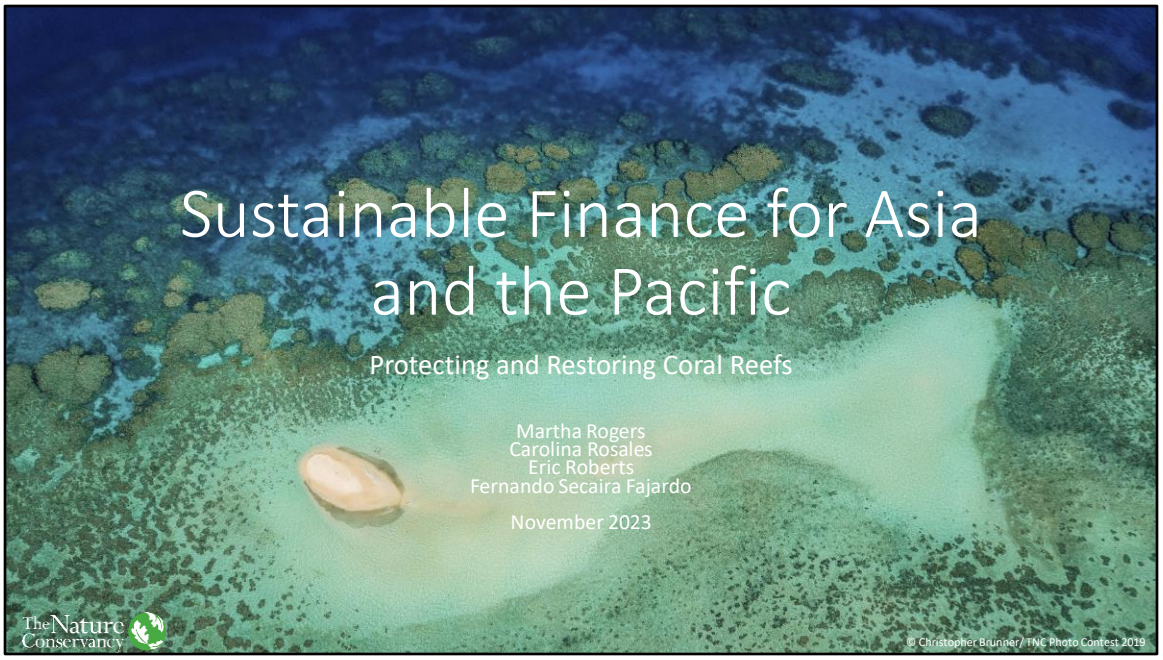


This slide deck was originally created by Fernando Secaira Fajardo and Martha Rogers of The Nature Conservancy. It summarizes key findings and recommendations that The Nature Conservancy put together as a part of the preparation of a knowledge product for ADB. The knowledge product reviews the benefits of coral reefs, the risks faced by coral reefs, and opportunities to sustainably finance the protection and restoration of coral reefs in Asia and the Pacific. Taking inspiration from the first-ever insurance policy taken out against coral reefs in Quintana Roo, Mexico in 2019, we explore similar opportunities for a coral reef insurance policy in Asia and the Pacific.

Coral reefs provide a multitude of values

Food & Livelihoods

Over half of all coral reef fishers reside in Asia and the Pacific (3.8 million people).

Tourism

In Asia and the Pacific, coral reefs can provide up to $900,000 per km^2 in reef-associated tourism.

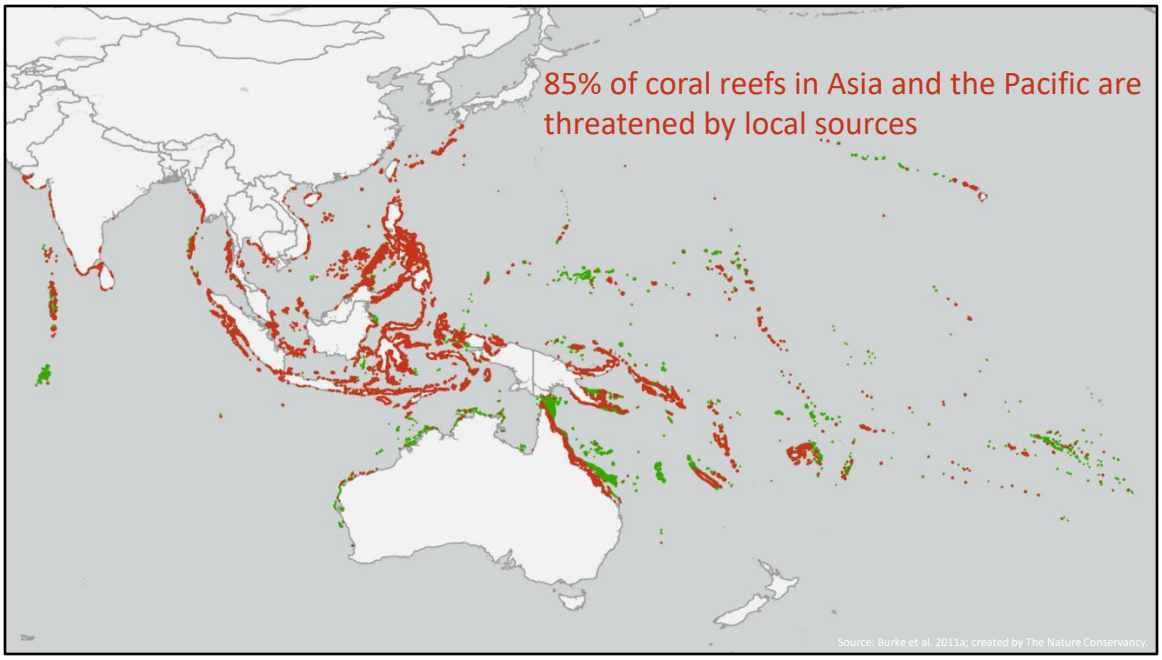
Coastal Protection

Coral reefs can dissipate up to 97% of wave energy, reducing erosion and flooding.

Coral reefs provide a multitude of benefits to local and global communities. Over 275 million people around the globe live within 30 kilometers of a coral reef and 150 million of those people are residing in Asia and the Pacific. In addition to the direct benefits listed here, coral reefs host a quarter of all known marine species with the highest concentration of coral and reef species living in the Asia and the Pacific region.

Other relevant facts (IF NEEDED):

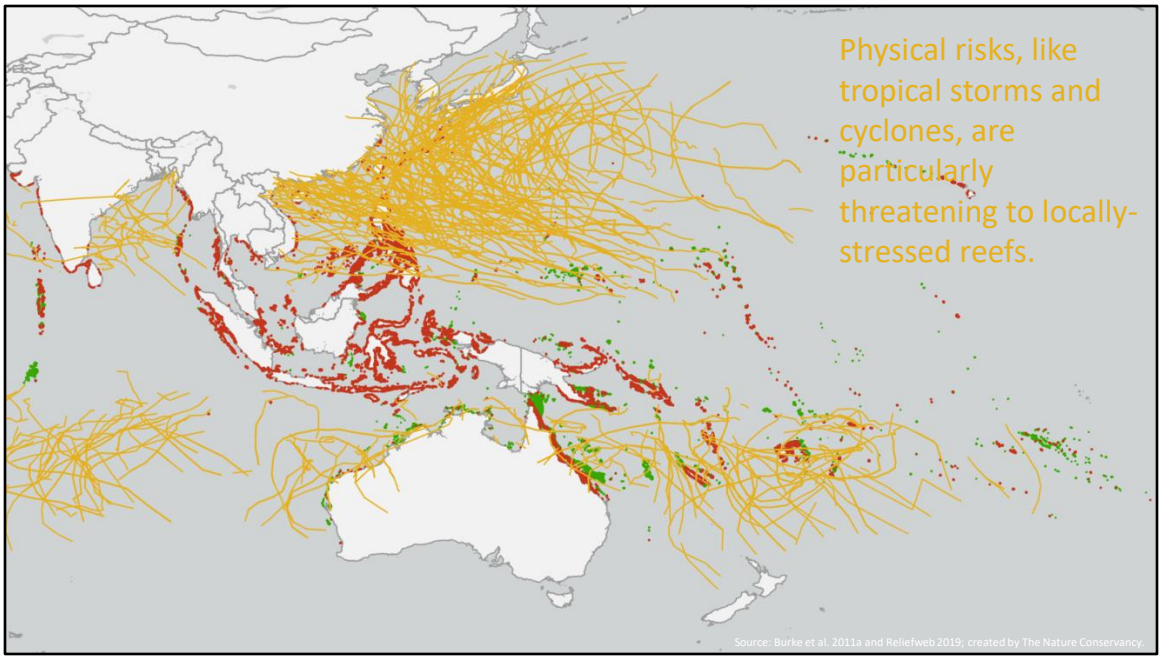
- Healthy coral reefs can sustain yields of between 5 and 15 tons of fish per square kilometer annually. In some countries in Asia and the Pacific, over 20% of daily protein needs come from marine fish, compared to just 5% on average globally.
- Globally, the estimated value of coral-reef associated tourism is $36 billion, with 100 countries benefitting from coral reef tourism.
- Globally, coral reefs reduce the annual expected damage from storm events by as much as $4 billion. In Asia and the Pacific, annual expected flood protection benefits from coral reefs are highest in Indonesia ($639 million), Philippines ($590 million), and Malaysia ($452 million).



Yet, coral reefs in Asia and the Pacific remain particularly threatened. Over 85% of coral reefs in the region are threatened by local sources, such as overfishing, destructive fishing, coastal development, and pollution. The red on this map indicates coral reefs with medium, high, or very high threats while the green indicates less threatened reef systems.

Other relevant facts (IF NEEDED):

- Overfishing and destructive fishing is the most pervasive and damaging threat to coral reefs in Asia and the Pacific, threatening nearly 60% of the region's reefs.

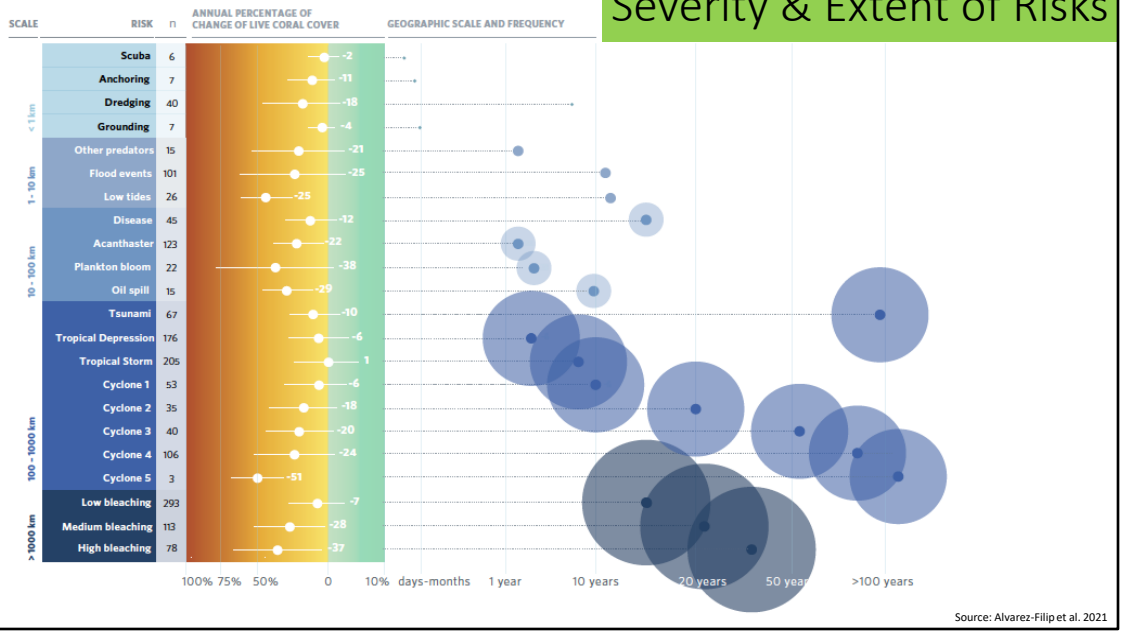


In addition to the local stressors, many reefs in Asia and the Pacific are also threatened by physical risks, such as tropical storms and cyclones. This map shows the paths of tropical storms and cyclones that occurred in the region from the 2010 to 2018 time period. Countries such as the Philippines, People's Republic of China, Pacific Small Island Developing States, India and Bangladesh are particularly prone to these storm events. While global climate models do not consistently predict changes in the location or frequency of tropical cyclones/typhoons as temperatures rise, they do point to more intense storms (measured by higher maximum wind speeds and heavier rainfall).

Other relevant facts (IF NEEDED):

- For example, Typhoon Yolanda, which made landfall in the Philippines on November 8, 2013, had sustained wind speeds of 250 kilometers per house. The storm destroyed 600,000 houses, killed 6,300 people, displaced 4 million people, and caused an estimated $1 to $10 billion in damage. In addition, some reefs in the Philippines were completely destroyed by the typhoon.

Severity & Extent of Risks



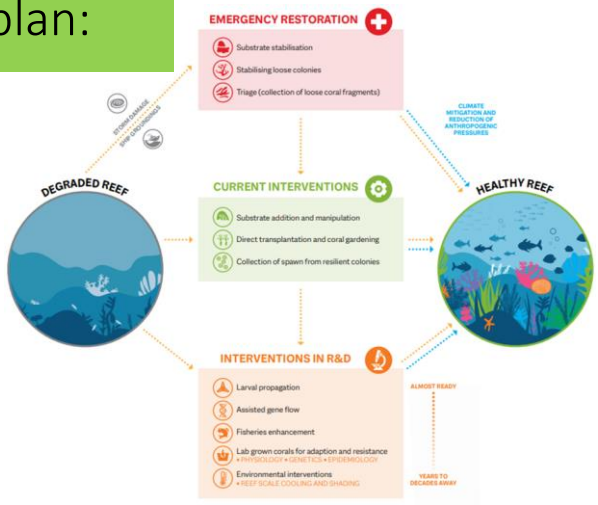
Source: Alvarez-Filip et al. 2021

However, not all risk events are created equal. This slide shows the variation in frequency and extent of damage across a number of different risks derived from a review of 157 studies spanning over 1,000 coral reef sites globally. This figure shows, on average, the frequency (how often the disaster event occurs), damage extent (area of the reef is damaged), and intensity (% change in coral cover) for the different risks reviewed. The size of the circle indicates the damage extent and the location indicates how frequently the disaster event is anticipated to occur, on average. For example, bleaching events can impact up to 1,000 kilometers of coral reefs at once but are only anticipated to occur every 15 to 35 years, depending on the intensity of the bleaching event. Most coral reefs are threatened by many of these risks simultaneously.

Managing risks to coral reefs with a comprehensive plan:

Components:

- ✓ Reef management;
- ✓ Reef restoration;
- ✓ Post-disaster reef repair;
- ✓ Legislation and actions to address chronic threats.



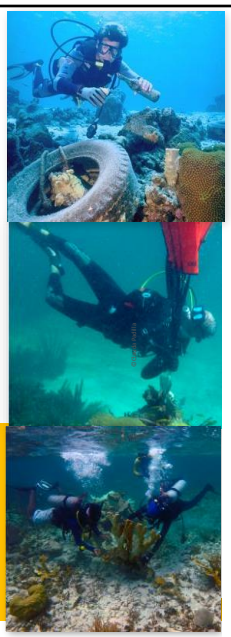
Managing all of the compounding and overlapping risks to coral reefs requires a comprehensive management plan. The management plan needs to address chronic stressors, like overfishing, that may require a long-term management plan as acute stressors, like storm events, that are going to require immediate emergency responses to effectively restore and repair the reefs. This slide shows some of the management components and restoration actions that can be used to manage different risks to reefs.

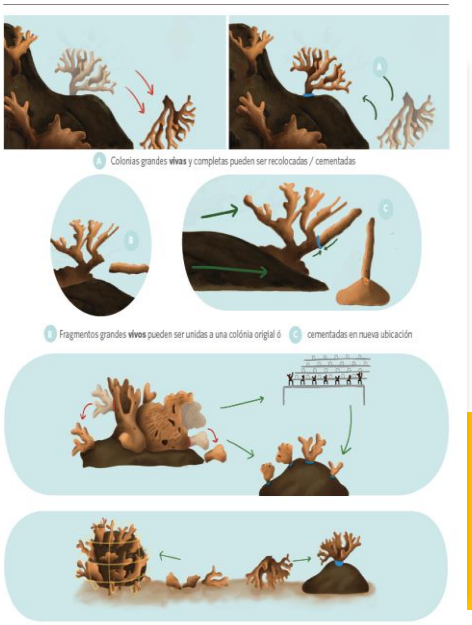
Developing reef management strategy

1. Understand Risks
2. Impact of Risks
3. Identify Responses to Risks
4. Estimate Costs of Responses
5. Compare Costs & Benefits
6. Select Cost-Effective Responses

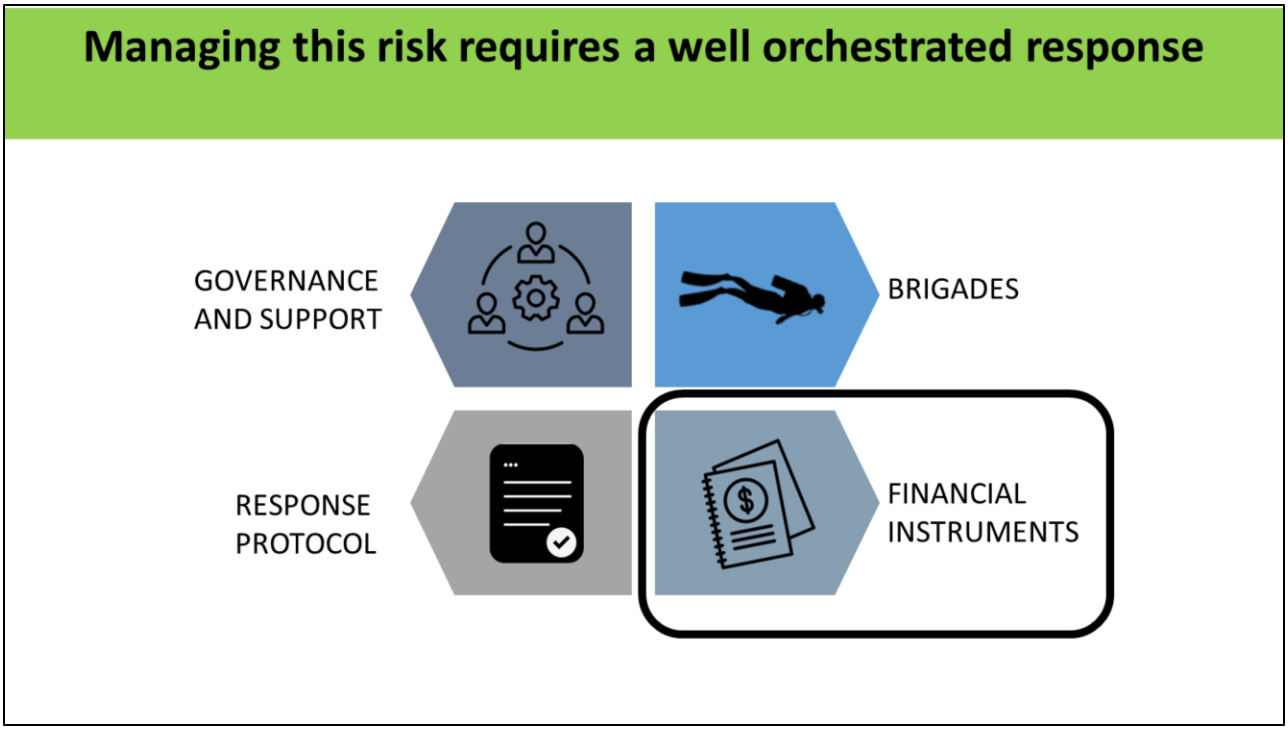
How do we put together this reef management plan? What is laid out on this slide are some of the key steps that are needed in order to develop such a plan, which ultimately requires taking time to understand the key risks to a particular reef and the most cost-effective means of responding to those risks. Any final reef management plan is going to be very locally specific.

Good news: damages can be significantly reduced in short term

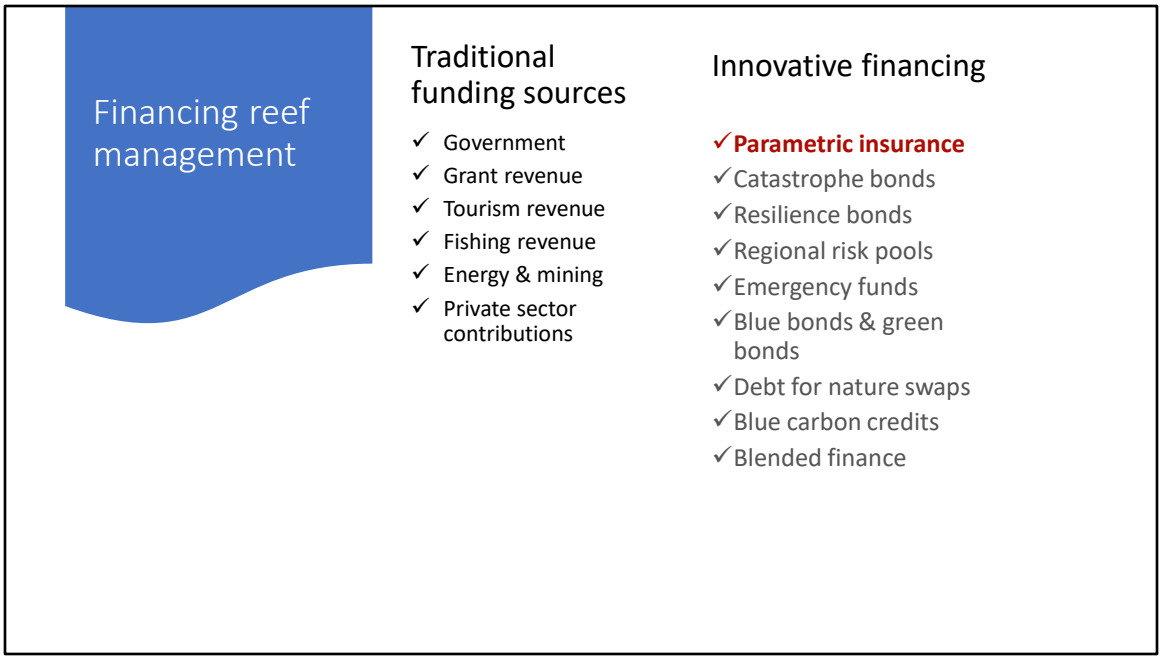




And, while this whole process may seem like a lot, the good news is that we have a solid scientific understanding of appropriate techniques to restore and repair reefs after disaster events, such as tropical storms and cyclones. Reef management plans have been successfully implemented in the past. We are now going to discuss lessons from The Nature Conservancy's development and implementation of such a plan on coral reefs in Mexico.



First, responding to a disaster event, such as a cyclone, requires a well-organized response with four key elements. One is the governance and support aimed at clearly defining who will lead the response effort and who is going to participate and support the response effort. Second, we need the response protocol, which is a document that outlines all the steps that need to be followed for the response, such as who is going to be what and the way to do it. It's very critical to have the response protocol clearly articulated. Third, we have the brigades, which are the people that are trained and equipped to go into the water to do the repairs themselves. And finally, we need the financial instruments to pay for all the response. Today, we'll focus on these financial instruments.

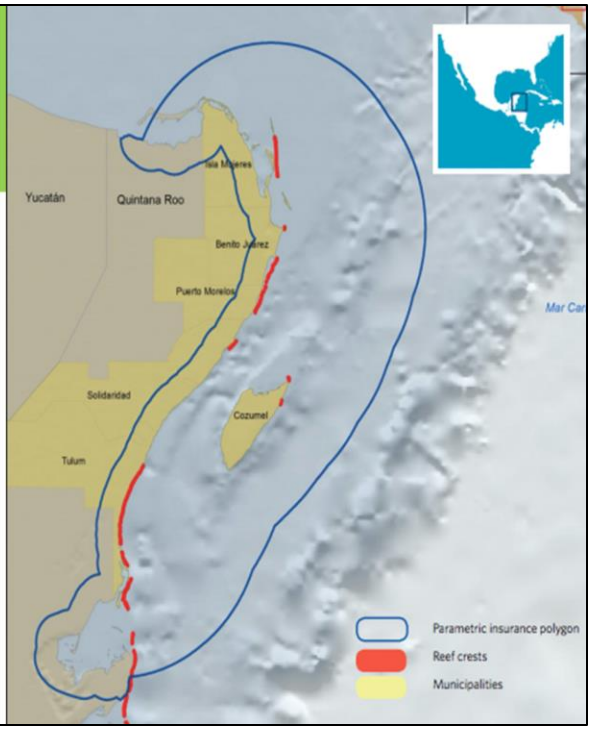


Traditional sources of funding for reef management and restoration include government revenues or grants, donations and other private sector contributions that may occur in the area. Today, we're going to focus the remainder of the presentation innovative financing that can be used to effectively manage risks to coral reefs. This risk financing is used to secure funding to deploy a response effort following a disaster event. Particularly, we're going to talk about the parametric insurance that TNC, and others, have used in Mexico and other parts of the world.

Reef insurance in Mexico, Belize, Honduras and Hawaii

Mexico was the first:

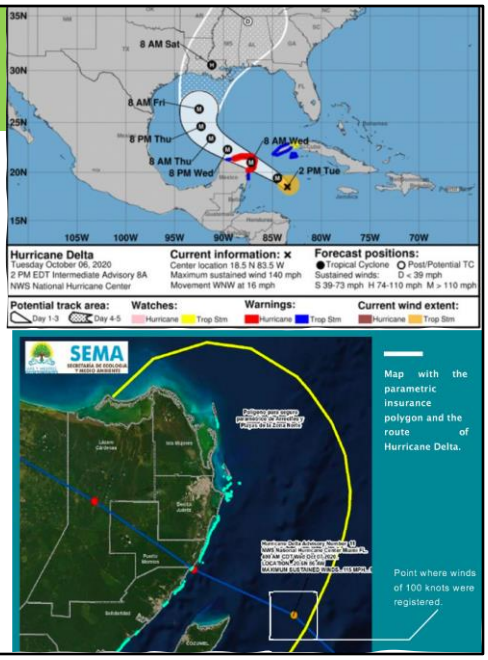
- Goverment of the Quintana Roo State, TNC and Swiss RE support.
- Policies purchased since 2019 to present.
- Covers beaches and reefs.
- Coverage up to USD 2.5 million.



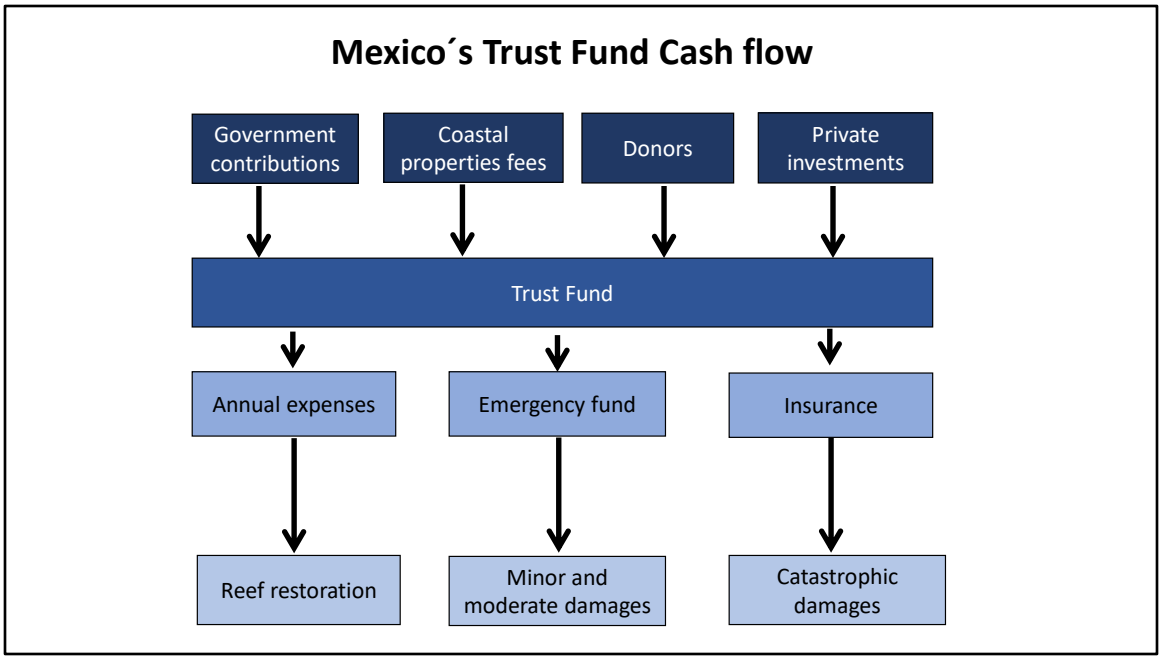
In 2019, the government of Quintana Row, a state government in Mexico, purchased a parametric insurance policy that was designed and supported by The Nature Conservancy and Swiss Re. The policy has been renewed every year since 2019. The parametric insurance policy purchased covers beaches and coral reefs along a very touristy and highly exposed coastline. So how does parametric insurance work? First, there is a defined polygon, as show on this slide, that corresponds to the area where if a hurricane or cyclone passes through it then the insurance policy will be triggered. In this case, the insurance policy is triggered if the recorded wind speed surpasses specific limits that have been set by the policy. The insurance payout will then increase according to the strength of the recorded wind speed with more intense winds corresponding to higher payouts.

Response was tested in 2020 succesfully

- Hurricane Delta impacted with 100 knot maximun windspeed.
- Triggered a payout of US$850,000
- Reef brigades deployed for 3 months and rescued/estabilazed 15,000 colonies and fragments.
- Restoration efforts during the next 2 years

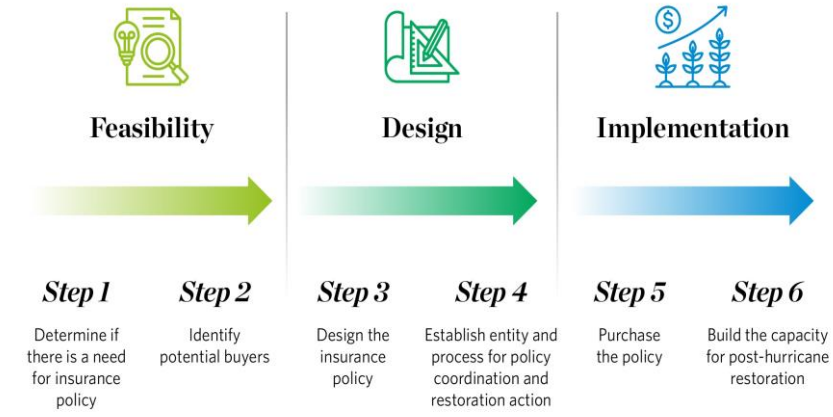


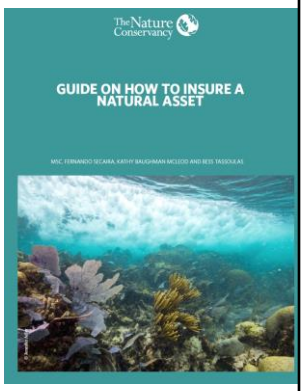
This parametric insurance policy and the whole response protocol developed in Mexico was successfully tested in 2020 when Hurricane Delta hit the area. Hurricane Delta was a category two storm when it crossed the pre-defined polygon, corresponding to an insurance payout of $850,000. With the insurance payout, the reef brigades were financially supported to be able to go out and rescue and stabilize reef colonies and fragments all over the impacted area. In addition, a similar parametric insurance policy was purchased on the Mesoamerican Reef for which a payout was triggered and successfully deployed in Belize following Hurricane Lisa in 2021.



Ultimately, the successful implementation of any parametric insurance policy will only be as good as the institutions and organizations managing the funding and policy, which will all be a part of the comprehensive reef management plan discussed earlier. In Mexico, The Nature Conservancy worked with others to develop this trust fund for coastal management that receives financial contributions from several sources, including the government, coastal property owners who benefit from reef restoration efforts, donors, and other private investors in the area. The trust fund uses the money uses the money for: annual reef management and beach cleaning: to finance an emergency fund to cover reef restoration when the insurance policy is not triggered, such as in the event of a Category 1 or Category 2 hurricane: and, third, to pay the premium to purchase the parametric insurance policy, which funds reef restoration in the event of a more catastrophic Category 3, 4 or 5 hurricane.

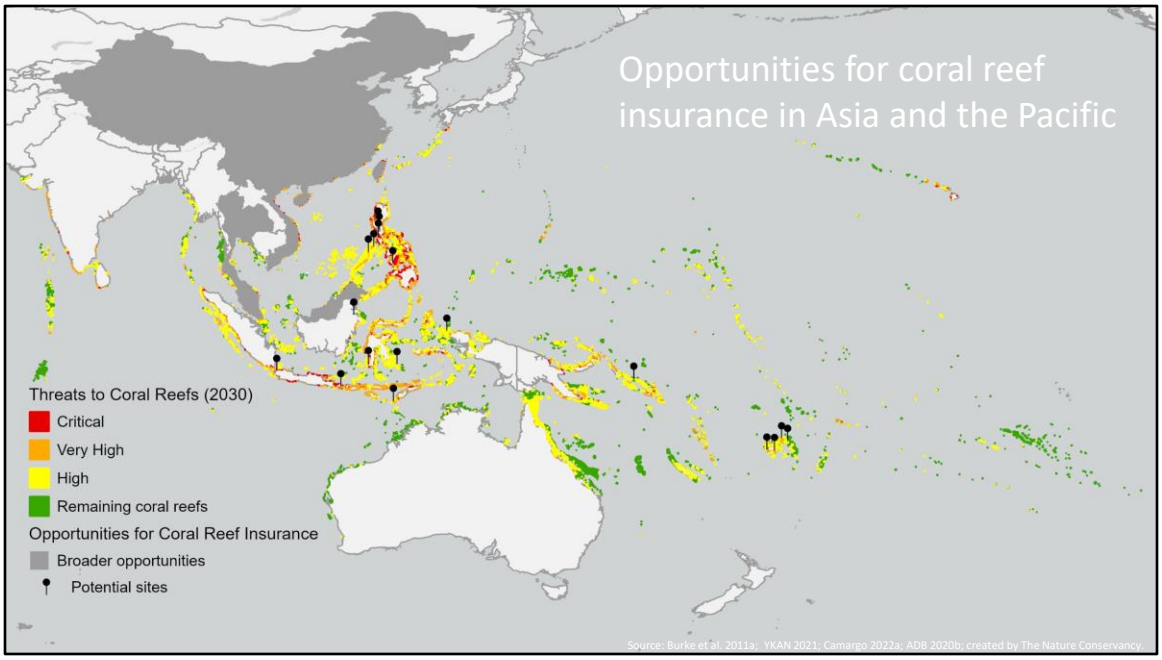
Designing a reef insurance policy





Source: Secaira Fajardo, McLeod, and Tassoulas 2019 (Table 8).

Following The Nature Conservancy's experience working on the parametric insurance policy in Mexico, we developed this guide on how to insure natural assets as a way to share our experience and what we learned this process. So the first step is to determine if you actually need an insurance policy. Some of the risk to the coral reef must be insurable, that is, it's negatively impacting your reef and you are able to do the repairs to mitigate the damage. Next, you need to determine who is going to buy the insurance policy and who is going to fund the policy. Third, having these initial feasibility steps completed, you design the insurance policy. As we mentioned before, for a parametric insurance policy, you need to define the polygon, decide on the triggers, and determine the amount of money to be paid out in the event of a trigger event. Then you set up the whole organizational structure needed for the coordination and implementation of the policy and response protocol, including the organizational governance. Finally, in step 5, you buy the policy. It is typical that you would go through a bidding process to get the best quote before purchasing the policy. Lastly, you must make sure that you have the capacity to implement the response, including identified reef brigades and the documented response protocol.



With ADB, governments and other partners in the area, we have been assessing where we have coral reefs at risk, where we have cyclones, and where it is worth exploring the opportunity to use parametric insurance to help communities and the governments repair damages to coral reefs after disaster events. The initial list of countries included in this assessment were the Philippines, Indonesia, Solomon Islands and Fiji, with the black pins representing the specific sites identified in these countries. Across Asia and the Pacific, there are likely many other places where an insurance policy could be a cost-effective means to protect and restore coral reefs, such as those highlighted in grey here.

Opportunities not limited to coral reefs

Mangroves

Salt Marshes

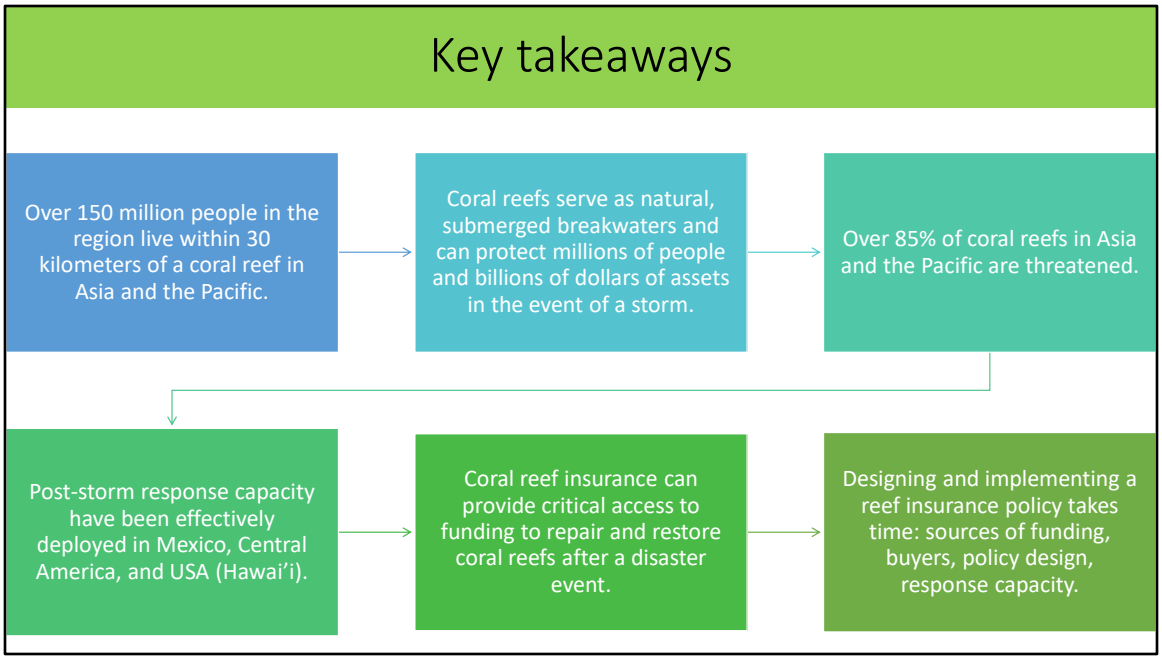
Oysters

Sand Dunes

Coral reefs are not the only natural assets where a parametric insurance policy could be applied. Other coastal ecosystems, like mangroves, salt marshes, oyster reefs, and sand dunes can also be negatively impacted by disaster events, or even by anthropogenic events. An adequate response is needed to effectively restore these ecosystems following damage, which could be funded through a parametric insurance policy or other type of financial instrument.

Other relevant facts (IF NEEDED):

- There are 14 million hectares of mangroves globally with over 40% of global mangroves located in Asia and the Pacific. Globally, mangroves provide over $65 billion in flood protection benefits to over 15 million people.
- There are 5 million hectares of saltmarshes across 90 countries, with the People's Republic of China having a large area of saltmarshes in Asia and the Pacific. Saltmarshes are one of the most productive ecosystems in the world and, like mangroves, can attenuate wave energy, slow and store floodwaters, and prevent erosion.
- Oyster reefs effectively function as living breakwaters and, because they grow faster than sea-level rise, they are an effective natural defense against shoreline erosion. In Asia and the Pacific, oyster reefs can be found in Australia, New Zealand, and along the Yellow Sea to Hong Kong, China, and the Pearl River delta.
- Sand Dunes: When waves hit coastal dunes, the beach slope attenuates waves and, at high tide, they are attenuated by the foredune. Sand dunes also stabilize sediment and soil retention, which limits coastal erosion. In Asia and the Pacific, much of the regions coastal dune systems are in Australia, New Zealand, and southern China.



After this review and The Nature Conservancy's years of experience in Mexico, what are the main takeaways for Asia and the Pacific region? First, in Asia and the Pacific over 150 million people live within 30 kilometers of a coral reef. These coral reefs, in turn, protect millions of people and billions of dollars in the case of a disaster event, such as a cyclone. But these coral reefs are threatened and degraded. We know that post-storm response has proven to be an effective reef restoration strategy in the Americas that could likely be adapted to Asia and the Pacific. In particular, parametric insurance can provide critical funding to repair and restore coral reefs following disaster events. Designing and implementing such an insurance policy takes time, however, and requires identification of funding sources, buyers, policy structure, and development of response capacity and protocol.

And, with that, we end our presentation today. We thank you for the opportunity to present and share The Nature Conservancy's work this topic. Have a good day.