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

Healthy coral reef

Degraded coral reef

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

Global level damage to built capital with 1 m reef loss

Protection provided by coral reefs in Puerto Rico and USVI

Annual flood protection provided by coral reefs by island:

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

*GDP contribution of businesses and people (i.e. workers) in flood zone
Reef insurance - case study
Quintana Roo

Feasibility phase
Design phase
Implementation phase

BEACH AND REEF TO BE INSURED
- USA
- Mexico
- Cancun
- Reef
- Puerto Morelos
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 repairability of natural asset

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

Year-on-year rate of change in coral percent cover

Maximum hurricane intensity (knots)
## Insurance design

### Elements of a parametric insurance:

Payout defined based on estimated damage and cost of repair

<table>
<thead>
<tr>
<th>PHASES</th>
<th>SCENARIO 1</th>
<th>SCENARIO 2</th>
<th>SCENARIO 3</th>
<th>SCENARIO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricane wind speed in knots</td>
<td>50 to 90</td>
<td>110</td>
<td>130</td>
<td>160 or more</td>
</tr>
<tr>
<td>Category of damages</td>
<td>Minor damages</td>
<td>Moderate</td>
<td>Severe</td>
<td>Catastrophic</td>
</tr>
<tr>
<td>% loss of live coral cover</td>
<td>Less than 10%</td>
<td>20-30%</td>
<td>Around 30-40%</td>
<td>More than 50%</td>
</tr>
<tr>
<td>Structural damage</td>
<td>No</td>
<td>No</td>
<td>Moderate</td>
<td>Severe</td>
</tr>
<tr>
<td><strong>ESTIMATED COSTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post storm response</td>
<td>USD 60,000</td>
<td>USD 100,000</td>
<td>USD 140,000</td>
<td>USD 140,000</td>
</tr>
<tr>
<td>Ecological repair and structural restoration</td>
<td>No need.</td>
<td>USD 1,000,000</td>
<td>USD 2,000,000</td>
<td>USD 4,000,000</td>
</tr>
</tbody>
</table>
Insurance design

Business case (Scenario 3, severe damage)

<table>
<thead>
<tr>
<th>Expected annual losses</th>
<th>USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease in tourism revenue</td>
<td>4,000,000</td>
</tr>
<tr>
<td>Increased in damage to coastal infrastructure</td>
<td>3,500,000</td>
</tr>
<tr>
<td>Total avoided losses</td>
<td>7,500,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost of repair</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Post storm response</td>
<td>140,000</td>
</tr>
<tr>
<td>Ecological repair and structural restoration</td>
<td>2,000,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual insurance premium</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>To cover ecological repair and structural restoration</td>
<td>160,000</td>
</tr>
<tr>
<td>(post-storm response is paid out-of-pocket by insured parties)</td>
<td></td>
</tr>
</tbody>
</table>
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

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

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)
Reef insurance

Risk Owner

Tax

Coastal Zone Management Trust

Reef & beach maintenance

Insurance cover

Risk reduction OR risk transfer

Resilience insurance

Risk Owner

Resilience investment

Reef resilience structure

Risk reduction + premium saving

Insurance premium

Insurance cover

Risk reduction AND risk transfer

The Nature Conservancy
Resilience insurance concept

Risk Reduction + Risk Transfer

Resilience investment

Risk premiums

Insurance payout

Investment amortization

Risk reduction effects → premium savings
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Thank you!