Improving Climate-Adaptation Planning for Coastal Communities
Local planning informed by regional hazard exposure analysis

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Presentation Outline

- Project Overview
  - Why the Great Marsh
  - Project background
  - Adaptation planning process

- Results of the Geospatial Analysis

- Next Steps and Lessons Learned
Project Geography
The Great Marsh

- 20,000 acres of coastal habitat
- Numerous state/federal designations
- Parker River NWR
- Large human population
The Great Marsh: A Healthy Ecosystem Under Threat

Coastal habitats provide numerous ecosystem services – including serving as a natural defense against coastal hazards.
Super Storm Sandy

- 147 deaths
- 650,000 homes destroyed
- $71 billion dollars in damage
- 2nd costliest hurricane to impact the U.S.
Great Marsh Resiliency Partnership

GOAL: Implement a suite of projects that work together synergistically to reduce risk to coastal communities and enhance the resiliency and adaptive capacity of the ecological systems those communities depend upon.
Holistic Coastal Resiliency Enhancement and Community Risk Reduction in the Great Marsh

1. Marsh Restoration
   - Invasive species control
   - SAV restoration

2. Dune Restoration
   - Re-nourishment
   - Re-vegetation

3. Hydro-barriers Assessment

4. Hydro-dynamic Sediment Transport & Salinity Modeling

5. Community Resiliency & Adaptation Planning
   - Vulnerability assessment
   - Adaptation recommendations
Community Resiliency Planning

**Project Area:** Salisbury, Newbury, Newburyport, Essex, Ipswich, & Rowley.

**Project Objectives:**

A) Assess overall community vulnerability, providing focused assessments of vulnerable community assets through a comprehensive and integrated approach.

B) Identify (ecosystem-oriented) adaptation strategies that serve to reduce risk.

C) Engage communities as we work together to lay a framework for implementing adaptation strategies.
Stakeholder Engagement
Climate Vulnerability Assessments

- Collation of previous reports and studies
- Worked with task forces to identify current vulnerabilities
- New inundation modeling that includes storm surge and SLR
- Geospatial analysis by USGS
- Barriers Assessment
Adaptation Planning

- Adaptation Catalog
  - Natural solutions
  - Nature-based & hybrid strategies
  - Policy strategies
  - Gray infrastructure

- Identified top-strategies for assets in each community

- Technical input
# Sample Guide to Climate Adaptation Strategies

## Natural Solutions

### Remove Invasives
- **Advantages:**
  - Supports marsh ecosystem health & function.
  - A healthy marsh provides storm protection, erosion control, and supports wildlife habitat.
- **Disadvantages:**
  - May not be ecologically appropriate.
  - Requires maintenance.

### Shoreline Continuum
- **Advantages:**
  - The continuity of coastal habitats from sub-tidal waters to upland buffers provides long-term protection and maximum co-benefits.
- **Disadvantages:**
  - Requires space and time to fully establish.
  - Limits coastal development.

### Dune/Beach Complex
- **Advantages:**
  - Beaches and vegetated dunes combine to attenuate wave energy, reduce erosion, and slow inland water transfer.
- **Disadvantages:**
  - Changes shape over time.
  - Dunes are fragile and susceptible to human impacts.

## Nature-Based & Hybrid Strategies

### Shellfish Reef
- **Advantages:**
  - Offshore living structures that enhance water quality, reduce erosion, and act as a submerged breakwater to reduce wave energy.
- **Disadvantages:**
  - Overtopped by major storms.
  - Easily damaged by debris and ice.

### Edging/Sills
- **Advantages:**
  - Natural vegetation combined with engineered structures parallel to coastline, reduces erosion and wave energy, and enhances wildlife habitat.
- **Disadvantages:**
  - Limited storm surge reduction.
  - Requires more land area to implement.

### Thin-layer Deposition
- **Advantages:**
  - Raises the marsh platform by spraying sediment onto the marsh surface, mostly applied in sediment-starved environments.
- **Disadvantages:**
  - Impacts not fully understood.
  - Unknown utility in marshes that aren't highly degraded.

## Gray Infrastructure

### Revetment
- **Advantages:**
  - Rocks or other material placed on a sloping shoreline to stabilize the shore and mitigate wave energy.
- **Disadvantages:**
  - No major flood protection.
  - Prevents upland sediment transport to estuarine habitats.

### Bulkhead
- **Advantages:**
  - Vertical wall suitable in high-energy settings, stabilizes shoreline and reduces flooding.
- **Disadvantages:**
  - Can erode adjacent areas.
  - Prevents upland sediment transport to estuarine habitats.

### Road Flood Barriers
- **Advantages:**
  - Various designs exist, but all are meant to prevent flood waters from entering the roadway.
- **Disadvantages:**
  - Short-term/temporary solution.
  - Limited/no co-benefits.

## Policy Strategies

### Zoning
- **Advantages:**
  - Utilizes zoning overlays to limit development in flood-prone areas (legal precedent exists in MA).
- **Disadvantages:**
  - Can impact property tax base.
  - Limited/no co-benefits.

### Climate-smart Development
- **Advantages:**
  - Requires SLR to be considered in development proposals.
  - Promotes open spaces to increase flood resiliency.
- **Disadvantages:**
  - Creates additional work for developers up front.
  - Doesn't require action.

### Transferable Development Credits
- **Advantages:**
  - Market-based approach (with existing MA guidelines) that incentivizes development away from flood-prone areas.
- **Disadvantages:**
  - Can be costly and complex to implement.
  - Requires calibrated market.
END Part 1
Using Data to Spur Action

Data becomes useful when it’s in the right hands!
Implementing Strategies

- Build and Maintain Partnerships
- Don’t cut and run!
- Support implementation and build local capacity
Short Term Needs & Long-term Resiliency

Beachfront revitalization and Long-term resiliency
Coastal Ecosystems Are Complex!

- Take a holistic approach to coastal resiliency enhancement and community risk reduction
- Work with nature, not against it.
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