

A Brief Overview on Impacts of Climate Change and why Floodplain Management Matters

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Climate Change Impacts:

According to the U.S. Environmental Protection Agency, between 1895 and 2011, temperatures rose by almost 2°F. They are **expected to rise an additional 4.5°F to 10°F** by the 2080s.

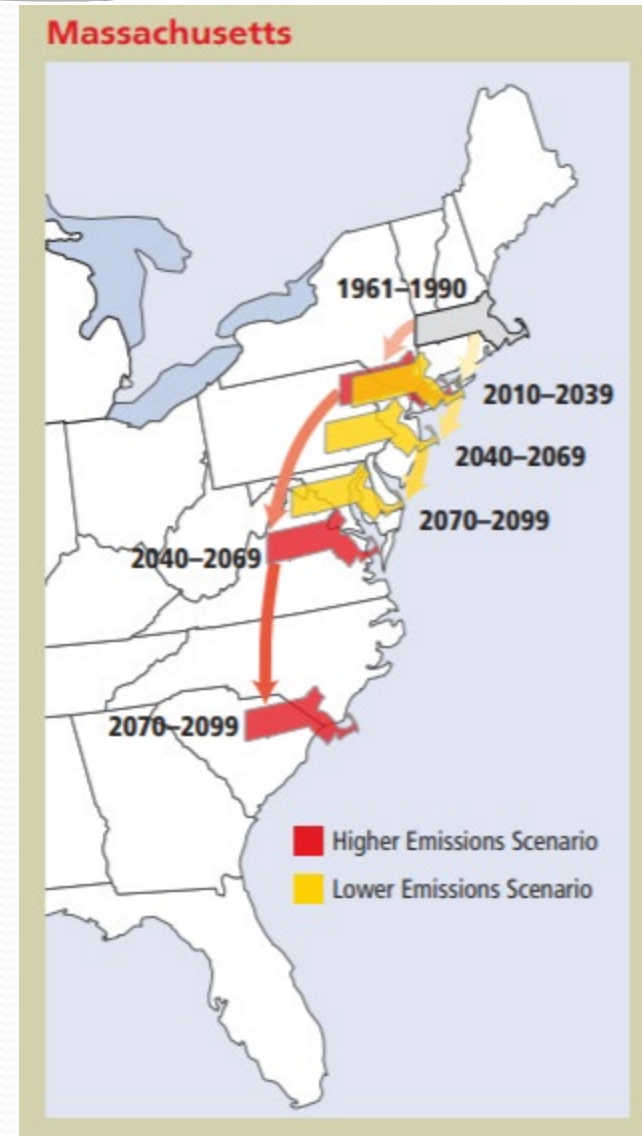


Fig.2. “The Changing Northeast Climate: Our choices, Our Legacy” Union of Concerned Scientists (2006)

Extreme Heat

- Climate change means warmer weather.
- Warmer weather causes stronger storms, which increases flooding and erosion;

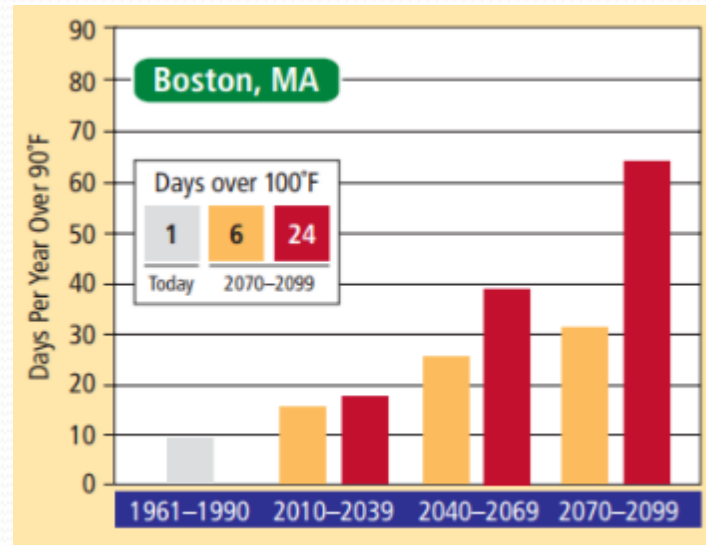


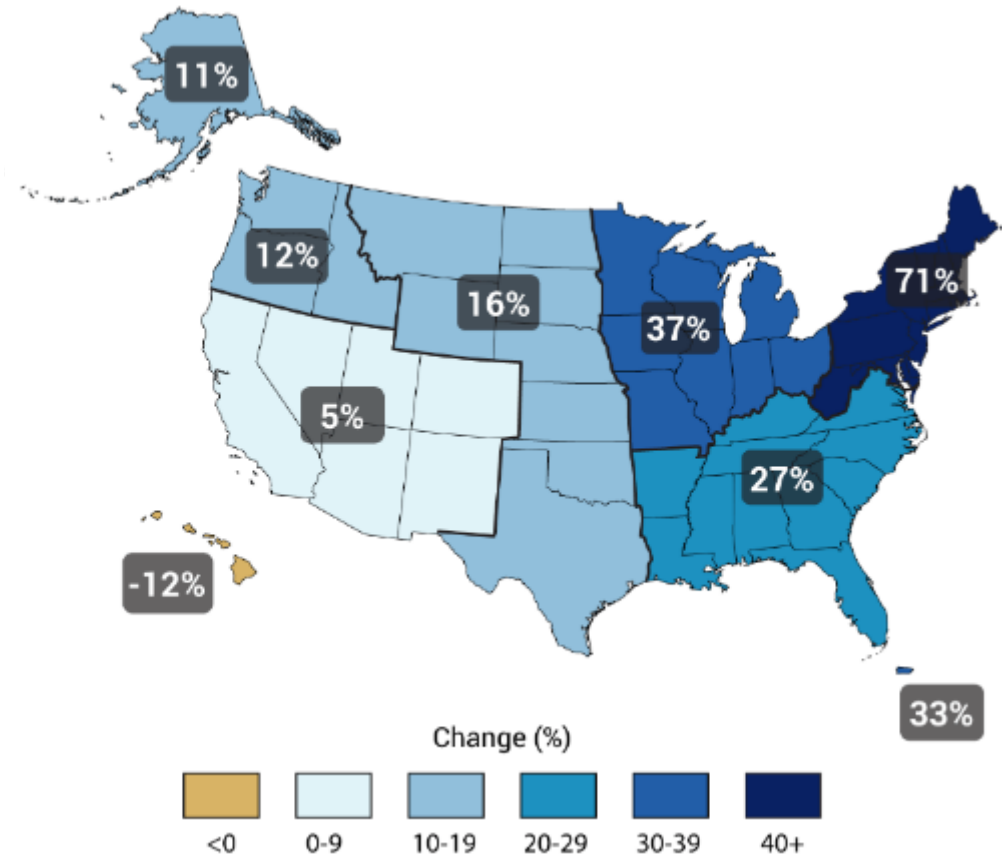
Fig.3. *The Changing Northeast Climate: Our choices, our legacy*



Heavy Downpours Increasing

“Between 1958 and 2012, the Northeast saw more than a 70% increase in the amount of rainfall measured during heavy precipitation events, more than in any other region in the United States.”

U.S. EPA



From National Climate Assessment (2014)

Sea Level Rise Exacerbates Flooding

According to the Union of Concerned Scientists, sea level is rising along the Northeast and mid-Atlantic coast much faster than the global average. **Sea level has increased 13 inches in Boston since 1880.**

In coastal areas, sea level rise will increase routine flooding and erosion – especially during King Tides - becoming the “new normal.”



King Tide on Great Marsh, Ipswich:
4/18/18

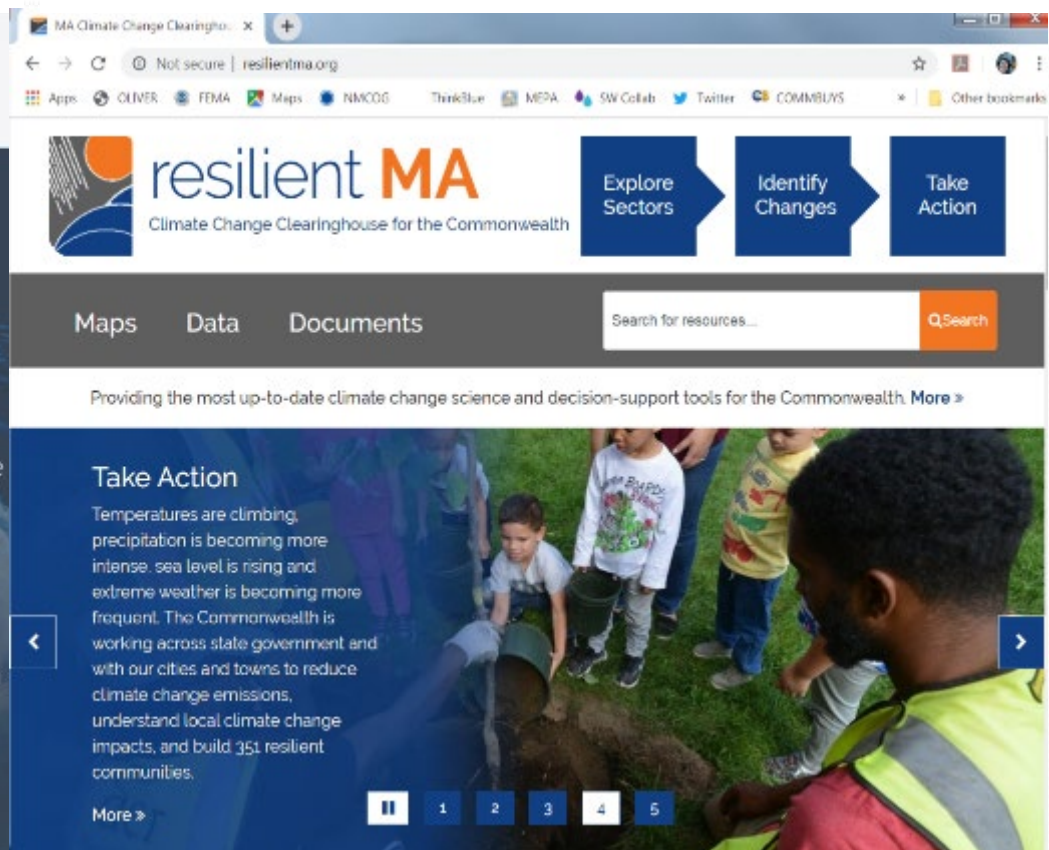
Additional Information

GlobalChange.gov Story Map



The screenshot shows the National Climate Assessment story map. At the top left is a globe icon and the text "National Climate Assessment". To the right, there are navigation icons and the URL "GlobalChange.gov". Below this is a large image of a globe with the text "National Climate Assessment" overlaid. Underneath the image, there is a paragraph: "The National Climate Assessment summarizes the impacts of climate change on the United States, now and in the future." Below that is another paragraph: "A team of more than 300 experts guided by a 60-member Federal Advisory Committee produced the report, which was extensively reviewed by the public and experts, including federal agencies and a panel of the National Academy of Sciences."

ResilientMA.org Climate Change Clearing House



The screenshot shows the ResilientMA.org website. At the top, there is a browser address bar showing "resilientma.org". Below the address bar is a navigation menu with "Maps", "Data", and "Documents". To the right of the menu is a search bar with the text "Search for resources..." and a "QSearch" button. Below the search bar is a navigation flow: "Explore Sectors" -> "Identify Changes" -> "Take Action". Below this is a section titled "Take Action" with a background image of children planting a tree. The text in this section reads: "Temperatures are climbing, precipitation is becoming more intense, sea level is rising and extreme weather is becoming more frequent. The Commonwealth is working across state government and with our cities and towns to reduce climate change emissions, understand local climate change impacts, and build 351 resilient communities." At the bottom of the page, there is a "More >" link and a set of navigation buttons (1, 2, 3, 4, 5).

FEMA Studies prove it's cheaper to plan for flooding than to respond to it.



FEMA

Federal Insurance and Mitigation Administration

Fact Sheet

June 2018

Natural Hazard Mitigation Saves Interim Report

Overall Findings

Natural hazard mitigation saves \$6 on average for every \$1 spent on federal mitigation grants, according to an analysis by the National Institute of Building Sciences. An earlier (2005) study by NIBS found a benefit-cost ratio (BCR) of 4:1.





The new study also estimates what society could save if buildings were to be constructed to exceed the minimum requirements of the 2015 International codes. The study further differentiates the BCRs of building resiliently for a range of different hazard types. These BCRs are averages and will differ among specific mitigation efforts. Additionally, BCR may be only a part—even a small part—of a well-thought-out mitigation decision.

Some mitigation benefits such as the reduction in domestic violence, the conservation of heirlooms and photos, and the preservation of community and culture can be extremely difficult to quantify, and as such, were omitted from the analyses. Therefore, the results of this study are considered to be quite conservative.

Flood Mitigation Results

The bottom-line is that above-code design and public-sector mitigation grant projects for riverine floods save more than they cost. The losses avoided by federally-funded riverine flood mitigation projects far exceeds the money spent (with a 7x return on investment). Both above-code design and public-sector mitigation for riverine floods result in increased occupant safety, reduced business interruption, and beneficial economic impacts for the community.

The new BCR estimate for public-sector riverine flood mitigation grant projects is higher than the 2005 study because the present study has modeled the impacts of mitigation projects at finer scales and using improved tools than those utilized in the previous study.

National Benefit-Cost Ratio (BCR) Per Peril <small>*BCR numbers in this study have been rounded</small>	Beyond Code Requirements	Federally Funded
Overall Hazard Benefit-Cost Ratio	\$4:1	\$6:1
 Riverine Flood	\$5:1	\$7:1
 Hurricane Surge	\$7:1	<small>low fire grants</small>
 Wind	\$5:1	\$5:1
 Earthquake	\$4:1	\$3:1
 Wildland-Urban Interface Fire	\$4:1	\$3:1

Wind Mitigation Results

Mitigating for wind hazards—in the form of building improvements, tornado safe rooms, and other methods analyzed in this study—offers a 5:1 BCR.

BCR estimates have risen from 4:1 (in the 2005 Mitigation Saves study) to 5:1 in the new study, largely because this new study assessed the country's major investment in tornado safe rooms in the intervening 13 years. Safe rooms offer significant savings when constructed in medium or high hazard areas and are utilized by schools, communities, hospitals, and in the home.

Analysis of the Insurance Institute for Building and Home Safety's (IBHS's) FORTIFIED standard reveals that above-code design of single family residential homes significantly reduces property losses and insurance fees if the insurance is priced in direct proportion to risk.

Strengthening the building envelop in high hazard areas offers substantial benefit to high value and critical facilities, where benefits can far exceed the property losses characterized by this study. In addition to cost-savings, many lives have been saved by using FEMA's safe room and coastal construction technical guidance.

Learn Where Your Vulnerable Areas Are

Flood projections for Downtown Ipswich, from “Great Marsh Resiliency Planning Project”

www.greatmarshresiliency.org

