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A REEF INSURANCE PRIMER

Hurricane damages to reefs, repair and restoration options and costs

Quintana Roo's Trust for Coastal Zone Management, Social Development and Security has purchased an insurance policy to cover coral reefs and beaches in the Mexican Caribbean against hurricanes above 100 knots (Cat 3 and above). Most people recognize the importance of beaches for the State, as well as the damages caused by hurricanes and the cost of repairing them. But, why buy insurance for reefs? How will the funds be used? Which reefs, and beaches will be covered? This document answers these questions.

Why coral reefs are so important for Quintana Roo?

- Coral reefs reduce more than 90% of wave energy during storms (Ferrario, et al, 2014) protecting the coastline. If reefs are degraded, losses to infrastructure from a storm could triple (Beck, M. et al, 2017). Reefs also reduce 60% of wave energy under normal conditions (Mariño, I. and Acevedo C. 2017) protecting beaches from erosion.
- Reefs are the most important tourism attraction in Cozumel, Puerto Morelos, Punta Nizuc and Punta Cancun, attracting more than one million visitors per year who pay approximately USD 60 million to local tour operators.
- Without reefs there would be no beaches; both, reef and beaches, sustain the USD 9 billion tourist economy of Quintana Roo.

FIGURE 1: A well developed and healthy colony of *Acropora Palmata* in a protected area.

FIGURE 2: Broken and displaced coral colonies after a storm.



What is the impact of hurricanes on coral reefs?

Reefs are affected by several threats, such as diseases, water pollution, bleaching, diving. Hurricanes can be particularly severe diminishing live coral cover and reef complexity in a few hours. A metanalysis (Gardner, T, et al, 2005) conducted for the Caribbean including more than 200 sites and 20 years of data show the following:

- Hurricanes with wind speeds from 50 to 100 knots affecting reefs caused losses of live coral cover ranging from 0 to 10%, with an average loss of around 2-3%.
- However, most hurricanes with wind speed above 110 knots caused damages to coral reefs considered severe or catastrophic. Loss of live coral cover ranged from 10 up to 30% with 110 knots and 20% to 50% with 160 knots (see figure next page, published by Gardner, T, et al, 2005).
- This loss is compared with an annual loss of 2.6% derived from other stressors combined.

Experts consider that hurricanes category 4 and 5 passing less than 65 km from the reefs are very likely to damage it (TNC interviews and Alvarez-Filipp, et.al. 2011).

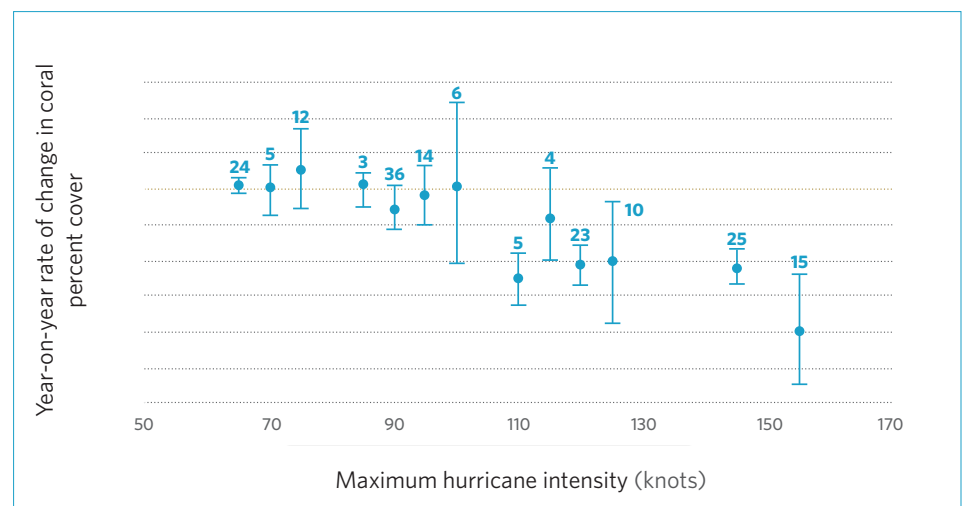




FIGURE 3:

Brigade member drilling the ground to fix a displaced coral colony.

Photos: © Jennifer Adler/TNC

FIGURE 4:

Nursery with *Acropora palmata* coral colonies.

Photo: © Oceanus A.C.

It is possible to reduce reefs' damages caused by hurricanes!

Building the post storm response capacity.

It is critical and possible to reduce damages to reefs after a storm. The National Commission for Natural Protected Areas (CONANP) and the Research Center for Aquaculture and Fisheries (CRIAP) and TNC trained brigades to conduct a post-storm response. These brigades will:

- Remove debris from reefs to prevent further damage, such as sand, loose stones or broken corals.
- Fix and consolidate loose colonies and broken fragments.
- Collect broken pieces and set up nurseries for future transplanting .

If this response is implemented up to 60 days after the storm it will greatly increase chances for the coral to survive and recover while reducing the overall damage that the storm has caused.

A partnership between CONANP-CRIAP and TNC developed a Post Storm Protocol (Zepeda, C. et al, 2019) to guide these efforts, trained 40 brigade community members, and equipped and organized them in brigades. Further training will add 20 new brigade members for the 2019 hurricane season in Cancún and Isla Mujeres.



FIGURE 5:
Reef crest covered with dead corals.
Photo: CRIAP.

Further repairing damages after the first response.

Managers responsible for the reef will support the recovery from storm damage during the next 2-5 years. There are several actions such as reproduction and planting of coral colonies (sexual and fragment-based reproduction), consolidations of broken or degraded reef structures, and, if possible, managing critical stressors to corals such as snorkelers, water pollution and fishing.

Preferred coral species for restoration are reef builders, such as *Acropora palmata* and *Acropora cervicornis*.

The purpose of reef repair is to plant back as many colonies as there were before the storm. For example, there are near 10,000 mature *Acropora palmata* 's colonies in Puerto Morelos Reef National Park.

Why buy insurance?

Repairing the reefs is costly. The cost of immediate response ranges from USD 100,000 to USD 150,000, for an area 20 km long and requires 20 to 30 days of work, based on estimations from the Puerto Morelos National Park.

The long-term response will be more costly, and hence the need for insurance coverage, taking 2 to 5 years to replace lost coral colonies depending on the extent of the damage and the scope of the repair.

The cost of not repairing the damages to coral would be much higher to the local economy, as tourism attracted by reefs will diminish and beach erosion will increase as coastal protection is reduced.

How does the Trust Fund will decide on investing the funds?

Quintana Roo's Trust for Coastal Zone Management, Social Development and Security will buy the insurance on behalf of the State Government and will be the beneficiary. It was established by the Quintana Roo Government in November 2018,

The Trust has a transparent and solid governance structure lead by a Technical Committee, which has the support of the Sub-Committee for Coastal Zone and an Advisory Committee. The Trust will decide on how to invest the payout in case of an event.

How does a parametric insurance work?

The parametric insurance is defined by three elements: 1) a parameter (wind speed), 2) an polygon where the wind speed must occur, and 3) a payout.

This parametric insurance will be triggered if wind speed within the polygon is above 100 knots (see figure 6).

The maximum payout over the 12 months policy will be approximately USD 3.8 million (known as Annual Aggregate Limit or AAL)

The payout varies according to the registered wind speed, as the higher the speed more damages:

- **Moderate damages:**
100 knots to less than 130 = 40% of maximum payout
- **Severe damages:**
130 knots to less than 160 = 80% of maximum payout
- **Catastrophic damages:**
60 knots or more = 100% of maximum payout

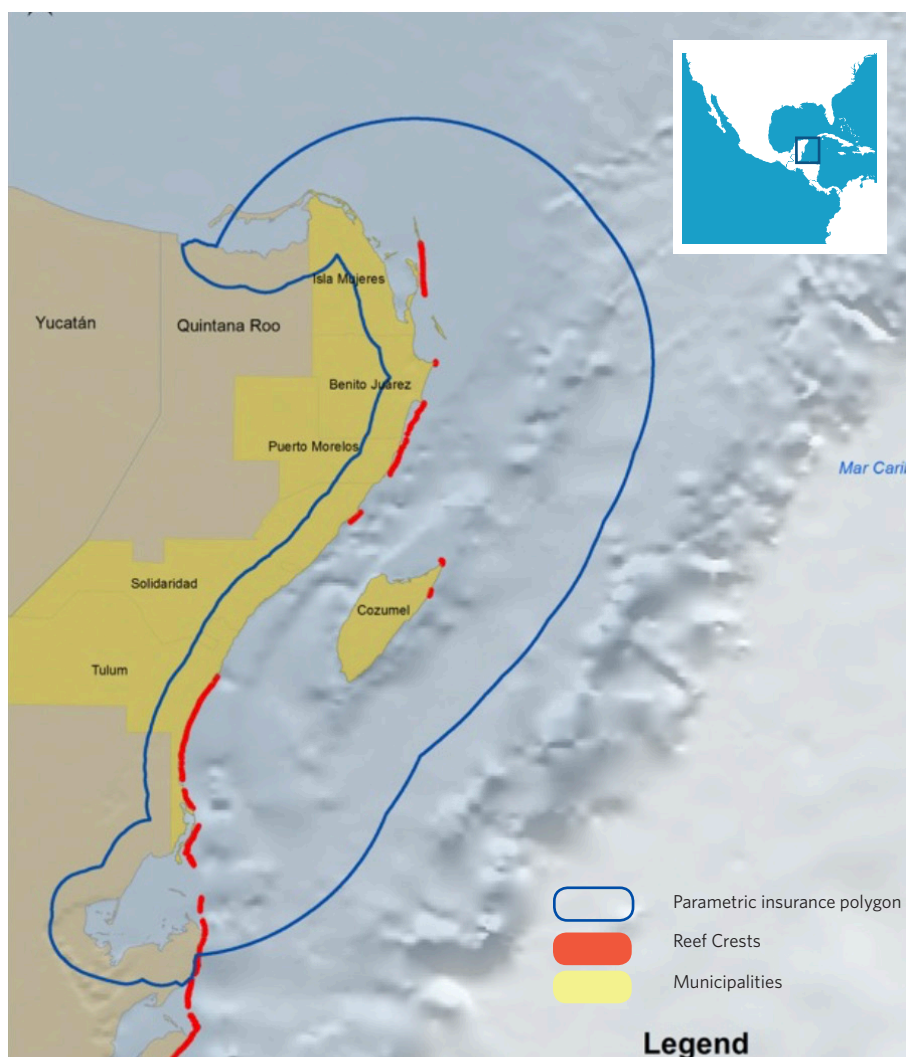


FIGURE 6: Polygon for parametric insurance in Mexican Caribbean.