Pacific Possible
Climate and Disaster Resilience

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Pacific Possible

Approach/Objectives

Key objectives:

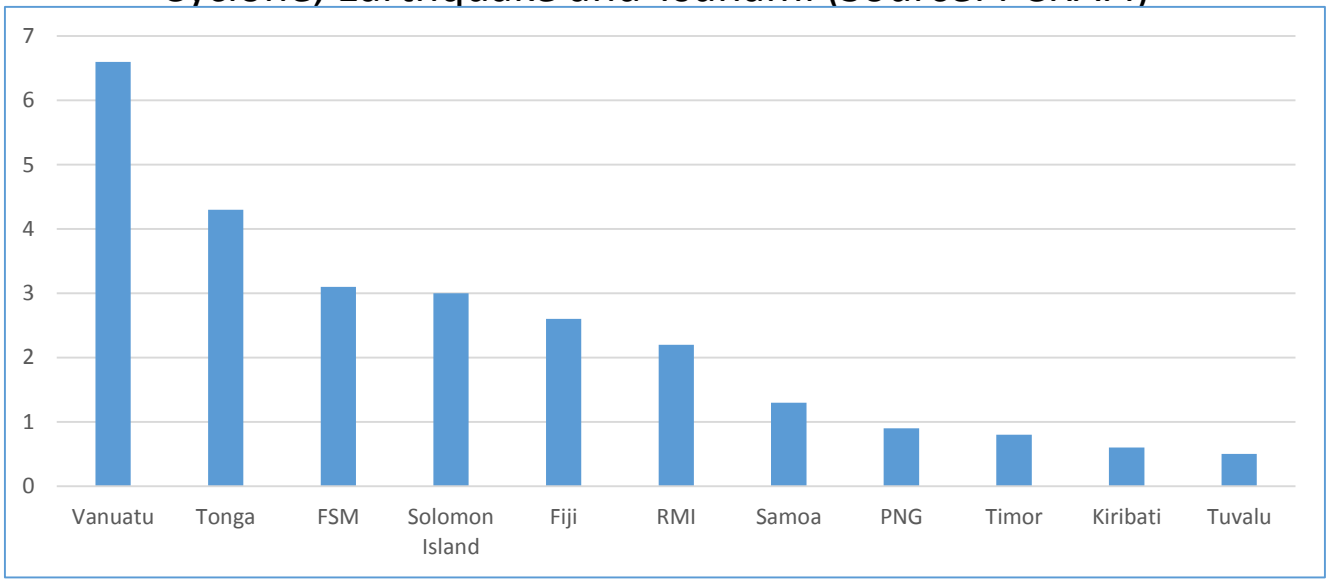
- Assess **potential increases of impacts** from natural hazards and climate change on PICs by 2040
- Estimate **cost of adaptation** and **suggest policy actions** to reduce the impact

Key sectors considered: coastal protection, water resources management and flooding, infrastructure and buildings, agriculture

A chapter on the Special Case of Atoll Islands

Current risks for PICs are already high

Average Annual Loss - % of the GDP
Cyclone, Earthquake and Tsunami (Source: PCRAFI)



Climate change will increase existing vulnerabilities

Majuro RMI, King tide, March 2015

Satellite image of Tropical Cyclone Pam taken over Vanuatu Mar. 13, 2015 (Source: NASA)

Kwajalein Atoll, RMI

Eroded plantation, Guadalcanal plains, Solomon islands, April 2014

North Tawara, Kiribati, 2011

What can be done to reduce these vulnerabilities

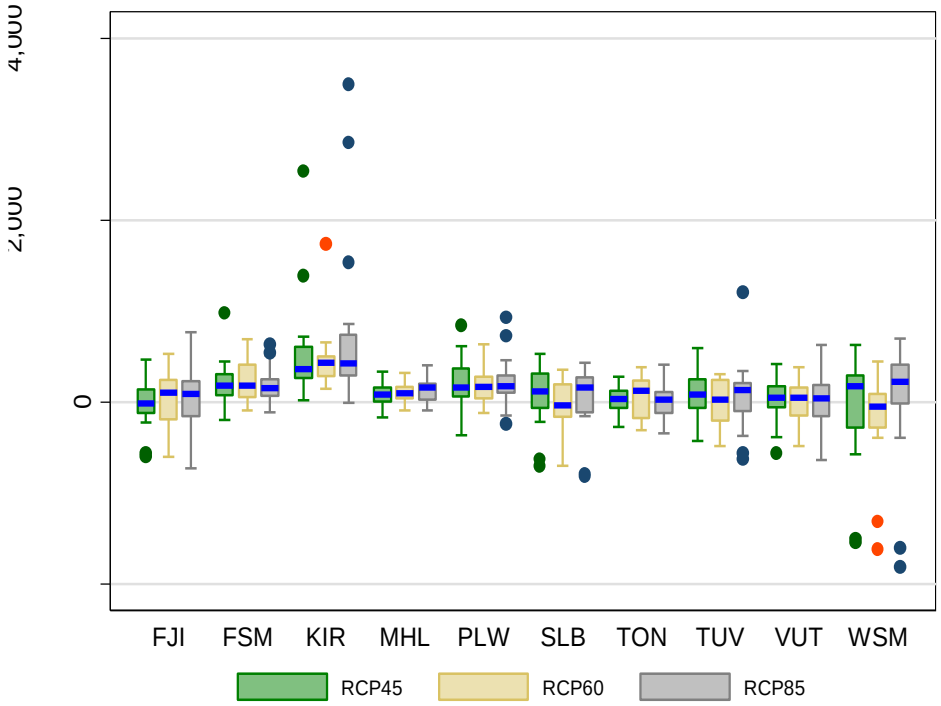
The challenge of estimating the cost of adaptation

Key messages:

- Changes are uncertain.
- Results should be used carefully.

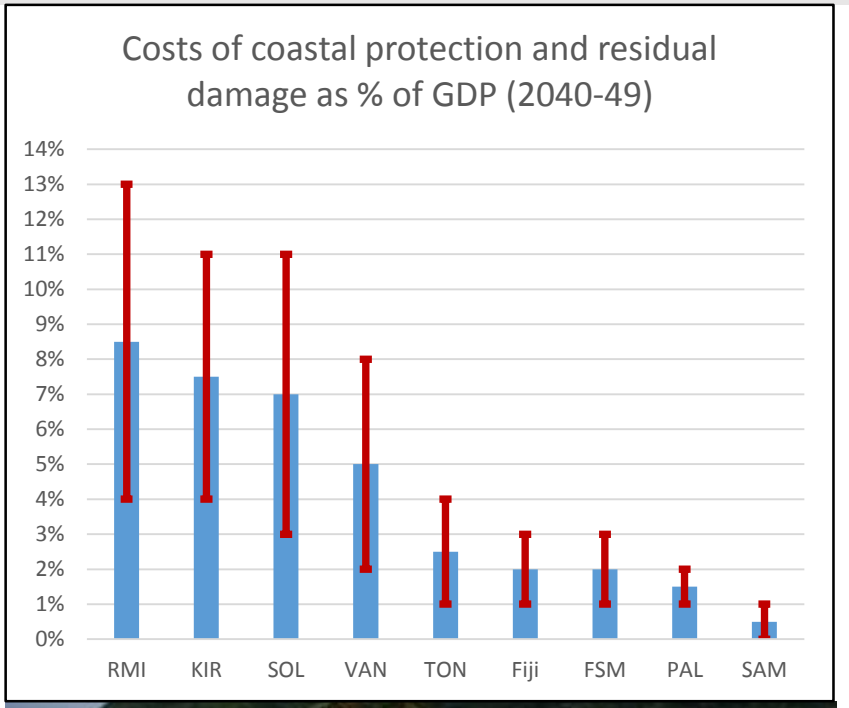
Overview of methodology:

- RCP scenarios (RCP4.5 mainly).
- PCRAFI for cyclone risks.
- WB EACC models for infrastructure.
- DIVA model for coastal protection



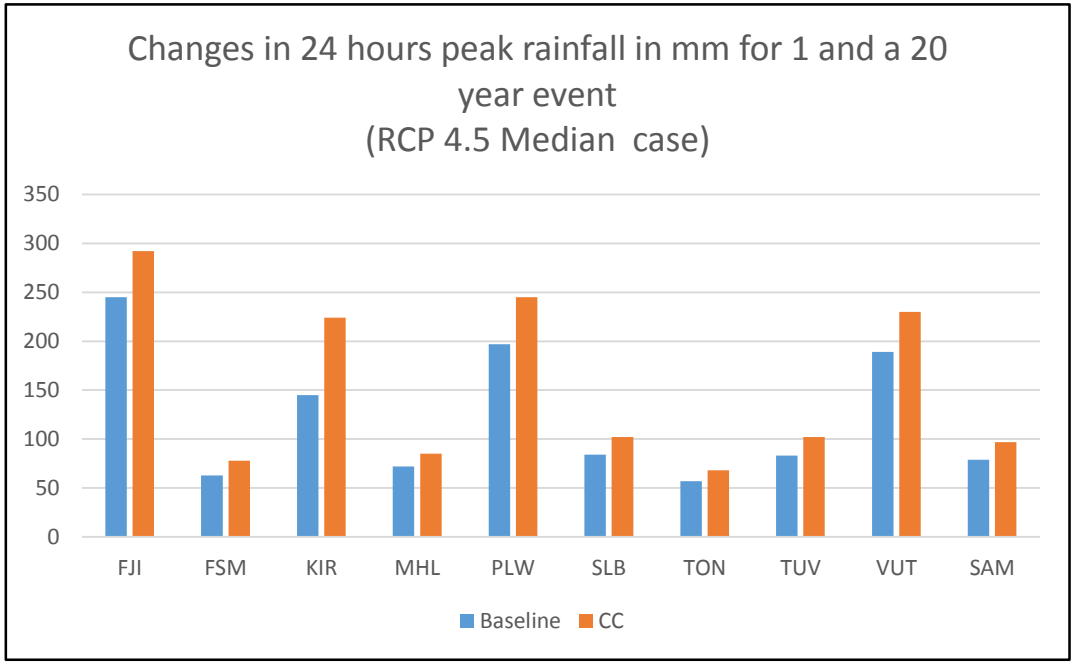
Sea level rise and coastal protection

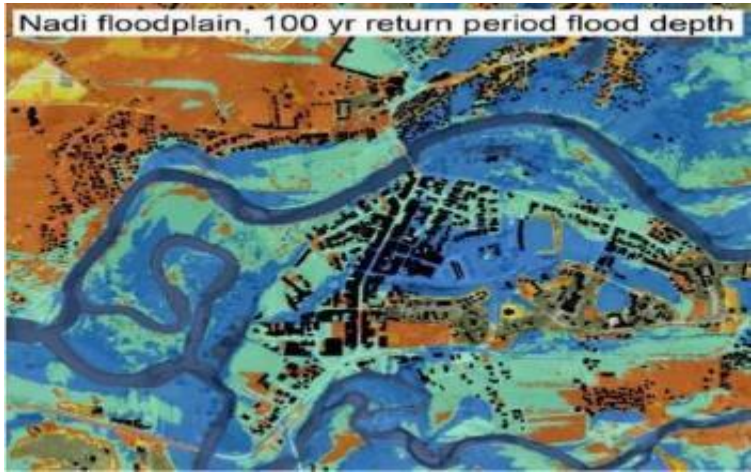
- Overall cost of coastal adaptation is high > 5% of GDP for RMI, Kiribati, Solomon Islands and Vanuatu in the medium SLR scenario.
- PICs may need to set geographical priorities (e.g: densely populated areas, critical assets).
- A priority: improving spatial planning.



Reducing flood risks

- Even under existing climate conditions, several PICs experience flooding.
- Most of the PICs will experience an increased flood risk.
- Increase in the design standard for flood defences is required.
- Effective spatial planning will be critical.





Managing water resources and droughts

- Even under existing climate conditions, several PICs experience drought related challenges.
- Most PICs will experience and Increased drought risk.
- Investments in additional water storage is required .
- An alternative may be reliance on other water sources, such as desalination.


Majuro, airport water reservoir

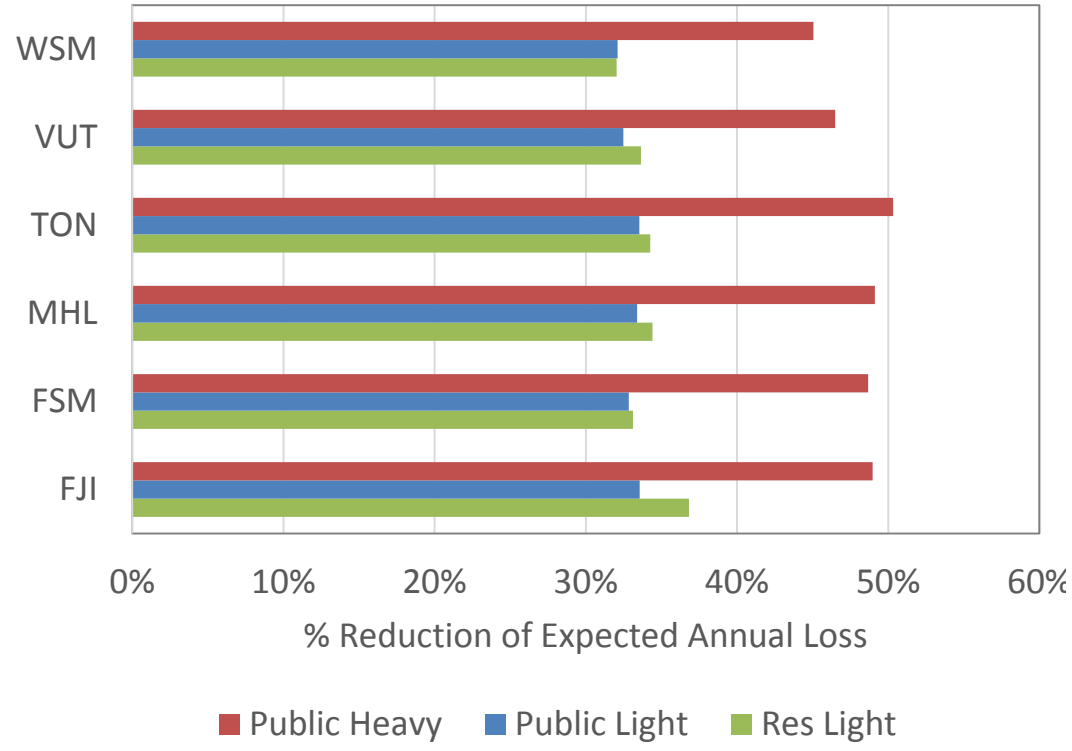
Adapting infrastructure to change in rainfall and temperature

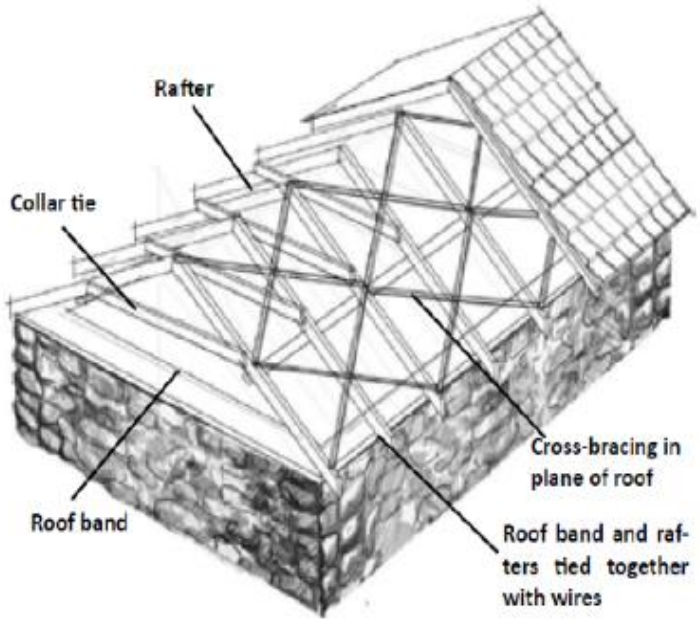
Country	Average cost	% of baseline expenditure
Fiji	20.2	2.9%
FSM	13.4	13%
Kiribati	18.9	21%
MHL	8.1	11%
Palau	4.5	6.3%
SLB	17.3	8.6%
Tonga	8.4	12%
Tuvalu	0.3	5.8%
Vanuatu	7.0	3.9%
Samoa	7.8	7.0%

Protecting buildings against cyclone winds

- Large scale retrofitting of public and residential buildings is expected to lead to about 50% reduction in Average Annual Losses.

Loss reductions due to cyclone wind retrofitting options





Roof bracing and collar ties details

Protecting buildings against cyclone winds

- However, the costs of retrofitting are not trivial and cost and benefits analysis are needed to inform retrofitting policies.

Benefit-Cost Ratios for Light Retrofitting of Public Buildings

Country	Material	BCR @ 2% discount rate			BCR @ 5% discount rate		
		NoCC	2050 Low	2050 High	NoCC	2050 Low	2050 High
Fiji	Timber	1.03	1.11	1.20	0.71	0.75	0.80
	Masonry	1.04	1.13	1.23	0.72	0.76	0.82
FSM	Timber	1.57	1.70	1.85	1.08	1.15	1.23
	Masonry	0.49	0.53	0.58	0.34	0.36	0.39
Marshall Islands	Timber	0.97	1.04	1.13	0.66	0.71	0.76
	Masonry	0.30	0.32	0.35	0.20	0.22	0.24
Tonga	Timber	1.21	1.30	1.40	0.83	0.88	0.94
	Masonry	0.93	1.00	1.09	0.64	0.68	0.73
Vanuatu	Timber	1.79	1.92	2.08	1.23	1.30	1.39
	Masonry	1.67	1.81	1.97	1.14	1.22	1.32
Samoa	Timber	1.34	1.44	1.56	0.92	0.98	1.04
	Masonry	0.47	0.51	0.55	0.32	0.34	0.37

Adapting the agriculture sector

- Cost of disaster (e.g: cyclone, flooding) to agriculture in PICs can be high – with losses between 1 to 8% of the GDP in recent events.
- The impact of climate change on agriculture may be slightly positive up to 2050 and strongly negative thereafter (ADB 2013).
- Priority to low regret options (e.g: improved weather forecasting, better agricultural practices) as well as research and development (e.g: more resilient crop varieties).

The Case of Atoll Islands

- **Atoll nations are particularly vulnerable to climate change.**
- High risk of dislocation of the islands due to SLR in the long term.
- The more significant short-term risk for the atoll nations, is the risk of storm surges.
- In addition, SLR and changes in rainfall patterns stress their fresh water supply.
- Vulnerability is worsened the countries' limited ability to respond and manage the risks.


Ebeye, Kwajalein Atoll, RMI

The Case of Atoll Islands

- The cost of adaptation will be significant (e.g: US$ 16-58 m/year only for coastal adaptation in RMI).
- Significant financial support from the international community will be required.
- Combination of engineering solutions (including land reclamation) and softer solutions.
- If the costs of adaptation are much higher than expected, some countries may give consideration in the long term to progressive relocation.

Rock revetment constructed in late 1980's along first section causeway, Ebeye

Strengthening early warning and preparedness

- Vital to save life and minimize economic losses
- High value investments – CBA ratio which can vary from 1:4 to as high as 1:30
- Large efficiency gains can be expected from relatively modest modernization investments (e.g: US$15-20 m in Samoa/Tonga) and appropriate staffing.

Toward a new decision making framework

- Adaptation is expensive (particularly in the atoll islands)

What is possible in 2040?

Annual costs ranging from US$400 million to US$1.2 billion for coastal adaptation and adaptation to increases in rainfall and temperature

- In face of the uncertainties, a new decision making framework to deal with risks and uncertainty is required, based on principle such as:
  - **No-regret strategies** - e.g: improved road maintenance
  - **Reversible and flexible options** - e.g: insurance, early warning systems
  - **Promoting soft adaptation strategies** - e.g: improved spatial planning
  - **Buying "safety margins" in new investments** - e.g: bigger drainage channels

Issues for discussion

- What are the key constraints to scaling up resilient investments and policies and what type of support would be required?
- Do participants agree that the development of new financial instruments such as contingency financing and risk transfer mechanisms, as well enhanced access to climate financing is a priority for PICs?
- How to better coordinate and prioritize across sectors to ensure effective interventions?
- Atolls: are there cases where relocation might be the ultimate solution?