Resilient Scituate and Duxbury

Planning and Preparing for Climate Change in Scituate & Duxbury





- How we got here (Climate Changes)
- What's Happening (Impacts)
- What to do (Resiliency)

How Did We Get Here?



What's Happening? (Impacts)

Parameter	Current Conditions (1961-1990)	Predicted Range by 2050	Predicted Range by 2100
Annual temperature (°F)	46	50 to 51	51 to 56
Winter temperature (°F)	23	25 to 28	27 to 33
Summer temperature (°F)	68	72 to 73	72 to 78
Annual sea surface temp. (°F)	53	56	61
Annual precipitation (in.)	41	5% to 8%	7% to 14%
Winter precipitation (in.)	8	6% to 16%	12% to 30%
Summer precipitation (in)	11	-1% to -3%	-1% to 0%
Streamflow (spring peak: days			
following Jan. 1)	85	77 to 80	72 to 74
Droughts lasting 1-3 months			
(#/30 yrs)	13	18 to 20	16 to 23
Sea-level rise		1 to 1.5 feet	2 to 6 feet

Sea Level Rise

- Rate of change in MSL for Boston Harbor is 2.63 mm/yr
- Sea level has risen about 10 inches in the last100 years



Heat/Health





Heat-related morbidity & mortality

Vector-borne diseases (Lyme, EEE, West Nile)

Pollen, Ozone

Asthma



Algal blooms (Red tide, cyanobacteria)



Frequency of waterborne diseases (crypto, E coli, giardiasis)

Intensity of Storms





GREENBUSH



011 Study







Saltwater Intrusion into Groundwater



Credit: Adapted from S. Horsley: Climate Change Impacts in the Coastal Zone

Salt Marsh Migration

South Shore Coastal Hazards Adaptation Study A District Local Technical Assistance Grant

Potential Salt Marsh Inland Migration



What Should We Do?

ADAPTATION = increasing resiliency and reducing vulnerability of our natural and built systems to best prepare for changing conditions

Adaptation

Change in land use, relocation

Emergency & business continuity planning

Upgrades or hardening of building and infrastructure

Residential programs promoting adaptation

Health programs

Mitigation

Seal Buildings

Green

Infrastructure

Water and Energy

Conservation

Smart

Growth

Energy conservation and efficiency

Renewable energy

Sustainable transportation, improved fuel efficiency

Capture and use of landfill and digester gas

Carbon sinks Source

Repurposing

- Master Planning
- Design Review & Guidelines
- Regulations / Zoning
- Transfer of Development Rights
- Easements
- Interdepartmental Coordination



Mitigation: Create Walking/Biking Opportunities





Development that includes a mixture of housing, office, retail, and other amenities integrated into a walkable neighborhood and located within a half-mile of quality public transportation. - Reconnecting America

Natural Resource Protection Zoning



Traditional



Natural Resource Protective

Shoreline Protection Rules/Regs.

- Establishes minimum requirements that all towns must abide by in developing their local ordinances:
- E.g. Set-back 250 feet from shoreline protected under law inland and coastal aquatic resources
- Creation of Resource Protection Districts with standards for development within



Transfer of Development Rights



Falmouth, MA

Raynham, MA

TDR: Resource Protection

Receiving area land owners gain density, developers gain an administrative advantage!



Source: Huron River Watershed Council, Michigan

Rolling Easements



Rolling Easements

Allows development to occur recognizing that land will be abandoned when sea/floodwaters rise



Redevelopment/Building Guidelines

- Elevation of the lowest floor + XX ft (e.g. 3 ft) above the Base
 Flood Elevation
- Walls that are "substantially impermeable to the passage of water" (U.S. Army Corps of Engineers <u>Flood Proofing</u> <u>Regulations</u>).



Source: LA Storm Smart Coasts

Design Guidelines



Integrated Water Management

- Aquatic Restoration
- Green Infrastructure
- Water Conservation/Reuse



Source: City of Portland, Environmental Services

Coastal Restoration

Beach Renourishment
 Plantings/Dune Stabilization
 Salt Marsh Restoration



Shellfish Restoration

Shoreline Protection

Oyster reef treatments reduce wave energy

Sediment deposition



Source: Dr. Boze Hancock

Source: EcoCheck





This visualization highlights how this green infrastructure protects the built environment, called gray infrastructure, from coastal storms. Click on the icons (i) to learn more.

Green Infrastructure = Flood Buffer



Source: Green Infrastructure Center

Green Infrastructure: Water Reclaim/Reuse







Green Infrastructure = Innovative/Alternative Wastewater



Green Infrastructure = Stormwater Management

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	Grey	Greer
Grading/Roads	\$569,698	\$426,575
Storm Drains	\$225,721	\$132,558
SWM Pond/Fees	\$260,858	\$ 10,530
Bioretention/Micro		\$175,000
Total	<u>\$1,086,277</u>	<u>\$744,663</u>
Unit Cost	\$14,679	\$9,193
Lot Yield	74	8

Local Codes & Regulations

Do They Discourage or Promote Green Infrastructure / Low Impact Development?

Do they Agree/Conflict with Each Other?

Wetland Regulations

- Stormwater Regulations
- Zoning Site Plan Review

Subdivision Rules and Regulations

MAPC's Code Checklist: http://www.mapc.org/sites/default/files/LID_Local _Codes_Checklist.pdf

Discussion



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