

The Role of Natural Defenses for Risk Reduction and Climate Adaptation & How to Incentivize Them



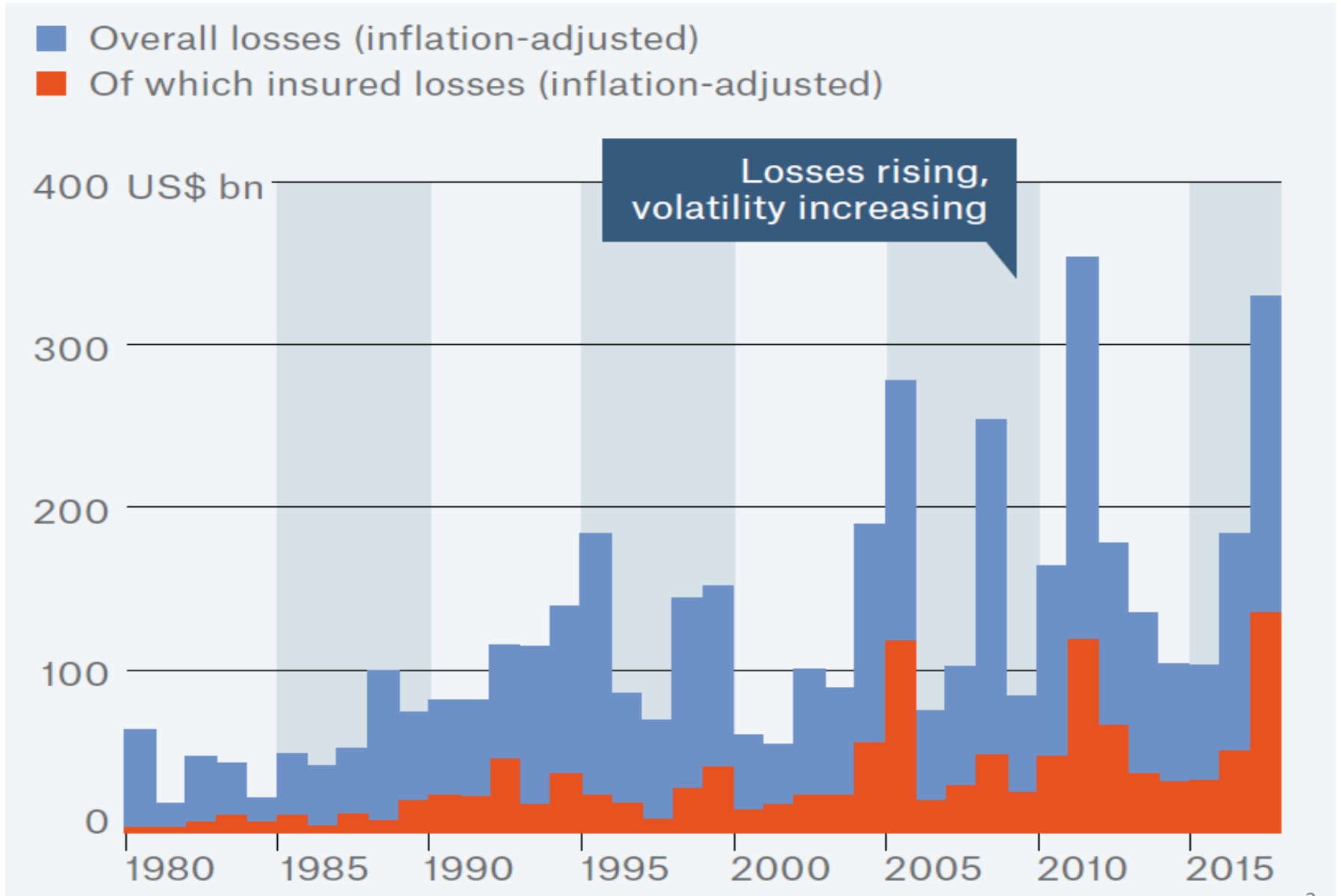
Michael W. Beck

Research Professor

<https://coastalresilience.ucsc.edu>



Risks & Losses Are Rising



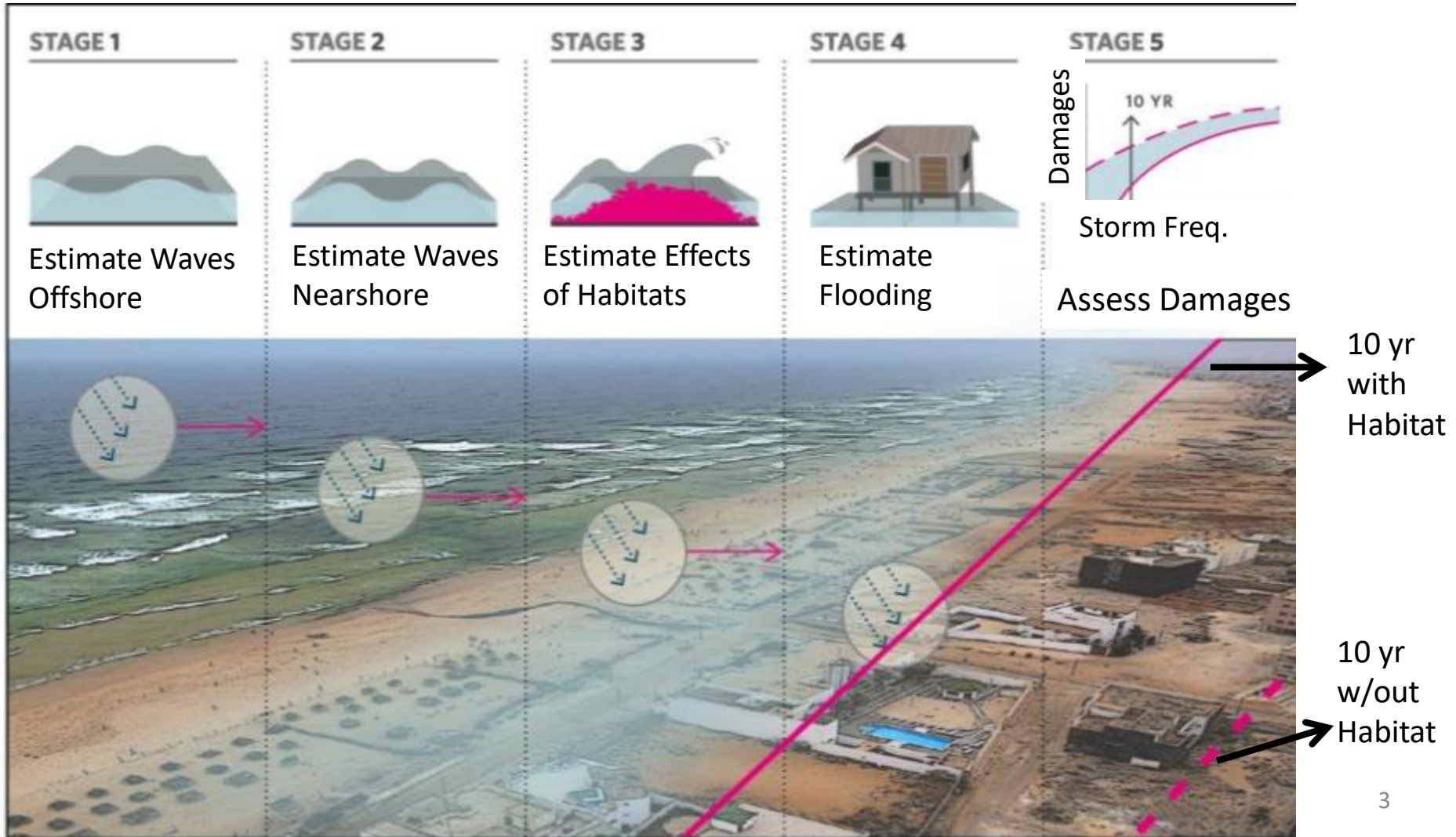
Guidelines for Valuing Coastal Protection Services from Mangroves and Reefs

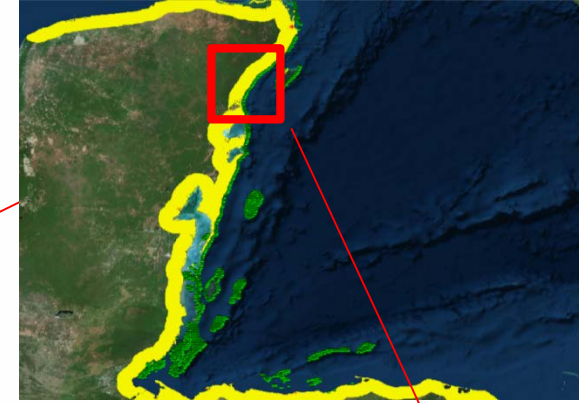
M W. Beck & G-M Lange (eds)



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Recommended Approach: Expected Damage Function



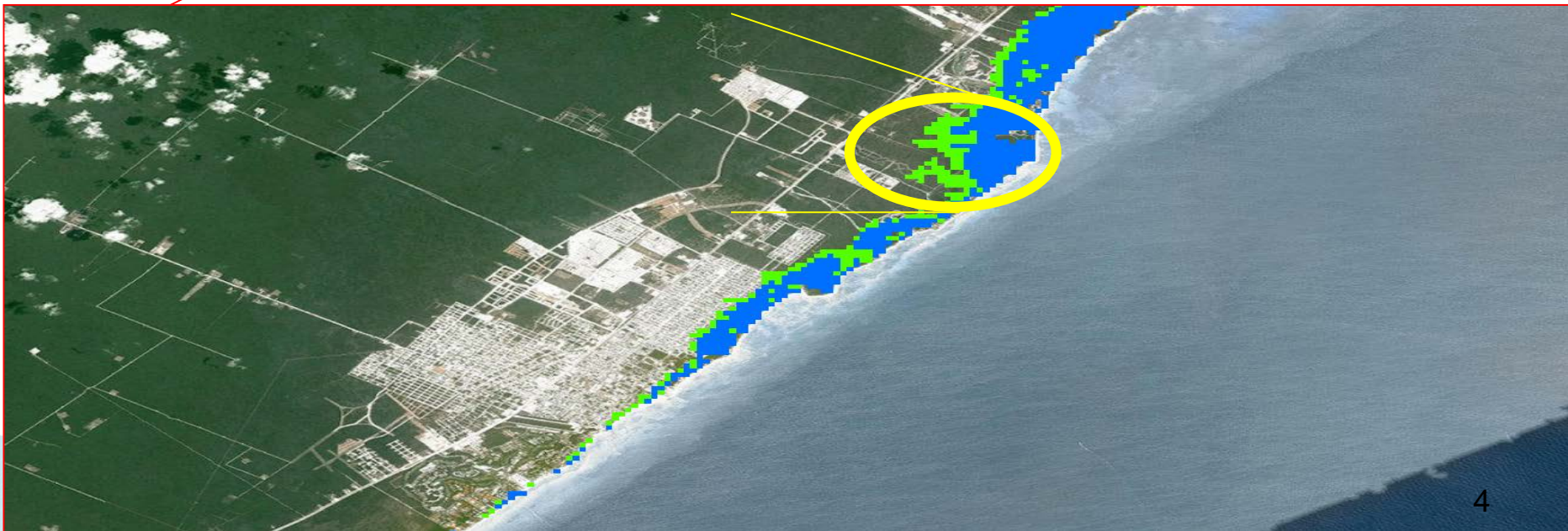


Flooding (25 - Year Event)

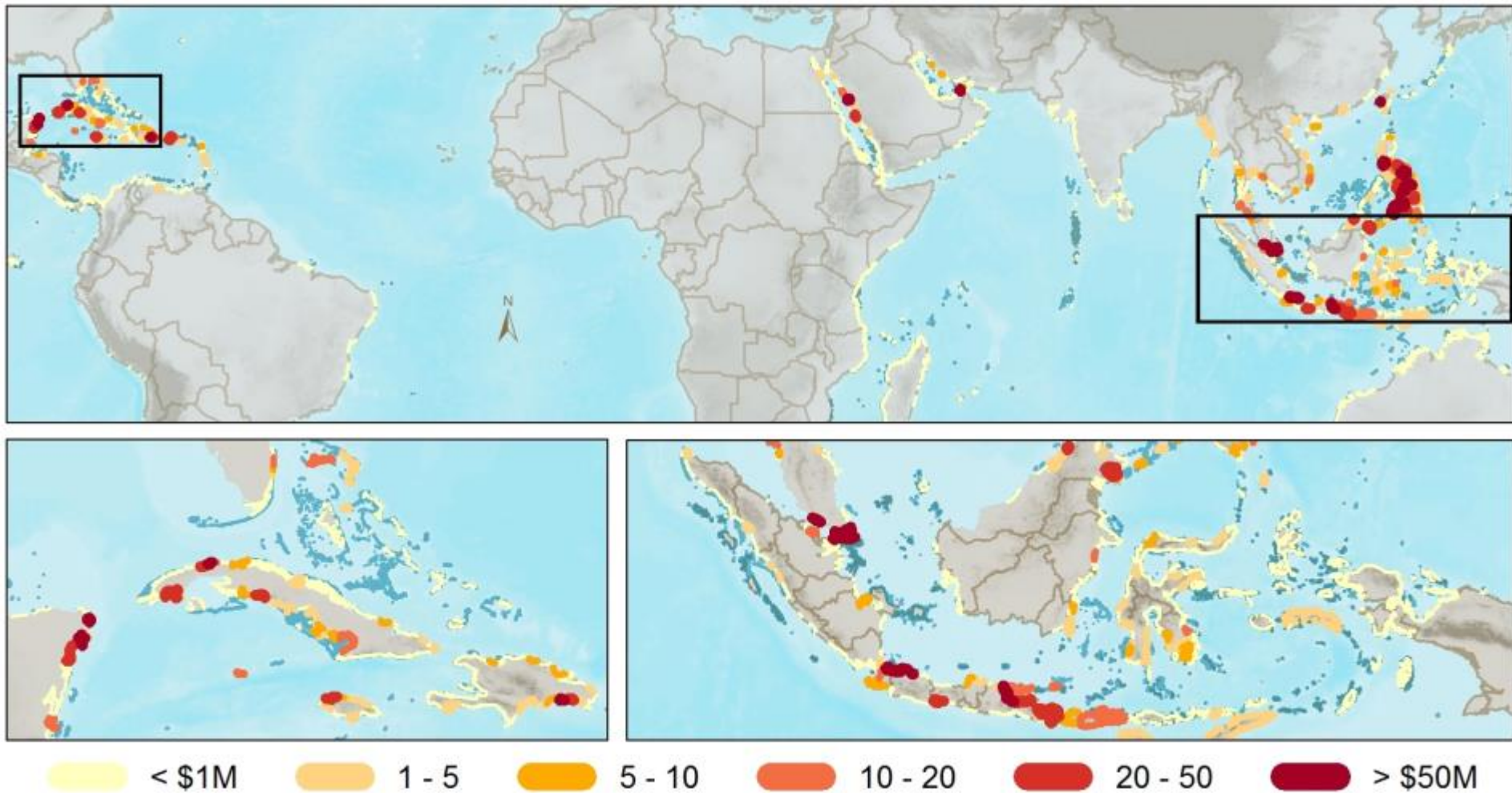
 Current Flooding

 Flooding With 1m Reef Loss

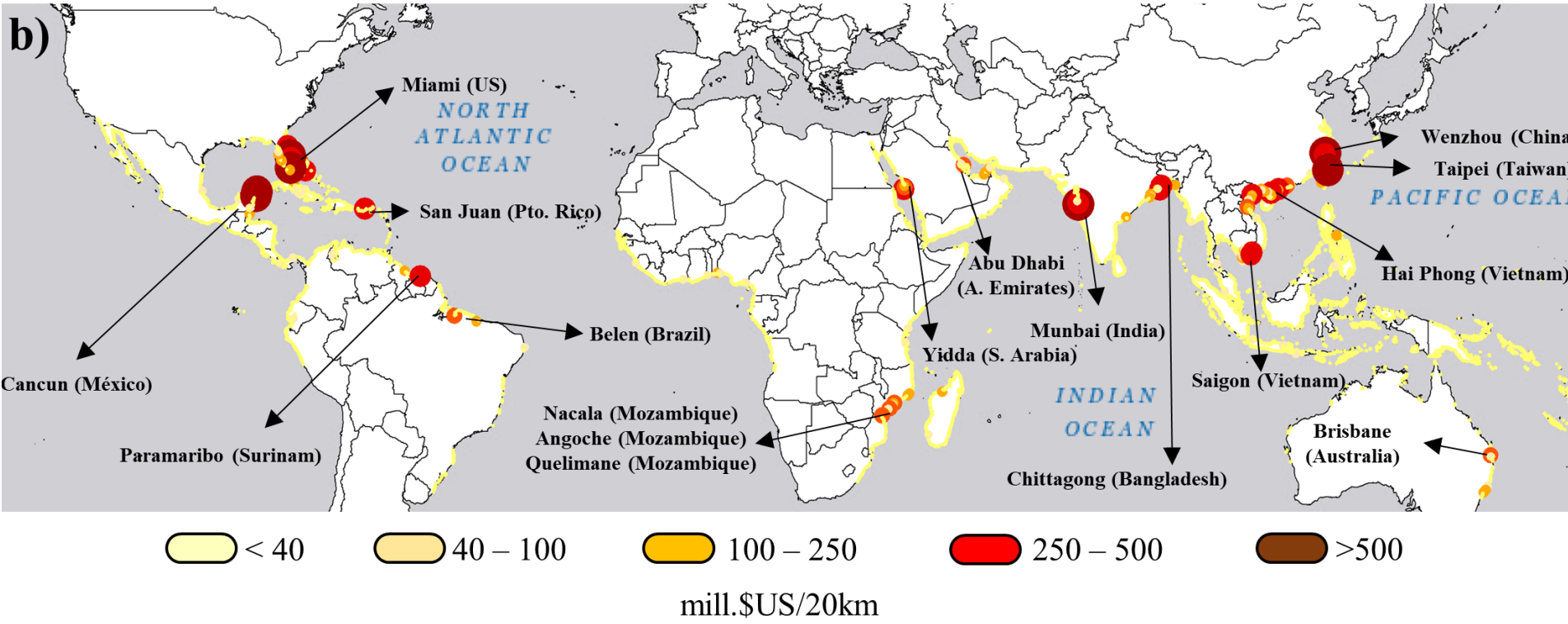
Playa del Carmen



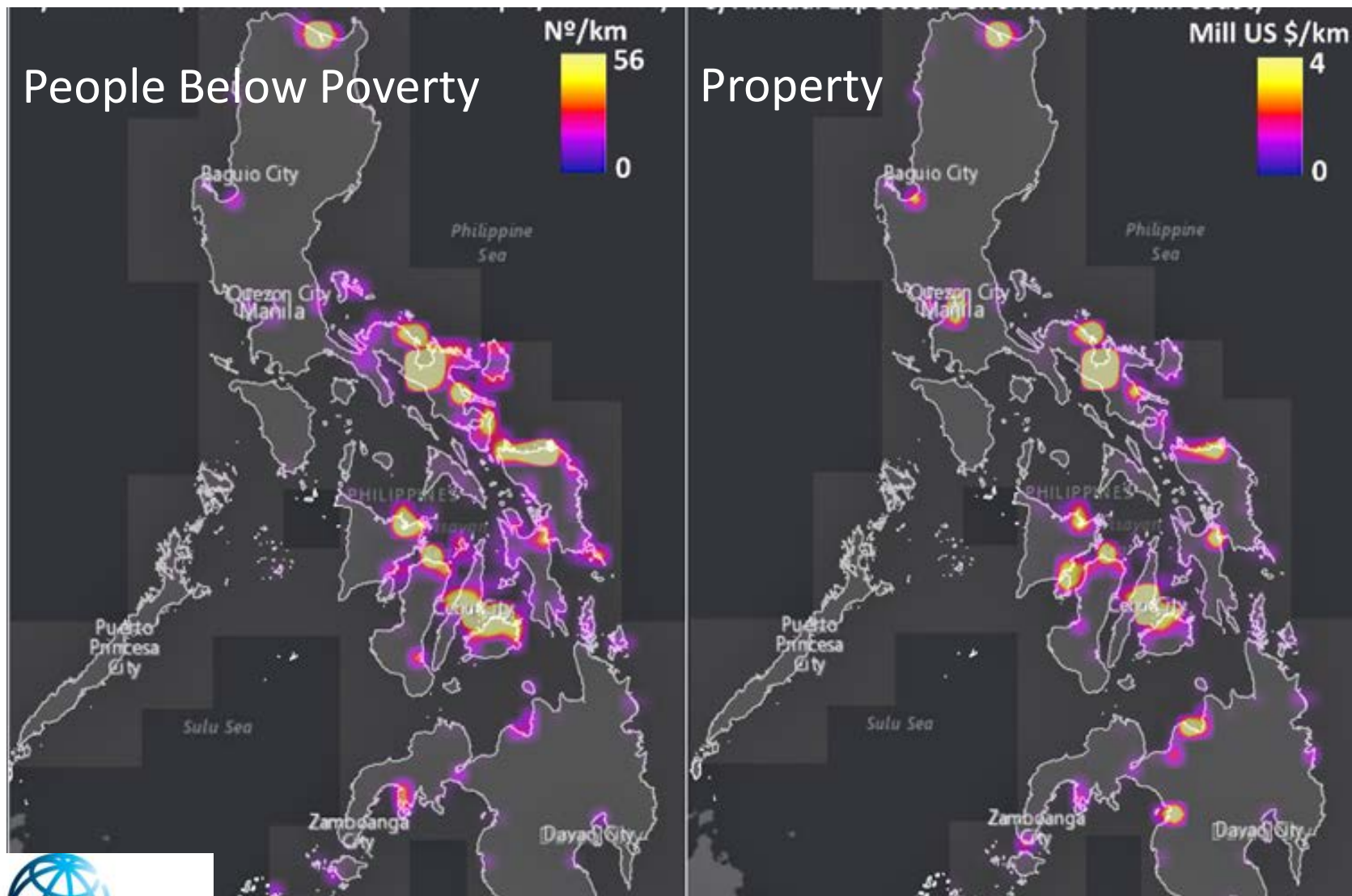
Annual Expected Benefits from Reefs: Avoided Flood Damage in \$M/20 km coastline



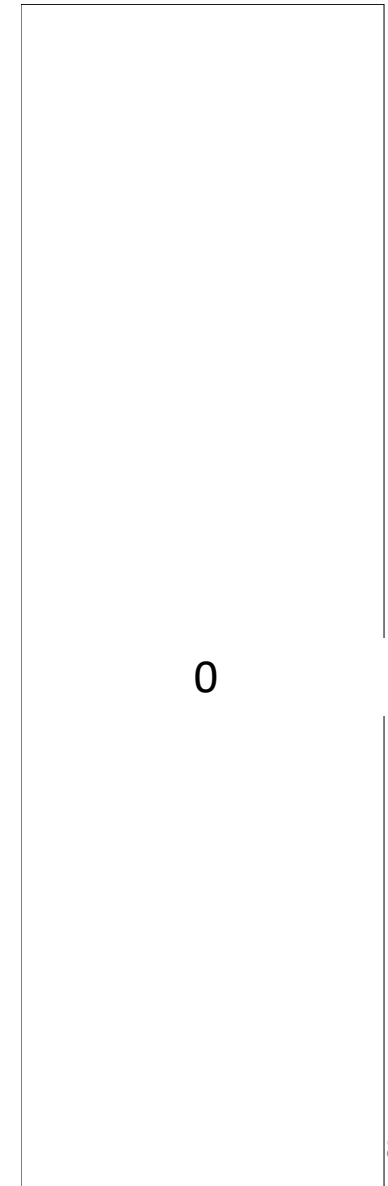
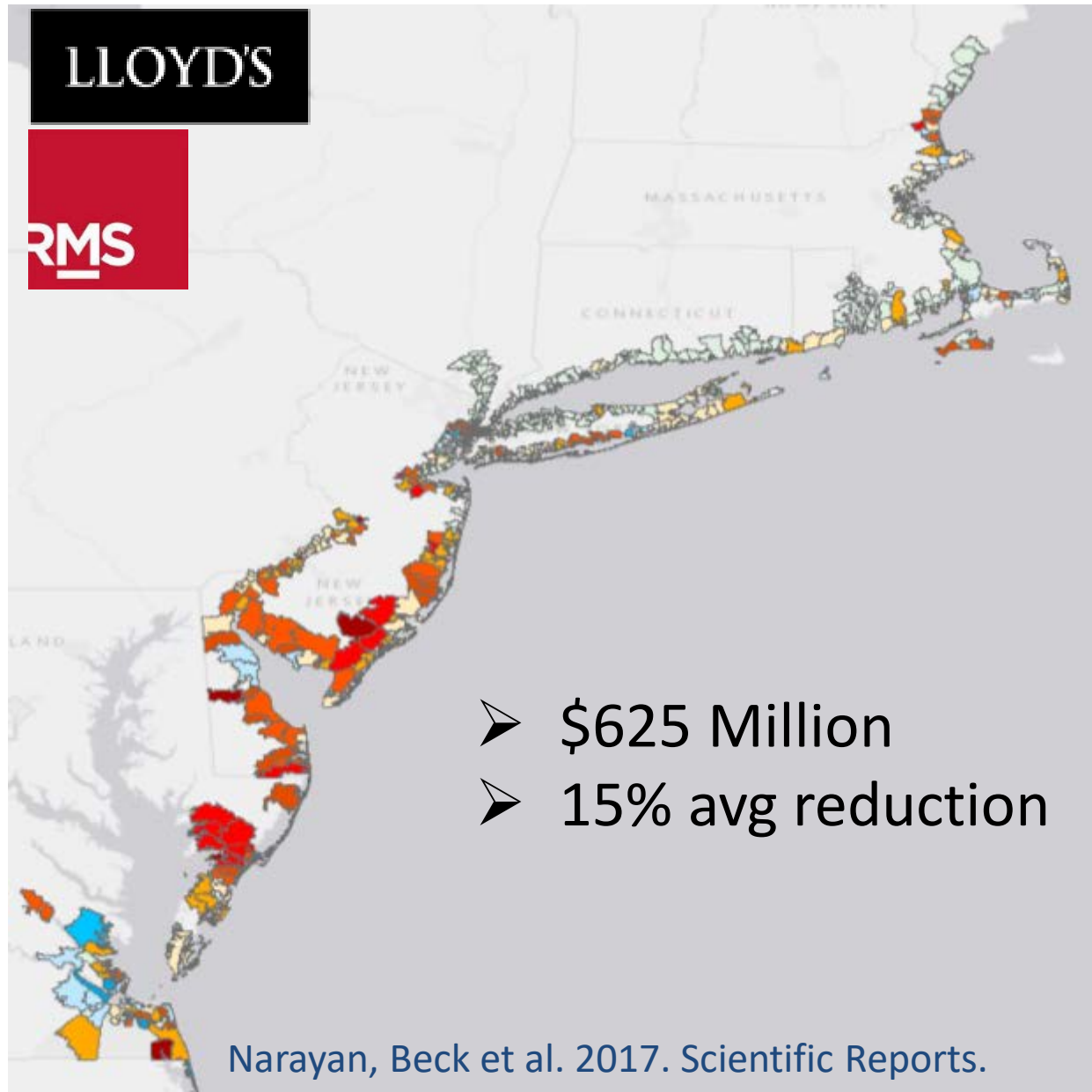
Annual Flood Reduction Benefits from Mangroves



Benefits of Mangroves in the Philippines: Comparing Benefits to Socially Vulnerable People vs Property



Effects of Marshes on Sandy Flood Damages

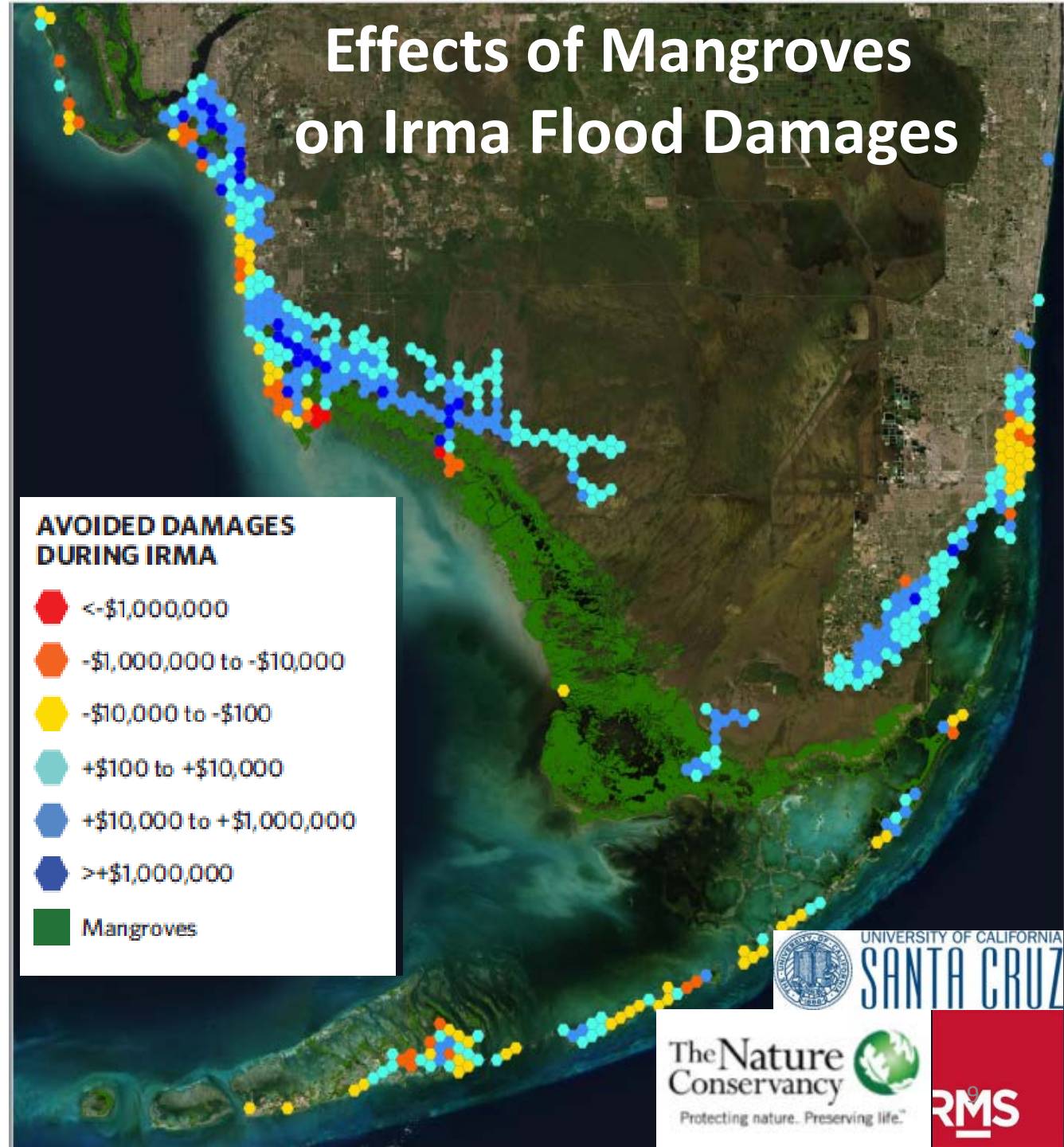


Effects of Mangroves on Irma Flood Damages

\$1.5 Billion in Avoided Property damages during Irma

25% Annual Reductions

AVOIDED DAMAGES DURING IRMA



Narayan, Beck et al. 2019. TNC.

https://www.nature.org/content/dam/tnc/nature/en/documents/Mangrove_Report_digital_FINAL.pdf



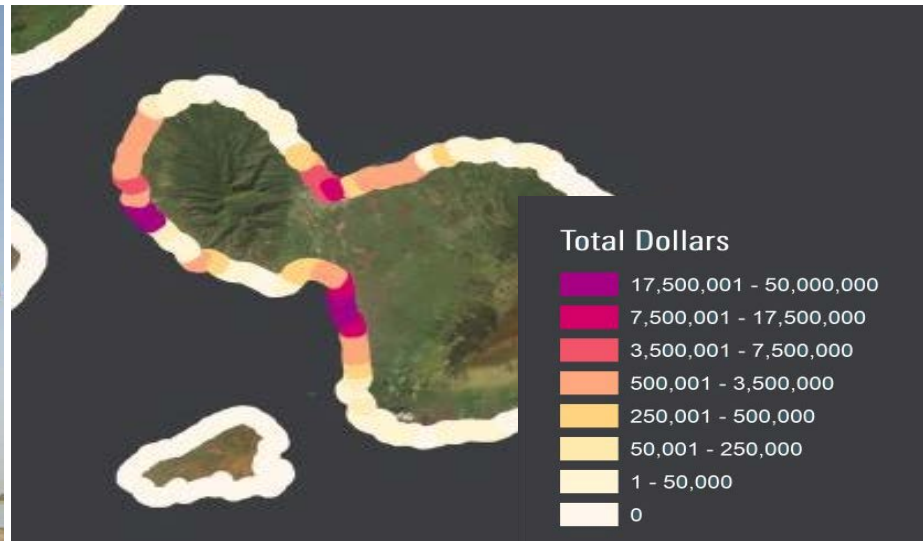
Valuing & Financing Coastal Protection

Summary of 2019 studies

- **USGS** – US Reefs \$1.8 Billion & 18,000 People Annually;
- **Risk Management Solutions & TNC** – FL Mangroves \$1.5 Billion in H. Irma; 25% annual reduction;
- **World Bank** – Jamaica Mangroves \$33 Million & 24% annually;
- **Swiss Re: MX Meso Am reef** \$42 million annually- *Frontiers Earth Sci*;
- **Insuresilience Secretariat**: 11 Cases combine Insurance & Ecosystem;
- **Munich Re**: New Reef Resilience Insurance – *Ecol. Econ.*

See <https://coastalresilience.ucsc.edu>

Or email mwbeck@ucsc.edu



What types of incentives could promote nature-based strategies such as living shorelines?

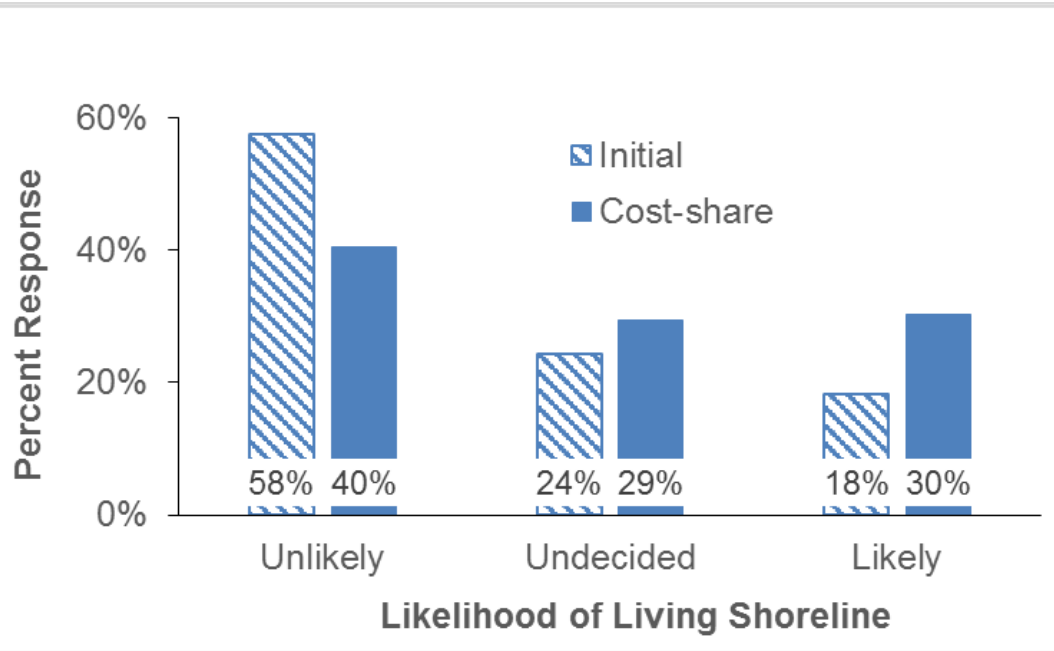
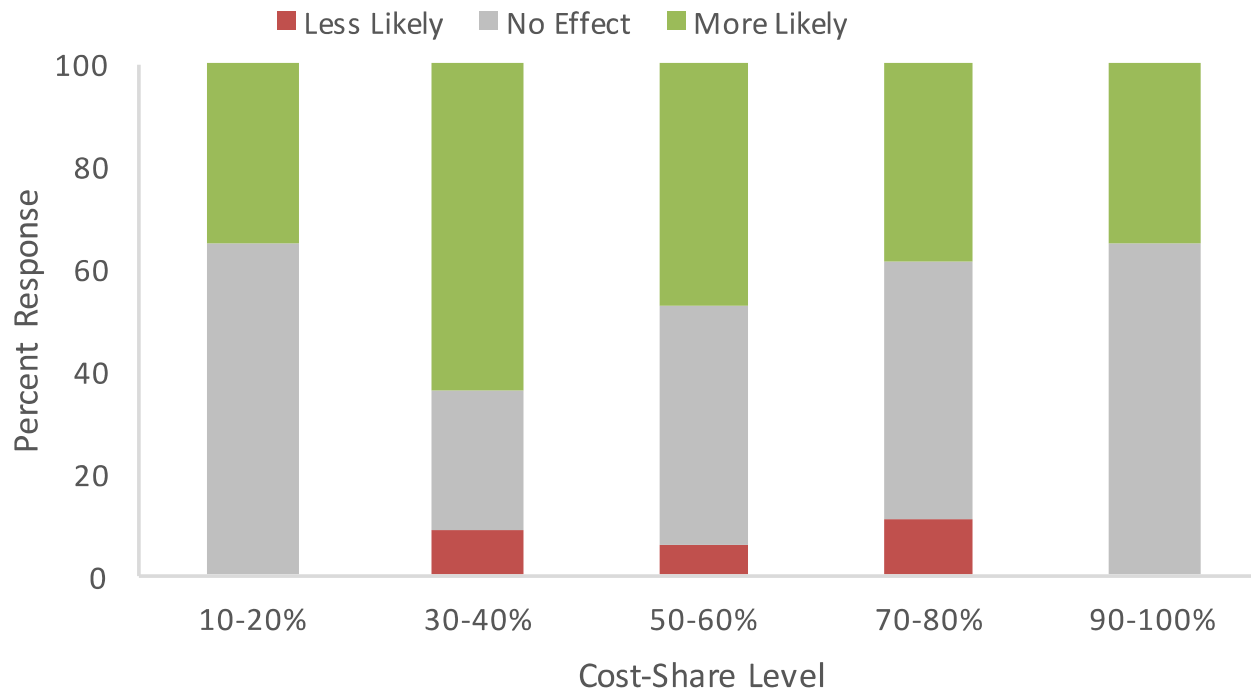


Photo credit: MB Charles, TNC

What types of incentives could promote nature-based strategies such as living shorelines?

b.



Marshes & Risk Financing in the Bay Area

In Progress

Component 1. Modeling flood risk reduction service of ecosystems

- Re-run Delft 3D model with and without salt marshes
- Assess flood exposure, vulnerability and risk
- Examine risk financing tools

Planned

Component 2. Protection saltmarshes provide to the levee system

- *(1st level) Overtopping model on levee section (cross shore or small section, e.g. Xbeach, for overtopping and wave action, toe erosion.*





InsuResilience
GlobalPartnership

Ecosystem-based Adaptation and Insurance: Success, Challenges and Opportunities



Published by



On behalf of



Beck, Quast, Pfliegner. 2019.
[Insurance and Ecosystem-based Adaptation: Successes, Challenges and Opportunities.](#)
Insuresilience Secretariat, Germany.

Recommendations

Insurance and Nature-based Solutions (NbS)

- Need better analyses of risk reduction for more habitats;
- Advance nature in risk industry modelling tools;
- **Include NbS in tools that underwriters use to assess premiums and incentives;**
- Greater inclusion of NbS in cost effective analyses;
- **Improvements in habitat restoration approaches to help meet risk reduction and environmental goals;**
- **More green bonds that explicitly include risk reduction**
- **New insurance-based tools for EBA**



Implications and Opportunities

- **Include Nature in Industry Risk Models**
- **Private incentives-** Insurance, Resilience Bonds
- **Public incentives-** Disaster Recovery, Green Bonds
- **Prioritizing Adaptation & Resilience-building Investments**
- **Prioritizing Natural Infrastructure in Policy (US ACoE, DOT)**

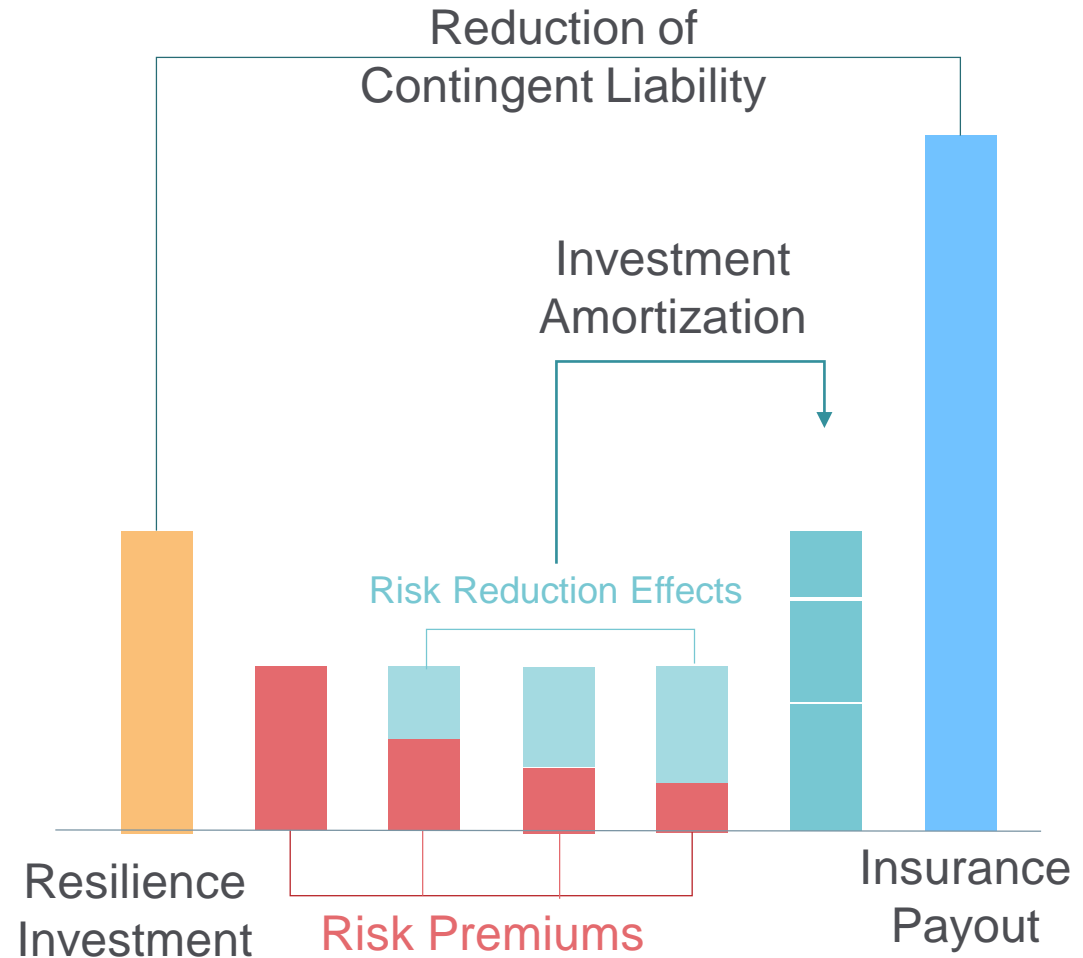
Photo credit: Jim Wright/LightHawk/TNC



Combining Reef Restoration & Insurance to Build Resilience

A resilience insurance solution overcomes trade-off between risk reduction & risk transfer:

- Up front reef restoration investment reduces risk
- The risk mitigating impact reduces premiums
- An incentive is created for restoration & risk transfer



SUMMARY

- Habitats reduce flooding and erosion
- We can rigorously value these benefits
- Identify innovative funding opportunities

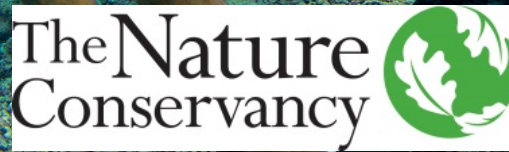


Thanks

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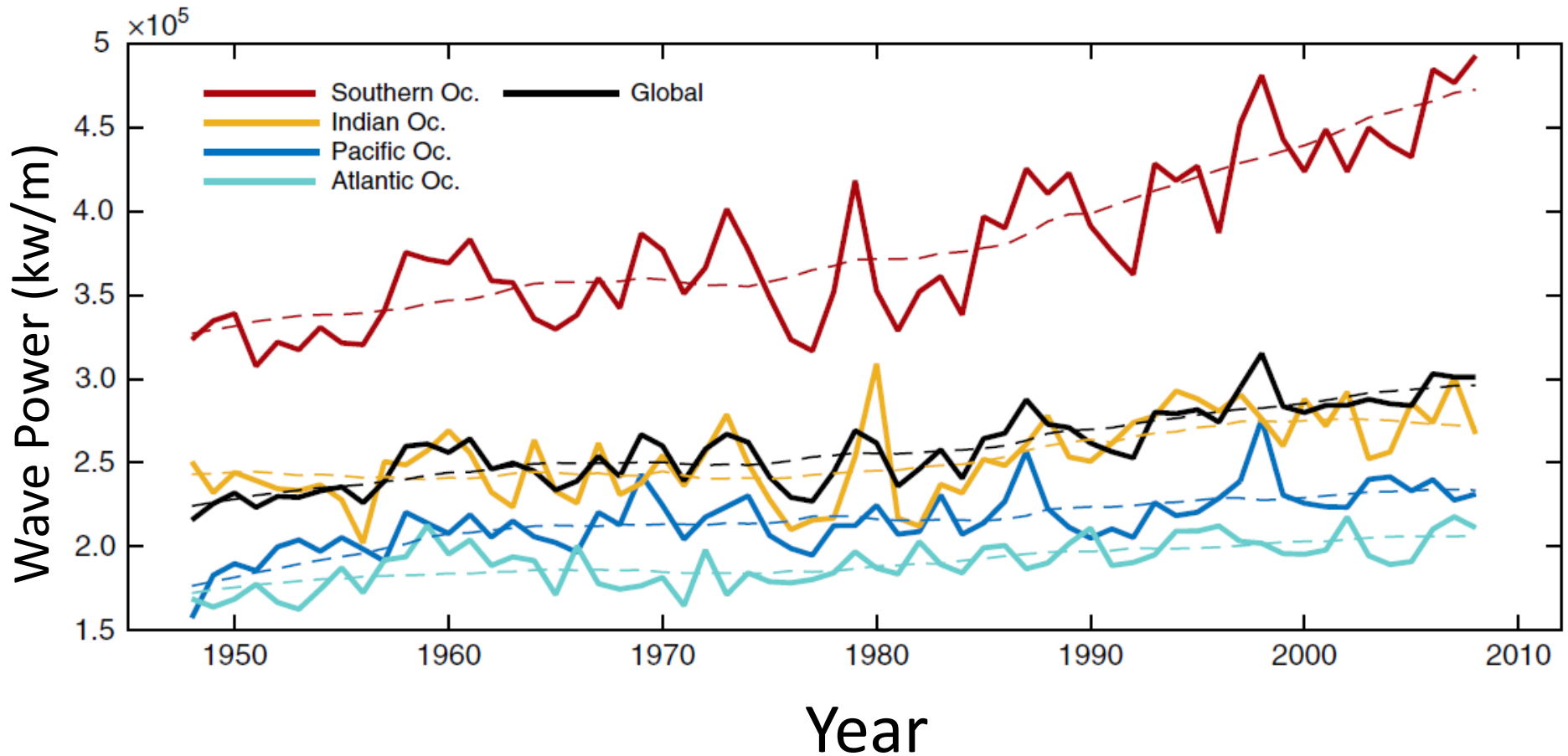


Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
International Climate Initiative



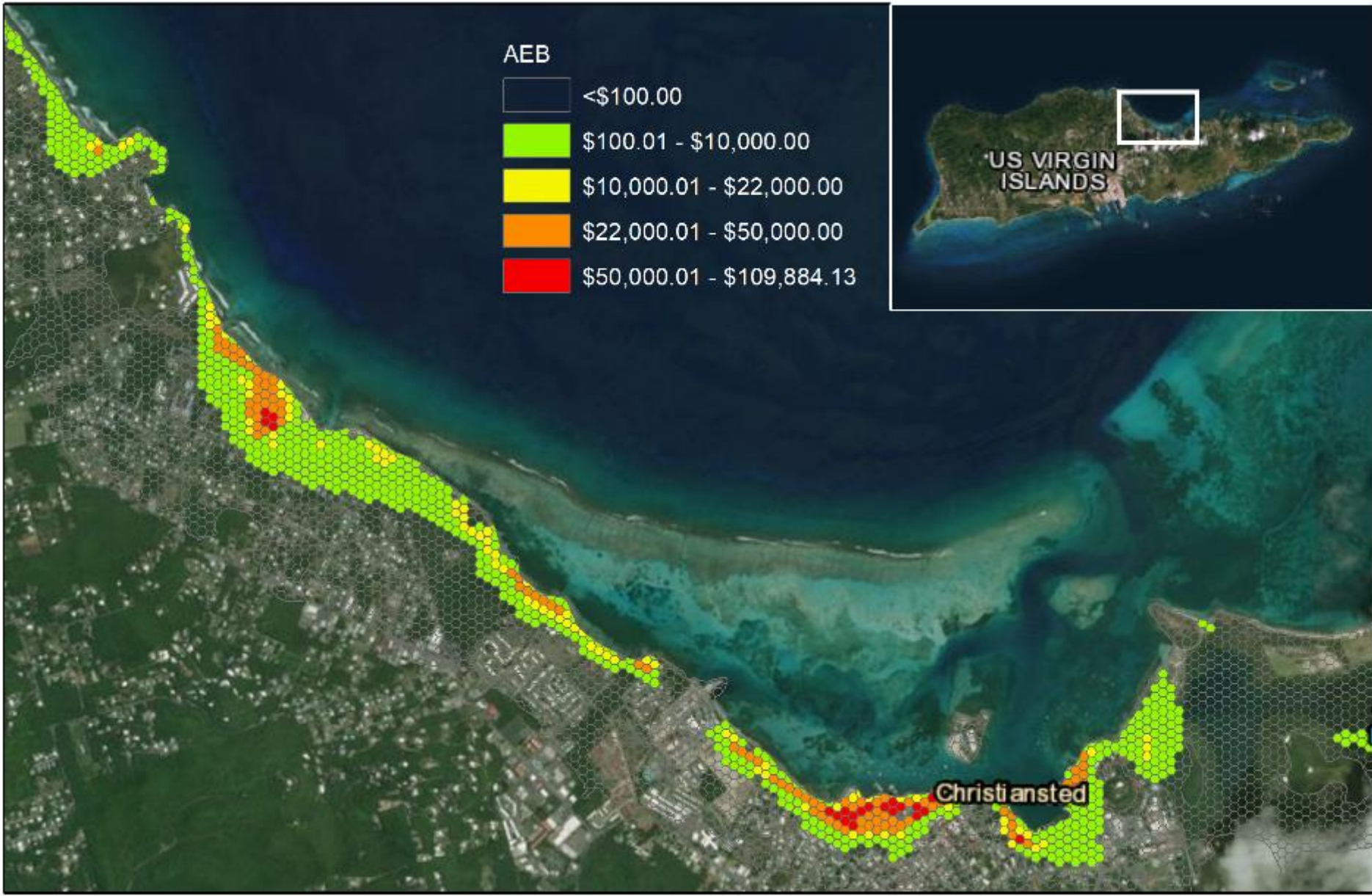
- **EXTRA SLIDES FOLLOW**

Global Wave Power Increasing



Benefit:Cost Ratios for Mangrove Restoration (30yrs@4%)





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