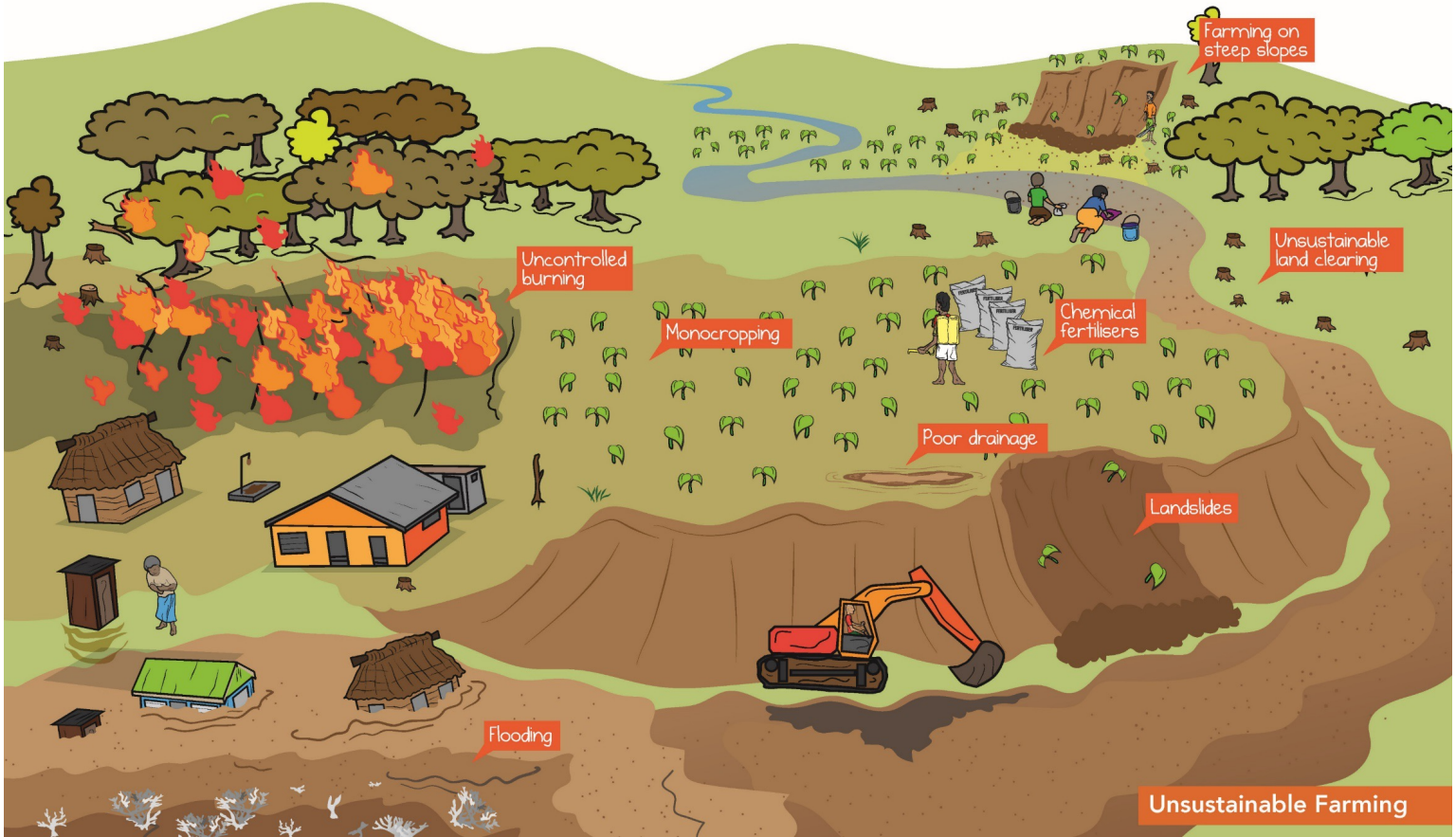
LANDSCAPE:
Impact: High sediment, nutrient, and contaminant loads in waterways
Intervention: Nature-based solutions, e.g., forest protection & soil conservation

RESIDENTIAL:
Impact: High sediment, nutrient, & contaminant loads in local water sources
Intervention: WASH improvements, fencing agriculture, waste management

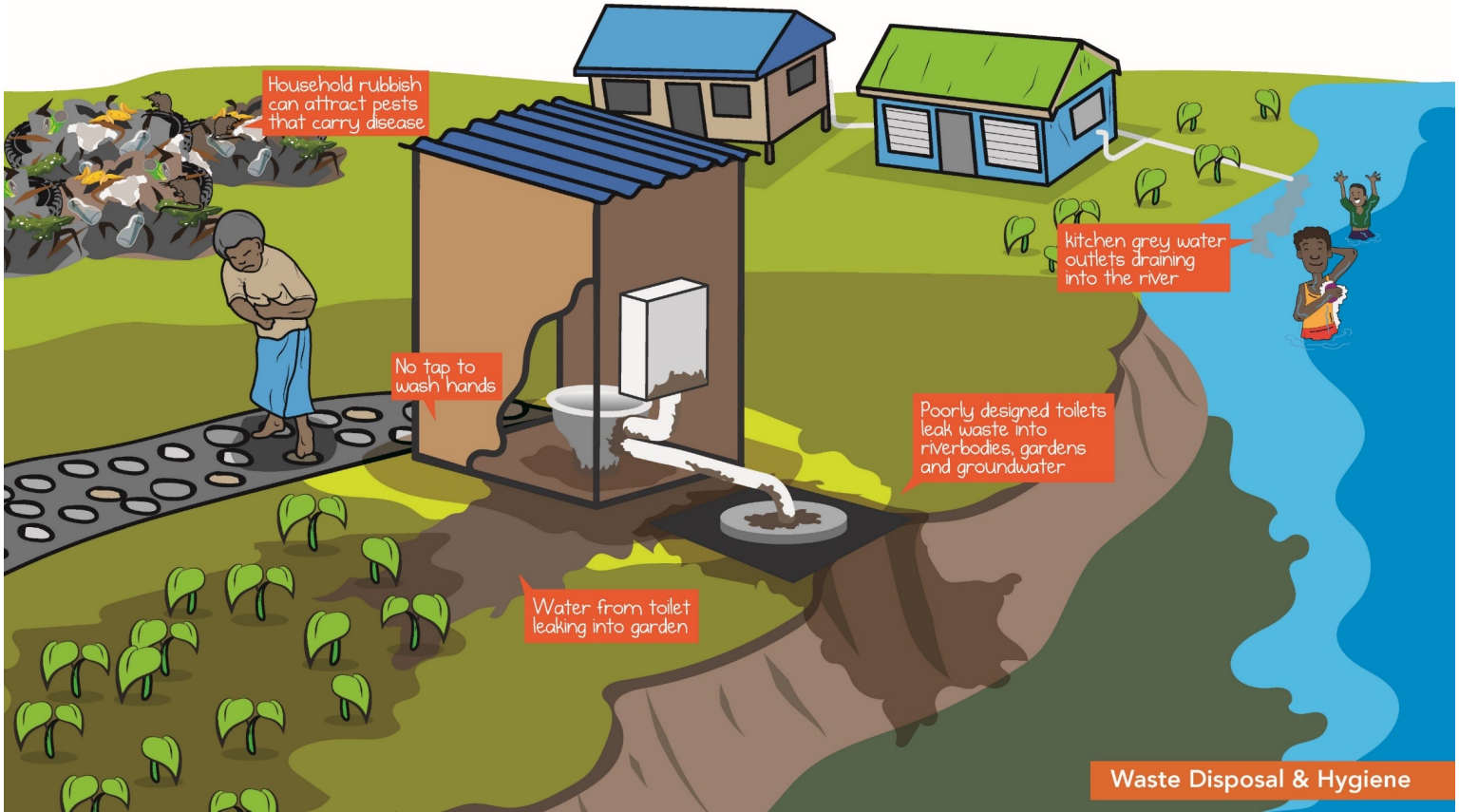
INDIVIDUAL:
Impact: Exposure to contaminants and pathogens
Intervention: Handwashing, covering drinking water

MICROBIAL:
Impact: Persistence of pathogens in the environment and in people
Intervention: Boosting immunity through vaccinations, supporting good nutrition

How we use the land is causing us problems



Poor hygiene and sanitation practices and habits can affect our health



If we farm differently, we can improve our crop yields and have a healthy environment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Thank you

WCS.ORG/OCEANS @WCSOCEAN

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Ed Rowe

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Water, WASH and Climate Symposium Presentation

21 June 2023

Ed Rowe

Climate and Multi-hazard Disaster Risk Assessment for Tongatapu, Tonga

Pacific Disaster Resilience Program

ADB ASIAN DEVELOPMENT BANK

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Outline

Tongan context

Overview of approach

- Hazard assessment
- Exposure database and assessment
- Vulnerability assessment
- Risk assessment

Key findings

So what?

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Tonga overview

Nuku'alofa – city mostly ~2m above current sea level.

Vulnerable to SLR, coastal inundation and tsunami, but also pluvial (surface) flooding due to flat topography / limestone.

Estimated 20,000 people regularly affected by flooding.

Vulnerability set to increase due to climate change for SLR, but also high confidence for pluvial flood (rainfall).

Tongatapu – island-wide generally has higher topographic elevation and lower population and infrastructure density toward the south. Why? Ports…

Vulnerable to cyclones and earthquakes.

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Project overview

Under the Tonga Integrated Urban Resilience Sector Project (TIURSP), ADB will support the Government to **manage current inundation risk and increase the resilience of the Nuku'alofa urban area.**

A 'Climate and Disaster Resilient Urban Development Strategy and Investment Plan' will be developed, including a **long-term adaptation pathway for Nuku'alofa** which will enable continued development of the city in a manner **resilient to natural hazards**.

This **Climate and Multi-Hazard Disaster Risk Assessment** provides the **basis for decision making** by estimating the cost of damage and number of people and assets at risk to inundation, tsunami, wind, and seismic hazards, including the impact of climate change, at a range of return periods.

Methodology

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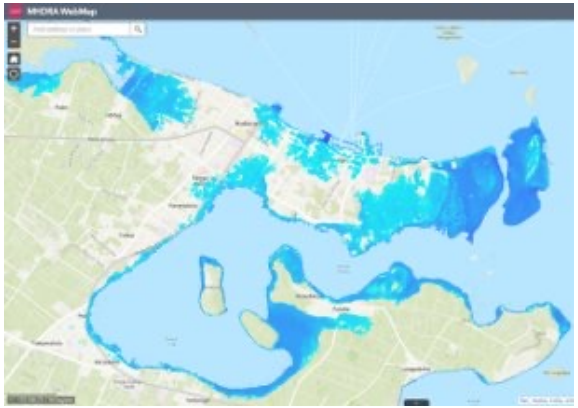
Hazard



Coastal inundation, pluvial flood, tsunami, wind and seismic hazards assessed.

Results include mapped outputs for 10-yr, 50-year, 100-year and 200-year return period probabilistic events.

Further events were determined to inform project outputs (risk).

Sea-level rise influence on coastal and pluvial flood hazards assessed.

Influence of future climate rainfall intensities on pluvial flood hazard assessed.

Total of ~220 island-wide mapped hazard scenarios.

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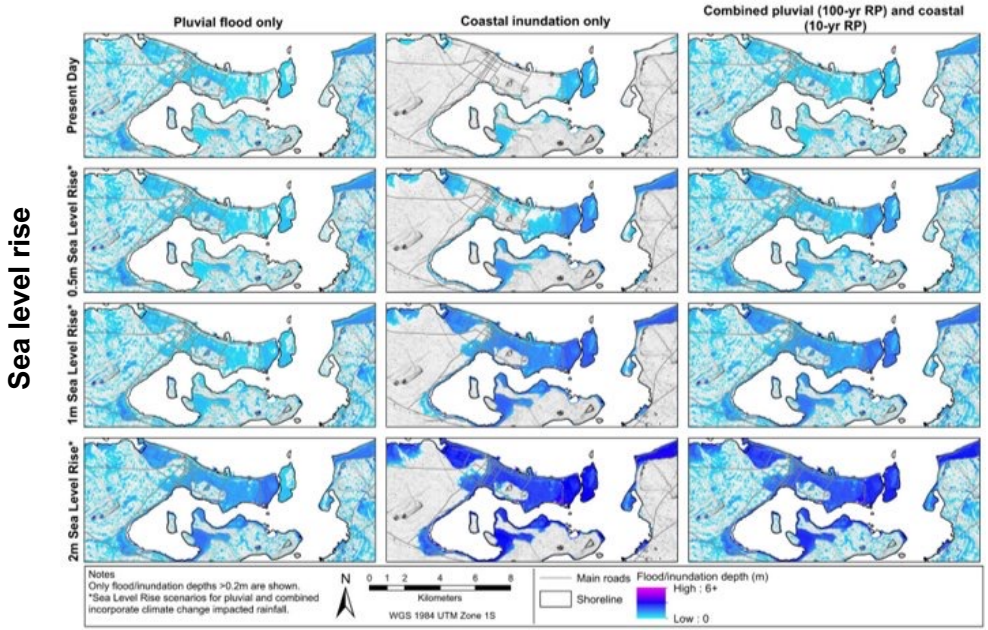
Hazard

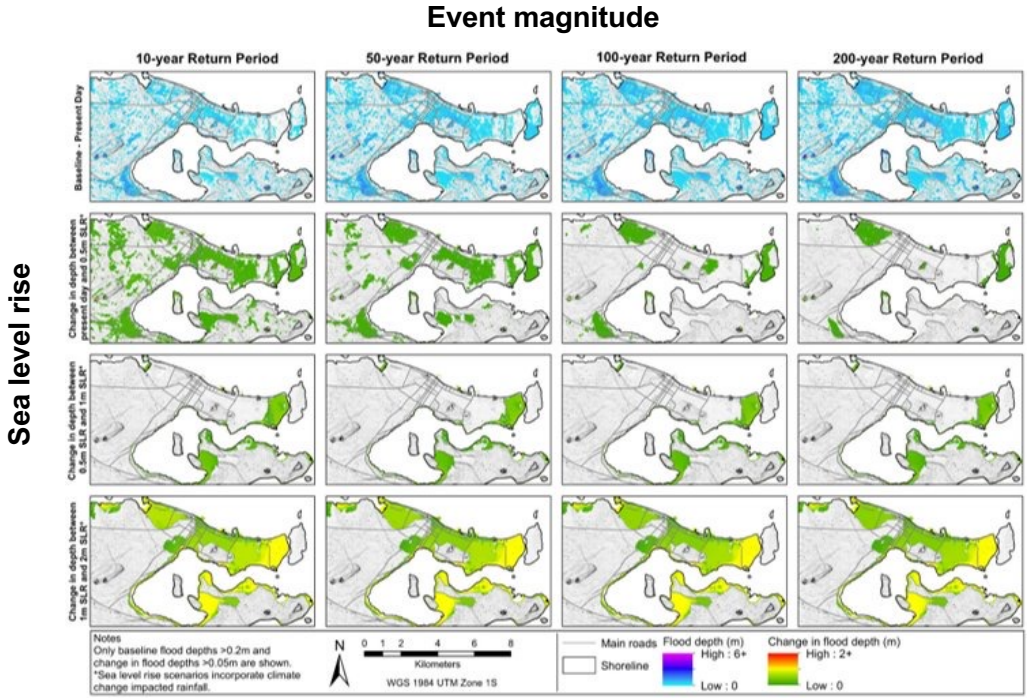
Comparing different hazards for the same Return Period events with sea level rise

100-year Return Period event



Hazard

Comparing pluvial hazard for different Return Period events and influence of sea level rise



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Exposure

Hazard x Exposure x Vulnerability = Risk

Storm Surge
Pluvial Flooding
Tsunami
Sea Level Rise
Earthquake
Wind

Buildings
Roads
Power
Water
Populations

Asset
Vulnerability
Social
Vulnerability

Outputs:
Maps
Loss Estimates
Social Impacts
Asset Database

To Inform:
Planning
Investment

Buildings: 31,488 (13,856 >100m2 area) | 2016 Census: 13,096 (households)

Roads: ~250km

Power: 20,000 poles, 373 transformers, numerous other components

Water: 180 Tanks, 176 Pumps, numerous other components

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Exposure

Data development mission

Metal sheet roof

Visible timber boards and timber frame

Foundation piers and ground floor height easily identifiable.

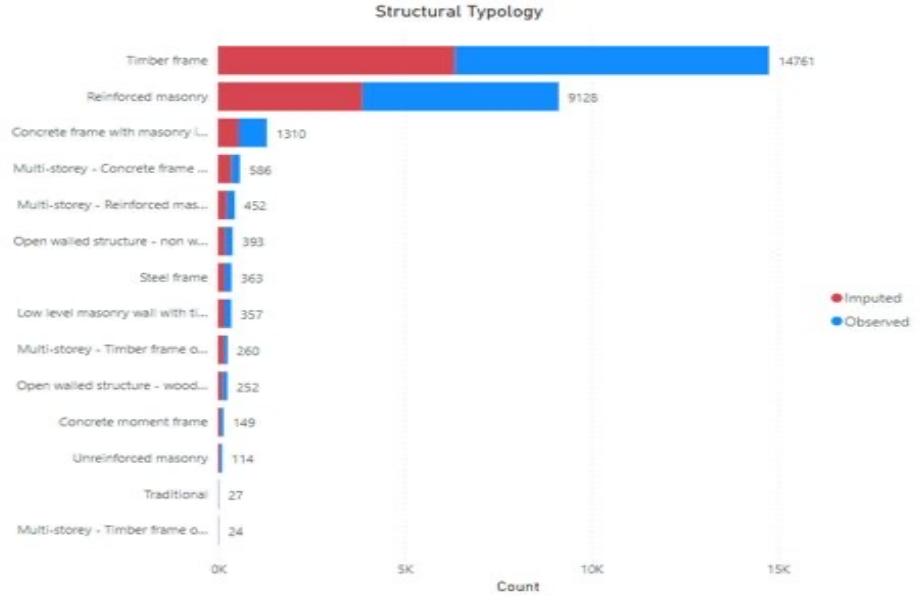
COVID impacted.

Trained local engineers through video workshops.

Digital mapping tools.

8,000 buildings mapped.

Machine learning to populate complete asset database.



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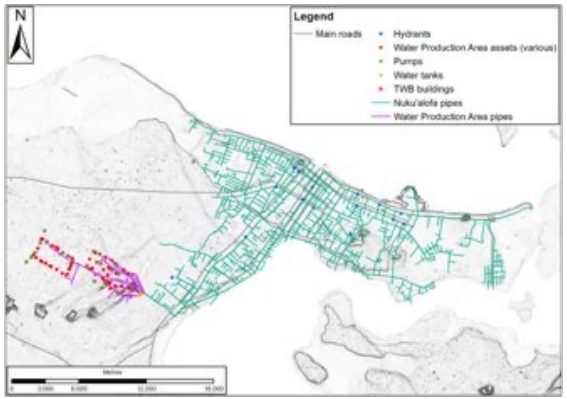
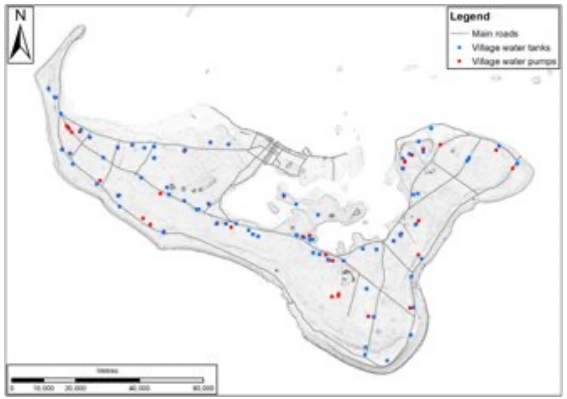
Exposure

Data development mission



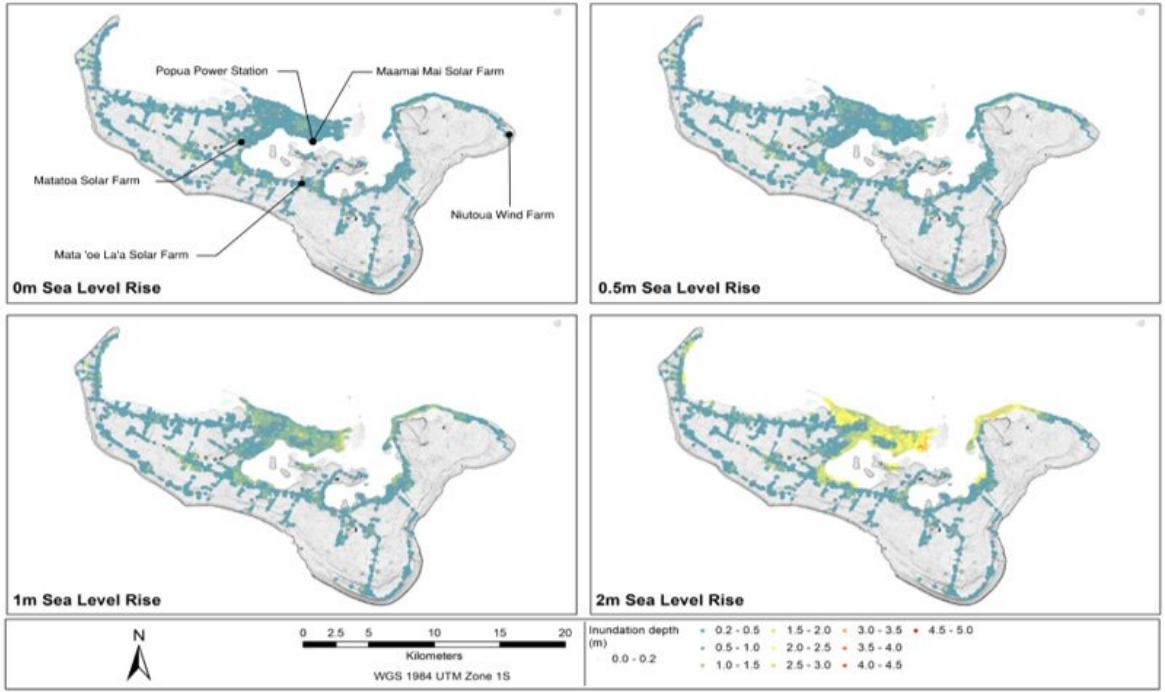


Water assets provided by responsible Ministry and utility with validation and data collection undertaken to compliment existing datasets.

Exposure

Exposure assessment

Asset exposure to hazard (pluvial flood and SLR) – intensity of hazard



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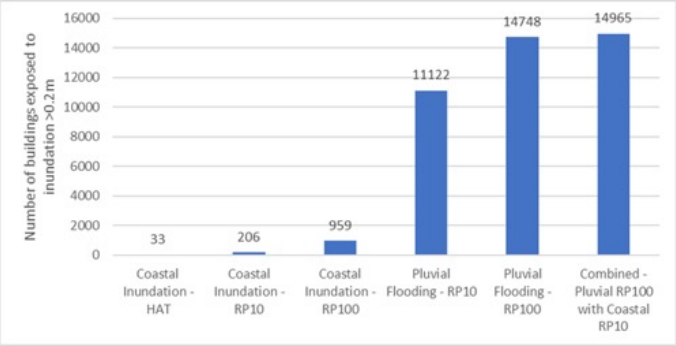
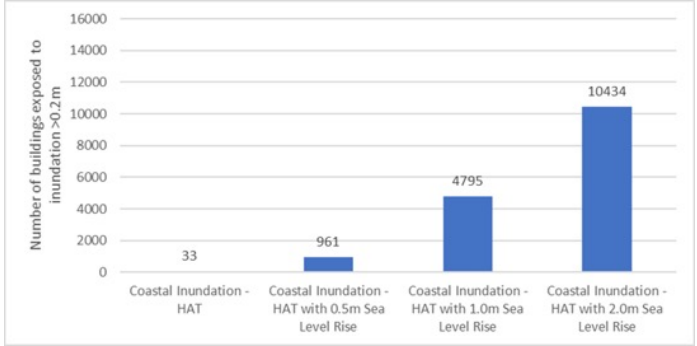
Exposure

Exposure assessment





Sector	Combined pluvial flooding for a 100-year return period and coastal inundation for a 10-year return period	Combined pluvial flooding for a 100-year return period and coastal inundation for a 10-year return period with 0.5m sea level rise incorporating climate change impacted rainfall	Combined pluvial flooding for a 100-year return period and coastal inundation for a 10-year return period with 1m sea level rise incorporating climate change impacted rainfall	Combined pluvial flooding for a 100-year return period and coastal inundation for a 10-year return period with 2m sea level rise incorporating climate change impacted rainfall
Residential	$5,012.33	$5,585.12	$5,945.44	$6,201.53
Religion	617.45	688.24	739.58	780.92
Education	542.37	609.93	707.98	730.06
Public (other than education and health)	340.45	390.40	472.12	493.13
Commercial	317.19	355.12	381.52	397.02
Other	241.62	259.70	309.26	331.53
Industrial	109.67	118.64	120.54	123.91
Power	88.55	106.70	136.14	143.10
Health	76.73	82.64	83.13	90.55
Infrastructure	34.15	50.87	73.09	77.27
Transport	27.85	33.07	40.73	45.67
Agricultural	12.03	12.03	12.03	12.03
Water	7.71	8.28	8.43	8.58
Total	**$7,428.09**	**$8,300.72**	**$9,029.99**	**$9,435.30**

Top – number of assets exposed for different hazard magnitude.

Bottom – value of exposed assets for different hazard magnitude.

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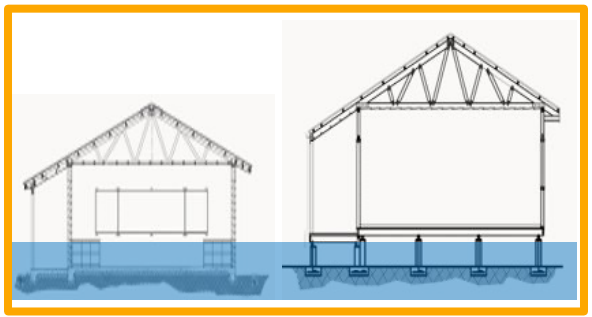
Vulnerability

Hazard x Exposure x Vulnerability = Risk

Hazard	Exposure	Vulnerability	Risk
Storm Surge Pluvial Flooding Tsunami Sea Level Rise Earthquake Wind	Buildings Roads Power Water Populations	Asset Vulnerability Social Vulnerability	Outputs: Maps Loss Estimates Social Impacts Asset Database To Inform: Planning Investment



Relationship between damage for each asset type and hazard combination was established.

Indicators established to establish the social vulnerability of each village.

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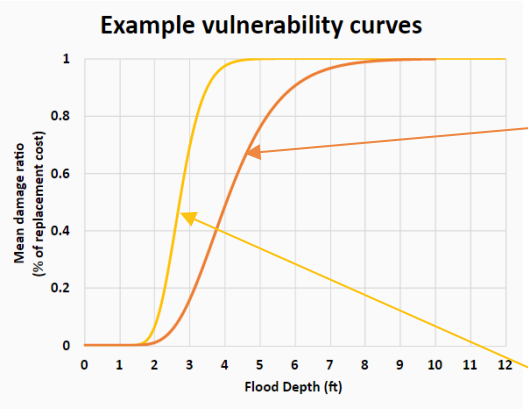
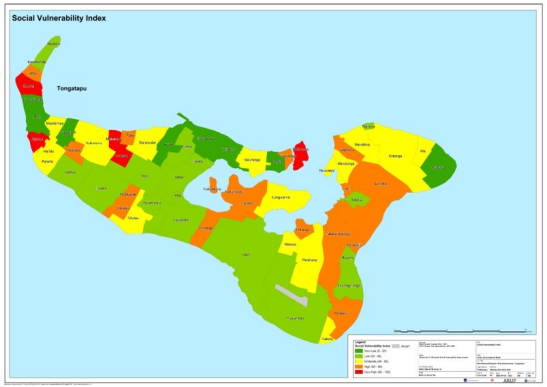
Vulnerability





Social vulnerability considered indicators under the following themes: *(data sourced from Census data only)*

- *Ability to cope*
- *Access to resources*
- *Built environment*

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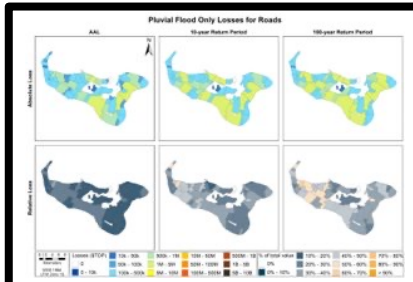
Risk

Hazard x Exposure x Vulnerability = Risk

Hazard	Exposure	Vulnerability	Risk
Storm Surge Pluvial Flooding Tsunami Sea Level Rise Earthquake Wind	Buildings Roads Power Water Populations	Asset Vulnerability Social Vulnerability	Outputs: Maps Loss Estimates Social Impacts Asset Database To Inform: Planning Investment



Scenario	Pluvial flood		Coastal inundation		Seismic		Wind	
10-yr	$541,834,000	4.0%	$8,557,000	0.1%	$109,525,000	0.8%	$242,000	0.0%
50-yr	$751,986,000	5.6%	$31,617,000	0.2%	$683,648,000	5.1%	$69,519,000	0.5%
100-yr	$851,097,000	6.3%	$41,301,000	0.3%	$1,354,739,000	10.1%	$206,948,000	1.5%
200-yr	$959,489,000	7.1%	$54,206,000	0.4%	$2,506,186,001	18.7%	$459,307,000	3.4%
AAL	**$309,978,000**	**2.3%**	**$6,393,000**	**<0.1 %**	**$134,032,000**	**1.0%**	**$10,055,000**	**0.1%**

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Risk

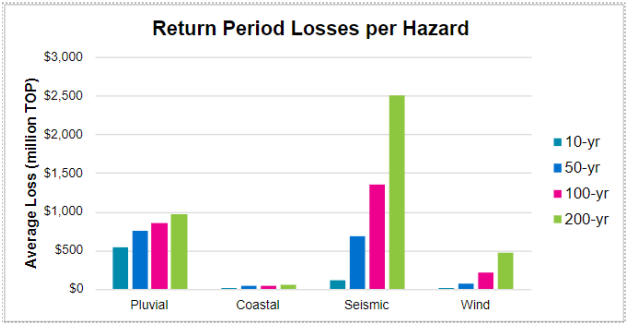
Pluvial flood is most impactful for the AAL and at shorter return periods/more frequent events.

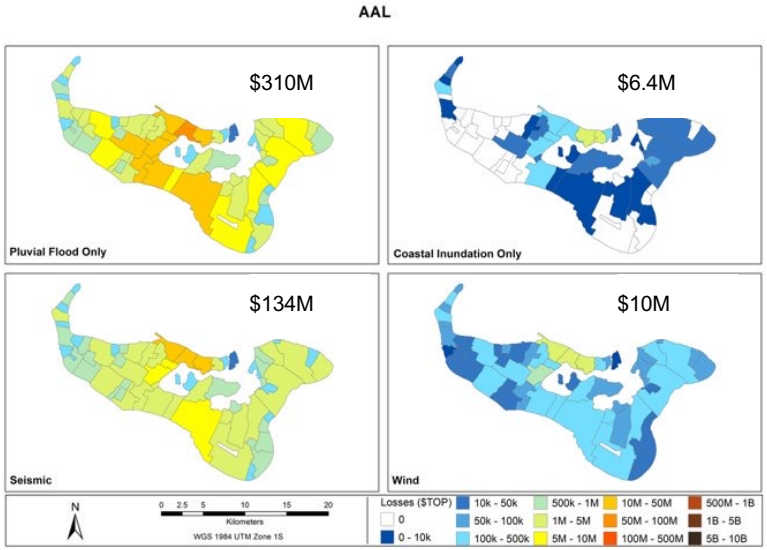
Wind and seismic are more impactful at longer return periods/less frequent events.

Sea level rise impacts are significant.

Buildings drive losses due to having the greatest volume of assets.

While losses due to damage to water and power are comparatively smaller, the **impacts of disruption** to service may be significant.





Sea level rise:

- Permanent losses under sea level rise are significant

- 0.5m SLR losses ($756M) are approximately equal to 50-yr pluvial losses ($752M)

- 1m SLR losses ($3.3B) are greater than the 200-yr seismic losses ($2.5B)

- 1m SLR losses are more than 10x the modelled losses for TC Gita ($300M)

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So what?

Informed **disaster risk recovery** after recent volcanic eruption and subsequent tsunami in Tonga.

Informed **investment in a new bridge** proposed for Tongatapu.

To inform (currently being procured) A ‘Climate and Disaster Resilient Urban Development Strategy and Investment Plan’ will be developed, including a **long-term adaptation pathway for Nuku’alofa** which will enable continued development of the city in a manner **resilient to natural hazards**.

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WATER & WASH FUTURES 2022
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Nature-based and other sustainable WASH solutions to Climate Change

Emily Darlison & Kerrie Burge

UTS Institute for Sustainable Futures

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The University Of Queensland AUSTRALIA

WCS

rise REVITALISING INFORMAL SETTLEMENTS AND THEIR ENVIRONMENTS

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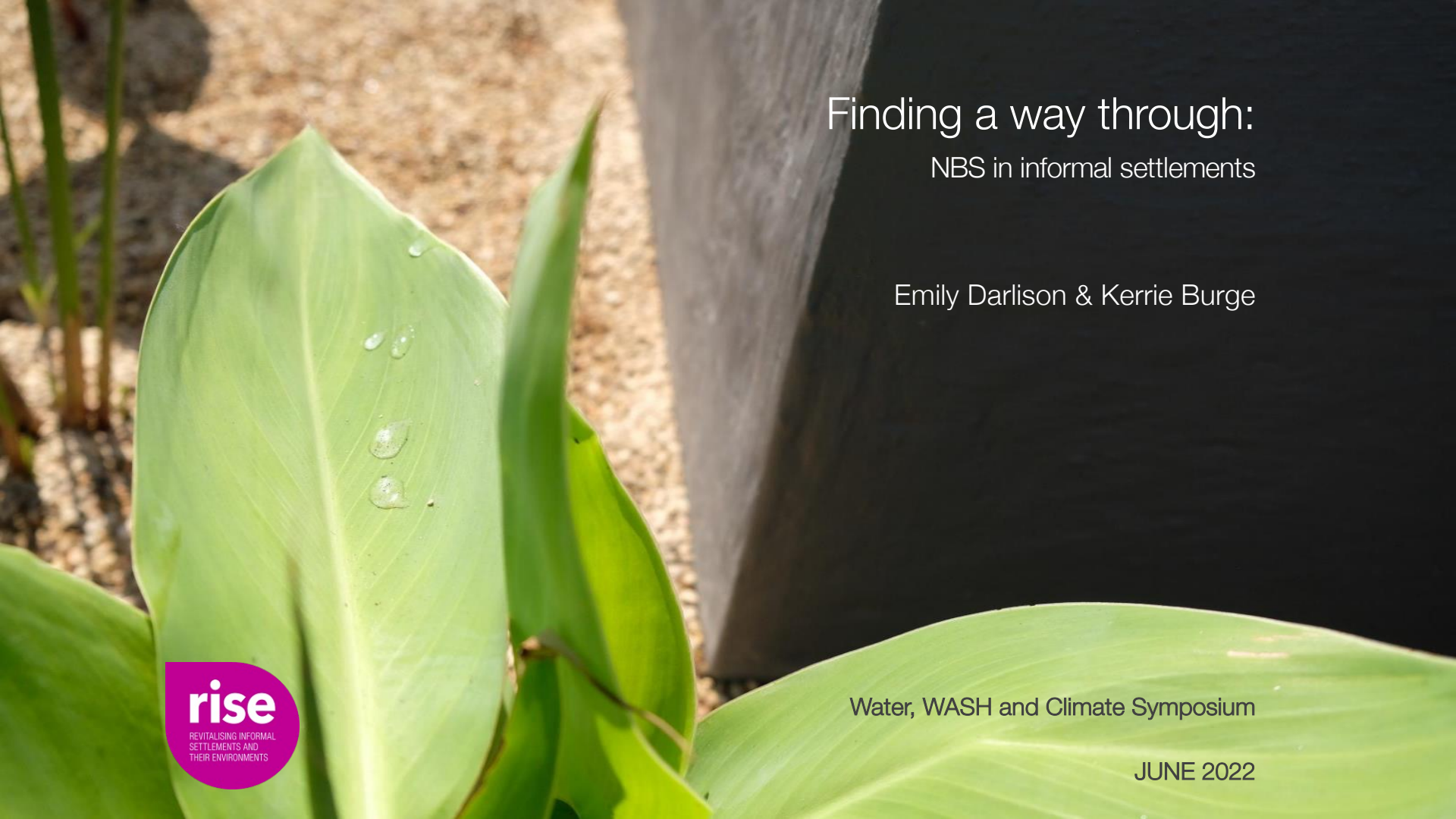


Finding a way through:

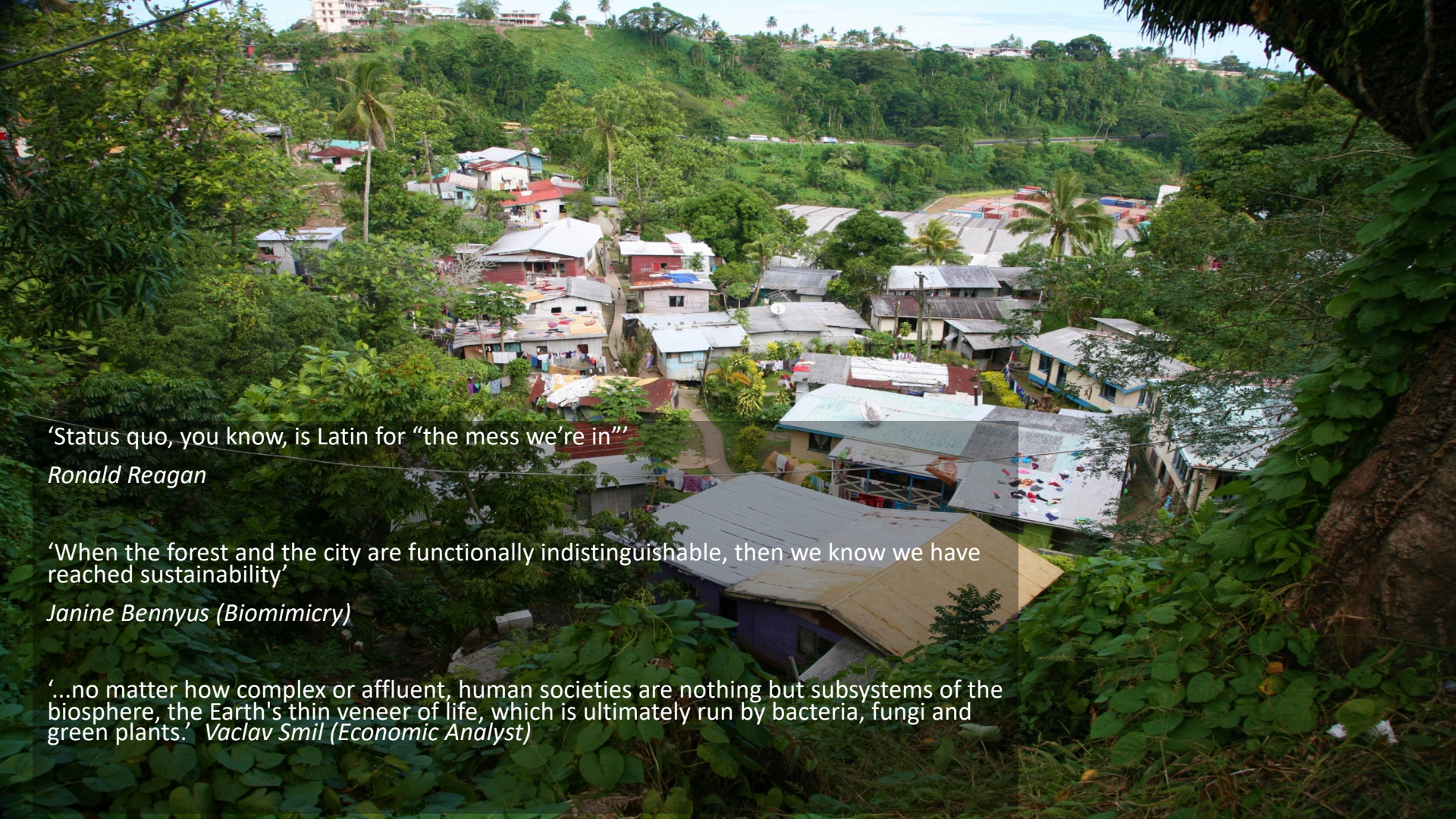
NBS in informal settlements

Emily Darlison & Kerrie Burge

rise
REVITALISING INFORMAL SETTLEMENTS AND THEIR ENVIRONMENTS

Water, WASH and Climate Symposium

JUNE 2022



‘Status quo, you know, is Latin for “the mess we’re in”’

Ronald Reagan

‘When the forest and the city are functionally indistinguishable, then we know we have reached sustainability’

Janine Bennyus (Biomimicry)

‘...no matter how complex or affluent, human societies are nothing but subsystems of the biosphere, the Earth's thin veneer of life, which is ultimately run by bacteria, fungi and green plants.’ *Vaclav Smil (Economic Analyst)*

rise
REVITALISING INFORMAL SETTLEMENTS AND THEIR ENVIRONMENTS

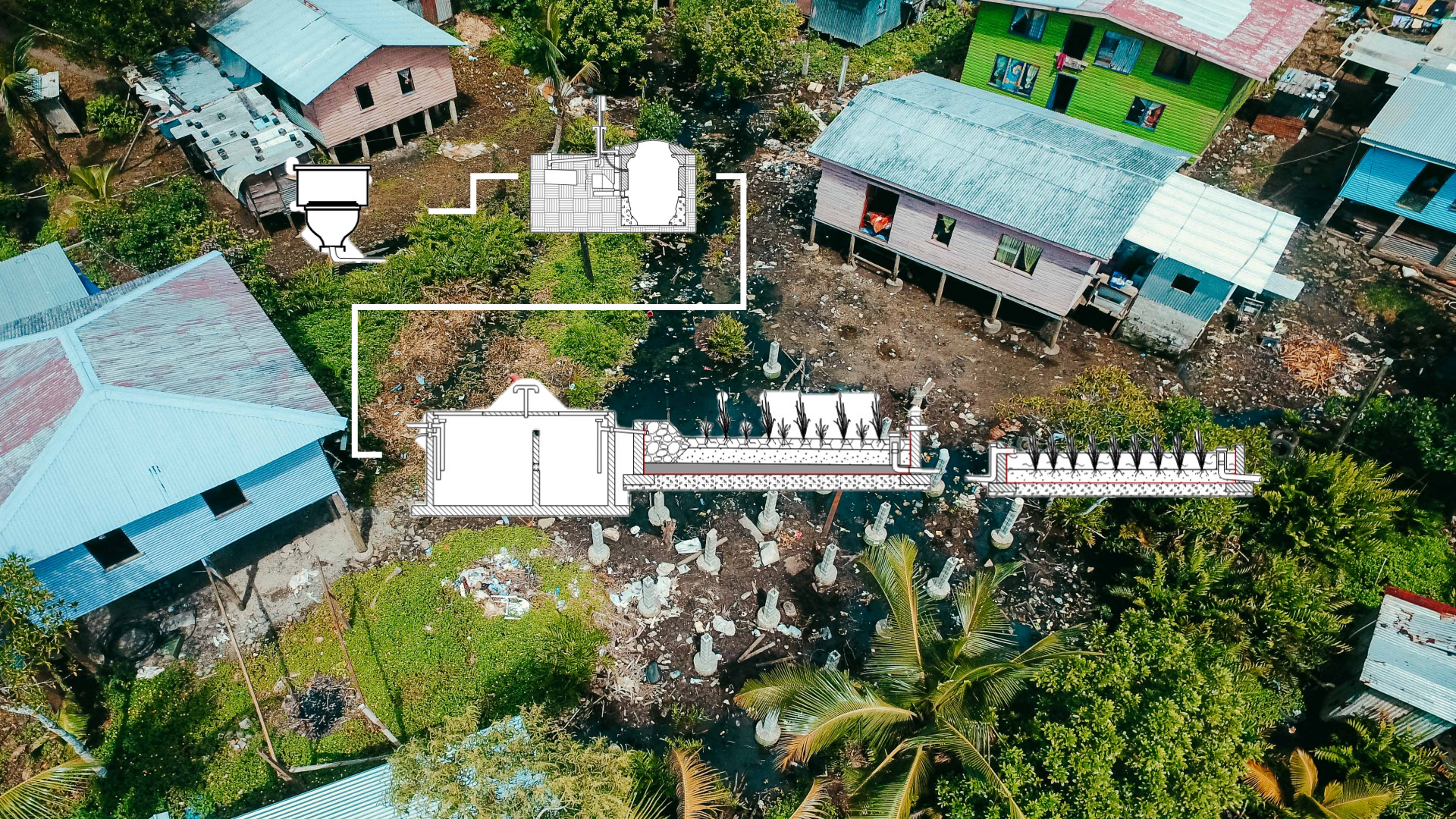
Background

RISE in Fiji:

- TiW demonstration site
- 6 informal settlement sites
- In-house management of design, approvals and construction management

Challenges

- The not development
- Tenureship
- Sewage in the backyard



Land Owners

- i'Taukei Land Trust Board
- Ministry of Lands

Build approval

- Municipal Councils
- Department of Town and Country Planning
- Ministry of Housing

Discharge requirements

- Central Board of Health
- Ministry of Health
- Department of Environment

Operational partners

- Department of Energy
- Energy Fiji Limited (EFL)
- Water Authority Fiji
- Fiji Roads Authority

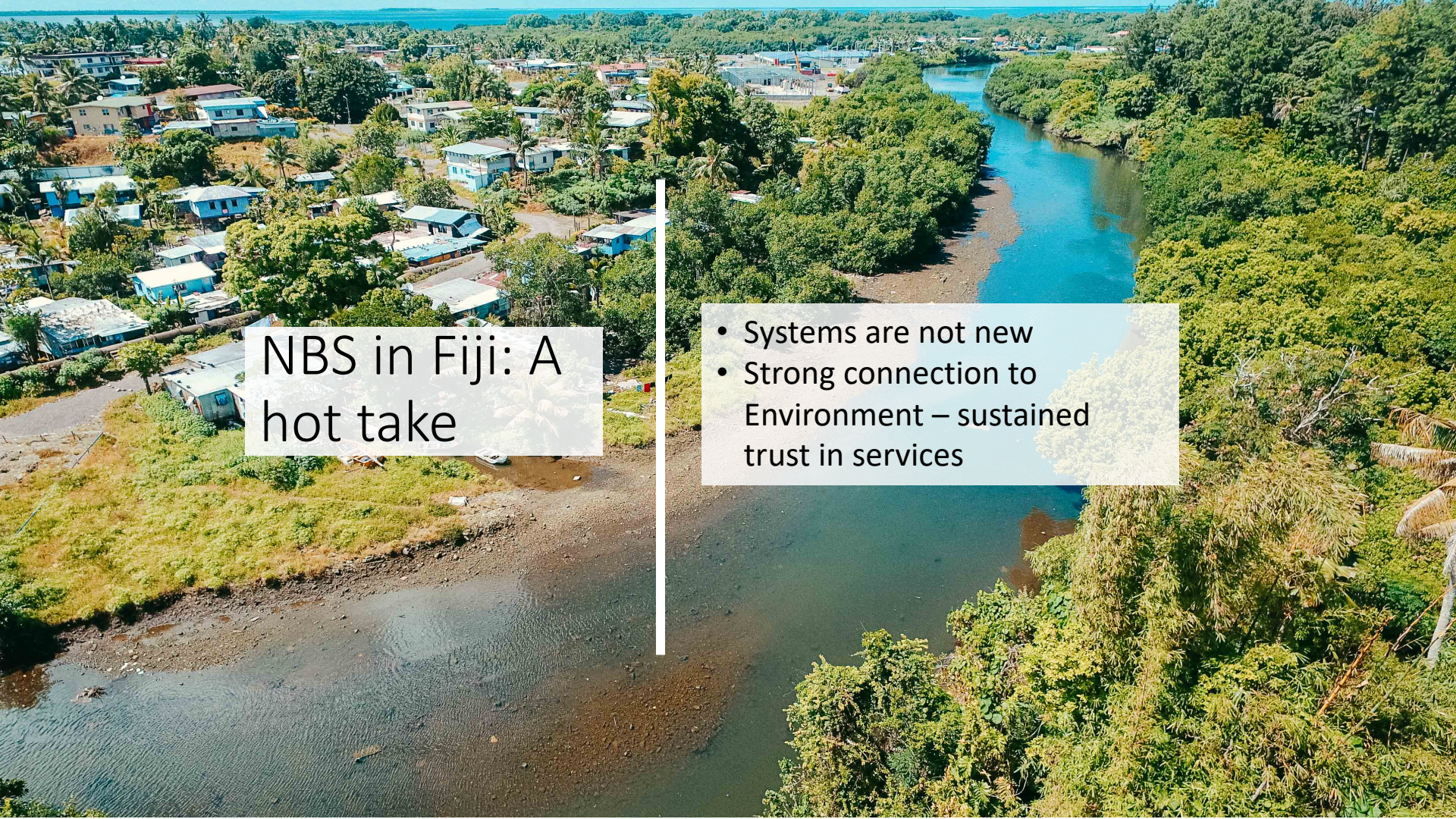
The pathway in place

- Tenancy at Will (TAW) granted by Ministry of Housing
- Land ownership consenting required via a no objection letter
- Building permits approved by Council in MOST cases
- Discharge requirements permitted by CBH
- EIA requirements by Department of Environment
- Electrical – found ways to connect to the grid – future challenge is billing to a community.
- Constant conversations ongoing
- Technical Coordination Committee established at beginning of RISE. Loudest players change with stage

- Who you know
- Find a champion
- Long conversations. Repeated conversations
- Emails are not engagement
- Government is big, complex and slow
- Take care how you frame things. Do your research
- Don’t question an open door tooooo much
- Be adaptable
- People have other things on too
- Rushing can jeopardise long term sustainability

Challenges

- The not development
- Tenureship
- Sewage in the backyard



NBS in Fiji: A hot take

- Systems are not new
- Strong connection to Environment – sustained trust in services

Community support

- Community support drove this process
- Land tenure
- Space allocation
- RISE providing a sense of security

RISE Demonstration Project: MAKASSAR, INDONESIA

rise REVITALISING INFORMAL SETTLEMENTS AND THEIR ENVIRONMENTS

Timeline

Participatory Design [2018]

Concept and Detailed Design [2018]

Construction [2019]

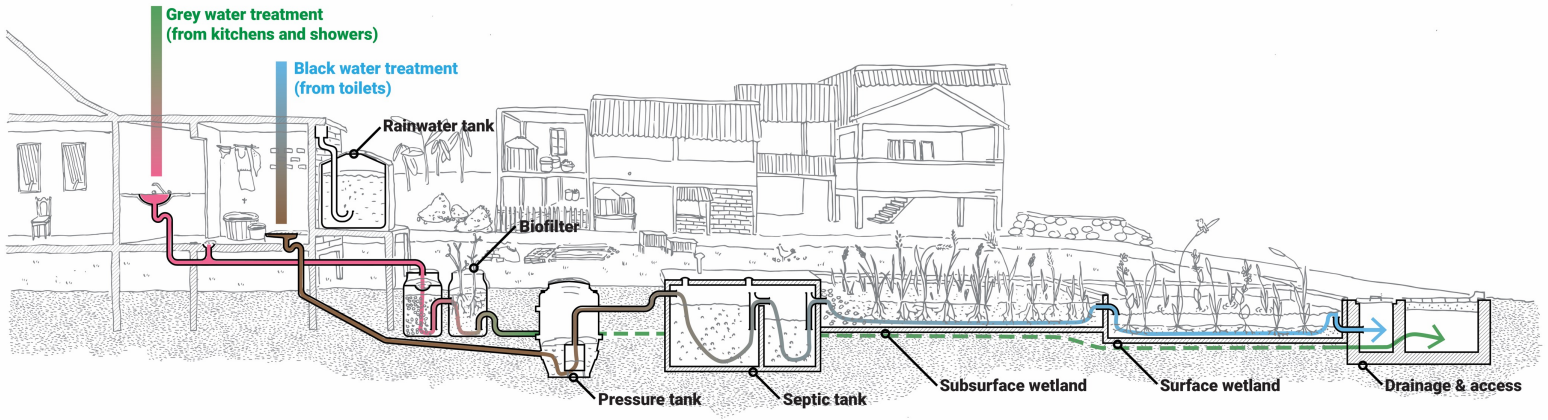
Final adjustments [2020]

Commissioning [2020]

Troubleshooting and weekly WQ monitoring

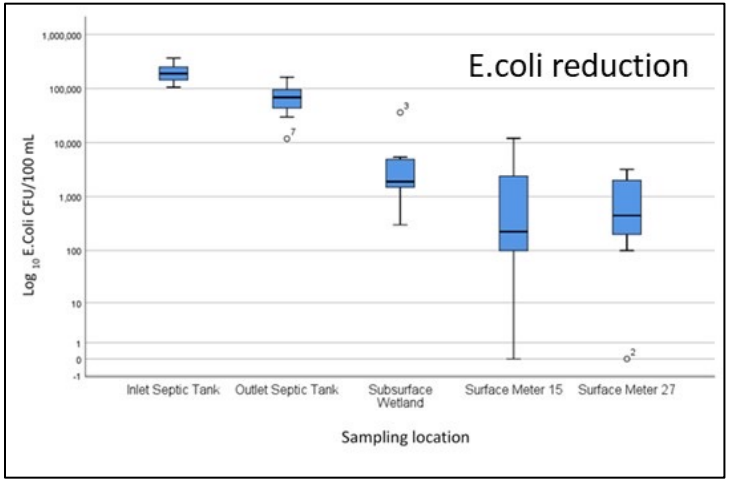
Quick stats:

- 2 pressure sewer units & controllers
- 3 new toilets
- 13 HH connections
- 40 m2 wetland area
- 3 bioflters
- 9 rainwater tanks
- Servicing ~50 ppl (as of June 2022)
- Formal drainage
- Raised access way
- Designed for future growth



Small scale demonstrations

Adapting to the context, construction methods and materials



Small scale demonstrations

Demonstrating the performance

ADB President
[March 2020]

ADB VPKM
Opening ceremony [OCT 2019]

Mayor, Ir.H.Mhd Ramdhan Pomanto
Ground breaking [NOV 2018]

BAPPANAS
[JAN 2020]

Cipta Karya (Jakarta)
[March 2019]

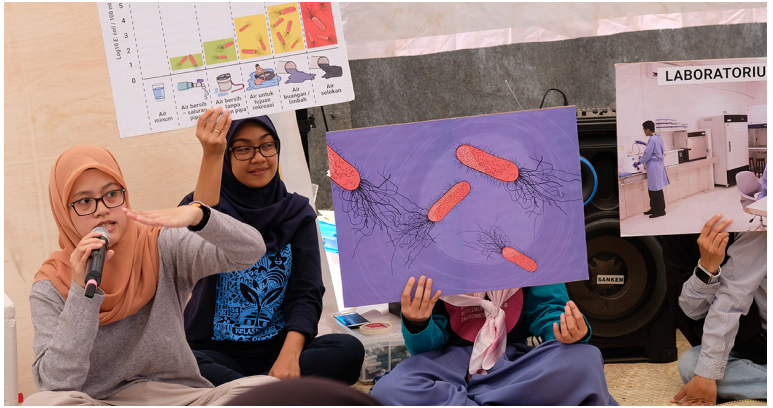
Citarum West Java delegation
[FEB 2020]

Dept. Public Works Makassar City
[DEC 2020]

KotaKu visit
[FEB 2021]

Penny Wong, Foreign Minister
[June 2022]

Small scale demonstrations
Building broader support for NBS



Participatory Approach

Residents are partners in design and planning

Construction Cost

Compared to city sewer network

CENTRALISED SANITATION

Proposed sewerage network in Indonesia

USD 4,700 per HH

- *wastewater treatment*
- *household connections*

RISE

Demonstration project

USD 5,200 per HH

- *wastewater treatment*
- *household connections*

+

- ***rainwater harvesting***
- ***raised access way***
- ***drainage***
- ***sanitation***
  - ***new toilets***
  - ***toilet renovations***
  - ***HH connections***
  - ***treatment system***
- ***flood resilience***

RISE

Engineering estimates for future sites

USD 6,700 per HH

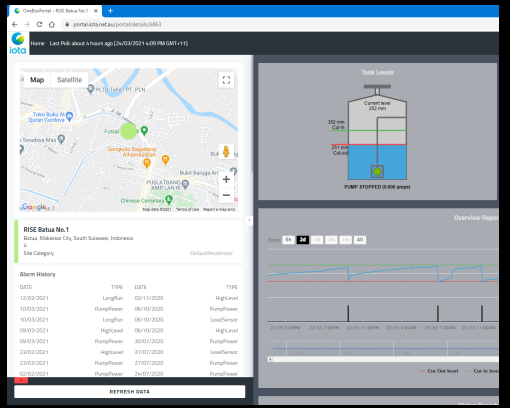
(range 4,600 - 9,300)

- *wastewater treatment*
- *household connections*

+

- ***water supply***
- ***roads and drainage***
- ***private toilets***
- ***toilet renovations***
- ***flood protection***

Grey + Green + Smart



Together, they provide real opportunities to achieve success with NBS.

The Water Sensitive upgrading approach builds climate resilience


WHAT IS RISE?
THE CHALLENGE
THE RISE RESPONSE
BATUA TRANSFORMATION
ELEMENTS OF RISE REVITALISATION
NATURE-BASED SOLUTIONS FOR SAFE SANITATION
CO-DESIGNED WITH THE COMMUNITY
RISE – TRANSFORMING HEALTH, WELLBEING AND THE ENVIRONMENT
BUILD TEAM MAKASSAR
Thank you
Terima kasih
Bula Vinaka


Questions?

Australian WASH Reference Group

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Water, WASH and Climate Virtual Symposium

Nature-based and other sustainable WASH solutions to Climate Change

Mariny Chheang
TechDev Project Lead-EWB

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Rehabilitation of Rural Water Supply and Climate Change: Kratie Province, Cambodia

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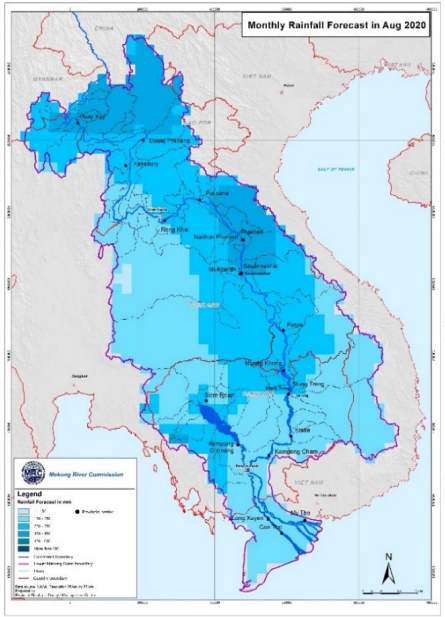
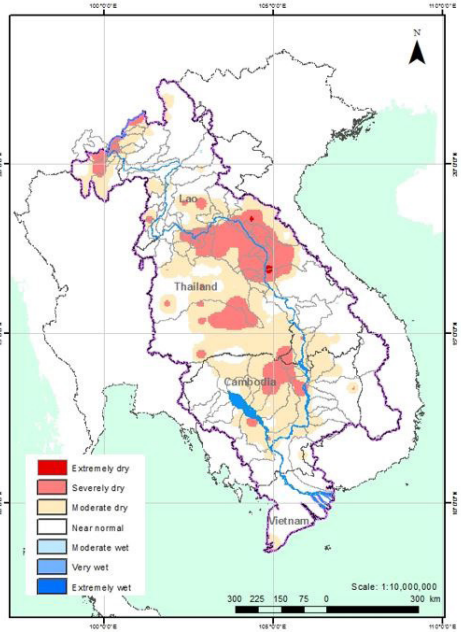
CLIMATE CONDITIONS

- Climate in Cambodia is hot all year round the temp from 21 to 35°C, with a rainy season from May to mid-Nov and a dry season from mid-Nov to April.
- Cambodia is considered Southeast Asia's most vulnerable country to the effects of climate change, alongside the Philippines.
- Nearly all provinces in Cambodia are affected by climate change.
- Shortages of clean water, extreme flooding, mudslides, higher sea levels and potentially destructive storms are of particular concern, according to the Cambodia Climate Change Alliance.
- Climate change has also had a major impact on water levels, water quality, ecology and productivity of the Tonlé Sap and Mekong River in recent years.



The Forecasted Rainfall from satellite in Aug-Sept 2020 in the LMB. Source: MRD, 2020



Standardised Precipitation Index (SPI) maps for six months from January-July 2020. Source: MRC, 2020

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PROJECT BACKGROUND

2016

Cambodia Rural Development Team installed three Rural Water Supply Systems.
The system pumped water to water towers by a network of PVC pipes.

Only 66/839 households in the three RWS stations (Koh Thnoat, Koh Dambong, Ksach Leav) connected and used the water systems for household consumption and home gardening

2019

EWB Solutions for Sustainable Development Intensive (S4SDi) reviewed existing problems with the water system.

Technical issues included:

- supply capacity/weak pressure, storage,
- Damaged pipework both within the household and the distribution infrastructure
- Low capacity to maintain and repair broken pipework,
- Unreliable solar panel power supply,

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PROJECT GRANT

- This project was funded by ANCP and;
- 2021-2022, EWB+CRDT were awarded a UNDP Solar-Water Pump grant to improve the clean water supply in Koh Thnot village, and in turn increase sustainable small-scale agricultural production for rural communities through the installation of solar water pumps.

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PARTNERS

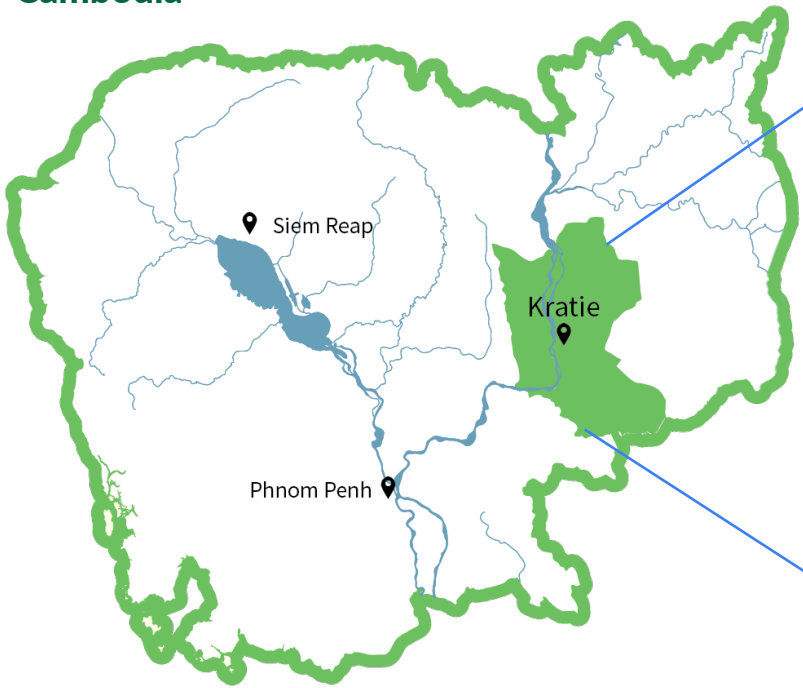
- CRDT formed a partnership with EWB to work on the rehabilitation of rural water supply project. CRDT coordinated the mobilization and the community engagement of the project.

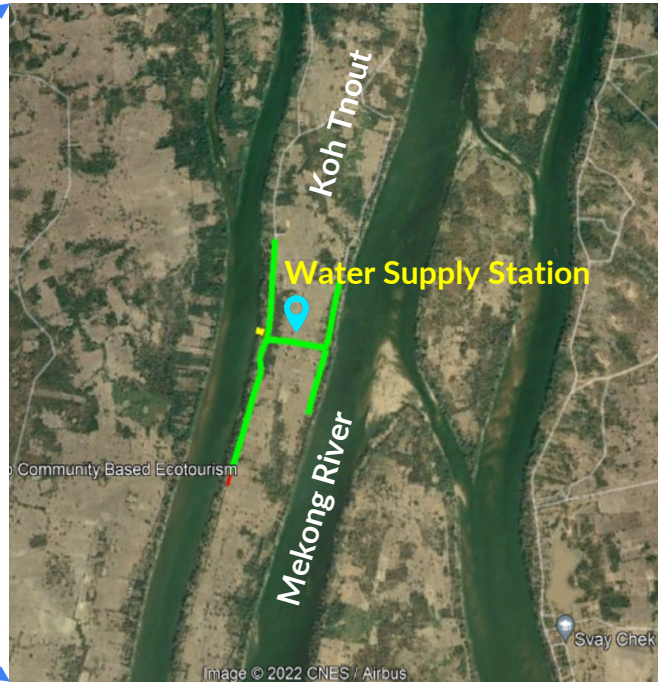
- Aurecon Group volunteers to support EWB team on the design of solar water pump and water treatment system.

- Sevea Consultant (hired by UNDP) provided EWB with training on how to identify customers for the solar water pump, how to create milestone documents and how to create business plans and financially manage the project.

PROJECT LOCATION

Koh Tnout Island in Sambo District, Kratie Province, Cambodia



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GEOGRAPHY OF TARGET AREA

- *Koh Tnout is an island surrounded by tributaries of the Mekong River and several other islands.*
- *The island's total population as of 2020 is 172 families, 802 people and 128 households*
- *Villagers live alongside the Mekong River. Most residents are subsistence famers and fishers. Some are employed in home gardens and animal husbandry.*

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WATER AND SANITATION CHALLENGES

Environment

- The Mekong River has a steep slope, making it unsafe and difficult to access for the women tasked with water collection.
- Water shortages are common during the dry season
- Water quantity is unpredictable due to dams in Laos and China

Infrastructure

- Community uses unclean water for household consumption and drinking.
- Ceramic filters are being used for drinking water, but they require frequent maintenance to treat river water.
- Community needs water for households consumption, irrigation, home gardening and farming

Consequences

- Insufficient water for raising livestock (requires many trips)
- Water costs hinders farmers from making profit
- The community uses diesel pumps for water collection
- Villagers expend time, energy and money collecting water

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EXISTING WATER SUPPLY CHALLENGES

There is no electricity in the village

The plastic tank and steel supports in the water towers are poor quality.

There is insufficient solar power capacity to operate the water system

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EXISTING WATER SUPPLY CHALLENGES

PVC pipes are often broken

Existing solar water pumps are not working well

There is a lack of water available for distribution

Water management committees are ineffective

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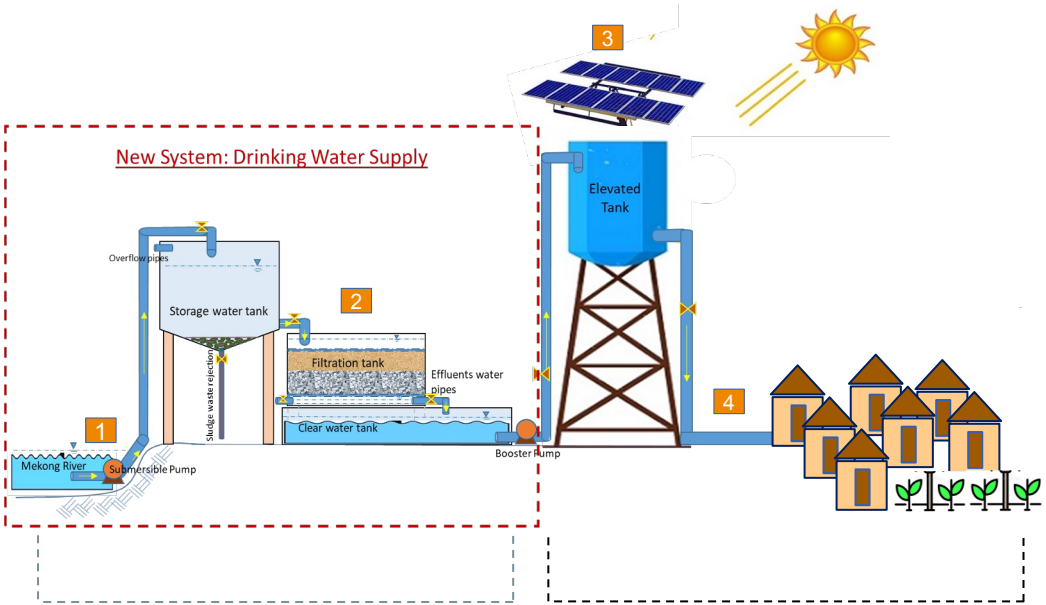
Conceptual Design of Water Supply System Is Operated by Business Activator

Feedwater is pumped from the Mekong river by the submersible solar water pump 1

Untreated water will be pumped to the water treatment plant (WTP) 2

Clear water pump to pump water from treatment plant to elevated tank 3

Water is released from elevated tank through gravity distribution 4



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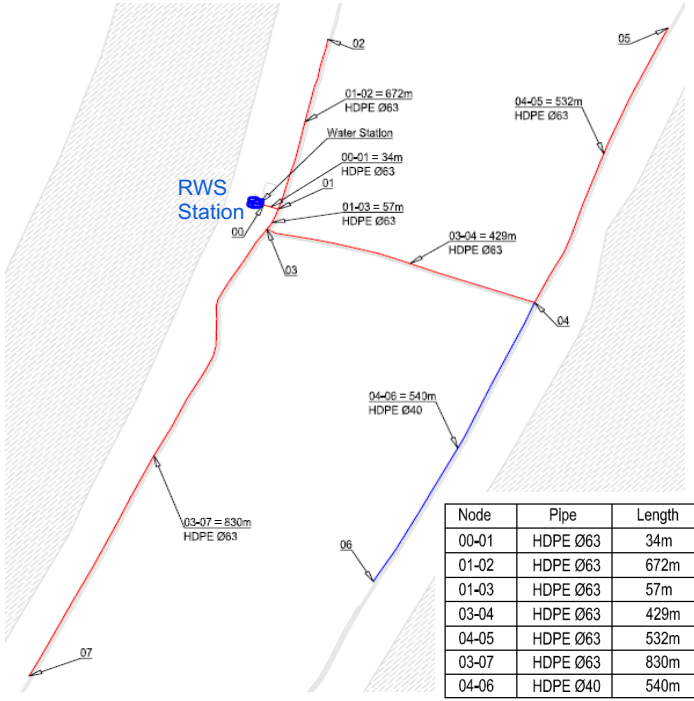
Solutions: Install Good Quality of Pipe Distribution Network

The HDPE pipe network stretches 3120m

Pipe transportation and installation activities

After installation, testing the quality

Map of the pipe network



Node	Pipe	Length
00-01	HDPE Ø63	34m
01-02	HDPE Ø63	672m
01-03	HDPE Ø63	57m
03-04	HDPE Ø63	429m
04-05	HDPE Ø63	532m
03-07	HDPE Ø63	830m
04-06	HDPE Ø40	540m

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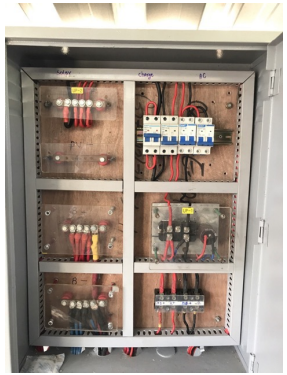
Solutions: Increase Power Capacity of Solar Power System



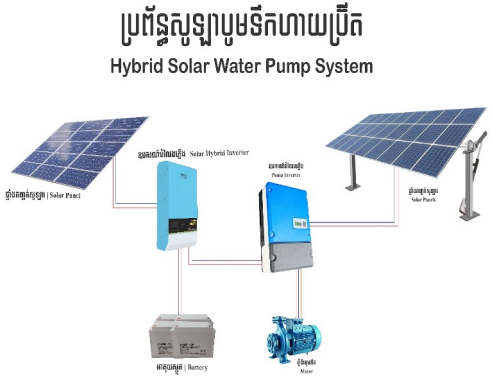


Table of Specification of solar tech materials and electrical load list

Item	Value
Solar support structure	Fixed-tilt
Minimum solar capacity	**7.2kWp**
Minimum daily solar generation	18kWh at the end of life
Minimum battery and hybrid inverter power rating	4.5kW continuous
Minimum battery capacity	8.8kWh usable at the end of life
Tech spec compliance	Required
Solar panel minimum performance warranty	20 years
Battery warranty	5 years
Inverter warranty	5 years
Installation warranty	5 years
Remote/online monitoring	Optional

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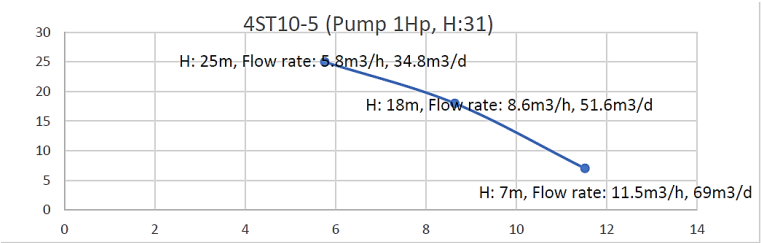
Solutions: Replace The Broken Plastic Tank and Raw Water Pump

Motor 1Hp Three Phase
Model : 4ST10-5
Voltage: 220V/50Hz,60Hz
Power: 750W (1Hp)
Max. Flow rate: 14.4m^3/h
Max. Head: 31m
Outlet Size: 60mm
Diameter: 4" (101.6mm)
Heat shrinkable tube for cable connection
1.5m cable with MC4 connector
Water level senssors

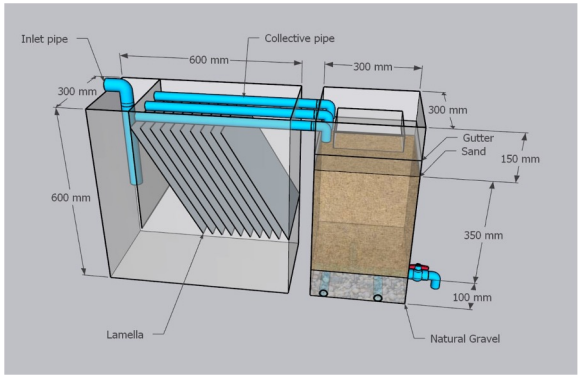
Replaced one broken plastic tank of capacity 5000L to ensure water has sufficient quantity and pressure to supply in each households

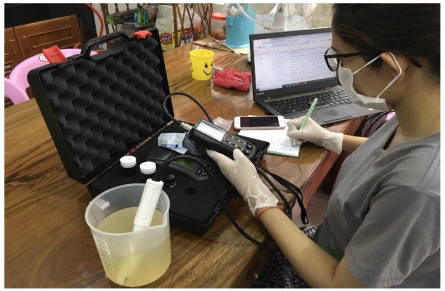


Improve Water Quality: Prototyping of Water Treatment System

Prototyping for water treatment system with concept of lamella clarifier and sand filter

- Measure flowrate
- Measure quality of inlet/outlet water
- Determine the infiltration rate of the media
- Determine the dosing rate of PaCl for flocculation

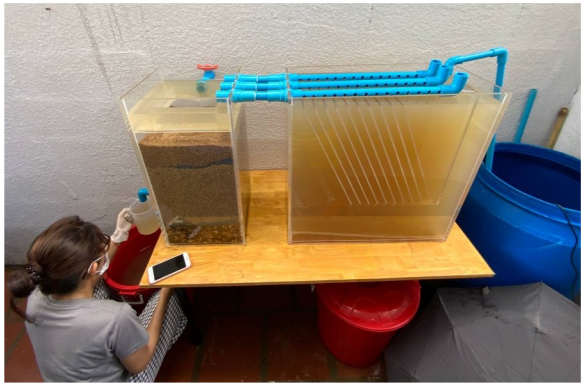




pH/EC/TDS/ Temperature Meter

Turbidity test

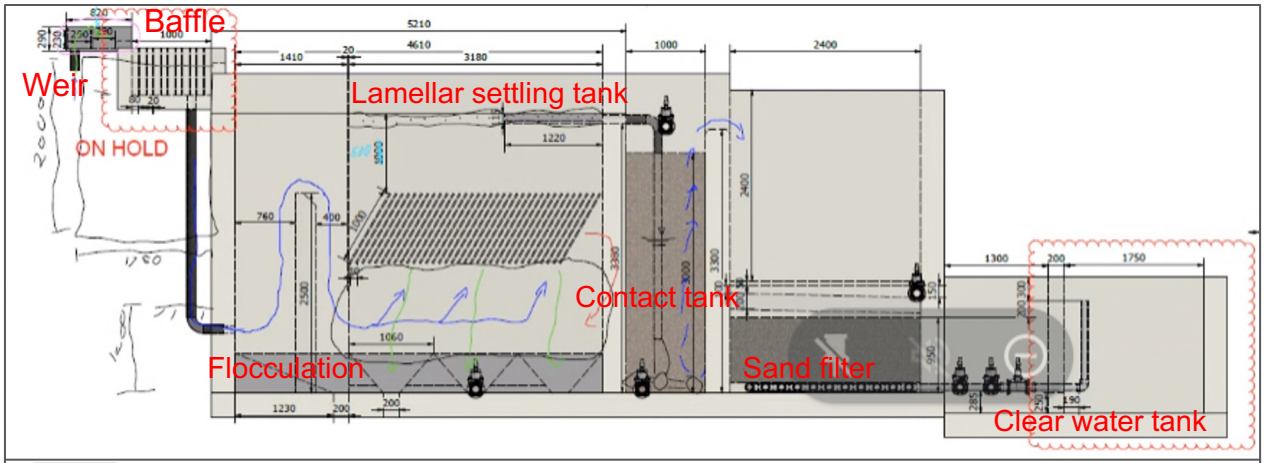
Chemical dose rate test (PaCl)



Prototyping of water treatment system

Process Design Basic: Water Treatment Plant

- On-going the process design of water treatment plant



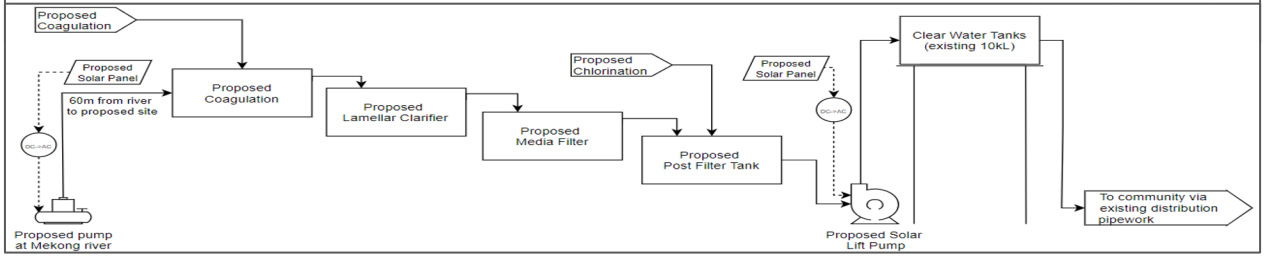


Table of WTP capacity summary

Parameter	Unit	Value
Operating Time	hr	8
Average Daily Demand	kL/d	79.2
Plant Recovery (Estimated)	%	90
Capacity		
Design Average	kL/h	10
Peak	kL/h	11
Minimum	kL/h	9

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Future Scaling Up

Feasibility Study

- Geographical area
- Economic – cost benefit analysis
- Technical (Risk Assessment and Solutions)
- Operational (Control efficiency and services
- Schedule (timeline estimation and optimizing resources)

Marketing Plan

- Situation analysis
  - ✓SWOT
  - ✓Product offering
- Marketing strategies
  - ✓Market segmentation
  - ✓Targeting strategies
  - ✓Positioning strategies
- Marketing program
  - ✓Product decision
  - ✓Price decision
  - ✓Marketing communication decision
  - ✓Channel decisions

Technical Plan

- Identify raw water source
- Pumping
- Energy
- Infrastructure
- Pipe distribution network

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WATER & WASH FUTURES 2022

Water, WASH and Climate Virtual Symposium

THANK YOU FOR LISTENING!

https://washfutures.com/water-wash-climate-virtual-symposium-session-information/thematic-session-nature-based-and-other-sustainable-wash-solutions-to-climate-change/

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Nature-based and other sustainable WASH solutions to Climate C

Australian WASH Reference Group

UTS Institute for Sustainable Futures

engineers without borders australia

The University Of Queensland AUSTRALIA

WCS

rise REVITALISING INFORMAL SETTLEMENTS AND THEIR ENVIRONMENTS

MONASH SUSTAINABLE DEVELOPMENT INSTITUTE

ARUP

Coming up……

Registrations open until an hour before sessions start washfutures.com

Tuesday

Building equality into climate resilience – ***starting in half an hour***

Wednesday

Water management to alleviate water-mediated disasters
Stories from Practice Exhibition (Remo)
Early Career Professional Session (for <35 year-olds!)

Thursday

Partnerships for scaling up private sector investment in WASH

Closing Panel: Collaborating across sectors for local water security