



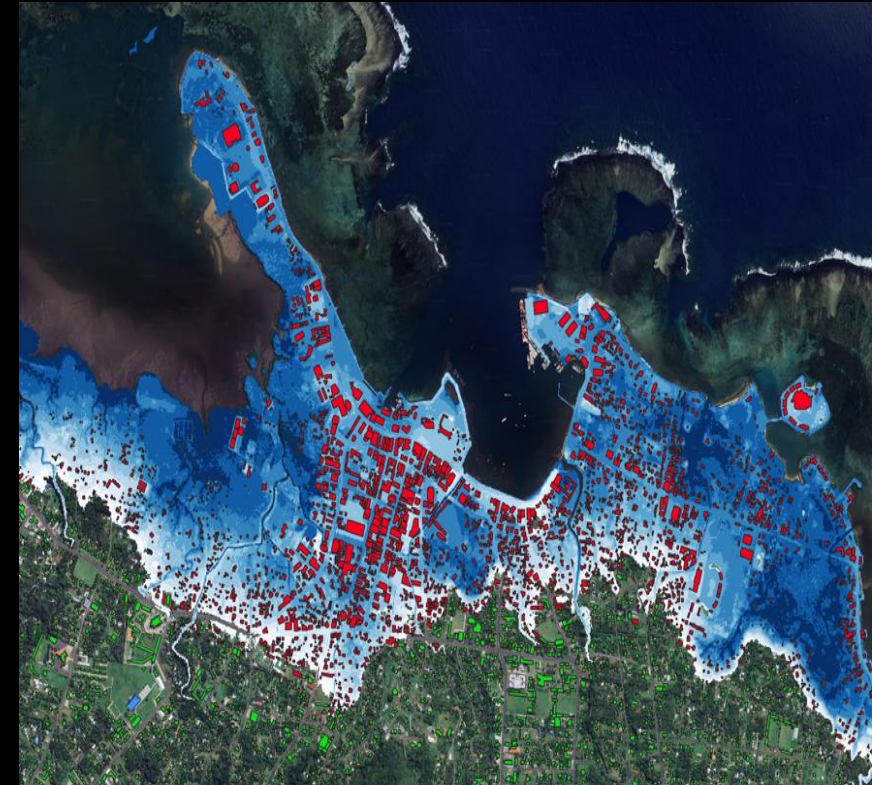
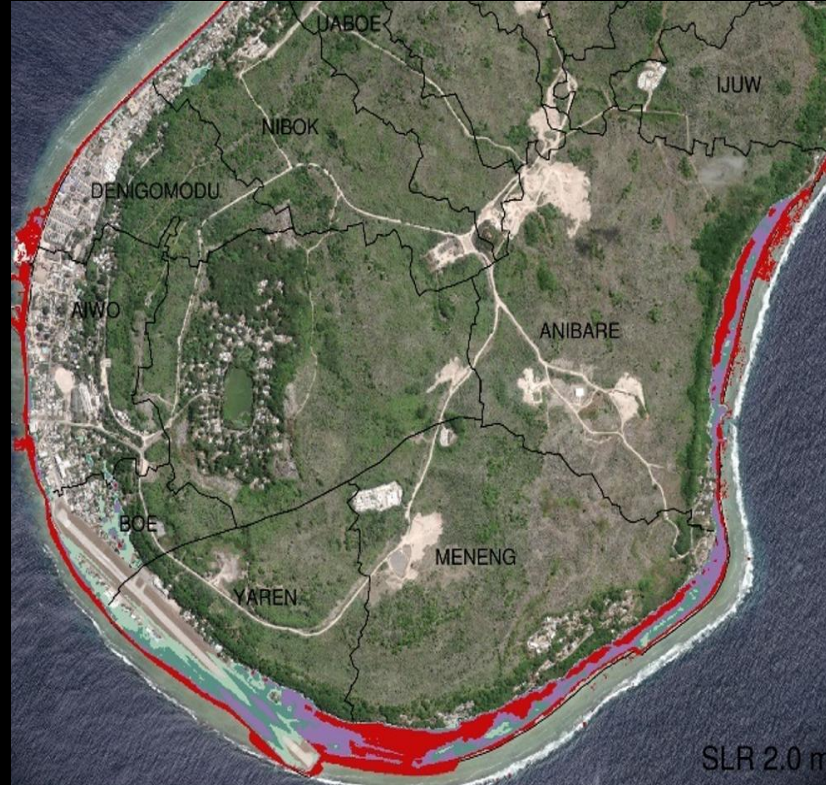
Pacific GIS and
Remote Sensing

202
3

Applying Coastal Flood Risk Information in Climate and Disaster Adaptation Planning

Examples from Aotearoa New Zealand, Nauru, and Samoa

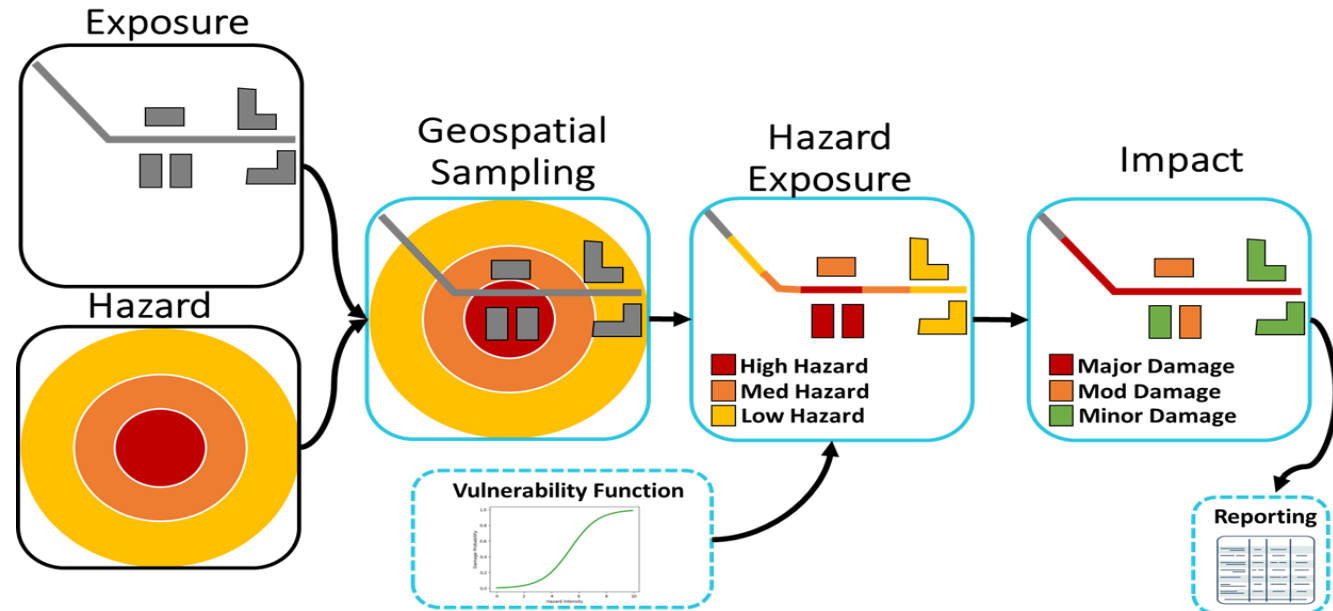
Shaun Williams, Cyprien Bosserelle, Rebecca Welsh, Ryan Paulik



Outline

- Overview and Background
- SLR inundation at Wairau Bar – preservation of cultural heritage
- SLR inundation in Nauru – long-term relocation planning
- SLR inundation in Samoa – adaptation and investment planning
- Summary

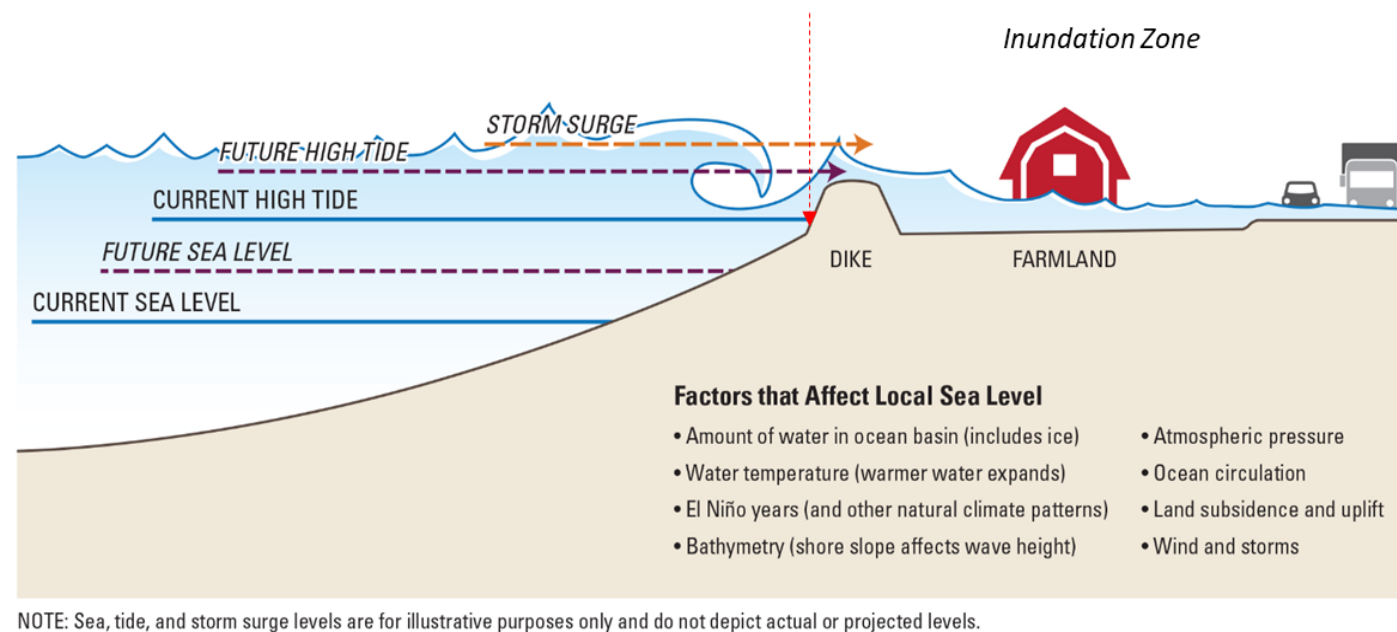
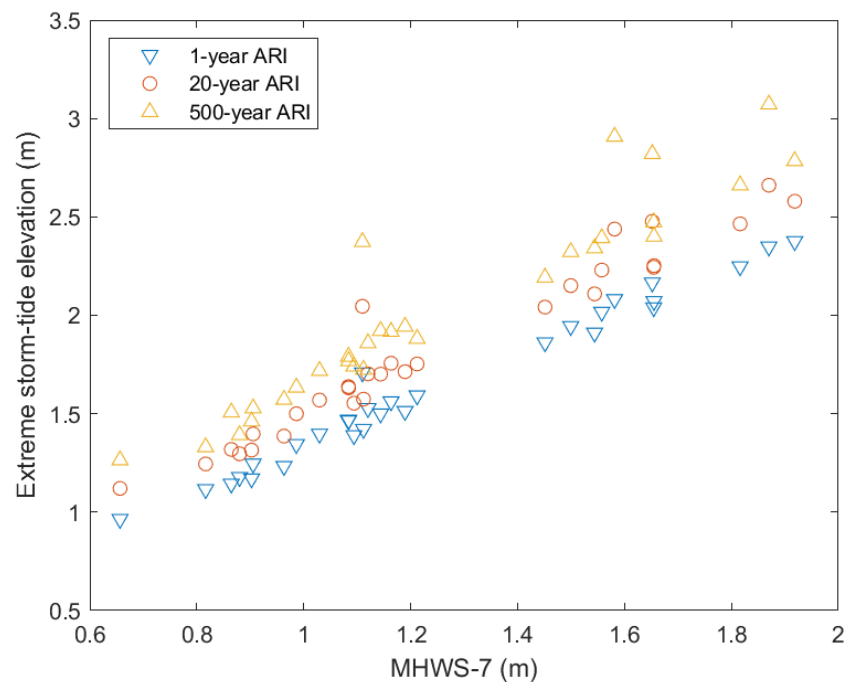
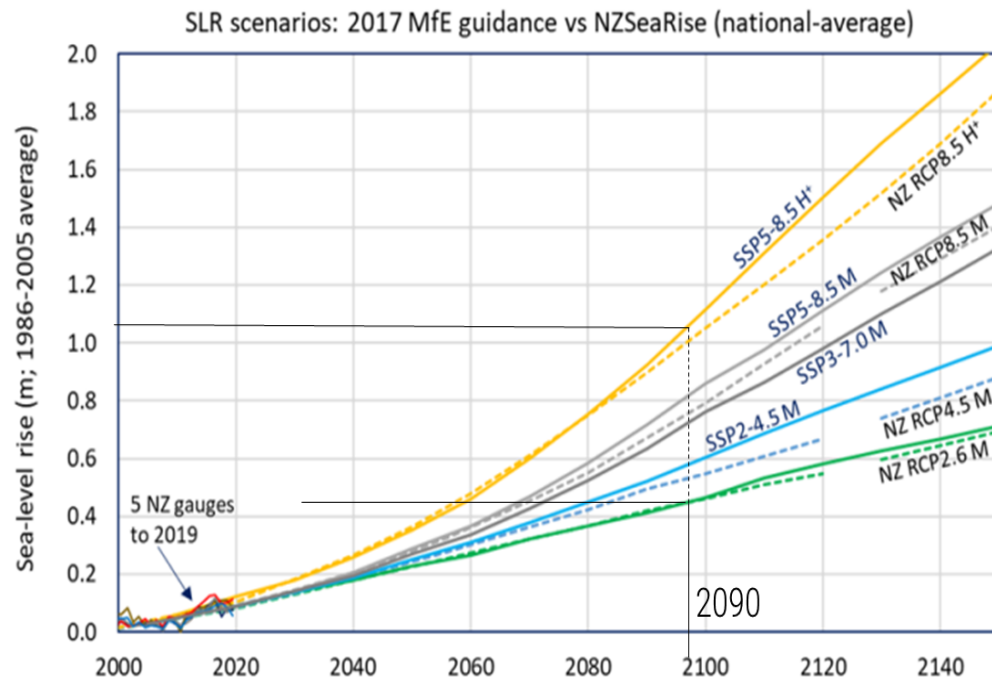
Case studies apply the use of Geospatial Datasets & Modelling Analysis & Mapping Tools to produce Decision Support Information



SLR inundation

Te Pokohiwi o Kupe

Datasets



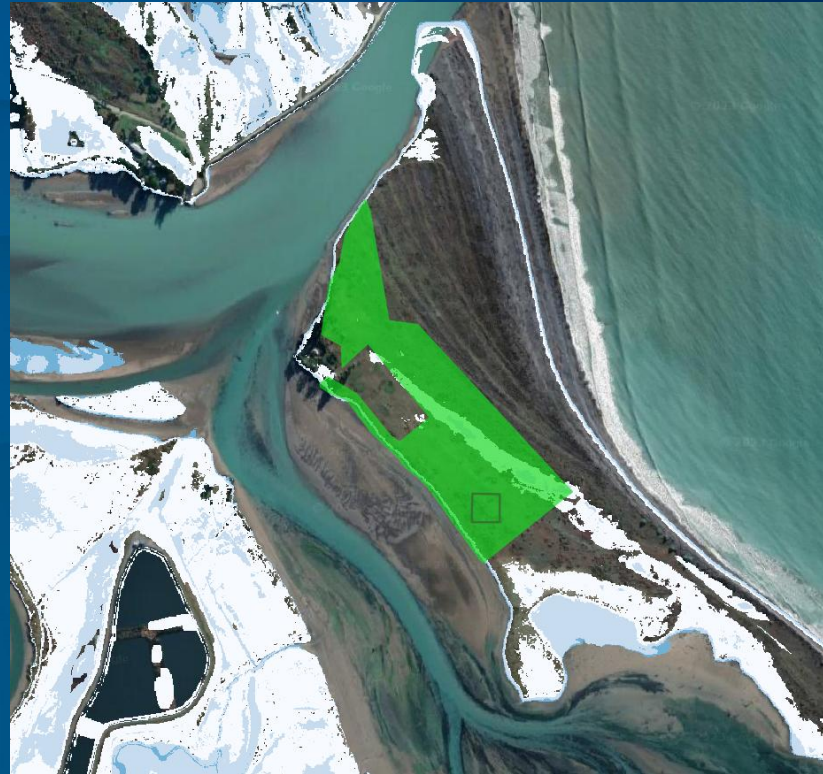
Results – SLR at Te Pokohiwi o Kupe

Permanent Spring Tide Inundation Exposure of Heritage Land Area under relative sea level rise

Present **SLR=0.0m**
Heritage area: 120,851 m²
Exposed area: 5,677 m²
% Exposed: 5%

2045–2060 **SLR=0.5m**
Heritage area: 120,851 m²
Exposed area: 19,740 m²
% Exposed: 16%

2070–2130 **SLR=1.0m**
Heritage area: 120,851 m²
Exposed area: 63,439 m²
% Exposed: 53%



Results – SLR at Te Pokohiwi o Kupe

100-year Storm Inundation Exposure of Heritage Land Area under relative sea level rise

Present

SLR=0.0m

Heritage area: 120,851 m²

Exposed area: 24,311 m²

% Exposed: 20%

2045–2060

SLR=0.5m

Heritage area: 120,851 m²

Exposed area: 65,732 m²

% Exposed: 54%

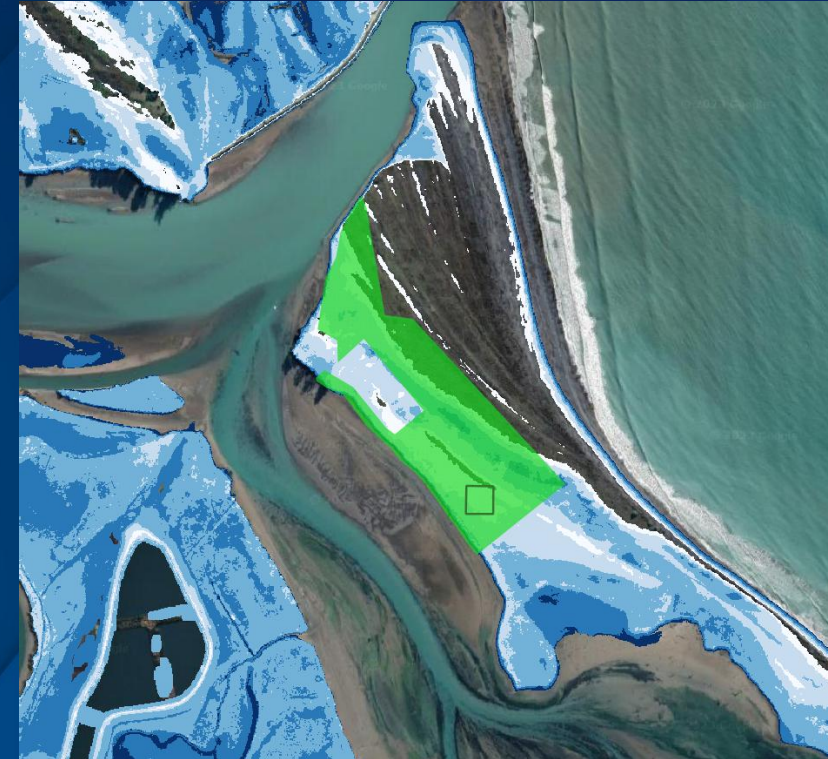
2070–2130

SLR=1.0m

Heritage area: 120,851 m²

Exposed area: 90,468 m²

% Exposed: 75%

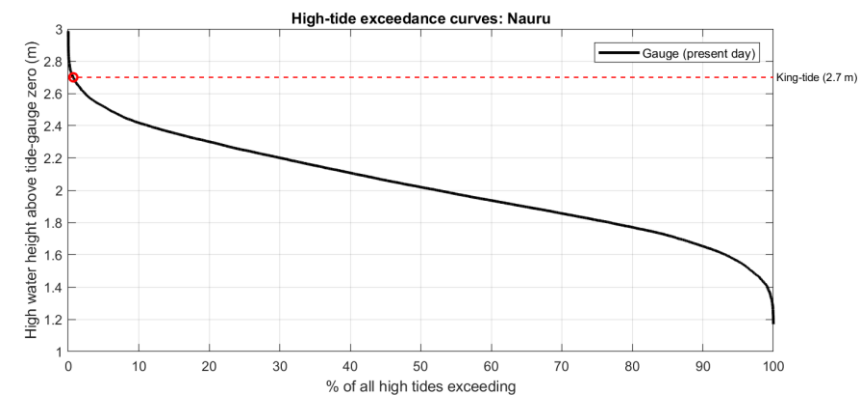
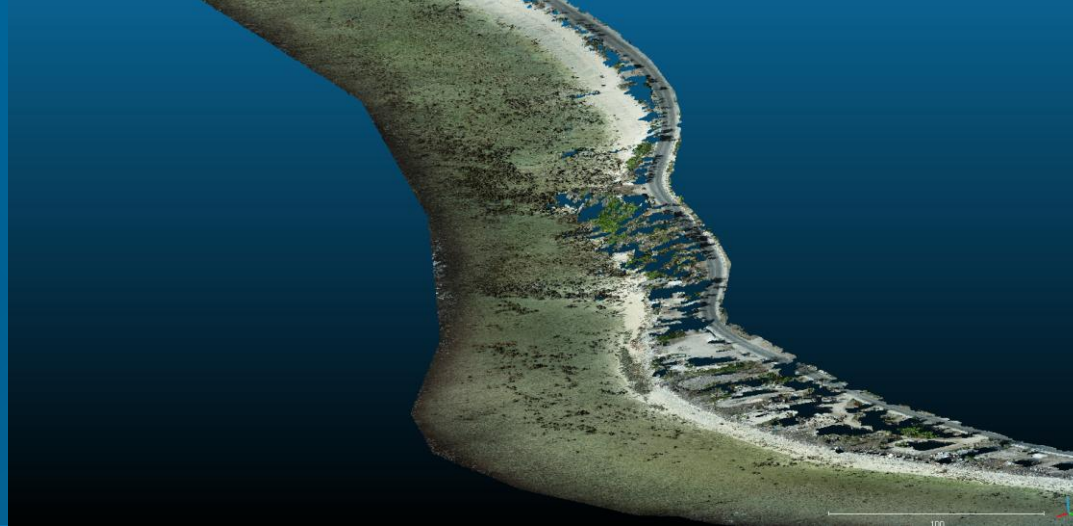


Key findings

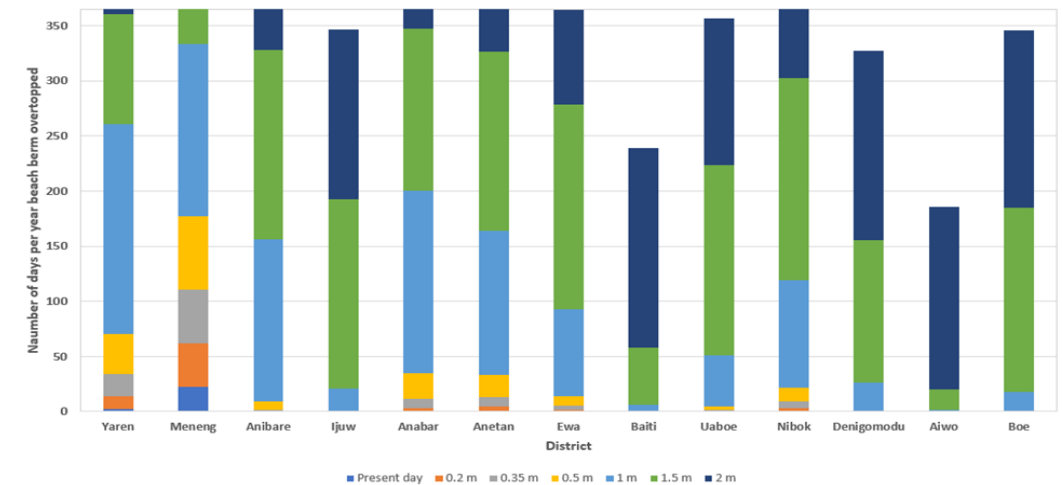
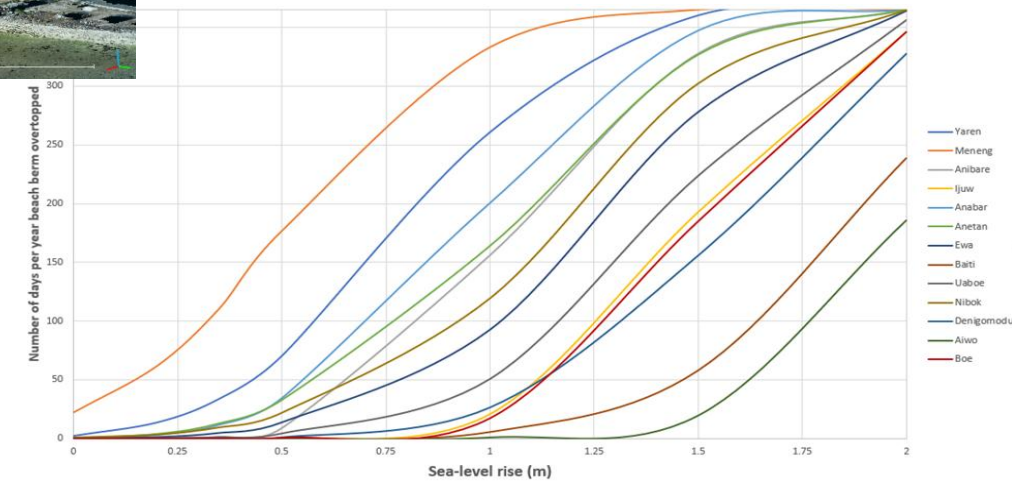
- Heritage land (wāhi tapu) at Te Pokohiwi o Kupe is already susceptible to inundation by significant storm waves
- Effects become more prominent as sea-level continues to rise over the next few decades
- Evidence-base to inform the dialogue on identifying adaptation and implementation options for rescuing/preserving wāhi tapu and taonga within the heritage area



SLR inundation Nauru

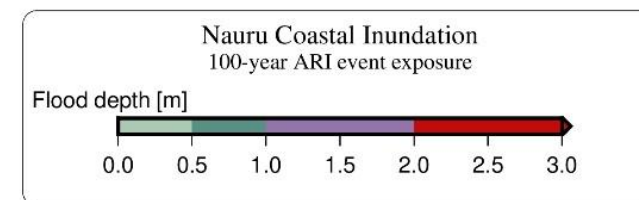


Datasets



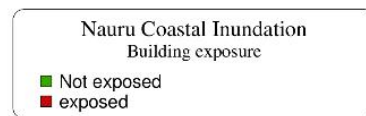
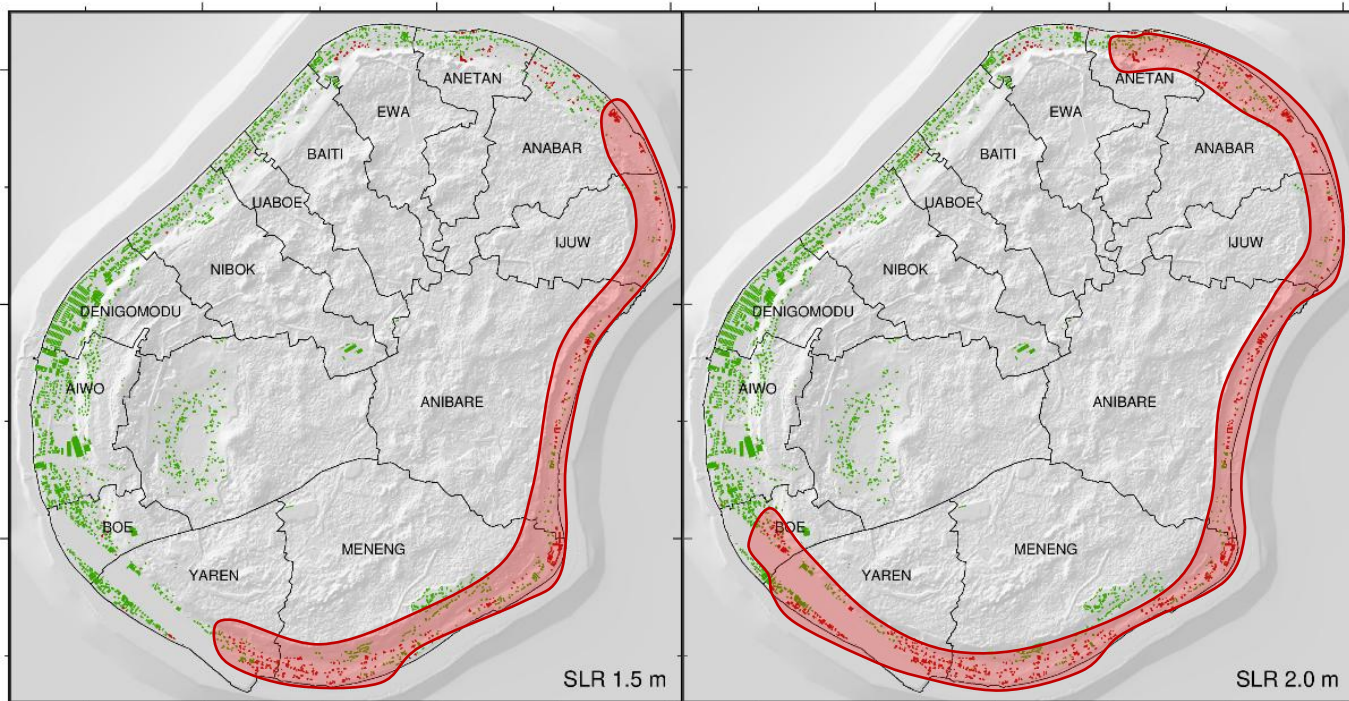
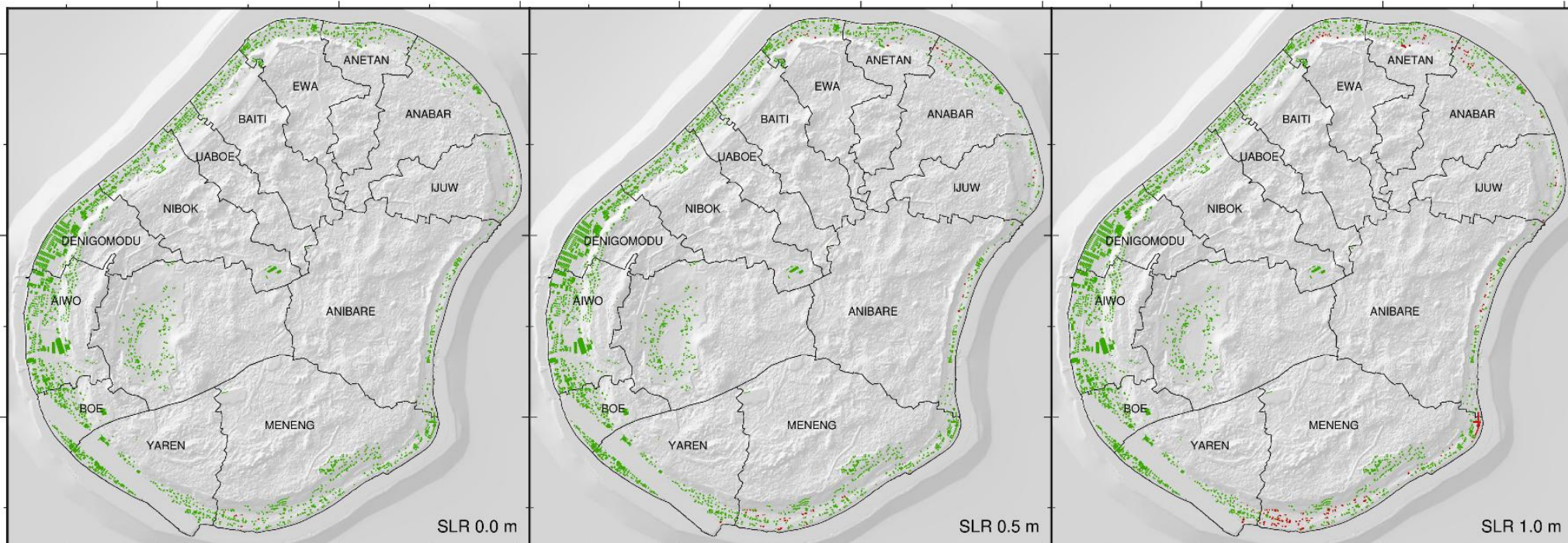


Example – Nauru SLR exposure study



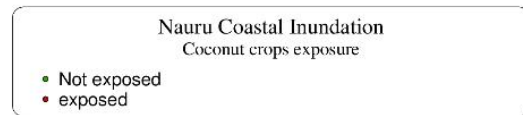
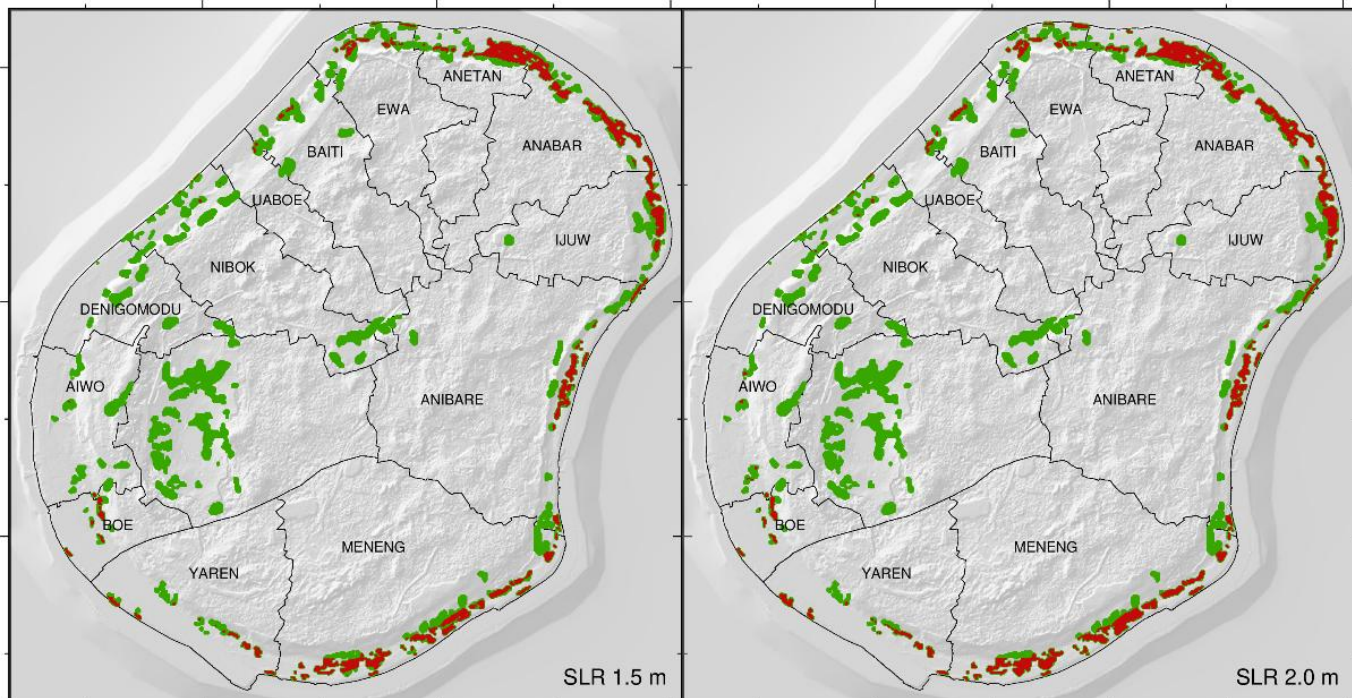
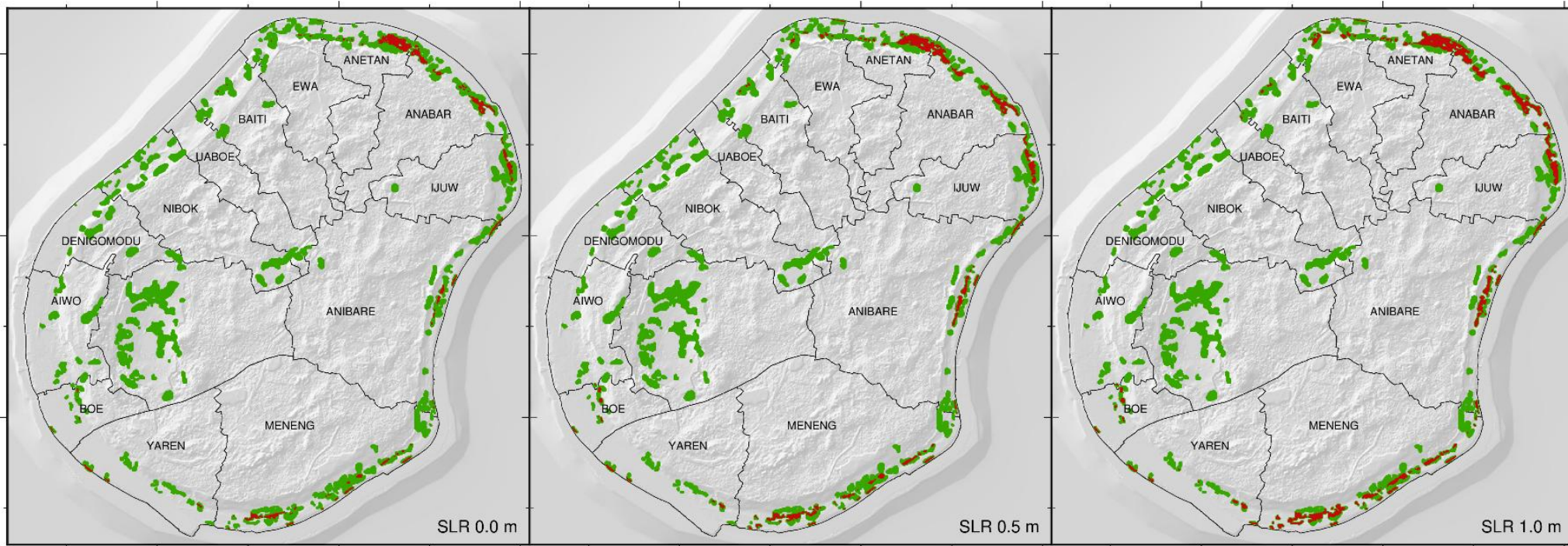
Bosserelle C, Williams S. 2023.
Coastal flooding from sea-level rise
in Nauru: Stage 2 wave inundation
mapping. *NIWA Client Report*

Example – Nauru SLR exposure study



Bosserelle C, Williams S. 2023.
Coastal flooding from sea-level rise
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Example – Nauru SLR exposure study



Bosserelle C, Williams S. 2023.
Coastal flooding from sea-level rise
in Nauru: Stage 2 wave inundation
mapping. *NIWA Client Report*

Example – Nauru SLR exposure study

District name	Total district population	Population exposed							Proportion of district population exposed							Average rank of percentage exposed
		Wave Inundation	Wave Inundation +0.2m SLR	Wave Inundation +0.35m SLR	Wave Inundation +0.5m SLR	Wave Inundation +1m SLR	Wave Inundation +1.5m SLR	Wave Inundation +2m SLR	Wave Inundation	Wave Inundation +0.2m SLR	Wave Inundation +0.35m SLR	Wave Inundation +0.5m SLR	Wave Inundation +1m SLR	Wave Inundation +1.5m SLR	Wave Inundation +2m SLR	
Aiwo	2,033						7	20						0.3%	1.0%	12
Anabar	793	12	43	61	85	153	342	488	1.5%	5.4%	7.7%	10.8%	19.2%	43.1%	61.5%	2
Anetan	1,135		10	19	39	97	184	369		0.9%	1.7%	3.4%	8.5%	16.2%	32.5%	7
Anibare	797		29	48	58	144	384	595		3.6%	6.0%	7.2%	18.1%	48.2%	74.7%	1
Baiti	718							7							1.0%	11
Boe	1,138					16	55	237					1.4%	4.9%	20.8%	8
Buada	955		17	17	24	133	180	202	0.0%	1.8%	1.8%	2.5%	13.9%	18.8%	21.1%	
Denigomodu	1,976															
Ewa	764		16	16	62	117	172	242		2.0%	2.0%	8.2%	15.3%	22.4%	31.6%	5
Ijuw	254	5	11	16	16	32	74	122	2.1%	4.2%	6.3%	6.3%	12.5%	29.2%	47.9%	6
Meneng	2,040	75	129	177	252	558	850	1,183	3.7%	6.3%	8.7%	12.3%	27.3%	41.7%	58.0%	3
Nibok	872						6	12						0.7%	1.4%	10
Uaboe	518						8	32						1.6%	6.3%	9
Yaren	1,138	16	24	24	24	55	466	830	1.4%	2.1%	2.1%	2.1%	4.9%	41.0%	72.9%	1
All of Nauru	15,131	108	277	377	559	1,304	2,728	4,339	0.7%	1.8%	2.5%	3.7%	8.6%	18.0%	28.7%	

Key findings

- Assets become significantly exposed esp along SE-NW coast when SLR reaches/exceeds 1m
 - Cropland exposure increase from 10% (present) to 22% (1m SLR)
 - Coastal land area exposure increase from 7% (present) to 18% (1m SLR)
 - Coastal land area exposure increase from 7% (present) to 18% (1m SLR)
 - etc (buildings, population, roads, tanks, electric poles, runway)
- Evidence-base to identify 'risk hotspot' areas for more detailed site-specific investigation, and ongoing dialogue on relocation planning



SLR Inundation Apia

Datasets



PARTneR-II



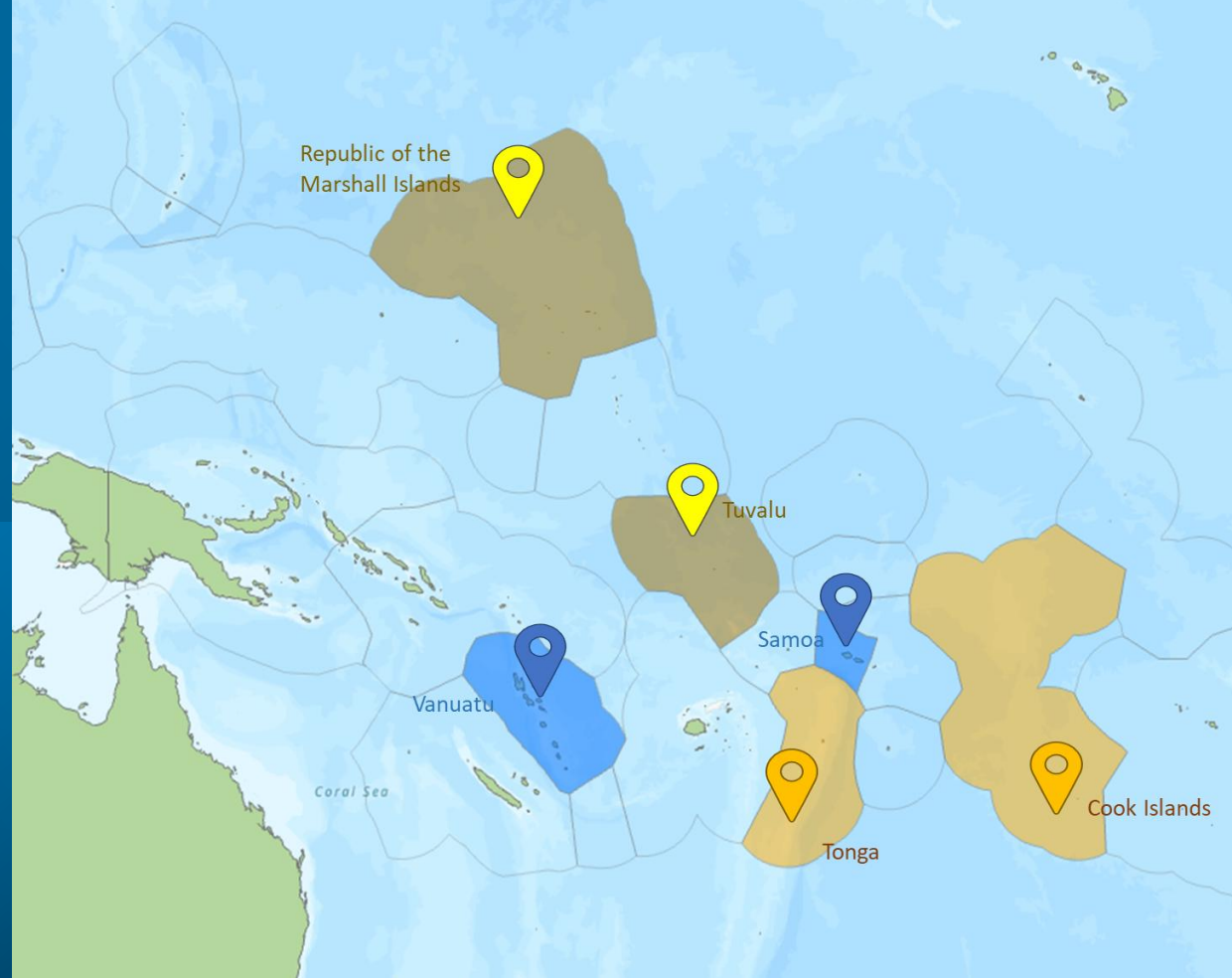
PCRAFI
PROGRAM



PACIFIC
DATA
HUB



Pacific
Community
Communauté
du Pacifique



Focus on climatic hazard risks

- Sea Level Rise
- Tropical Cyclone
- Drought



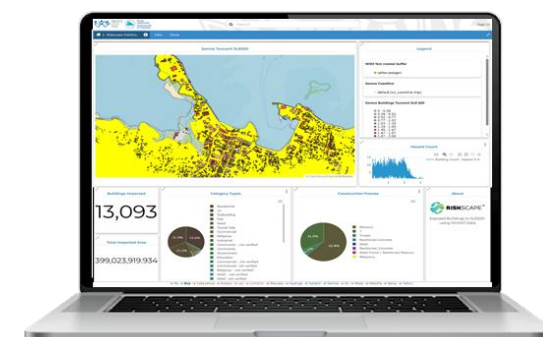
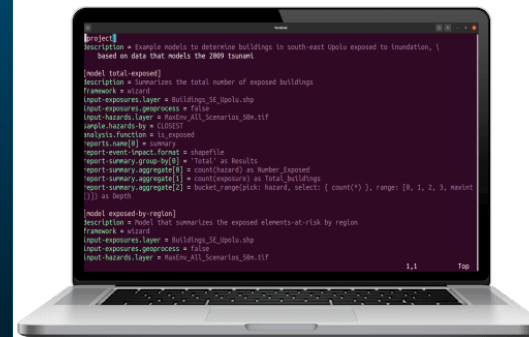
Build on the
pilot PARTneR
project



Build on the
RiskScape
drought
model



New to the
project



MHWS-10 0.0 m SLR



Example Selected MHWS-10 Scenarios

Indicative of areas exposed to permanent spring tide inundation under present (0.0m SLR), and future climate conditions (0.5m and 1.0m) – Apia, Samoa

Exposed buildings

Not Exposed

Exposed

Flood depth (m)

Band 1 (Gray)

<= 0.5

0.5 - 1.0

1.0 - 1.5

1.5 - 2.0

2.0 - 2.5

2.5 - 3.0

3.0 - 3.5

> 3.5

Coastline

Google Satellite

0 0.5 1 km



MHWS-10 0.5 m SLR



Exposed buildings

Not Exposed

Exposed

Flood depth (m)

Band 1 (Gray)

<= 0.5

0.5 - 1.0

1.0 - 1.5

1.5 - 2.0

2.0 - 2.5

2.5 - 3.0

3.0 - 3.5

> 3.5

Coastline

Google Satellite

0 0.5 1 km



MHWS-10

1.0 m SLR




Exposed buildings


Not Exposed


Exposed


Flood depth (m)


Band 1 (Gray)


 ≤ 0.5


 0.5 - 1.0

 1.0 - 1.5


 1.5 - 2.0

 2.0 - 2.5

 2.5 - 3.0

 3.0 - 3.5

 > 3.5

 Coastline

Google Satellite

0 0.5 1 km



50-year ESL 1.0 m SLR



PARTheR-II

Exposed buildings

Not Exposed

Exposed

Flood depth (m)

Band 1 (Gray)

<= 0.5

0.5 - 1.0

1.0 - 1.5

1.5 - 2.0

2.0 - 2.5

2.5 - 3.0

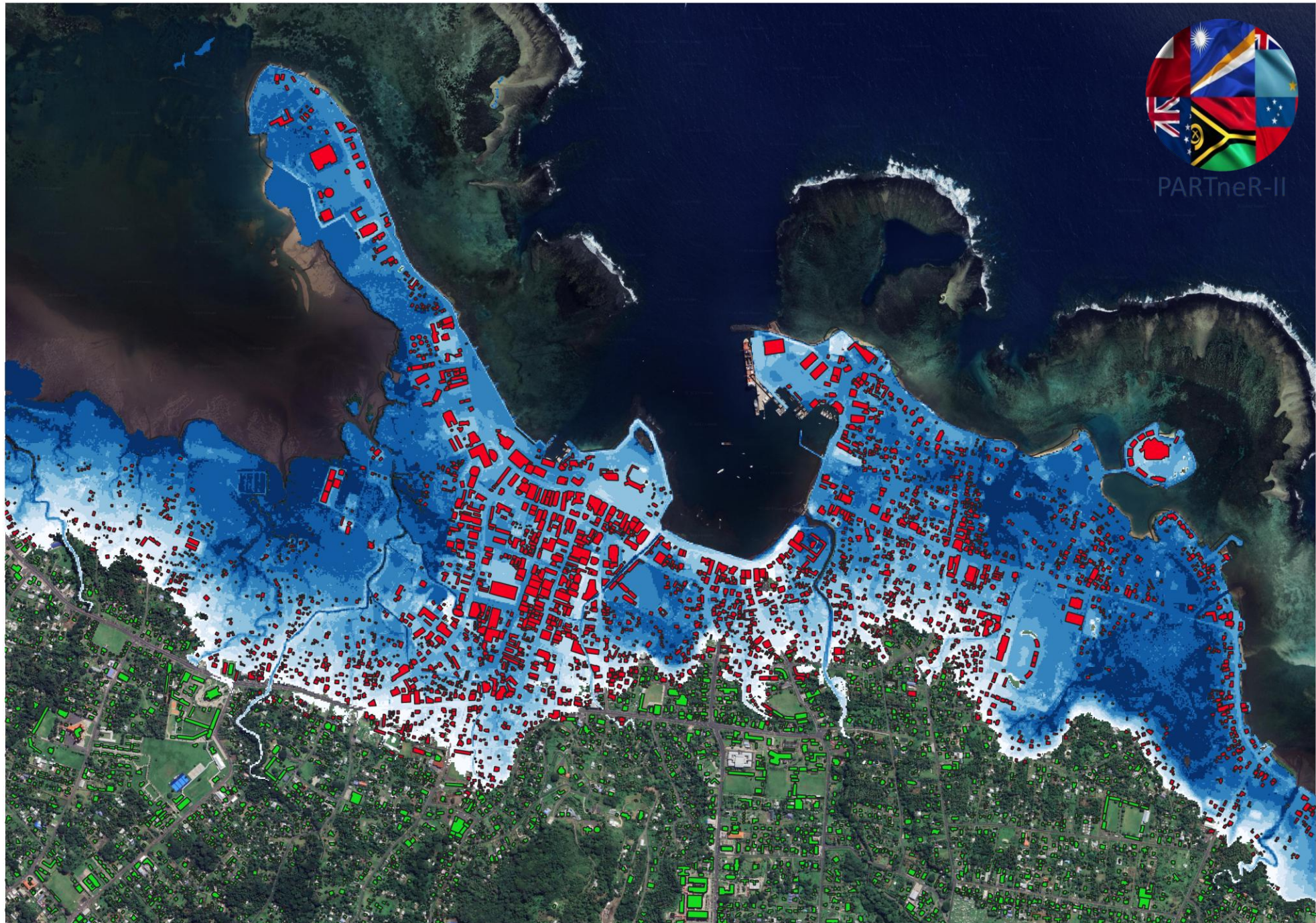
3.0 - 3.5

> 3.5

Coastline

Google Satellite

0 0.5 1 km

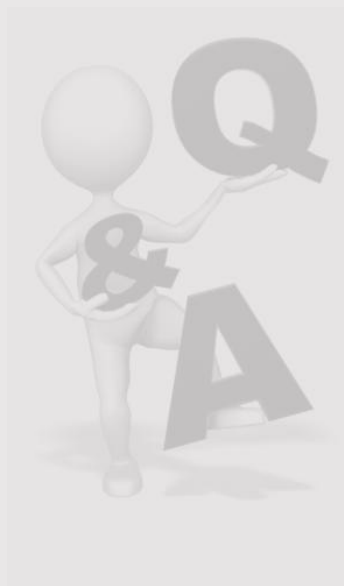


Key findings

- Assets become significantly exposed esp along SE-NW coast when SLR reaches/exceeds 1m
- Evidence-base to inform areas and potential options for targeted resilience / adaptation investment (both soft and hard solutions)
- Includes ongoing dialogue with project donors



Vina'a
Va'alevu



PGRSC

Pacific GIS and
Remote Sensing

PACIFIC GIS & REMOTE SENSING USER CONFERENCE
27 NOVEMBER - 1 DECEMBER, 2023
JAPAN-ICT USP HALL | SUVA | FIJI ISLANDS

IMPROVING RESILIENCE IN THE PACIFIC ISLANDS
THROUGH GIS & REMOTE SENSING

Shaun.Williams@niwa.co.nz

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