Flood Mitigation Bond

Morgan Stanley Sustainable Investing Challenge
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Julie Andress, Meaghan McGrath, Heather West, & Sarah Wilson
Hurricane Sandy in New York City

$19 billion USD in flood damage

40,000+ people displaced in NYC
Consistent Threat of Flooding

Failing grey infrastructure

Increased flooding incidents

Disappearing natural habitats

20 million people & $2.9 trillion GDP at risk
Natural Infrastructure
A scientifically proven approach to flood mitigation

According to the Army Corps and FEMA, each $1 spent on natural infrastructure results in future savings of $4 in comparison to grey infrastructure.

This is due to lower project and maintenance costs.

- Wetlands
- Oyster Beds
- Dunes and Beaches
How Natural Infrastructure Works

Waves decreased with healthy coastal habitats.

Waves with degraded coastal habitats.
The Opportunity

The New York Tri-State Area

- Demand for capital
- Restoration opportunities
- Political will
- Protecting high value property
Our Solution

- $200 million bond offering
- 1,700 acres of degraded land restored
- 5.7% coupon + principal, 20 years
- Targeting institutional investors
Project Pipeline

14,044 Acres of Wetlands

50,000 Acres of Oyster Beds

Revenue Stream #1

Principal from U.S. Army Corps of Engineers

Benefits to Army Corps
- Decrease in future O&M expenses
- Delayed capital obligations

Benefits to Investors
- Fixed annual payments based on project completion
- Payment from U.S. Federal Government
Revenue Stream #2

5.2% Coupon from the Federal Emergency Management Agency

Benefits to FEMA

• More than $8.6 million annual savings accrued in perpetuity
• Increased stability and predictability for budget allocations

Benefits to Investors

• $8.6 million annual savings generated during the life of the bond
• Fixed annual payments based on project completion
• Payment from U.S. Federal Government

FEMA → National Flood Insurance Program → 5.2%
Revenue Stream #3

0.5% Coupon from Additional Revenue

Includes

- Recreation fees, fishing licenses, environmental credits, and oyster sales

Benefits to Investors

- Additional sources of revenue from monetizing environmental impact benefits
# Widespread Impact

<table>
<thead>
<tr>
<th>ENVIRONMENTAL</th>
<th>SOCIAL</th>
<th>ECONOMIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 1,700 acres of restored coastline</td>
<td>• Resilient communities</td>
<td>• Job creation</td>
</tr>
<tr>
<td>• Nutrient and pollution uptake and retention</td>
<td>• Protection for diverse socioeconomic groups</td>
<td>• Increased property values</td>
</tr>
<tr>
<td>• Wildlife habitat</td>
<td>• 1,700 acres available for public use</td>
<td>• Fewer flood related business closures</td>
</tr>
<tr>
<td>• Enhanced biodiversity</td>
<td></td>
<td>• Strengthened recreation, tourism, and fishing industry</td>
</tr>
<tr>
<td>Risk</td>
<td>Mitigation Strategy</td>
<td></td>
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<td>------</td>
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</tbody>
</table>
| Cooperation of Key Partners | • Army Corps and FEMA benefit from projects in perpetuity  
• Prioritize Army Corps and FEMA high risk areas  
• Build consensus with real estate developers, state, and local governments |
| Volatility of Flood Events | • Volatility-smoothing through long-term, 20-year duration  
• Contract for fixed payments based on project completion |
| Default on Payments | • Guarantee from foundation (e.g. Rockefeller Foundation)  
• Upfront contracts with Army Corps & FEMA |
| Performance Management | • Payments based on historical data and sophisticated modeling  
• Partnership with NGO (e.g, The Nature Conservancy) to monitor performance of natural infrastructure |
Investment Criteria

- Publicly Owned Land
- Large Adjacent Areas
- Degraded Sites Suitable for Restoration
- FEMA Special Flood Hazard Areas
Scalability: Market

Flood Market

- Army Corps spends $1.17 billion on new infrastructure
- FEMA spends $4 billion on insurance claim payouts
- Globally, $20 billion is spent on flood disaster relief each year

Source: ClimateBonds.Net
Scalability: Geography

**Rivers**
United States and Global

**Coral Reefs**
Mexico, Belize, Honduras, and Guatemala

**Mangroves**
China, Vietnam, and Japan
Our Team

Julie Andress
MBA
• Investment banking at Morgan Stanley
• Construction management at GBBN Architects

Heather West
MBA/Master of Forestry
• Land investment at Beartooth Capital
• Natural resource management at The Nature Conservancy

Meaghan McGrath
MBA/Master of Environmental Management
• Coastal project development at Blue Earth Consultants
• Real assets investing at Sonen Capital

Sarah Wilson
MBA/Master of Environmental Management
• Project finance at Bank of America Merrill Lynch
• Entrepreneurship in sustainable food
Questions and Thank You’s
Appendix Slides
### Bond Assumptions

#### Basic information on the bond

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Coupon</td>
<td>5.7%</td>
</tr>
<tr>
<td>Duration of bond</td>
<td>20 Years</td>
</tr>
<tr>
<td>Size of bond offering</td>
<td>$201.5MM USD</td>
</tr>
<tr>
<td>Fee collected (from principal)</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

#### Detailed information on the bond

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td># of wetland acres restored</td>
<td>500</td>
</tr>
<tr>
<td># of oyster bed acres restored</td>
<td>1200</td>
</tr>
<tr>
<td>Cost to restore 1 acre of wetland</td>
<td>$277K USD</td>
</tr>
<tr>
<td>Cost to restore 1 acre of oyster bed</td>
<td>$52K USD</td>
</tr>
<tr>
<td>Property protection per acre of wetlands per year</td>
<td>$13K USD</td>
</tr>
<tr>
<td>Property protection per acre of oyster beds per year</td>
<td>$5K USD</td>
</tr>
<tr>
<td>Proportion of Property Insurance that is Subsidized by FEMA</td>
<td>67%</td>
</tr>
<tr>
<td>Construction Period (# of Years)</td>
<td>4</td>
</tr>
<tr>
<td>Additional revenue per acre per year</td>
<td>$500 USD</td>
</tr>
</tbody>
</table>
### Competitive Research on Bonds

Criteria includes:

- **Long term duration** (20-30 years)
- **Non-callable bonds expire at maturity**

<table>
<thead>
<tr>
<th>Issuer Name</th>
<th>Annual Coupon (%)</th>
<th>Offering Size ($MM)</th>
<th>Duration (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowe's Cos Inc</td>
<td>5.50</td>
<td>500</td>
<td>30</td>
</tr>
<tr>
<td>Consolidated Edison Co of New York Inc</td>
<td>5.25</td>
<td>125</td>
<td>30</td>
</tr>
<tr>
<td>Consolidated Edison Co of New York Inc</td>
<td>5.30</td>
<td>350</td>
<td>30</td>
</tr>
<tr>
<td>Archer-Daniels-Midland Co</td>
<td>5.38</td>
<td>600</td>
<td>30</td>
</tr>
<tr>
<td>Southern California Edison Co</td>
<td>5.35</td>
<td>350</td>
<td>30</td>
</tr>
<tr>
<td>South Jersey Gas Co</td>
<td>5.45</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Connecticut Light &amp; Power Co/The</td>
<td>5.63</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>Public Service Co of New Hampshire</td>
<td>5.60</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>Verizon Communications Inc.</td>
<td>4.75</td>
<td>850</td>
<td>20</td>
</tr>
<tr>
<td>CF Industries Inc</td>
<td>5.15</td>
<td>750</td>
<td>20</td>
</tr>
<tr>
<td>Fedex Corp</td>
<td>4.90</td>
<td>500</td>
<td>20</td>
</tr>
<tr>
<td>Long Island New York Power Authority</td>
<td>5.00</td>
<td>578</td>
<td>20</td>
</tr>
<tr>
<td>Puerto Rico Commonwealth Aqueduct and Sewer Authority</td>
<td>5.25</td>
<td>1800</td>
<td>20</td>
</tr>
<tr>
<td>General Electric Capital Corp</td>
<td>4.25</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>5.20</strong></td>
<td><strong>470</strong></td>
<td></td>
</tr>
</tbody>
</table>
Target Institutional Investors

Academic

Pension Funds

Foundations

HARVARD MANAGEMENT COMPANY, INC.

CalPERS

Yale University Investments Office

CALSTRS

STANFORD MANAGEMENT COMPANY

MARKS & SPENCER

Bill & Melinda Gates Foundation

The Rockefeller Foundation
FIGURE 5. National Flood Insurance Program Debt Grows

The National Flood Insurance Program has fallen deeper in debt since the payouts after Hurricane Katrina and most recently the costs of Hurricane Sandy. As of November 2012, the program was more than $20 billion in debt to the U.S. Treasury (GAO 2013), and that figure is likely to rise once all the Sandy claims are settled.

Sources: FEMA 2013a; estimate for 2012 NFIP payments for Hurricane Sandy from King 2013; estimate for 2012 NFIP debt based on its borrowing limit of $30.4 billion set by the Hurricane Sandy Relief Act.
<table>
<thead>
<tr>
<th>Coastal storm damage reduction Features</th>
<th>Relevant Coastal storm damage reduction and Resilience Processes and Functions Provided</th>
<th>Potentially Important Performance Factors</th>
<th>Potential Coastal Risk Reduction and Socioeconomic and Environmental Resilience Outcomes</th>
<th>Potential Additional Socioeconomic and Environmental Benefits (Direct and Indirect)</th>
</tr>
</thead>
</table>
| **Salt Marshes**                       | • Wave attenuation and/or dissipation  
• Sediment stabilization  
• Raw material provision (sands of particular sizes and mineral proportions)  
• Store and filter water through sand | • Wave height  
• Wave period  
• Water level  
• Marsh elevation  
• Marsh continuity  
• Vegetation type  
• Vegetation height  
• Vegetation density | • Coastal storm damage reduction  
• Shoreline erosion control  
• Water quality regulation  
• Tourism  
• Recreation  
• Education | • Ecosystem diversification (biodiversity)  
• Enhance and diversify food production  
• Nutrient and pollution uptake and retention  
• Provide aesthetic landscapes  
• Provide suitable reproductive habitat and nursery grounds |
| **Beaches**                            | • Wave attenuation and/or dissipation  
• Nearshore sediment cycle  
• Raw materials (sands of particular sizes and mineral proportions)  
• Store and filter water through sand | • Beach slope  
• Berm elevation  
• Sediment grain size  
• Berm width  
• Presence of backing dune  
• Sediment supply  
• Presence of structures  
• Wave height  
• Wave period  
• Water level  
• Storm duration | • Coastal storm damage reduction  
• Shoreline erosion control  
• Tourist  
• Recreation  
• Education | • Provide unique and aesthetic landscapes  
• Flood protection  
• Improve water quality  
• Ecosystem diversification (biodiversity)  
• Potential beneficial use of dredged material  
• Biological productivity and diversity  
• Wildlife habitat creation and preservation |
| **Dunes**                              | • Wave attenuation and/or dissipation  
• Supports sediment cycle  
• Raw material provision (sands of particular sizes and mineral proportions)  
• Store and filter water through sand | • Dune height  
• Dune crest width  
• Dune field width  
• Variability in dune height  
• Wave height  
• Wave period  
• Water level  
• Storm duration  
• Presence of vegetation  
• Berm width  
• Beach slope | • Coastal storm damage reduction  
• Shoreline erosion control  
• Water catchment and purification  
• Aquifer recharge  
• Tourism  
• Recreation  
• Education | • Improve water quality  
• Ecosystem diversification (biodiversity)  
• Increase recreational opportunities  
• Reduction of unwanted sediment sources  
• Increase Information and knowledge  
• Generate biogeochemical activity and productivity  
• Wildlife habitat creation and preservation  
• Provide aesthetic landscapes |