Hurricanes, Coastal Restoration and Climate Finance for Small Islands

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Hurricane Matthew battered The Bahamas from October 5th through the 6th, 2016 as Category 3 and 4 hurricane.

The islands that Hurricane Matthew directly hit were Great Exuma, New Providence, Andros, and Grand Bahama.
THE COMMONWEALTH OF THE BAHAMAS IS A SIDS

- 1273 Islands, rocks and cays
- Flat carbonate sediment environment.
- 13,940 km² of island territory, < 10% of bank area
- Capital: Nassau, located on New Providence
- Population: 325,000
THREE MAJOR HURRICANES IN THREE YEARS IMPACTING TEN ISLANDS
Population: 267,000 (68% of total population)

Total area: 207.2 km²

HIGH DENSITY OF PEOPLE 1,289 persons per km²
Growing Crisis for The Bahamas
WHAT HAS HAPPENED TO OUR COASTS?

1. HOW DO WE ASSESS THE DAMAGE TO THE COASTS?

2. HOW CAN WE BUILD CAPACITY TO ADDRESS THE UN 2030 AGENDA?

3. HOW CAN WE FUND THE RESTORATION NEEDED TO BUILD RESILIENCE FOR ALL BAHAMIANS?
Research Goal

Create a decision-making tool for coastal investment for restoration that aims to reduce the vulnerability of Bahamian communities.

Explore the investment conditions to support a Catastrophe Bond Market for coastal restoration aimed at community protection.
RAPID HURRICANE IMPACT ASSESSMENT
BUILDING DAMAGE RANKINGS - CONTINUED

Examples of Building Damage:

**Building Damage Ranking 5:** Half of the house is gone, which is classified as wall structure failure and roof structure failure.

**Building Damage Ranking 5:** The roof structure is damaged. The right-most portion of the house is missing the roof entirely. Several windows were blown out and the door appears to be missing.

**Building Damage Ranking 4:** The roof structure is intact, but there is extensive roof sheathing damage. There is no visible window/door breakage. There is partial wall structure failure, but not enough to classify as a 5.

**Building Damage Ranking 3:** There is major roof cover loss (over 20%) that must be covered to prevent leaks. This is evident by the blue tarp on top. There are no visibly broken windows and doors.

**Building Damage Ranking 2:** The house is in good condition and was minimally affected. The only damage sustained was the loss of a few shingles, which is less than 20% of the roof cover.

**Building Damage Ranking 1:** This house exhibits no visible damage following Hurricane Matthew.
A Spatial Database was constructed using natural communities, coastal geomorphology, coastal neighborhoods and infrastructure.
FLOOD DAMAGE
WHAT HAS HAPPENED TO OUR COASTS?

LOSS OF ECOSYSTEM SERVICES THAT INCLUDE
• LOSS OF COASTAL STABILITY
• DEGRADATION OF WATER QUALITY
• LOSS OF BIOLOGICAL DIVERSITY
• INCREASED FLOODING OF PROPERTY
Who are the Residents of South Beach?
## Cost of Rebuilding after Hurricane Matthew

<table>
<thead>
<tr>
<th>Approx. # of houses in South Beach</th>
<th>Average total Sqft.</th>
<th>Average Rebuild Value</th>
<th>Rebuild Total ($US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,785</td>
<td>2190</td>
<td>$438,000</td>
<td>$461,279,700</td>
</tr>
</tbody>
</table>

*Current Bahamas Building Code at BD $200/Sqft.*
WILL HOME OWNERS RE-BULD OR RE-LOCATE?

**Neighborhood stakeholders**

- **Relocate** – future flood risks are too high
  - Land has ecological value
  - Re-location is socially acceptable

- **Rebuild** – future flood risks are acceptable (risk transfer)
  - Rebuild time is socially acceptable
  - Rebuild costs can be funded by available credit

**GLOBAL CLIMATE CHANGE AND REGIONAL ENVIRONMENTAL RISKS**

**GLOBAL FINANCIAL MARKETS AND INNOVATIONS**
Poorly Managed Coastline
Illegal dumping
Sand Mining and removal of dunes
Filled Wetlands
Invasive Australian Pines
<table>
<thead>
<tr>
<th>Project</th>
<th>Structure/Service</th>
<th>Cost per Linear Feet ($US)</th>
<th>Cost per Linear Meter ($US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saunders Beach Restoration</td>
<td>Groynes</td>
<td>$1,182</td>
<td>$3,900</td>
</tr>
<tr>
<td>Project</td>
<td>Structure/ Service</td>
<td>Cost per Linear Feet ($US)</td>
<td>Cost per Linear Meter ($US)</td>
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<tr>
<td>Bakers Bay</td>
<td>Invasive Tree removal Dune Restoration Artificial reefs</td>
<td>$378</td>
<td>$1,230</td>
</tr>
</tbody>
</table>
Insurance, re-insurance, & catastrophe bonds, are novel ways for diversifying investments BUT these instruments are driven in a BUSINESS ENVIRONMENT.

Environmental risks are known but poorly articulated to investors in terms of recovery and restoration costs.
CREDIT DRIVES LAND USE CHANGE

1. NATURAL WETLAND SYSTEMS ARE DRIVEN IN SOME PART BY THE FINANCING AVAILABLE FOR COASTAL DEVELOPMENT AND REAL ESTATE VALUES

2. FINANCIAL SYSTEMS ARE DRIVEN IN SOME PART BY NATURAL DISASTERS LIKE FLOODS THAT REQUIRE EXTENSIVE REBUILDING

3. NATURAL DISASTERS LIKE HURRICANES/FLOODS DRIVE RESTORATION INVESTMENT

4. NATURAL WETLAND SYSTEMS ARE DRIVEN IN SOME PART BY THE FINANCING AVAILABLE FOR COASTAL DEVELOPMENT AND REAL ESTATE VALUES
Catastrophe or “Cat” Bonds

- Cat bonds provide collateralized (re)insurance usually protecting against low-frequency / high severity natural catastrophe events.
- Cat bonds are motivated by weather-related losses, or fear of the possibility.
- Cat Bonds are required by investors or the Government.
- Cat Bonds require KNOWN and documented costs associated with a disaster = known financial risk.
$21.8 \text{ MILLION IN COASTAL RESTORATION TO PREVENT $461 MILLION IN REPAIRS TO PROPERTY}$

\textbf{RISK ASSESSMENT for catastrophic events must account for linked natural and human systems}
Partnerships with scientists and community-based groups can provide valuable support for coastal restoration cost-benefits for small communities.

GET INVOLVED!
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