

Reef & Resilience Insurance

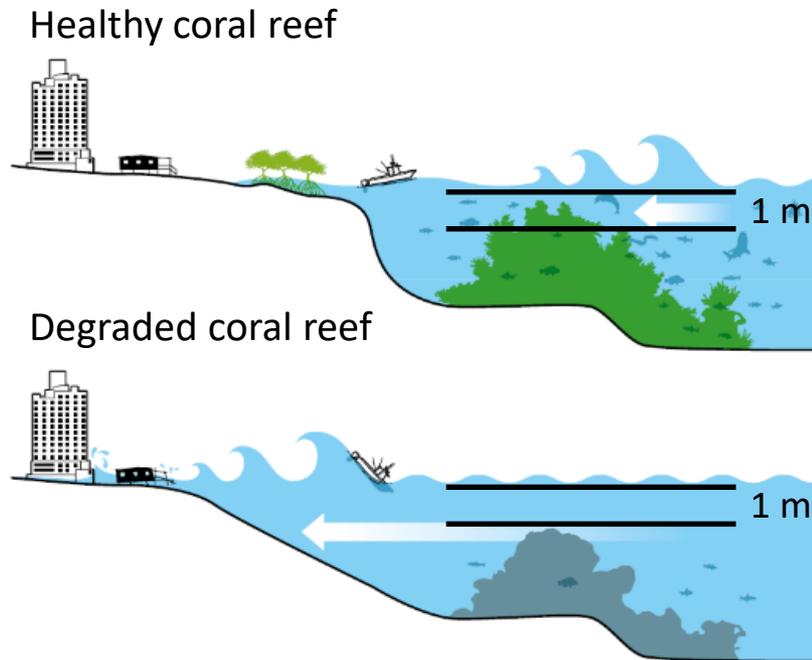
NOAA in the Caribbean Stakeholder Workshop
August 19 - 23, 2019



Outline

- 1 Protective value of coral reefs
- 2 Reef insurance - case study Quintana Roo
- 3 Resilience insurance concept

Protective value of coral reefs



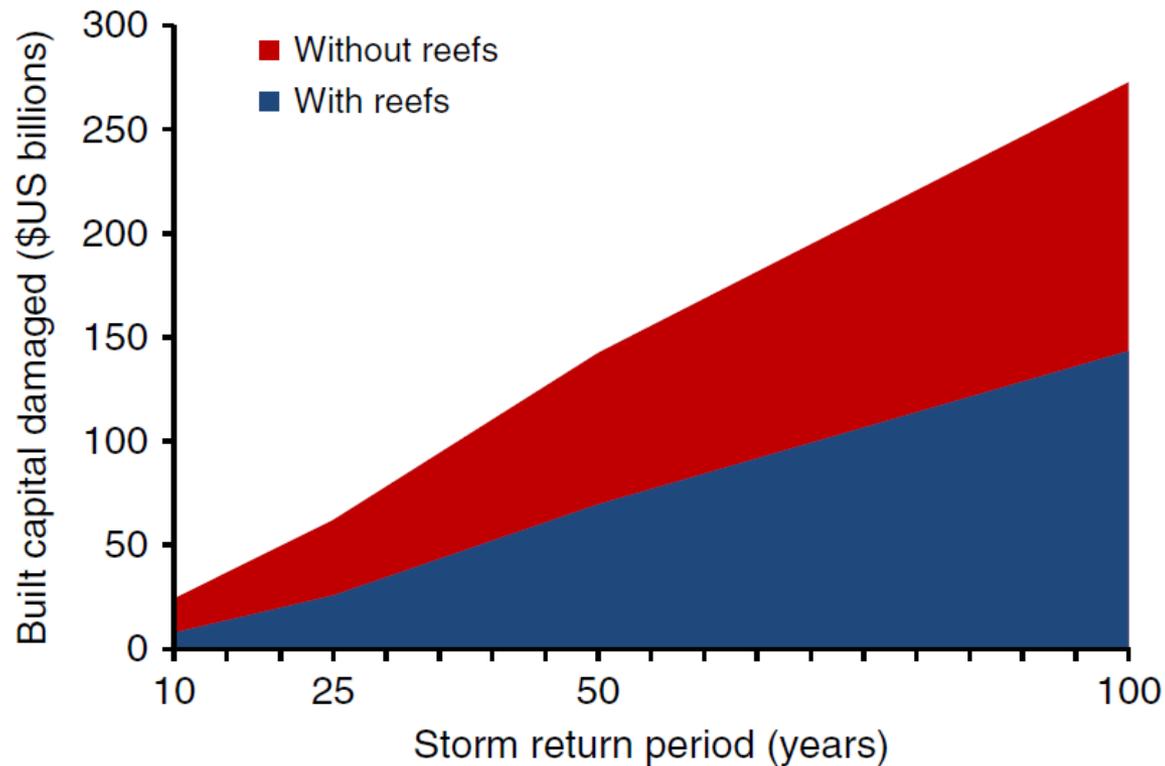
Flooding from storm expected once every 25 years - Playa del Carmen



- Flooding with current reef level
- Flooding with 1 m reef loss

Michael W. Beck, Iñigo J. Losada, Pelayo Menéndez, Borja G. Reguero, Pedro Díaz-Simal & Felipe Fernández, 2018, The global flood protection savings provided by coral reefs, *Nature Communications* 9:2186

Global level damage to built capital with 1 m reef loss



Michael W. Beck, Iñigo J. Losada, Pelayo Menéndez, Borja G. Reguero, Pedro Díaz-Simal & Felipe Fernández, 2018, The global flood protection savings provided by coral reefs, *Nature Communications* 9:2186

Protection provided by coral reefs in Puerto Rico and USVI

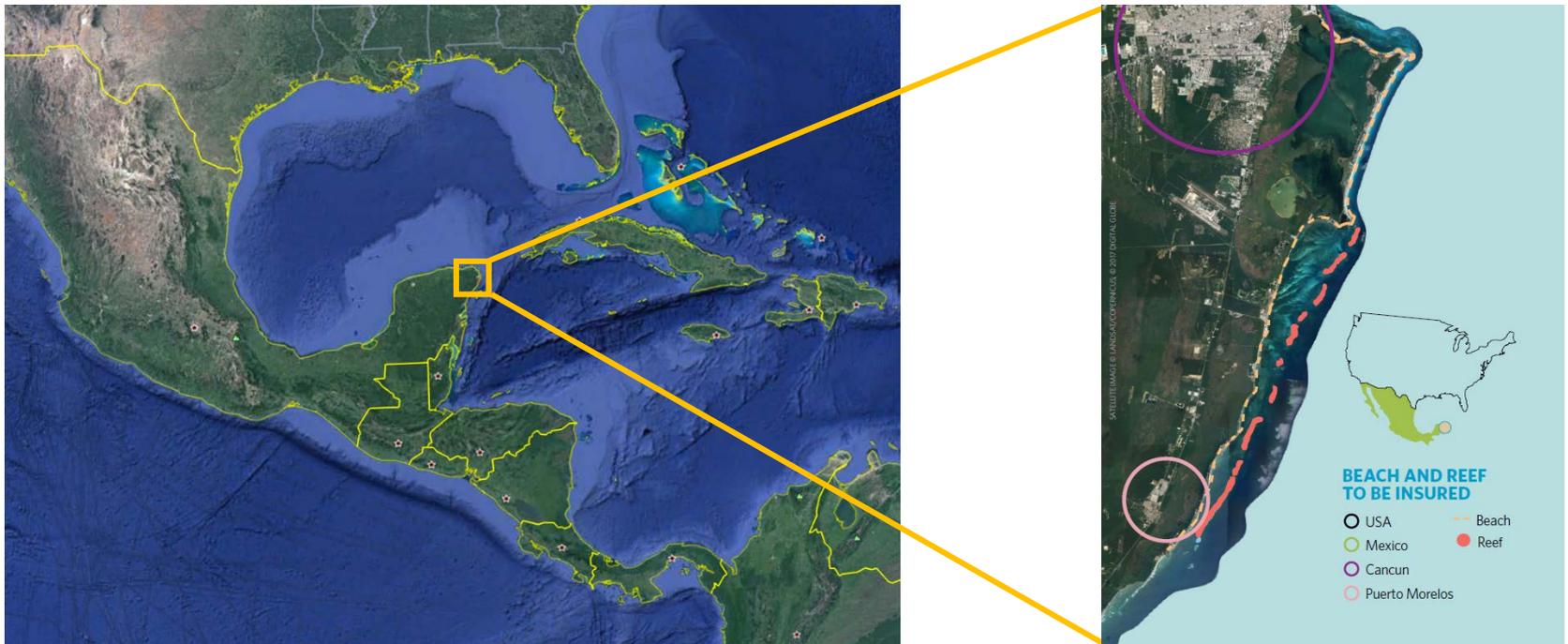
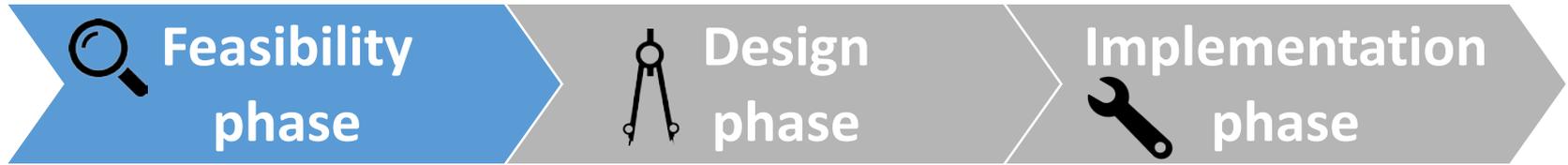
Annual flood protection provided by coral reefs by island:

Location	Sublocation	Number of people	Building value (2010 USD)	Econ. Activity* (2010 USD)
Puerto Rico				
	Isla de Puerto Rico	4,210	65,880,224	117,301,923
	Isla de Culebra	11	148,502	286,275
	Isla de Vieques	0	94,075	9,710
Virgin Islands				
	Saint Croix	278	18,021,883	21,325,668
	Saint John	3	527,814	323,358
	Saint Thomas	59	3,319,769	3,565,110

*GDP contribution of businesses and people (i.e. workers) in flood zone

Storlazzi et al., Rigorously valuing the role of U.S. coral reefs in coastal hazard risk reduction, 2019.

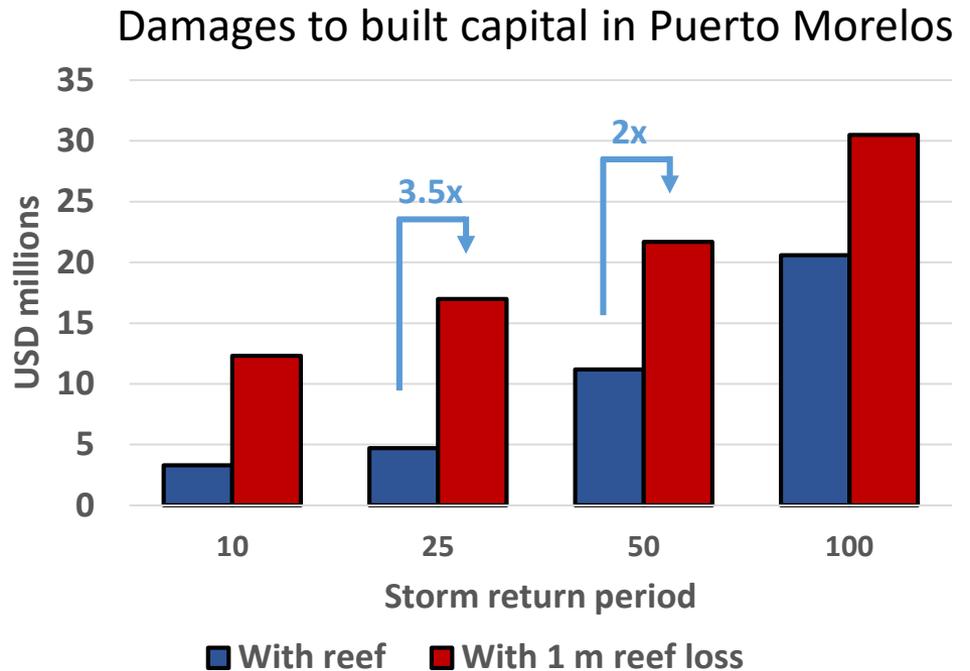
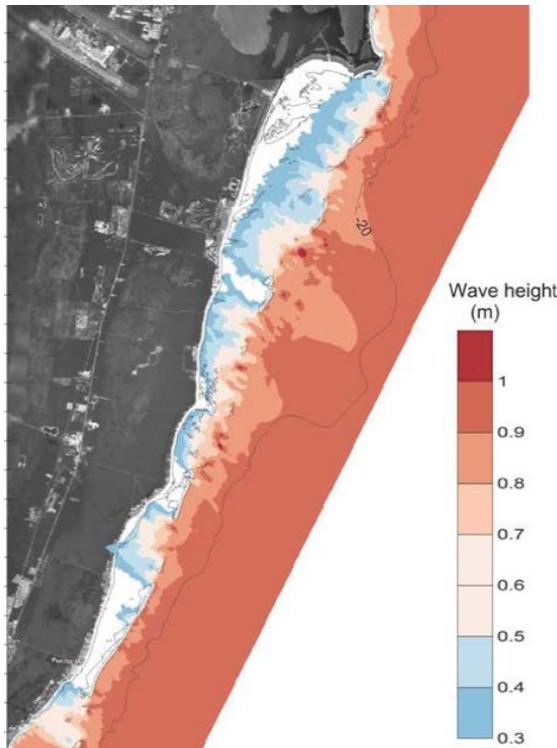
Reef insurance - case study Quintana Roo





Asset evaluation

Valuable services provided by natural asset



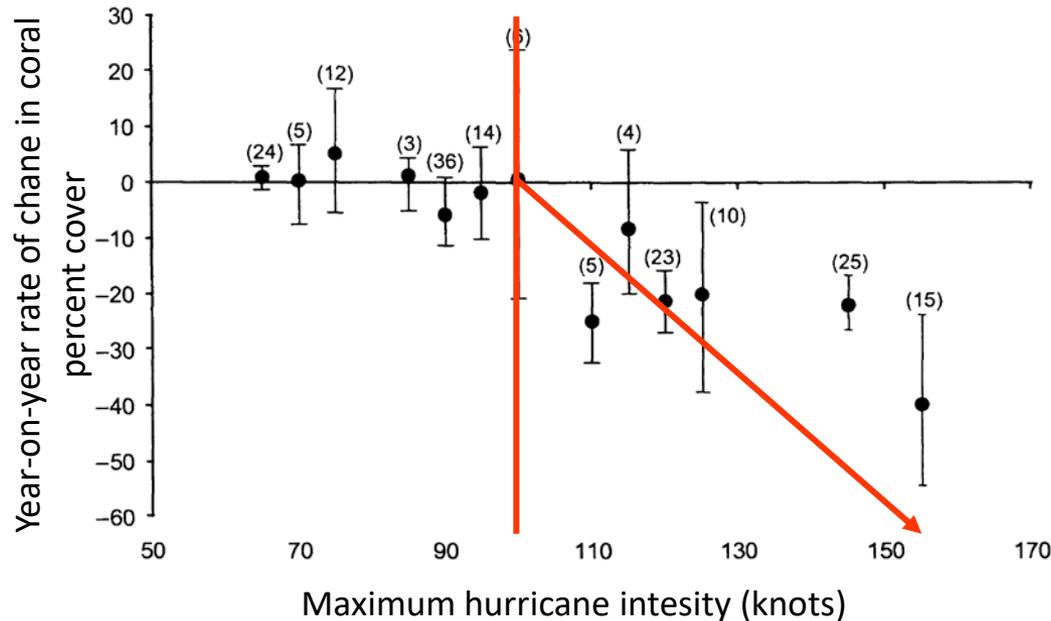
Left: Mariño and Acevedo, Guide to restore coastal protection services provided by coral reefs, 2017.

Right: Reguero et al., Valuation of the Coastal protection services of dunes and coral reefs in Quintana Roo, Mexico, 2018.



Asset evaluation

Risks, insurability, and reparability of natural asset



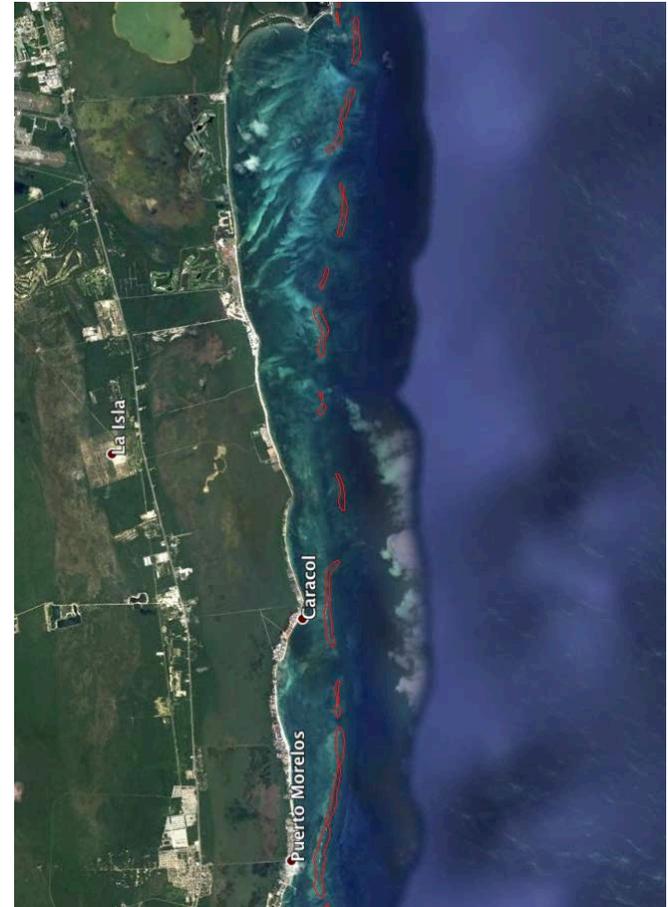
Gardner et al., Hurricanes and Caribbean coral reefs: Impacts, recovery patterns, and role in long-term decline, 2005.



Buyer identification

Stakeholders:

- National commission of protected areas: responsible of the reef
- Hotels: beneficiary of coastal protection service
- State government: interested in reducing damages to the economy





Insurance design

Indemnity or parametric insurance?

Indemnity

- Covers actual loss incurred
- Payment is made only after an actual loss assessment and investigation

Parametric

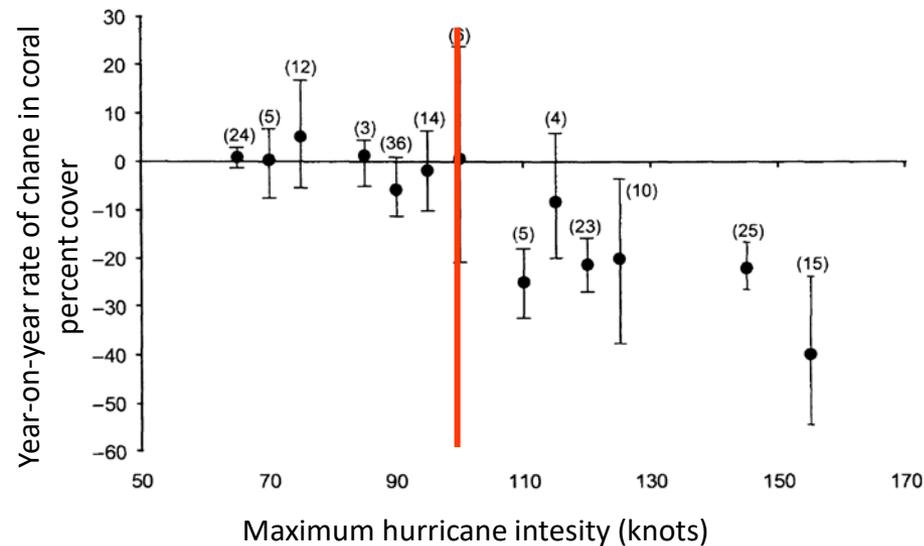
- Cover is pre-agreed
- Payment is triggered if pre-defined event parameters are met



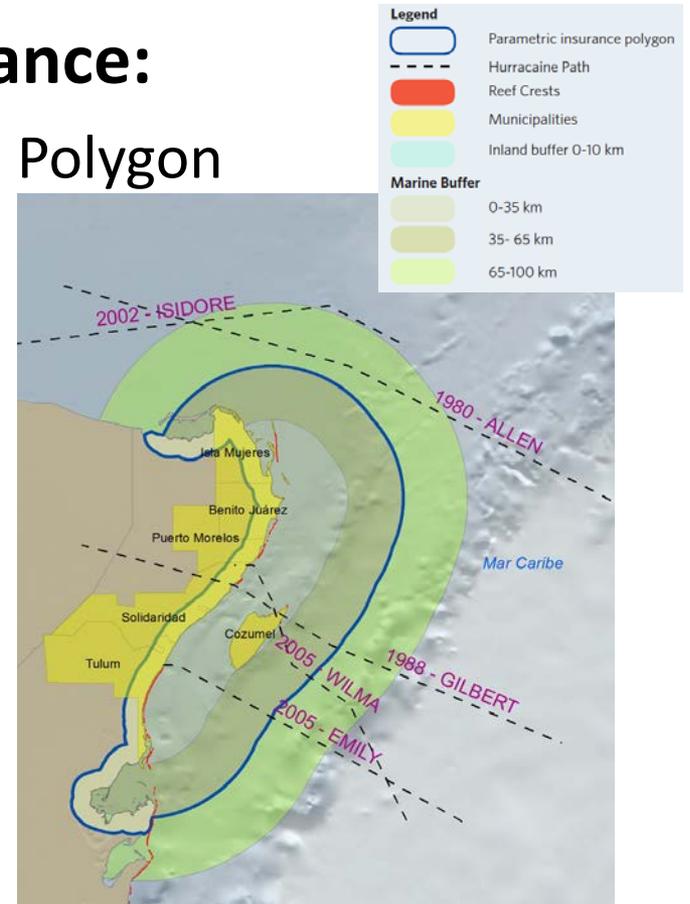
Insurance design

Elements of a parametric insurance:

Parameter and threshold = trigger



Polygon





Insurance design

Elements of a parametric insurance:

Payout defined based on estimated damage and cost of repair

PHASES	Hold risk ← → Transfer risk via insurance			
	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4
Hurricane wind speed in knots	50 to 90	110	130	160 or more
Category of damages	Minor damages	Moderate	Severe	Catastrophic
% loss of live coral cover	Less than 10%	20-30%	Around 30-40%	More than 50%
Structural damage	No	No	Moderate	Severe
ESTIMATED COSTS				
Post storm response	USD 60,000	USD 100,000	USD 140,000	USD 140,000
Ecological repair and structural restoration	No need.	USD 1,000,000	USD 2,000,000	USD 4,000,000



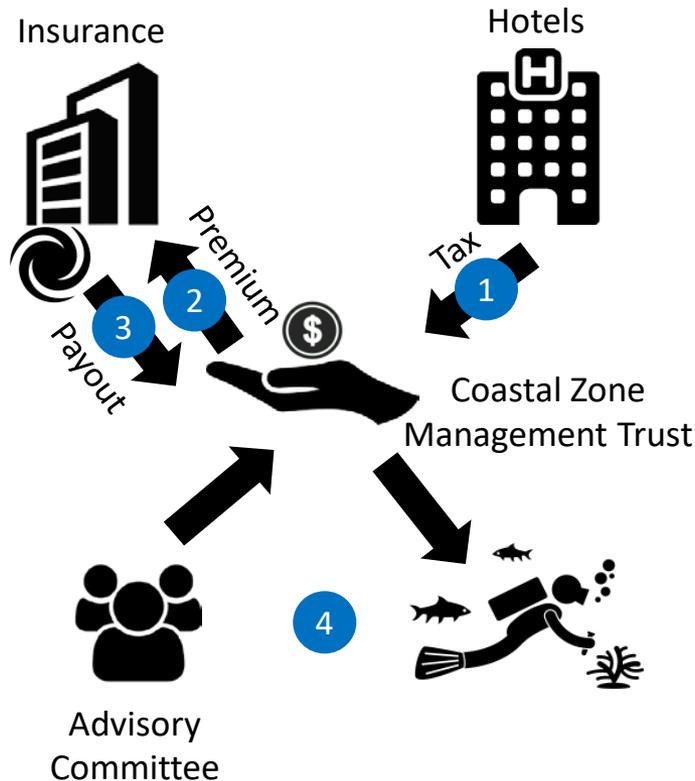
Insurance design

Business case (Scenario 3, severe damage)

Expected annual losses	USD
Decrease in tourism revenue	4,000,000
Increased in damage to coastal infrastructure	3,500,000
Total avoided losses	7,500,000
Cost of repair	
Post storm response	140,000
Ecological repair and structural restoration	2,000,000
Annual insurance premium	
To cover ecological repair and structural restoration (post-storm response is paid out-of pocket by insured parties)	160,000



Institutional arrangement



1. Define who pays for the insurance
2. Define who buys the insurance
3. Identify who receives the payout
4. Define the governance and process to manage the payout



Transaction

	TERMS OF COVERAGE	EXAMPLE
1	Contracting party	Coastal Zone Management Trust.
2	Beneficiary of the payout	Coastal Zone Management Trust.
3	Assets covered	Reefs and beaches
4	Risks covered	Hurricanes
5	Parameter and threshold to trigger the insurance	Wind speed at 110 knots
6	Third party that measures the parameter	Hurricane Center NOAA
7	Insured amount of maximum liability.	USD 2 million (hypothetical value)
8	Escalated payout in relation to values of the parameter	110 knots 40% of the Maximum Liability 130 knots 60% of the Maximum Liability 160 knots 100% of the Maximum Liability
9	Polygon of coverage	Defined in a map with geographic coordinates.
10	Period or term of the coverage	1 year
11	Coverage type: parametric or compensatory	Parametric
12	Currency of transaction and payments	Values stated in USD, payments made in Mexican Pesos.
13	Terms of payment	One exhibition and installments.

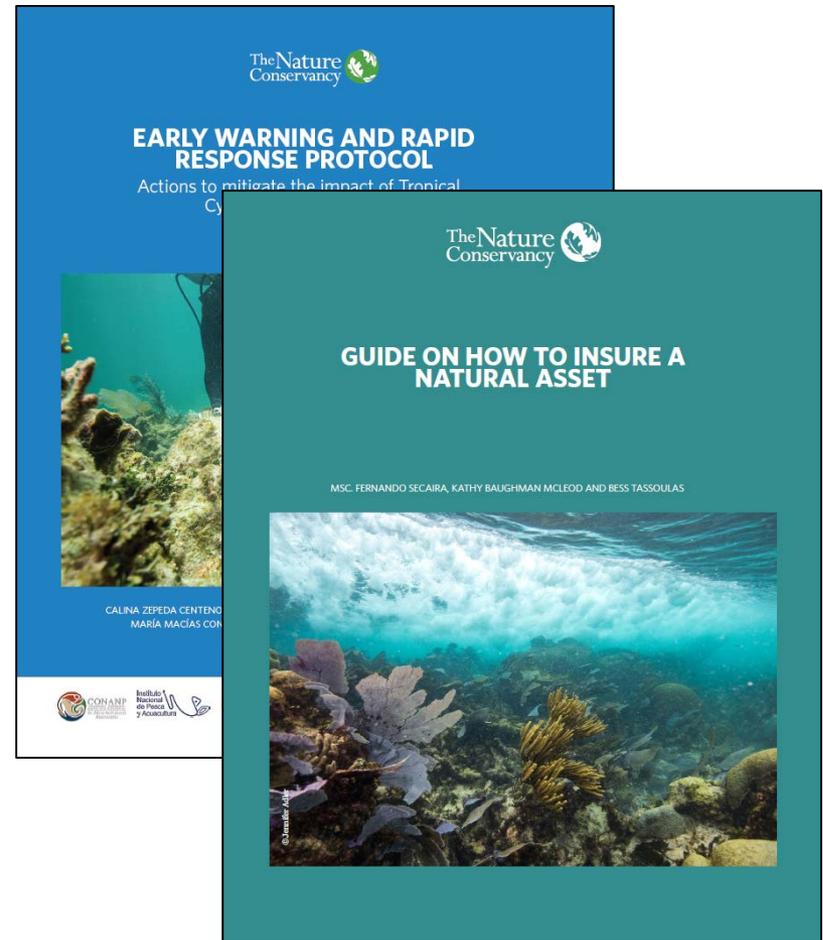
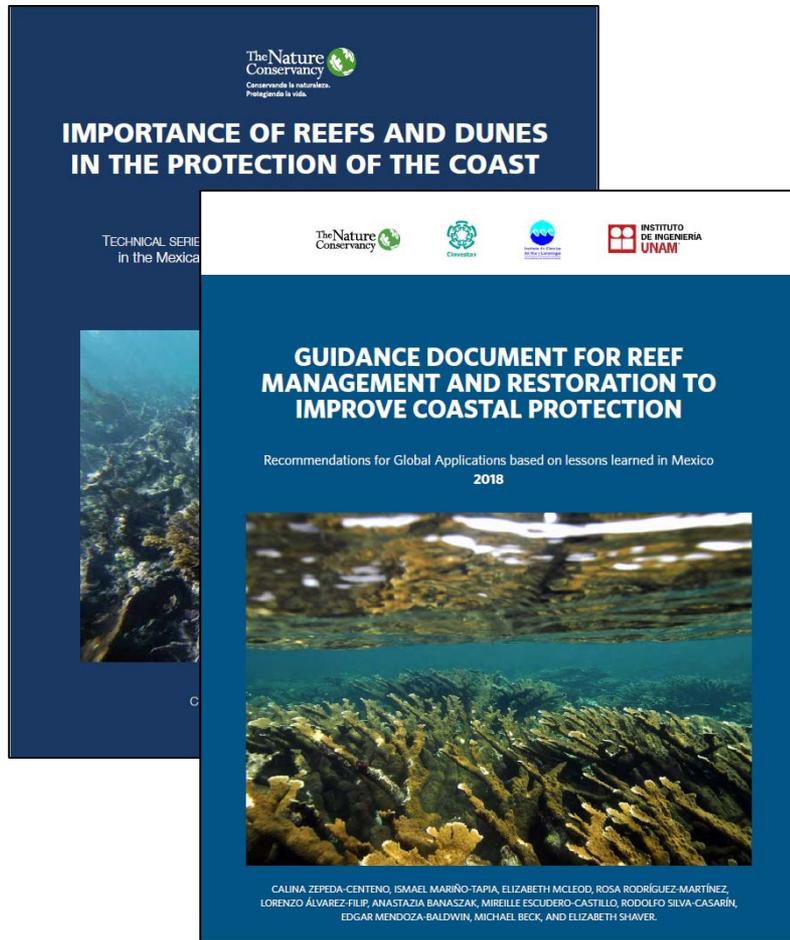


Capacity building for repair

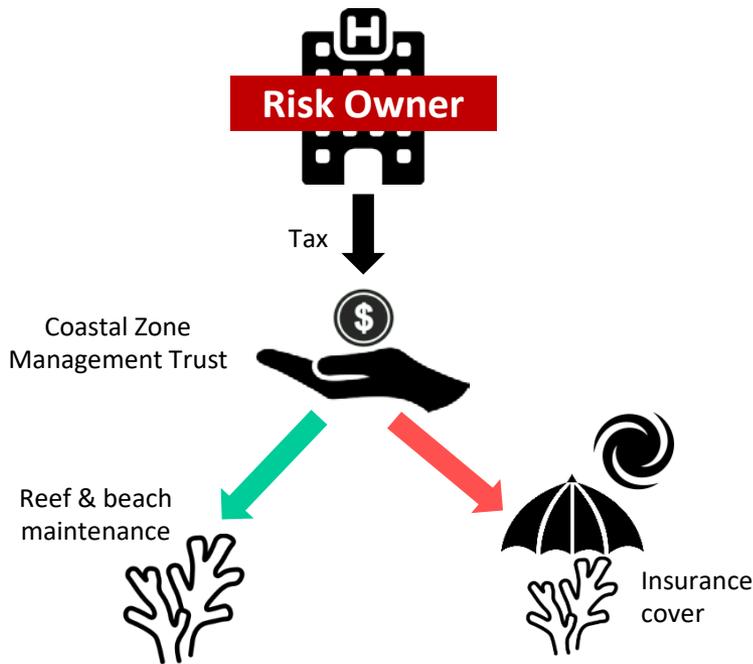
1. Define post storm action: “Early Warning and Rapid Response Protocol”
2. Train people: “Guardians of the reef” consisting of 60 volunteers (e.g. tour operators, fishermen)
3. Obtain permits: held by CONANP (Commission of Natural Protected Areas)



Resources

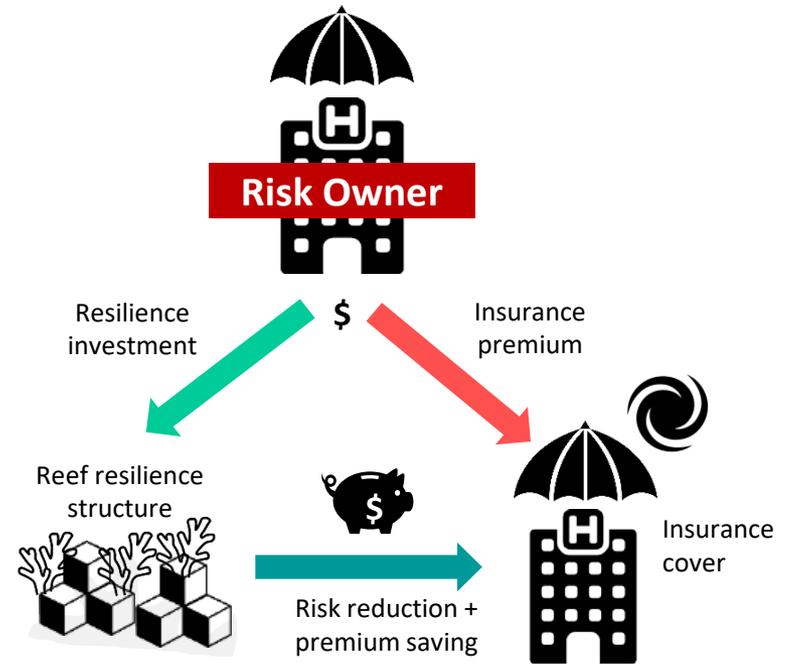


Reef insurance



Risk reduction **OR** risk transfer

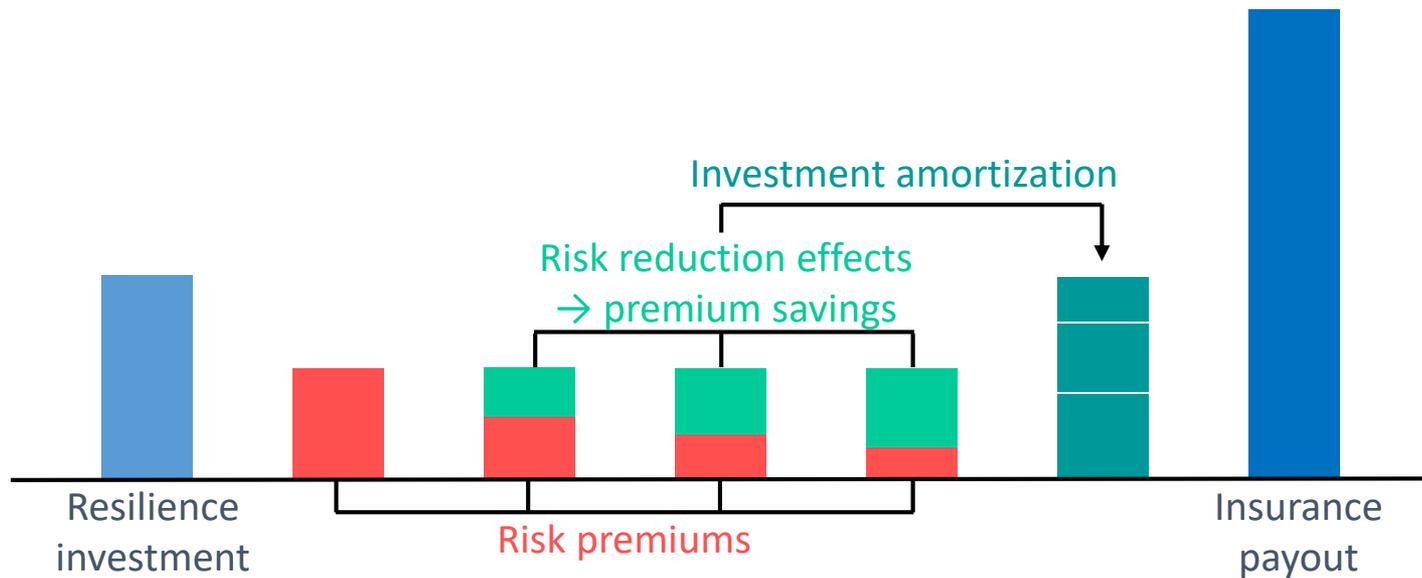
Resilience insurance



Risk reduction **AND** risk transfer

Resilience insurance concept

Risk Reduction + Risk Transfer



Acknowledgements

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Resilience Insurance

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Thank you!