



Pacific Islands Ridge to Reef
National Priorities – Integrated
water, land, forest and coastal
management to preserve
biodiversity, ecosystem services,
store carbon, improve climate
resilience and sustain livelihoods

Regional guidelines to implement R2R spatial prioritization procedures

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RSC-5 Meeting

Virtual Meeting, October 22 & 23, 2020



Aims:

- Reflect on the importance of R2R approach in natural resource management and governance, and the utility of land-sea modelling as a decision support tool
- Endorse the regional guidelines



What's spatial prioritization modelling?

Science-based and spatial planning procedure that supports selection of priority areas and sites for R2R interventions and reforms.

It demonstrates the **interface between science and policy** thereby improving the understanding, and enriching the knowledge base on the cause and effect relationship of “whole-of-island’ environmental degradation. It also develops systems to better manage the impacts.

Degree of uncertainty and utilization in scenarios and models by direct driver.

Drivers	Utilization in Scenarios and Models	Stochastic Uncertainty	Scientific Uncertainty	Linguistic Uncertainty
Land Use Change	medium	medium	medium	medium
Climate Change	high	low	low	high
Pollution	low	low	medium	low
Natural Resource Use and Exploitation	low	high	medium	low
Invasive Species	high	high	low	low

Degree of uncertainty and utilization in scenarios and models by indirect driver

Drivers	Utilization in Scenarios and Models	Stochastic Uncertainty	Scientific Uncertainty	Linguistic Uncertainty
Economic	high	low	low	low
Demographic	high	low	low	low
Sociocultural	low	low	high	high
Governance and Institutions	medium	medium	medium	medium
Technological	high	high	high	low

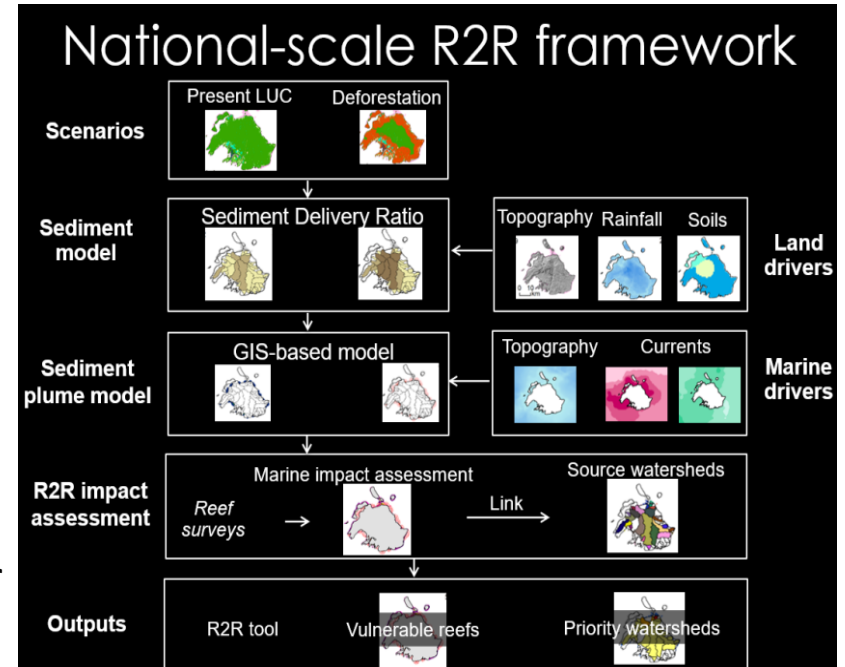
Process, Outputs

- Quantifiable criteria and indicators for the identification of priority R2R sites
- Biological, environmental, and socio-economic conditions nationally
- Procedure will cover the following:-
 - (i) Existing data and defined criteria, identify national level priority sites or target areas
 - (ii) Results support planning for ICM and IWRM
 - (iii) land-sea model results - priority area that are most critical to protect.

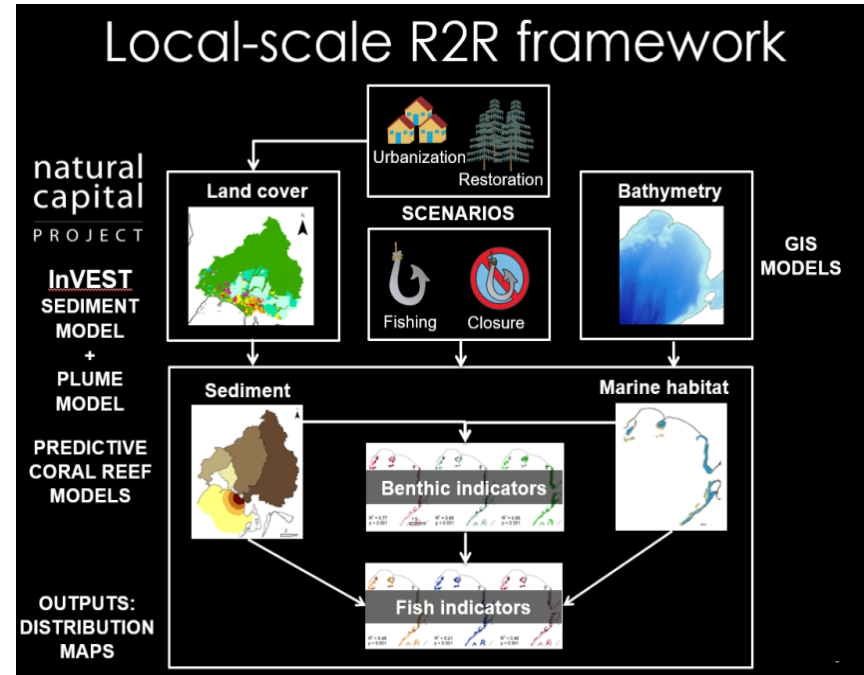


Stepwise procedures

- Participatory **planning** processes
- Develop potential future land-use or marine-use **change scenarios**
- Identify relevant **spatial data gaps** important for analyses and inputs into land-sea **models**
 - If yes, then prepare to carry out field work to ground-truth & collect additional primary data
- Prepare sampling protocols & designs for **field work**



- Coordinate logistical arrangements
- Field work closely adhering to **sampling design**
- Data processing and analyses
- Additional survey work to optimise **calibration** of marine and terrestrial models.



Calibrate coral reef models



Corals

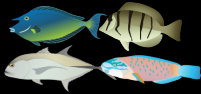


Macroalgae

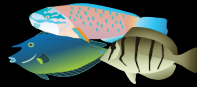


Turf algae

Benthic models = sediment + habitat



Total biomass

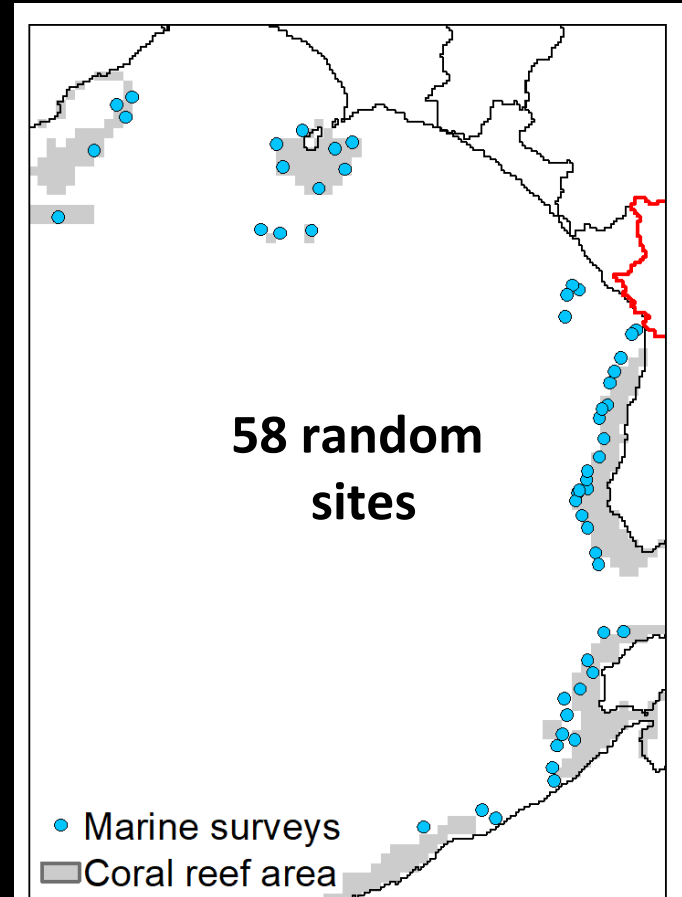


Herbivore biomass



Targeted biomass

Fish models =
sediment + habitat + *benthic* indicators



Scenario analysis

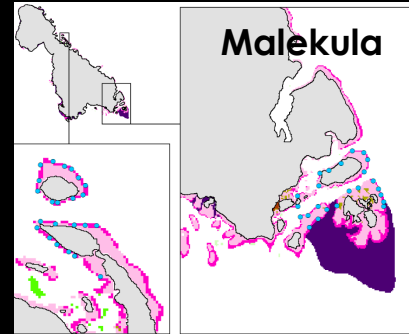
1. Predict coral reef **benthic** & **fish indicators** under **present** & **each scenario**
2. Calculate the coral reef **indicators** change for **each scenario** compared to **present**

Tracing land-sea linkages

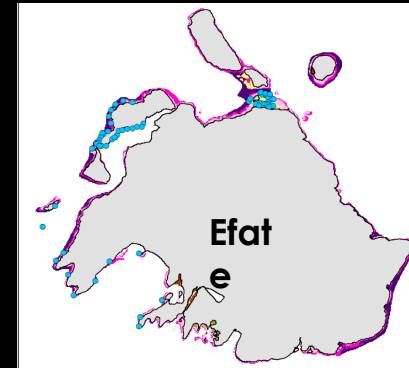
1. Model the **sediment export** & **plume** under **present** & each **deforestation scenario**
2. Identify **coral reef areas** exposed to **significant** change in **sediment** for **each scenario** compared to **present**
3. Identify the **watersheds** supplying the most **sediment** (>40%) to those **coral reef areas**

Spatial prioritization

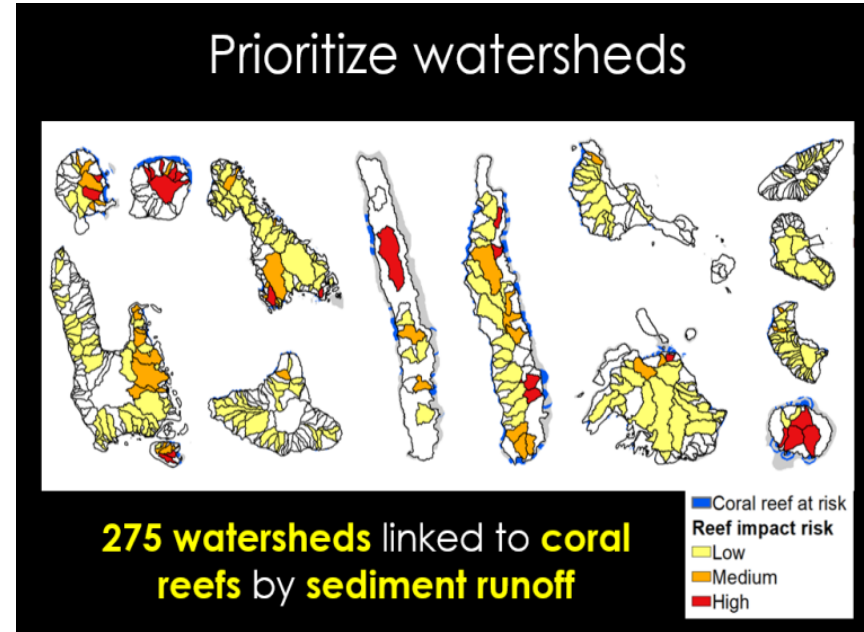
1. Characterize the **potential marine impact** using **coral % cover** & **fish biomass** from **empirical data**
2. Prioritize **watersheds** by **potential marine impact**
3. Identify **land areas** exposed to **significant** change in **sediment export** under **each scenario** compared to **present**



130 sites



- Prepare technical **reports** that include clearly the methods employed, model outputs, maps depicting priority areas and sites, and packaged models.
- Present and discuss methods and outputs with other actors or **peer review and refinement**.





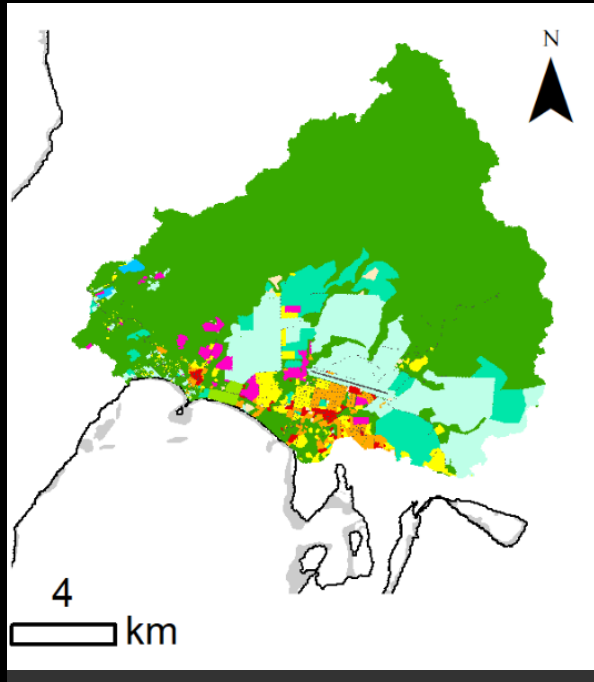
LOCAL-SCALE APPROACH RESULTS



CORAL REEF
ALLIANCE

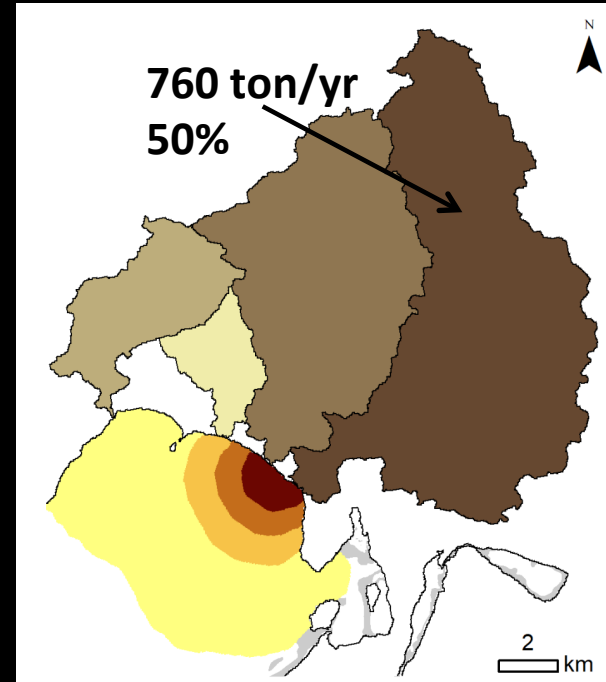
Present scenario

8% of **Human LUC**



69% of **Native forest**
22% of **Grass/shrubland**

1,260 ton/yr
9.7 ton/km²/yr



Sed exp (t/yr)

0 - 26

27 - 69

70 - 673

674 - 759

TSS (t/yr)

5.2 - 167.7

167.8 - 471.6

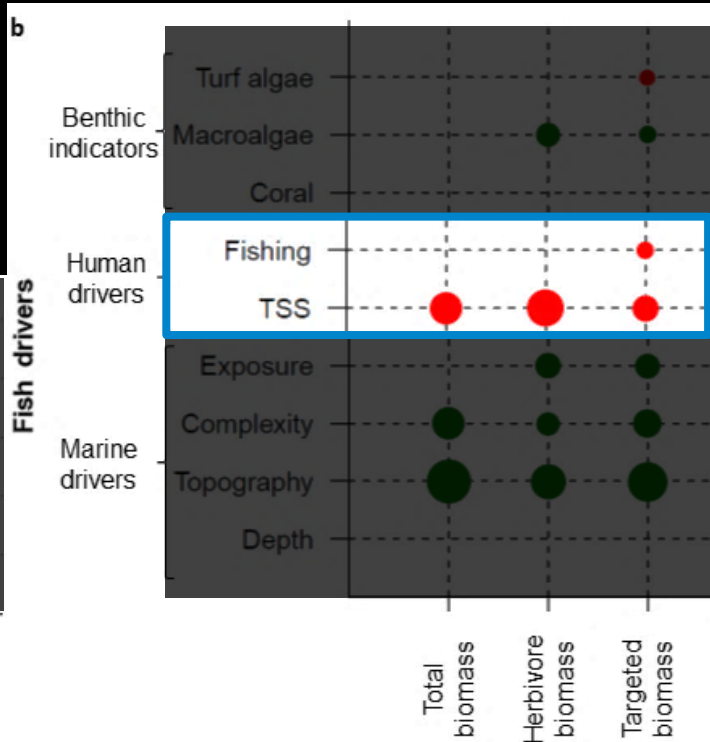
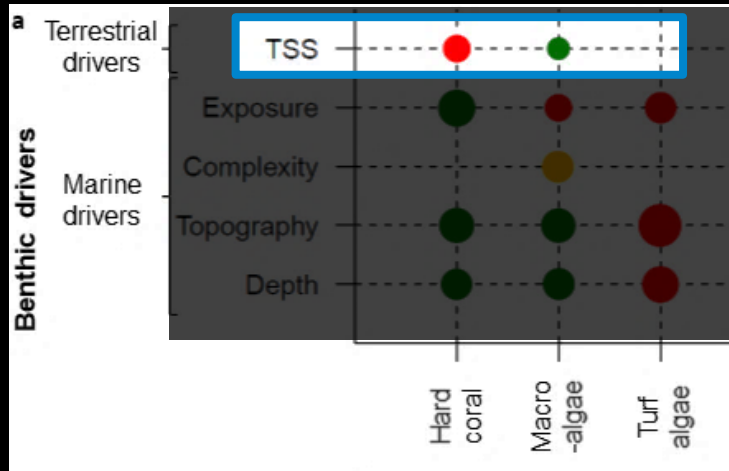
471.7 - 859.4

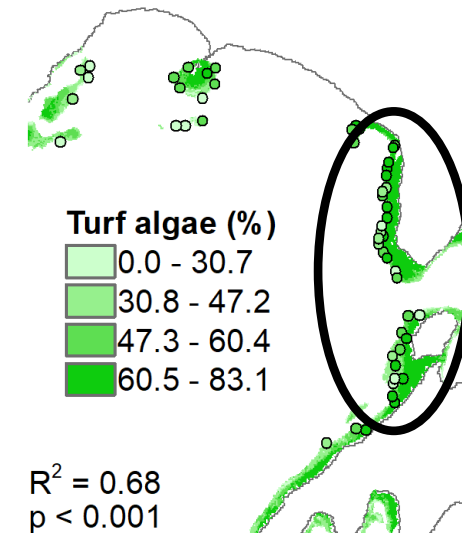
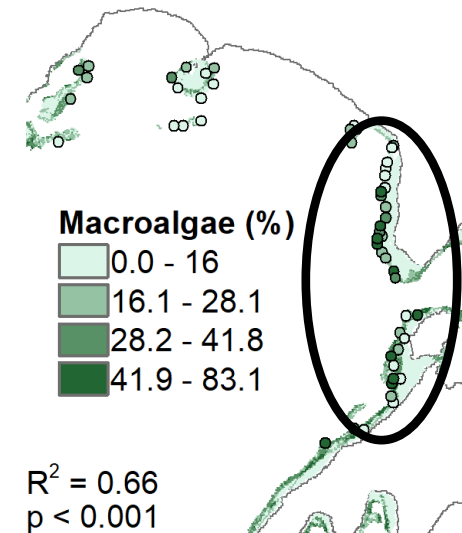
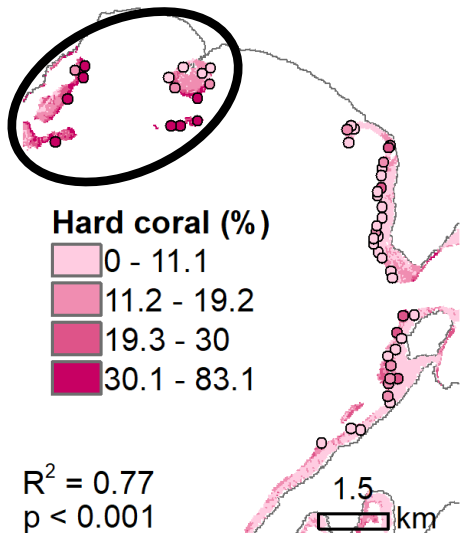
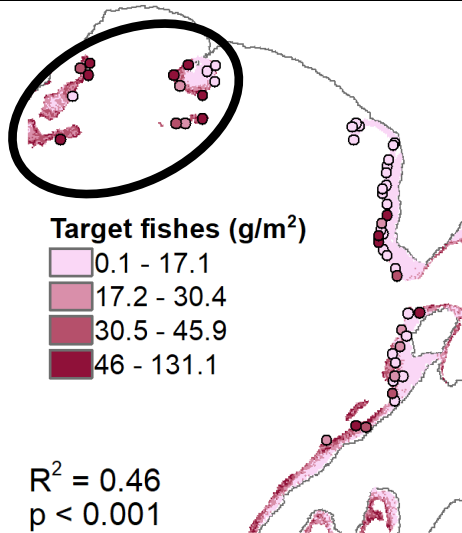
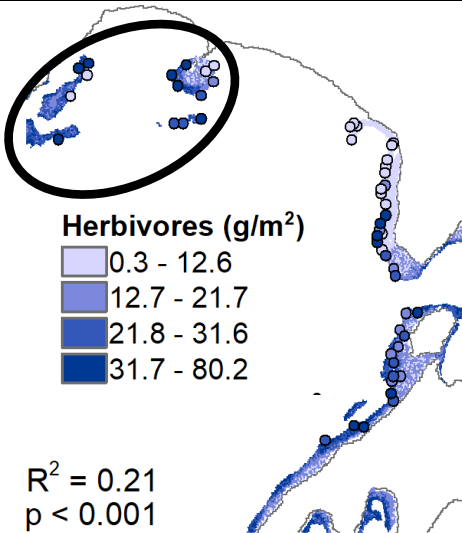
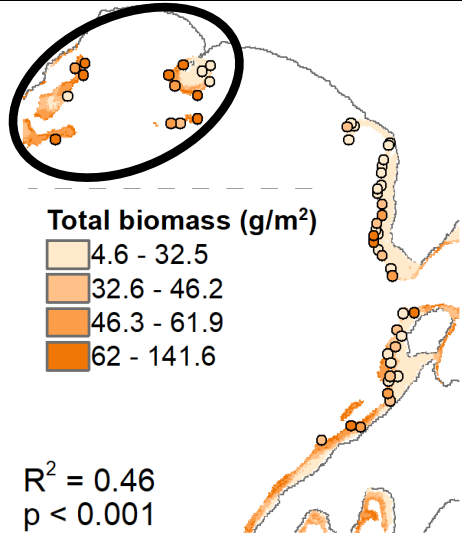
859.5 - 1,336.3

Calibrated coral reef models

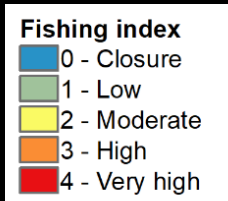
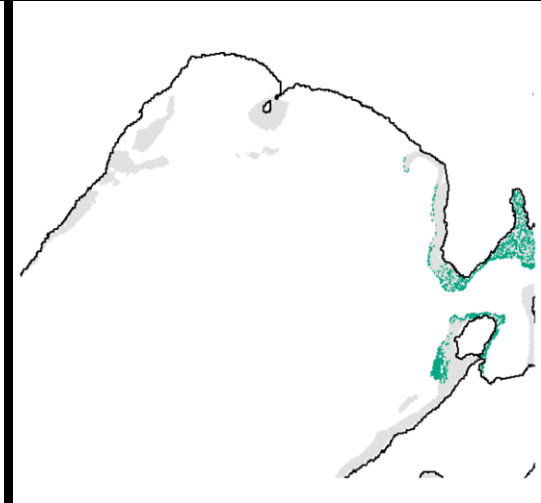
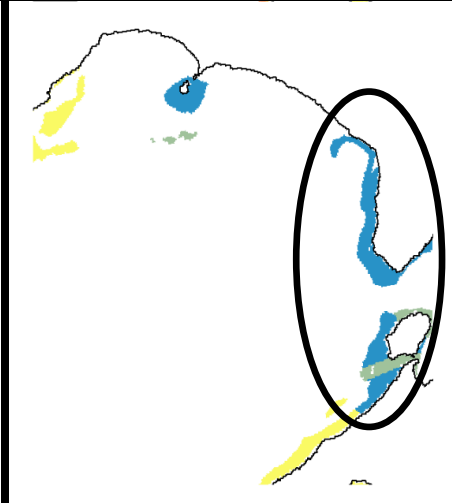
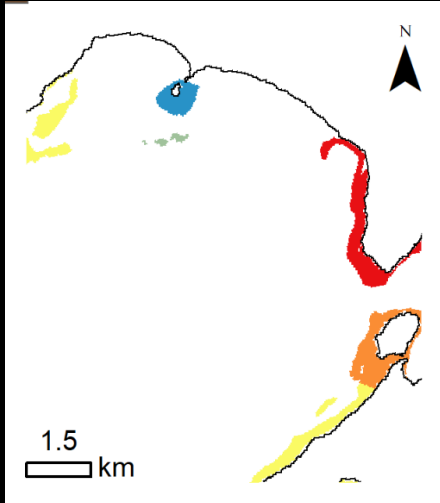
Relationships:

● Positive ● Negative ● Concave or Convex





Marine closure scenario

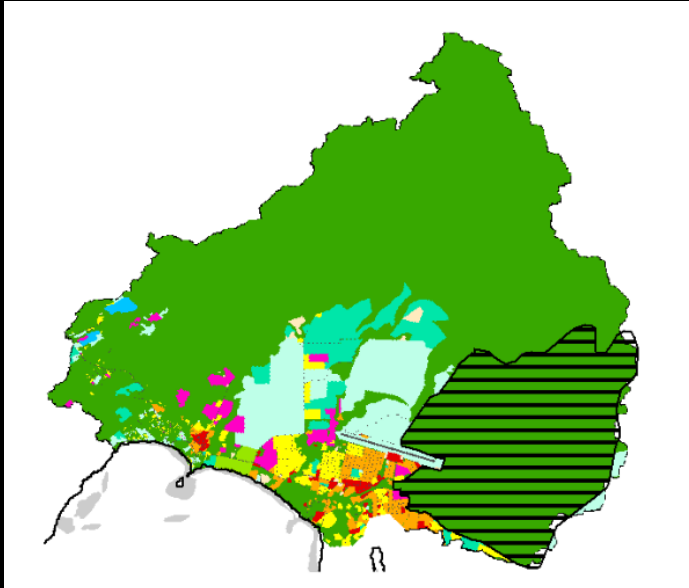


Closed area

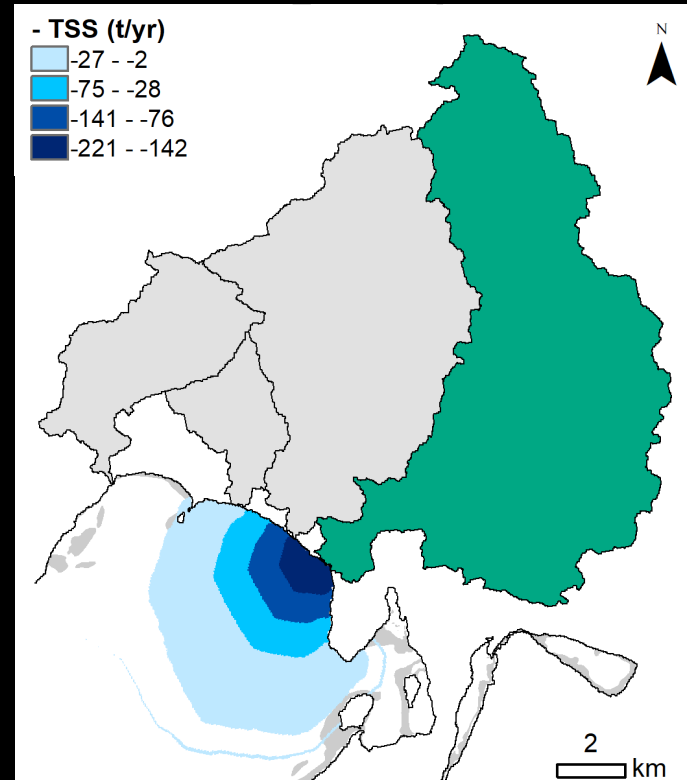
**Fish biomass
+2.5 tons**

Restoration scenario

**+1,330 ha of
Native forest**

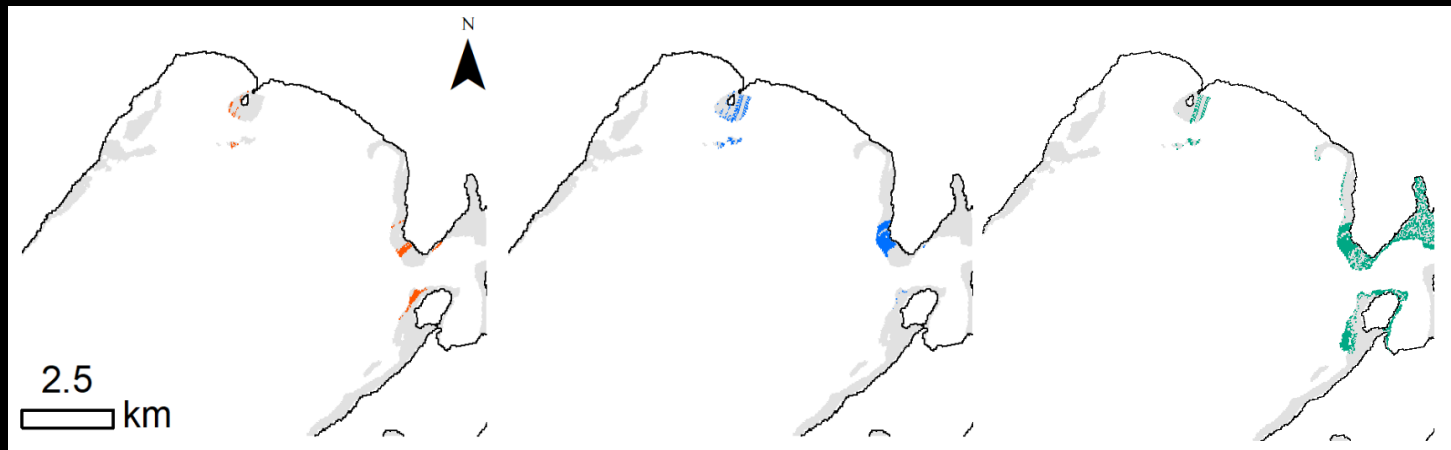


- 210 ton/yr



Restoration scenario

+Marine closure



Habitat quality

20 ha

+3% coral

-1.5% macroalgae

Fish biomass

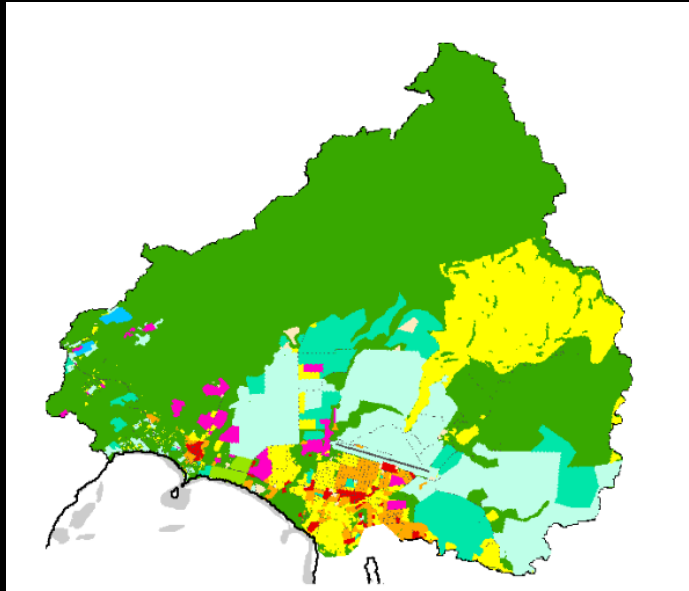
+0.7 tons

Fish biomass

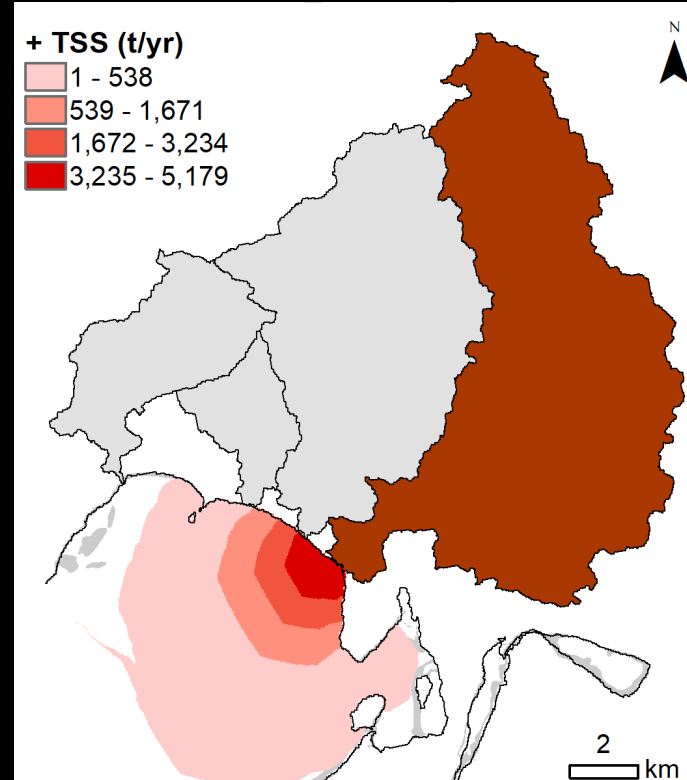
+3.3 tons

Urbanization scenario

+ 1,340 ha of
Human LUC

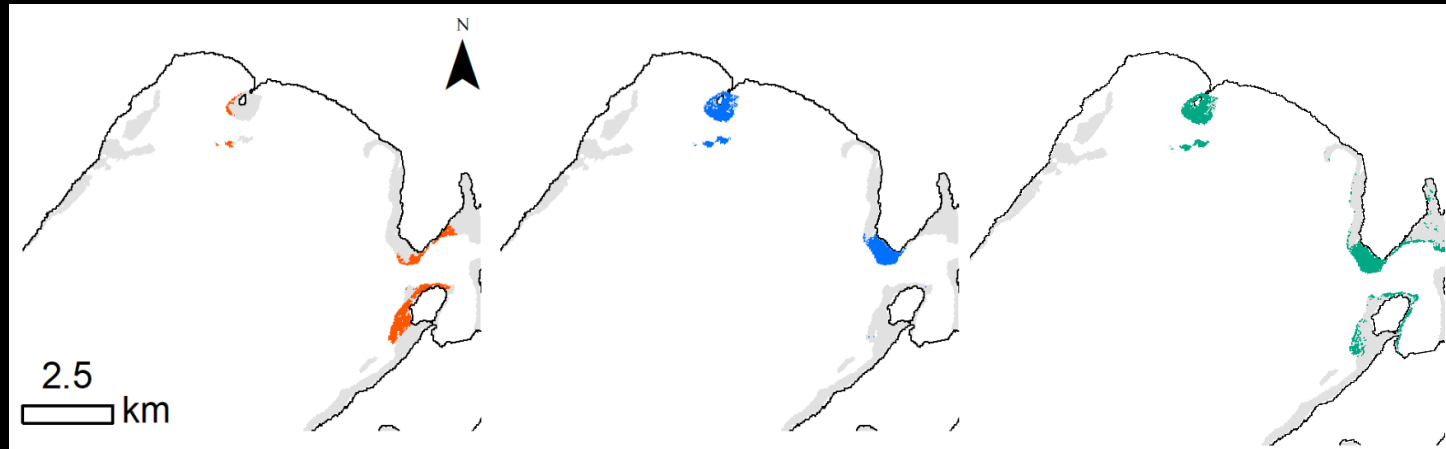


+ **5,180 t/yr**



Urbanization scenario

+Marine closure



Habitat quality

75 ha

-7% coral

+2% macroalgae

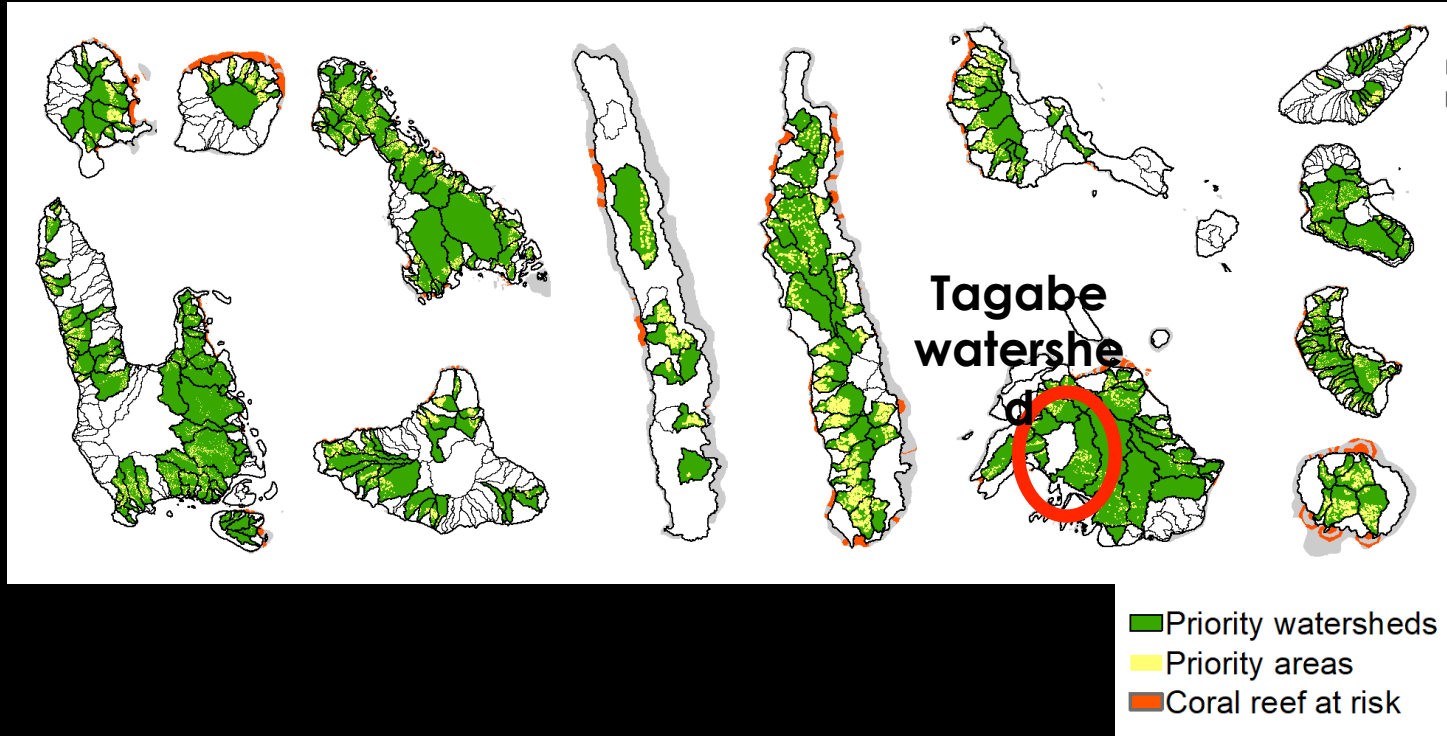
Fish biomass

-6.7 tons

Fish biomass

-5 tons

Social & economic drivers

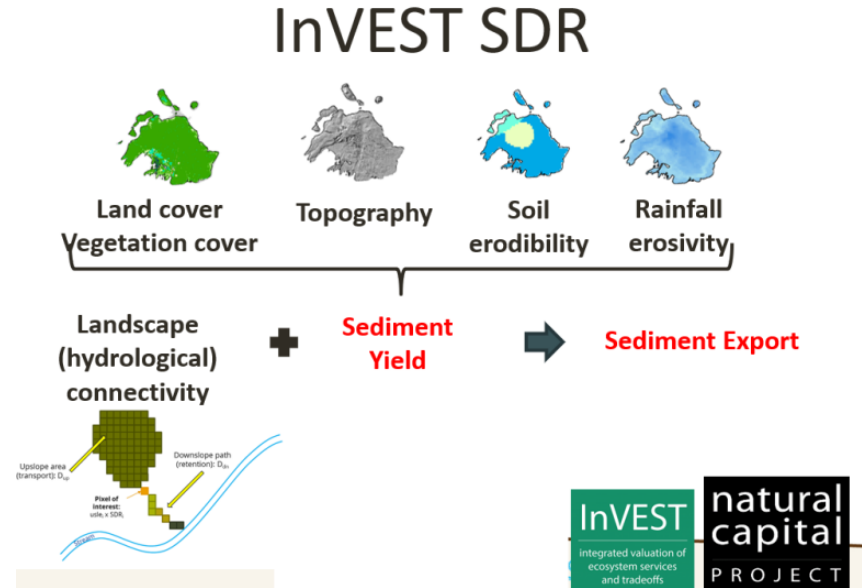


Decision support tool in data poor regions

- Resolution of input foundational layers (soils, currents)
- Decision support tool relies on **static modelling**
 - R2R framework can give an idea where may degrade or recover but not a dynamic model where possible to see impacts through measuring indicators
- Suggested approach to address challenges- e.g. invest more in research & modelling work (see para. 33)

Key Challenges

- Spatial data & data gaps for land-sea modelling
- SPC GEM spatial datasets
- Freely available software packages (InVEST SDR & R)
- Open access QGIS



Benefits & Implications

- Use existing data to define criteria and identify national level priority sites or target areas - **diagnostic analysis** stakeholder workshops or simply reporting back to communities in targeted demonstration project sites.
- Use the results to support future **upscaling R2R investments and national planning for ICM.**

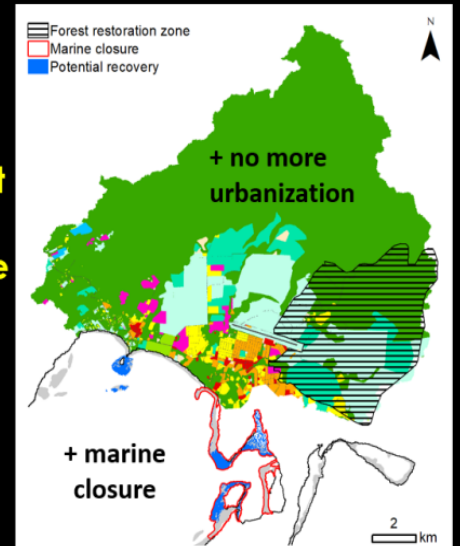
Benefits of R2R approach

Restore **native forest**:
+1,330 ha

-210 ton/yr of **sediment**

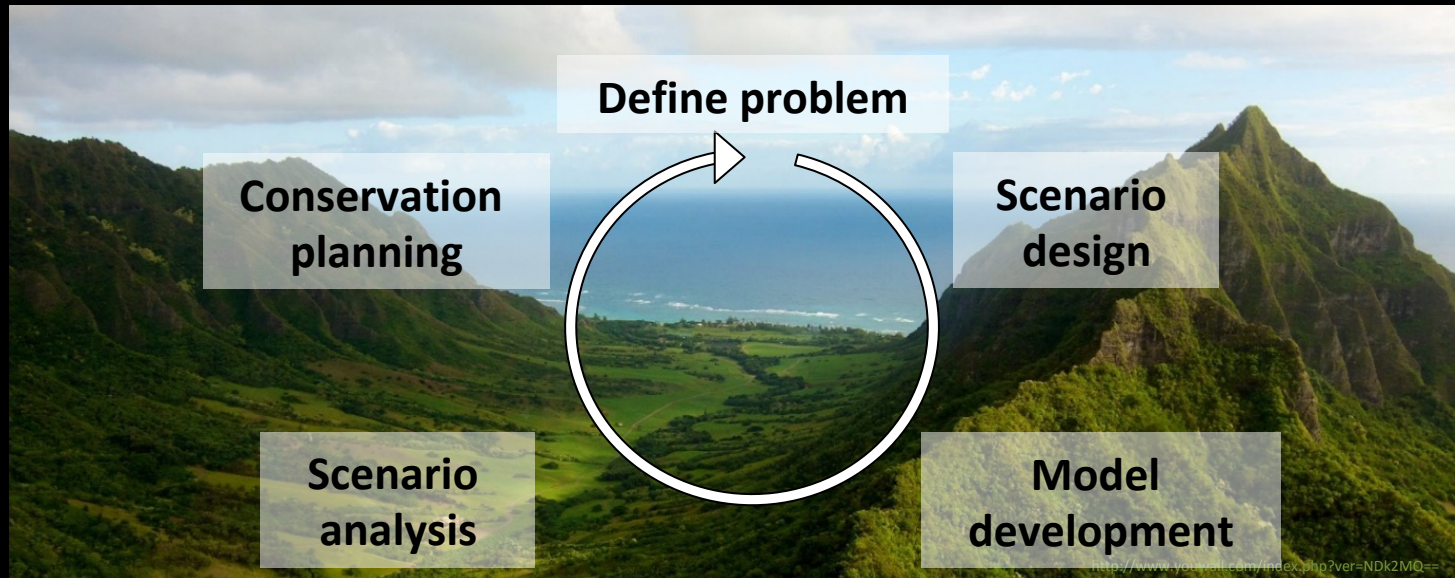
Restore/protect **marine habitat**:
Up to 75 ha

Restore/protect **fish biomass**:
Up to 8.3 ton



Collaborative management

1. Provide **information** to foster **dialogue** between **decision-makers**
2. Can be applied as part of an **iterative** decision-making **process**



Support decision making

1. Prioritize **conservation areas** at the **national-scale** that can **benefit** both **terrestrial** & **marine** environments
2. Support **local** decision-making by testing **policy actions** & estimating potential **outcomes** prior implementation



- (i) Reflect on the design, clarity and relevance of the R2R spatial prioritization and planning procedures noting the outcomes of its trials in Vanuatu; and
- (ii) **Discuss and approve** the practical application of the guidelines to implement the spatial prioritization and planning procedures to identify conservation areas in future upscaling R2R investments and ICM planning in PICs.

