



Quantified<sup>®</sup>  
Ventures

## VA Coastal Resilience Master Plan Finance Subcommittee

Environmental Impact Bonds  
Catastrophe Bonds  
Resilience Bonds

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# Agenda

- Introduction
- Outcomes-Based Financing Overview
- Environmental Impact Bonds
- Catastrophe Bonds
- Resilience Bonds



**Quantified Ventures develops projects, partnerships, and innovative financial transactions to drive transformational health, social, and environmental impact.**



# Our Practice Areas



**Forestry and  
Land Use**



**Urban and Coastal  
Resilience**



**Agriculture**



**Health and  
Human Services**

# What does outcomes-based financing include?



## List of example activities to develop an outcomes-based solution

- Work with city stakeholders to **define objectives and community priorities** to include in the program (e.g., workforce development, green space access in underserved neighborhoods)
- Partner with city stakeholders and engineering firms to **develop detailed cost model** (including development and maintenance)
- **Define potential co-benefits** (e.g., including a workforce development program) and beneficiaries beyond the city
- Engage with the city stakeholders to **determine repayment structure** that meets their needs and budget restrictions (e.g., define the price per outcome)
- **Determine the outcome metrics** to track and verify and the process for verification (e.g., frequency, data needed)
- **Engage with co-beneficiaries** to try and bring them in as "payors" to help subsidize the cost for the city.
- **Build the investment model** that includes terms, rates, and structure to attract impact capital for development and maintenance
- **Engage with impact investors and foundations** to gauge interest in funding the project

# What are examples of different outcomes-based financing solutions?



## Environmental Impact Bond

- Municipal bond with variable payments based on project results
- Municipality decides on structure and range of variable payments and how outcomes will be measured
- Municipality oversees construction and maintenance

## Outcomes Fund

- Investors seed special purpose vehicle (SPV) to fund project development and maintenance
- Municipality repays SPV based on project results and measured outcomes (e.g., price per gallon)
- Municipality oversees construction and maintenance
- Provides off-balance sheet flexibility in terms and repayment structure

## Community-Based Public-Private Partnership (CBP3)

- Investors seed private development venture (typically a SPV) to fund project development and maintenance
- Municipality repays based on project results and measured outcomes
- Other co-beneficiaries brought in to subsidize municipality costs
- 3<sup>rd</sup> party oversight of construction and maintenance



## CASE STUDY: Soil and Water Outcomes Fund

# Enhancing Soil and Water Health With Farmers



## Project Goal

Partner with the Iowa Soybean Association to develop the Soil and Water Outcomes Fund, a first of its kind multi-payor financial transaction to monetize the multiple benefits of sustainable agriculture best practice implementation

## Outcomes

- Reduce nutrient loading credited against municipal water permits
- Enhance carbon sequestration in soil
- Conserve and restore pollinator habitat and biodiversity

## Transaction Structure

- Upstream farmers provided with financial incentives to implement agriculture BMPs like reduced tillage and cover crops and structural improvements like nitrate removal wetlands
- Water quality outcomes sold to municipalities, carbon sequestration outcomes to agribusiness to meet supply chain sustainability targets



## CASE STUDY: Southwest Colorado Wildfire Mitigation Outcomes Fund

# Launching an Outcomes Fund in Southwest Colorado



**Multi-payor fund enables long-term cross-boundary wildfire risk mitigation**

### Project Goals

- Increase the scale of interventions around the San Juan National Forest - mostly private land - to reduce wildfire risk
- Stack payors, investors, biomass revenues, and public and philanthropic contributions to minimize funding required of small rural communities while repaying on risk mitigation outcomes
- Support local biomass industry (renewable power, biochar, etc.)
- Use state bond issuance to help capitalize a revolving fund, enabling treatments to be implemented and self-sustainable over the long term

### Outcomes

- Restored forests
- Reduced risk of wildfire
- Protected water resources
- Avoided economic costs
- Resilient communities in wildland-urban interface

### Transaction Structure

- Create a \$44M outcomes-based revolving fund, enabling treatments to be implemented and self-sustainable over the long term

# Environmental Impact Bonds: A Replicable but Flexible Structure



|   | WASHINGTON, DC  | ATLANTA, GA  | HAMPTON, VA  |
|---|---|--|--|
| <b>Primary Value Proposition of EIB</b> | What is the cost-effectiveness of green vs. grey infrastructure for CSO reduction?                                | How can green infrastructure improve local flooding, water quality, and economic conditions?   | How we use bond disclosures as a lever to attract new ESG investor demand to finance coastal flooding projects?  |
| <b>Size</b>                             | \$25,000,000  | \$14,020,000   | \$12,000,000   |
| <b>Term</b>                             | 30 years (5 year re-tender)   | 10 years   | 30 years   |
| <b>Placement</b>                        | Private   | Limited Public   | Public   |
| <b>Structure</b>                        | 3-tiered  | 2-tiered   | Disclosures only   |
| <b>Outcome Metric</b>                   | Volume capture (flow / runoff)  | Volume capture (capacity / storage)  | Volume capture (capacity / storage)  |
| <b>Regulatory Driver?</b>               | Yes   | No   | No   |
| <b>Types of GI</b>                      | <ul style="list-style-type: none"> <li>▪ Right of way planters</li> <li>▪ Bioretention on public parks</li> </ul> | <ul style="list-style-type: none"> <li>▪ Right of way planters</li> <li>▪ Bioretention on public parks</li> <li>▪ Stream &amp; floodplain restoration</li> </ul> | <ul style="list-style-type: none"> <li>▪ Drainage ditch conversions to bioswales with native plants</li> <li>▪ Holding pond conversions for stormwater and water quality</li> <li>▪ Transportation corridor elevation and protection against flooding</li> </ul> |



**CASE STUDY:**  
**DC Water & Sewer**  
**Authority**  
**Environmental Impact**  
**Bond**

## Building Green Infrastructure in Washington, DC



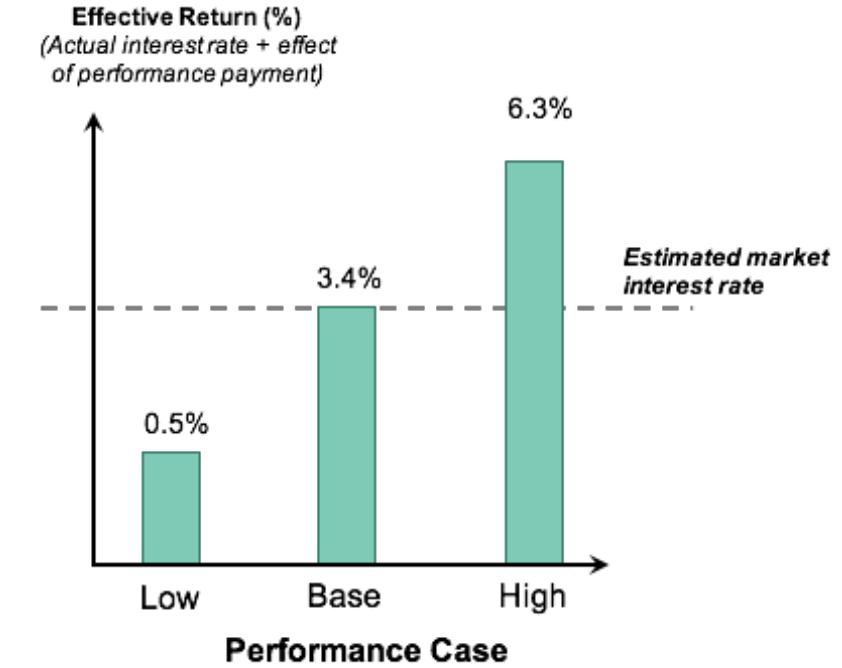
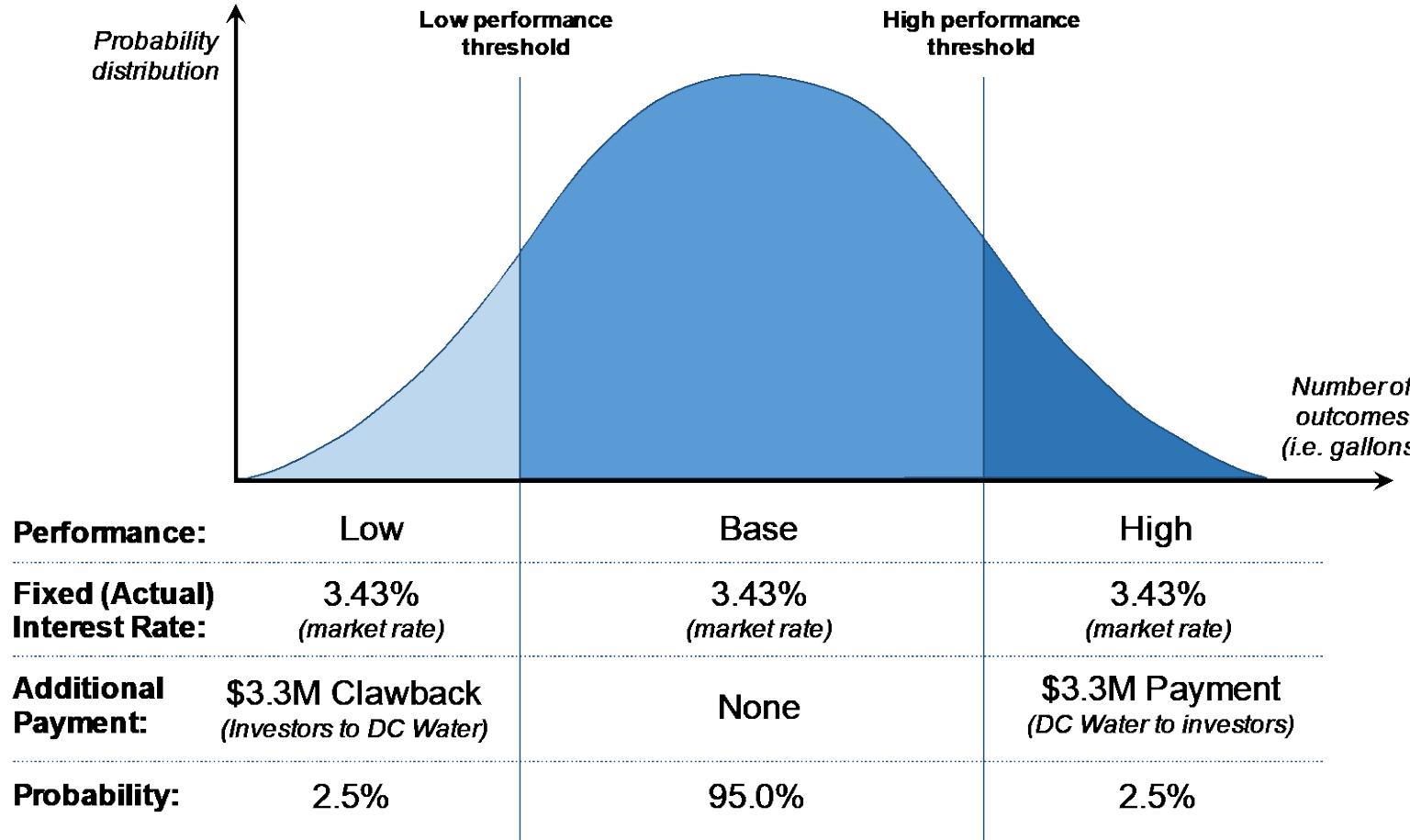
### Challenge

- DC's combined sewer system was dumping 2.5 billion gallons of overflow annually into 3 rivers
- DC given consent decree in 2005 to fix the issue
- Original approach - \$2 billion for grey tunnel system – was expensive and didn't provide community benefits
- DC Water interested in green infrastructure, but performance was uncertain and risky

### Solution

- \$25 million municipal Environmental Impact Bond issued to fund green infrastructure construction
- Investor payments tied to stormwater volume capture outcomes thereby transferring some performance risk to investors
- New green infrastructure and green space now installed across the city
- Green infrastructure workforce program that's trained >100 candidates

# DC Water EIB to Fund Green Infrastructure





## CASE STUDY: Resilient Hampton Environmental Impact Bond

# Coastal Resilience in Hampton



## Project Goal

Structure municipal debt as high-profile, performance-evaluated, and collaboratively-designed financing for urban green infrastructure

## Context

- Coastal location, low elevation, and high impervious surface coverage / groundwater table creates frequent local flooding
- Financed projects are prototypes for a decades-long pipeline of resilience work

## Transaction Structure

- \$12 million bond issuance for 3 green infrastructure projects to manage coastal and stormwater flooding
- Outcome metric: gallons of water managed in creek system
- Focus on and measurement of outcomes promotes governance best practices, attracts municipal bond investors with ESG mandates, and informs future planning, financing, and implementation

# Catastrophe Bonds

## Summary:

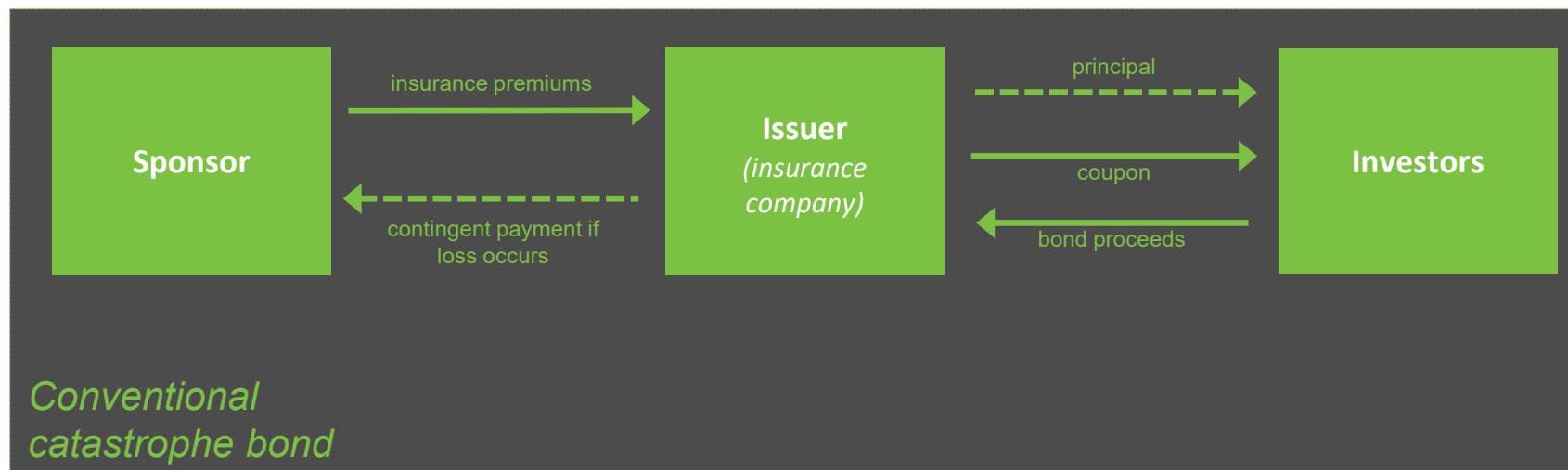
- Catastrophe (cat) bonds blend bonds and insurance
- Issued by governments or insurance companies

**Market Outlook:** growing demand despite riskiness

## Structure: Returns vary based on occurrence of a disaster

- Disaster occurs → Investor forfeits some or all returns, and funds are used to pay for recovery
- No disaster occurs → Investor receives significant returns (relatively high and uncorrelated with other investments)

## Pricing: driven by probability models and estimation of expected losses



## Summary

- Conceptual add-on to cat bonds
- Fund resilience infrastructure proactively rather than reactively paying for damage
- Monetize avoided losses through reduced insurance premiums

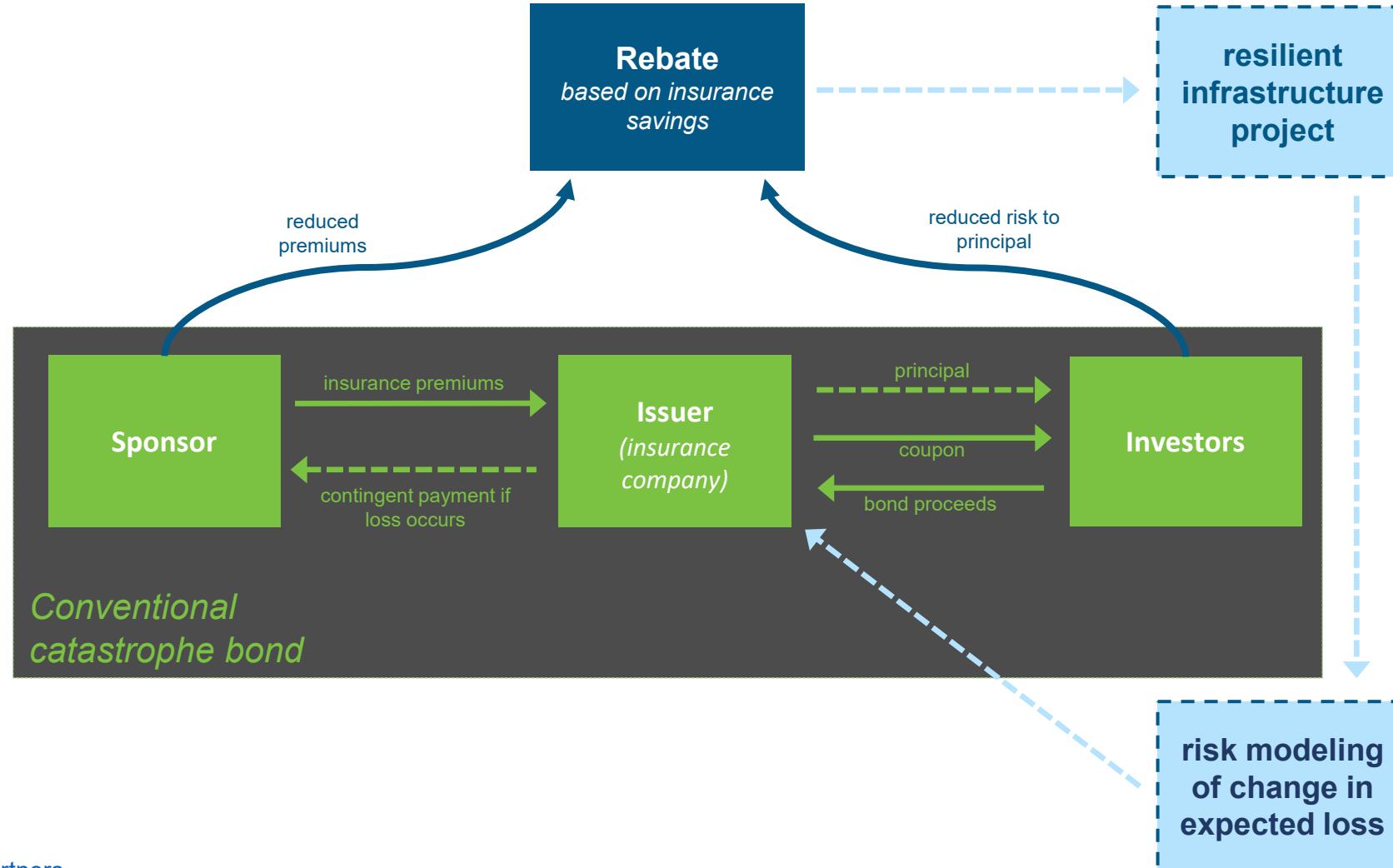
**Who benefits?** Large asset holders (public or private) that anticipate insurance obligations as a result of damage to their assets. Examples: cities, universities, utilities, hospitals, developers.

**Example projects include** seawalls, coastal flood barriers, green infrastructure

## Challenges include

- Estimating future premiums to project cash flow of savings
- Competition with reinsurance markets

# Resilience Bonds Structure



# Reach Out!



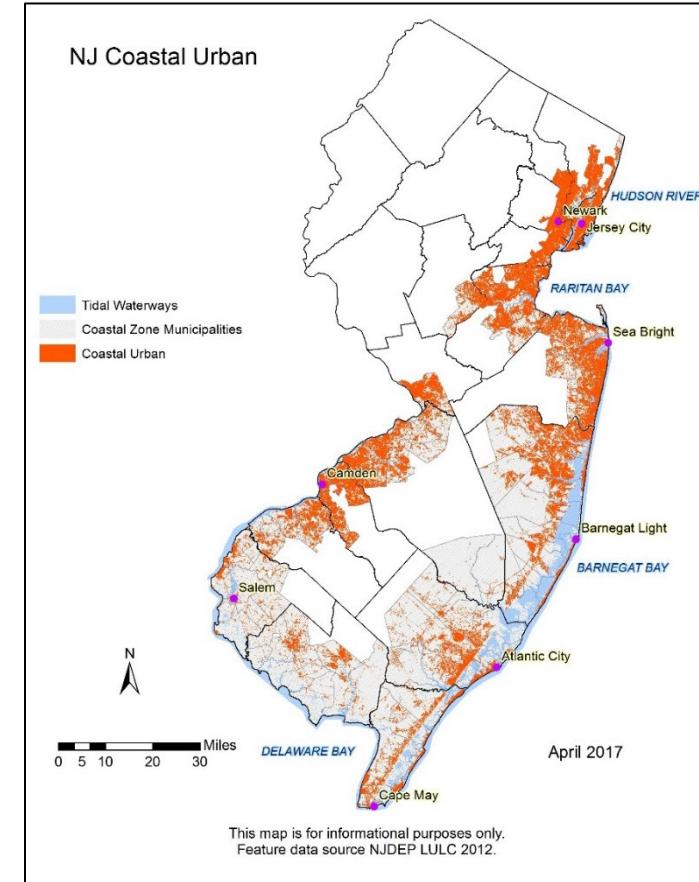
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# Virginia Coastal Policy Center-William & Mary Law School Webinar-April 26<sup>th</sup>, 2021

## NJ Blue Acres Buy-out Program

### A Changing Climate

- Rising Sea Level
- Storm Intensity Increasing
- Coastal Erosion
- Development causing storm water run-off
- Sunny-day (*nuisance*) flooding



\*FEMA, August 4, 2004

# A Densely Populated & Flood-prone State



Hackensack, 2007



Wayne, 2011



Hoboken, 2012



Toms River, 2012



Wildwood, 2016



Toms River, 2018

# October 29, 2012: Superstorm Sandy Strikes

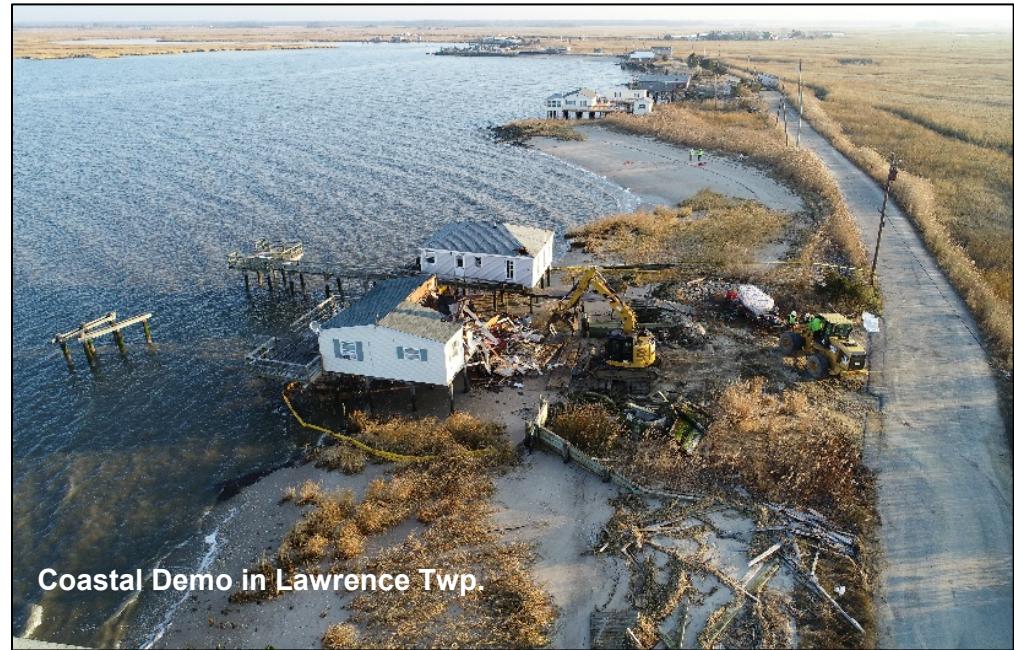
- 365,000 homes damaged
- 2.8M homes w/o power
- 100,000 downed trees
- 600 roads/tunnels closed
- 80 water/wastewater plants inoperable
- 1,400 vessels sunk/displaced
- 6.2M Cu Yds of housing materials and debris removed
- 100,000 Cu Yds of debris from waterways
- \$382M in commercial property damages



Hoboken, NJ, Oct. 2012

# Criteria for a Blue Acres Buyout

1. Flood damage from Superstorm Sandy or repeated flooding
2. Clusters of homes
3. Willing sellers/support of local officials
4. Opportunity for significant impact on environment, or public health, safety, and welfare
5. Repeated NFIP claims
6. Benefit-cost analysis(FEMA)
7. National Objective (HUD)

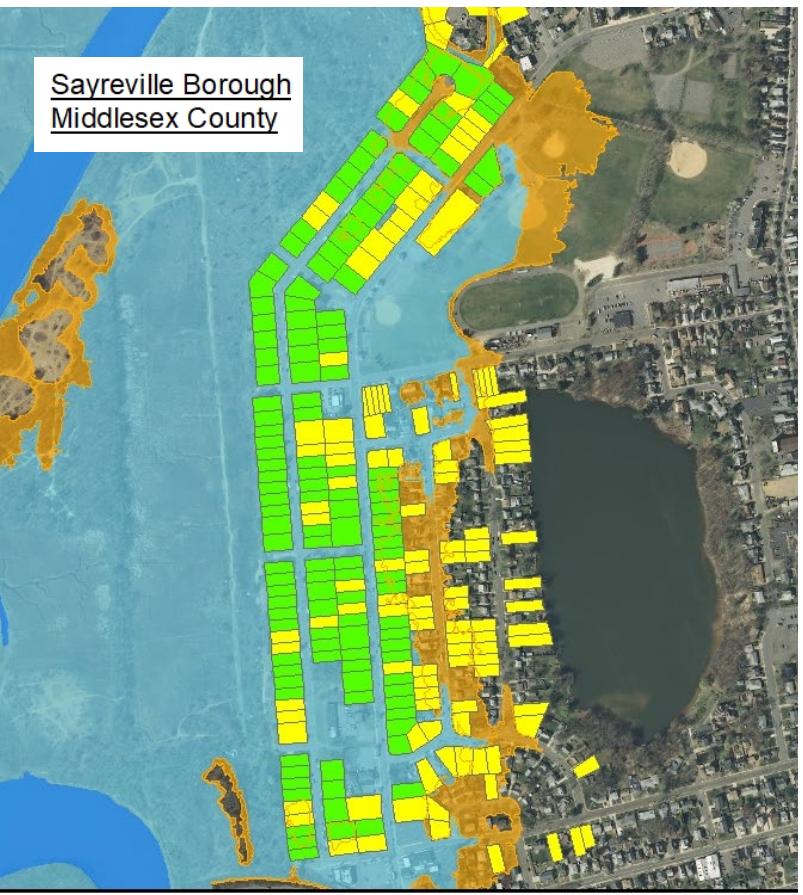


Coastal Demo in Lawrence Twp.

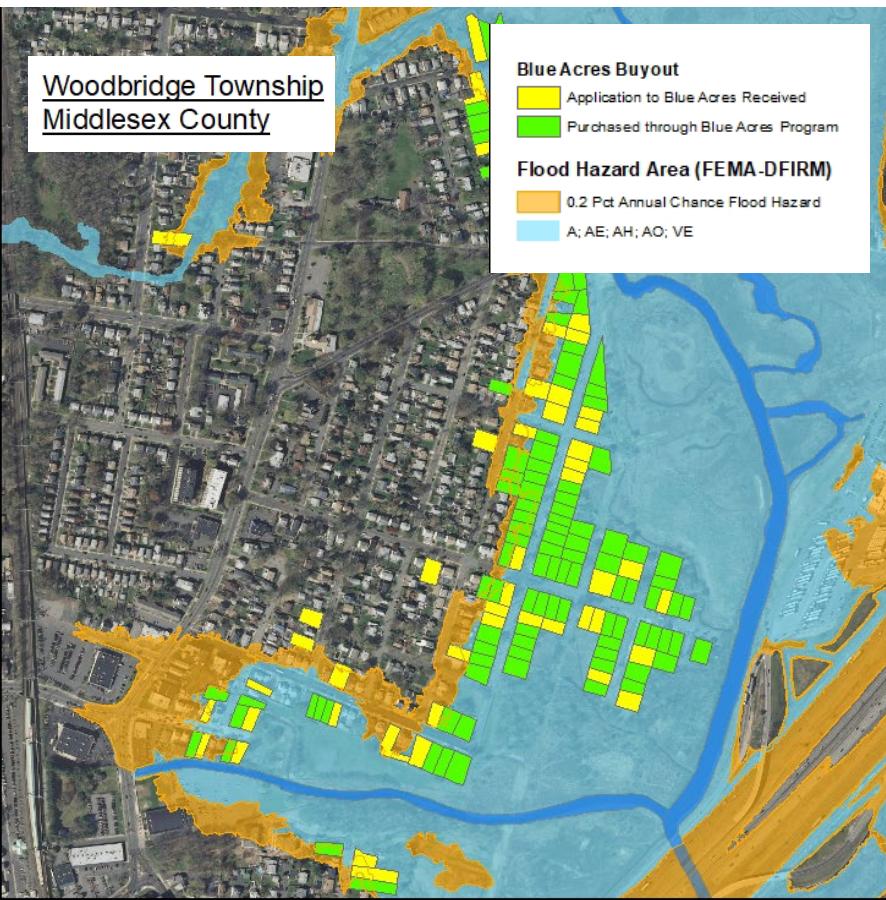
# Process: From Mapping to Demolition



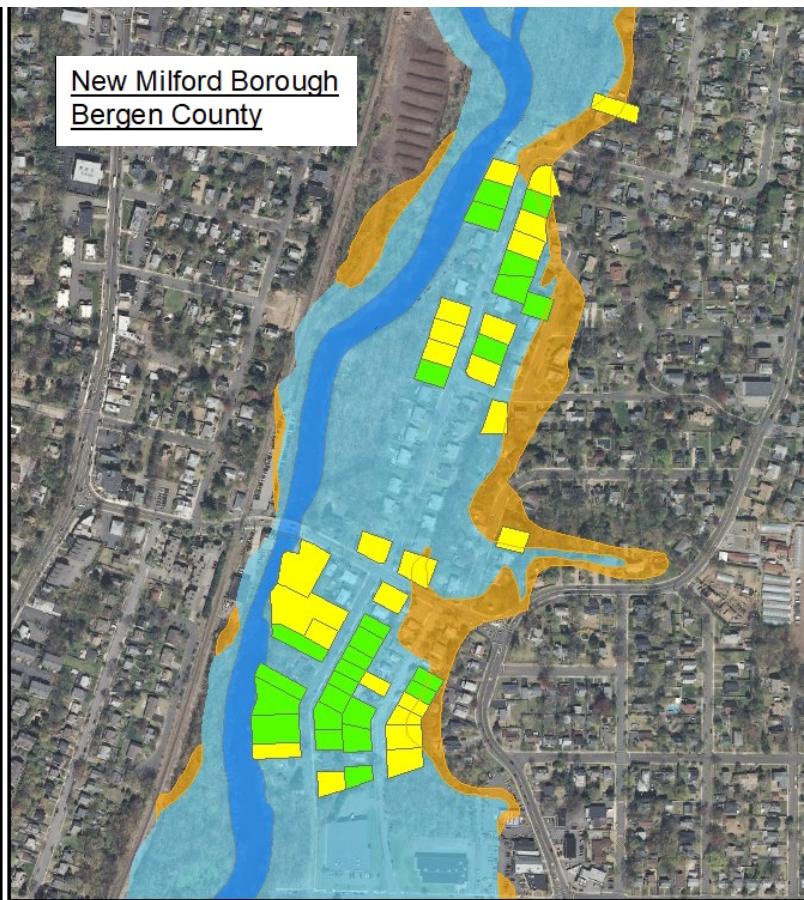
Sayreville Borough  
Middlesex County



Woodbridge Township  
Middlesex County



New Milford Borough  
Bergen County



# City of Linden Blue Acres Project Area



## Linden City Union County

### Blue Acres Buyout

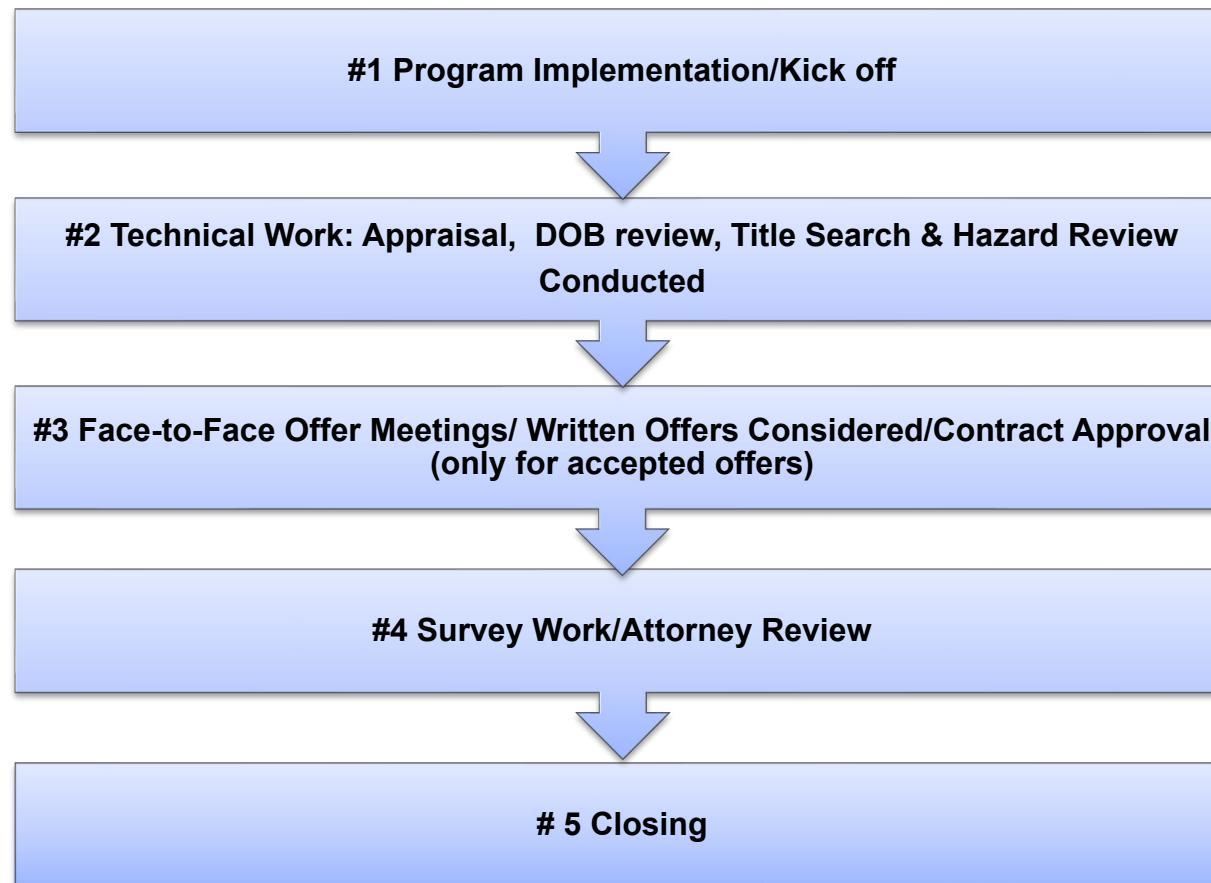
- Application to Blue Acres Received
- Purchased through Blue Acres Program

### Flood Hazard Area (FEMA-DFIRM)

- 0.2 Pct Annual Chance Flood Hazard
- A; AE; AH; AO; VE



# 5 Steps to A Blue Acres Closing



# Blue Acres Program: Innovations

- **Appraisal Appeal Process:** Instituted an offer appeal process to address homeowner concerns.
- **Dedicated Mortgage Team:** Forged relationships with lenders: FHA, Freddie Mac, Fannie Mae, NJ Housing and Mortgage Finance Agency and NJ Division of Banking and Insurance.
- **Tenant Relocation Team:** Relocate displaced Tenants. Units must meet Housing Quality Standard for both occupancy and habitability. Decent, safe and sanitary and “outside of the flood prone areas”.



- Successfully negotiated with 35 lenders resulting in \$5.7m in mortgage forgiveness for 73 homeowners



## Post-Buyout Demolition

- Structure and site Improvements removed
  - Property graded and seeded
- Property deed restricted for conservation and passive recreation
  - Municipality provides long-term care

# NJDEP Blue Acres Buyout Program

**1995-2012:** Purchased 300 homes pre-Sandy

**2013:** Blue Acres designated as State's Sandy buyout program to use federal funding to move families from harm's way.

**June 2019:** Governor Murphy signs constitutional measure creating a stable source of annual funding for Blue Acres.

**April 2021:** More than 759+ properties closed since 2013.

## Current funding:

FEMA HGMP: \$185M

HUD CDBG-DR: \$100M

State bond funds: \$15M+



**1,187 OFFERS**



**759+ CLOSINGS**



**699 DEMOLITIONS**



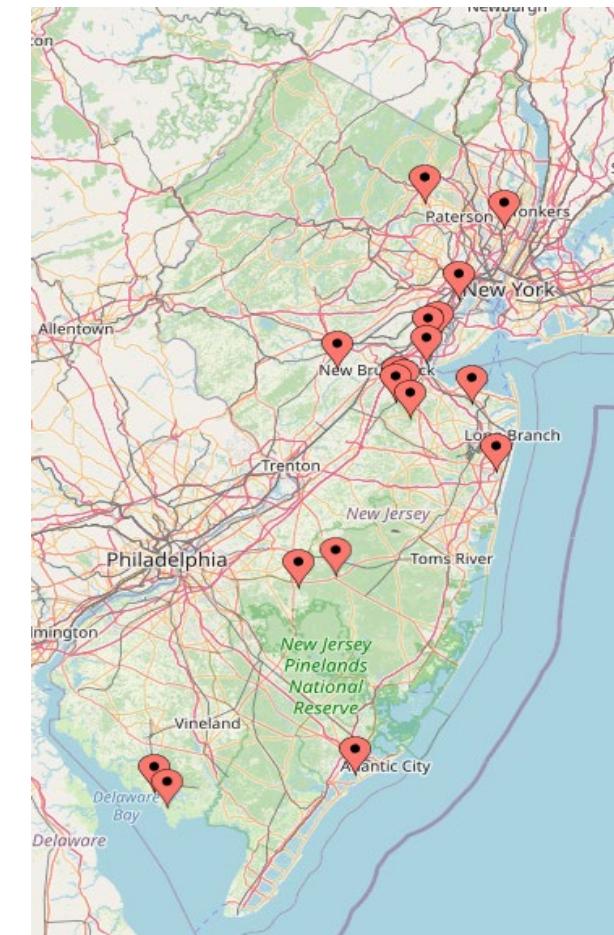
**\$5.7M in DEBT FORGIVENESS**



**48 TENANT RELOCATIONS**



**20 MUNICIPALITIES/10 COUNTIES**





For more information on the Blue Acres Program, visit:  
**[http://www.state.nj.us/dep/greenacres/blue\\_flood\\_ac.html](http://www.state.nj.us/dep/greenacres/blue_flood_ac.html)**

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