



# Connecticut

Confronting Climate Change in the U.S. Northeast



From Mystic Seaport to Kent Falls, the climate of Connecticut is changing. Records show that spring is arriving earlier, summers are growing hotter, and winters are becoming warmer and less snowy. These changes are consistent with global warming, an increasingly urgent phenomenon driven by heat-trapping emissions from human activities.

New state-of-the-art research shows that if global warming emissions continue to grow unabated, Connecticut can expect dramatic changes in climate over the course of this century, with substantial impacts on the state's economy and character. If the rate of emissions is lowered, however, projections show that many of the changes will be far less dramatic. Emissions choices we make today—in Connecticut, the Northeast, and worldwide—will help determine the climate our children and grandchildren inherit, and shape the consequences for their economy, environment, and quality of life.

The research summarized here describes how climate change may affect Connecticut and other Northeast states under two different emissions scenarios. The higher-emissions scenario assumes continued heavy reliance on fossil fuels, causing heat-trapping emissions to rise rapidly over the course of the century. The lower-emissions scenario assumes a shift away from fossil fuels in favor of clean energy technologies, causing emissions to decline by mid-century.

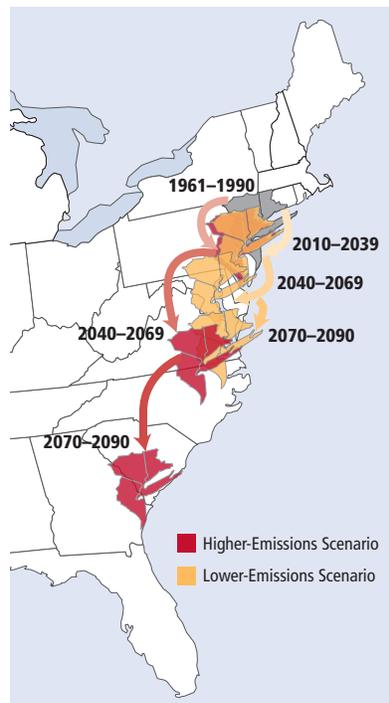
The research also explores actions that individual households, businesses, and governments in the Northeast can take today to reduce emissions to levels consistent with staying below the lower-emissions scenario and adapt to the unavoidable

changes that past emissions have already set in motion.

## CONNECTICUT'S CHANGING CLIMATE

**Temperature.** Average temperatures across the Northeast have risen more than 1.5 degrees Fahrenheit (°F) since 1970, with winters warming most rapidly—4°F between 1970 and 2000. If higher emissions prevail, average temperatures in this part of the region are projected to rise 8°F to 12°F above historic levels in winter and 6°F to 14°F in summer by late-century, while lower emissions would cause roughly half this warming. Under the higher-emissions scenario Connecticut's cities can expect a dramatic increase in the number of days over 100°F (see figure on p.3 and the section on health impacts).

**Precipitation and winter snow.** The Northeast region is projected to see an increase in winter precipitation on the order of 20 to 30 percent. Slightly greater increases are projected under the higher-emissions scenario, which would also feature less winter precipitation falling as snow and more as rain.



## Migrating State Climate

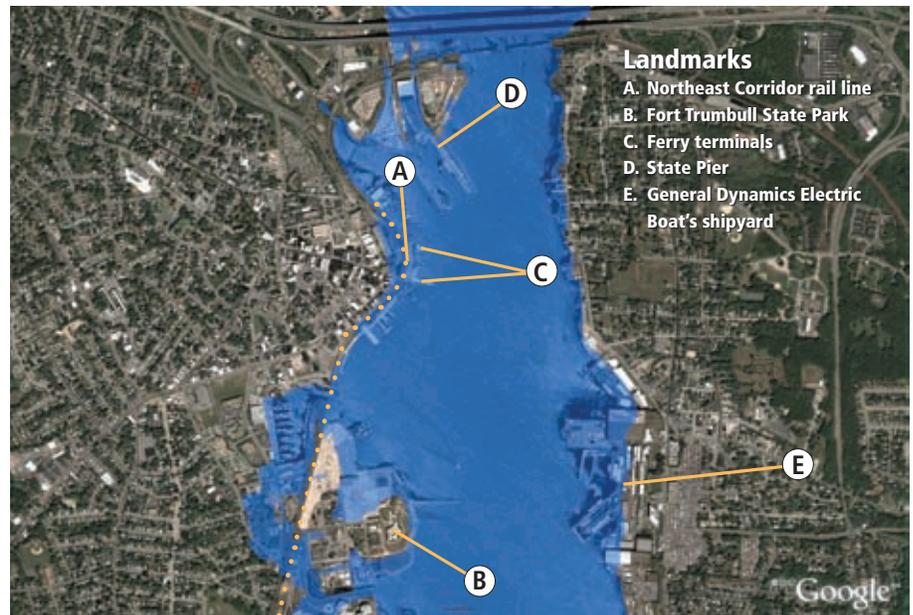
Changes in average summer heat index—a measure of how hot it actually feels, given temperature and humidity—could strongly affect quality of life in the future for residents of Connecticut. Red arrows track what summers could feel like in the Tri-State region (the greater New York City metropolitan region, encompassing parts of Connecticut and New Jersey) over the course of the century under the higher-emissions scenario. Yellow arrows track what summers in the region could feel like under the lower-emissions scenario.

Snow is an iconic characteristic of Connecticut winters and an integral part of many favorite winter activities and traditions. But rising temperatures over the past few decades have caused snow to become wetter (or more “slushy”) and decreased the average number of snow-covered days across the state. If higher emissions prevail, Connecticut’s snow season would be reduced by roughly half by mid-century and to only a few snow-covered days per winter month by late-century. Under the lower-emissions scenario the snow season would also be reduced by half, though not until late-century.

Heavy, damaging rainfall events have already increased measurably across the Northeast in recent decades. Intense spring rains struck the region in both 2006 and 2007, for example, causing widespread flooding. The frequency of these events is expected to rise further under either emissions scenario.

**Drought.** In this historically water-rich state, rising summer temperatures coupled with little change in summer rainfall are projected to increase the frequency of short-term (one- to three-month) droughts, particularly if higher emissions prevail. By late-century, for example, short-term droughts are projected to occur annually under the higher-emissions scenario (compared with once every two years, on average, historically), increasing stress on both natural and managed ecosystems. By contrast, little change in drought is expected under the lower-emissions scenario.

**Sea-level rise.** Global warming affects sea levels by causing ocean water to expand as it warms, and by melting land-based ice. Under the higher-emissions scenario, global sea level is projected to rise between 10 inches and two feet by the end of the century (7 to 14 inches under the lower-emissions scenario). These projections do not account for the recent observed melting of the



### New London/Groton Flooding

The light blue area in these maps depicts today’s 100-year flood zone for New London and Groton (i.e., the area of these cities that is expected to be flooded once every 100 years). With additional sea-level rise by 2100 under the higher-emissions scenario, this approximate area is projected to flood once every 17 years, on average; under the lower-emissions scenario, once every 32 years. The 100-year flood at the end of the century (not mapped here) is projected to inundate a larger area of these cities, especially under the higher-emissions scenario.

world’s major ice sheets—nor the potential for accelerated melting—and may therefore be conservative. However, even under these projections, Connecticut’s coast faces a substantial increase in the extent and frequency of coastal flooding, erosion, and property damage.

### IMPACTS ON COASTAL COMMUNITIES

The coastal area of Connecticut is home to more than 2 million people—more than 60 percent of the state’s population. That number swells each summer as tourists flock to the state’s sandy beaches and shoreline communities. From critical infrastructure to waterfront homes to salt marshes, much of this coastline is exceptionally vulnerable to sea-level rise. Indeed, some major insurers have withdrawn coverage from thousands of homeowners in coastal areas across the Northeast in recent years.

**Coastal flooding.** Rising sea levels caused by global warming are projected to increase the frequency and severity of damaging storm surges and coastal flooding. What is now considered a once-in-a-century coastal flood in New London and Groton (on opposite banks of the Thames River) is expected, by late-century, to occur as frequently as once every 17 years on average under the higher-emissions scenario. Connecticut communities have a lengthy history of protecting themselves against the sea, but the extra stresses created by sea-level rise and more frequent and extensive flooding can be expected to greatly tax both new and aging infrastructure and threaten vulnerable communities across the state.

**Shoreline change.** Sea-level rise is expected to permanently inundate certain low-lying coastal areas and dramatically accelerate erosion, particularly

on important barrier beaches such as Bluff Point and Long Beach. Continued sea-level rise will also threaten the state's ecologically important salt marshes and estuaries (which serve as critical feeding ground for migrating waterfowl and other birds, and nursery habitat for important commercial fish). Connecticut policy makers will need to take steps to protect the state's vulnerable populations and infrastructure, as well as wildlife and critical coastal wetlands. This includes public education, updating and enforcing building codes and land-use regulations, and working with the insurance industry to effectively protect property and people.

### IMPACTS ON FISHERIES

Clambakes and lobster festivals are synonymous with summer in Connecticut. Unfortunately, the Long Island Sound lobster population, which has declined nearly 70 percent in recent years due largely to warmer waters, is expected to collapse entirely by mid-century as the maximum heat-stress threshold for lobster is consistently exceeded under either emissions scenario.

### IMPACTS ON HUMAN HEALTH

Heat was the United States' leading weather-related killer in 6 of 10 recent years (between 1993 and 2003). More intense summer heat waves and deteriorating air quality caused by global warming will increase the risks of many health problems.

**Extreme heat.** While Connecticut residents are accustomed to the occasional summer heat wave, the number of very hot days in large cities (where the urban heat-island effect can amplify temperatures) is expected to increase significantly, particularly under the higher-emissions scenario (see the figure below). By late-century, for example, Hartford could experience nearly 30 days over 100°F every summer under the higher-emissions scenario, compared with roughly eight such days under the lower-emissions scenario.

Very hot days are not only unpleasant but also dangerous. As the number of these days increases, so does the risk of heat stress, heart attack, and even death. The state's larger cities, such as Bridgeport, Hartford, New Haven, and Waterbury, will need to prepare for an increase in dangerously hot conditions by taking steps (e.g., installing better insulation, establishing heat warning systems and cooling centers) that will lessen the impact of extreme heat on vulnerable populations.

**Air quality.** Air pollution from ground-level ozone and other components of smog is a serious concern across much of Connecticut. In 2006 the New York-Newark-Bridgeport region (including Fairfield, Greenwich, and Southport) was ranked the ninth-most ozone-polluted metropolitan region in the country according to U.S. Environmental Protection Agency (EPA) standards. From 2001 to 2005, the average sum-

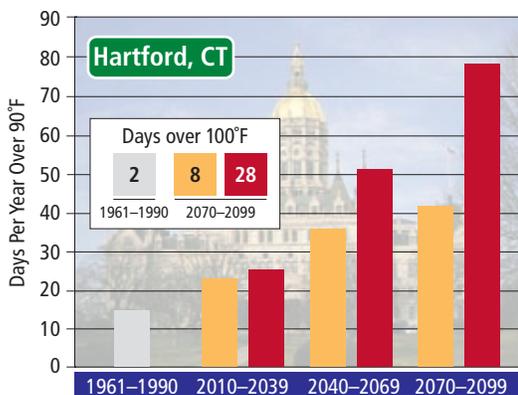
mer in Connecticut included 20 days that did not meet EPA air-quality standards for ground-level ozone, putting additional stress on people with cardiovascular and respiratory diseases. In the absence of more stringent controls on ozone-forming pollutants, the number of days with poor air quality is projected to quadruple in cities like Hartford by late-century under the higher-emissions scenario. Under the lower-emissions scenario such days could increase by half.

Higher temperatures and increasing levels of plant-stimulating carbon dioxide (CO<sub>2</sub>) in the air are also expected to accelerate seasonal pollen production in plants in the next several decades under the higher-emissions scenario. This could extend the allergy season, increase asthma risks, and exacerbate symptoms for both urban and rural residents of Connecticut.

**Vector-borne disease.** Mosquitoes and ticks carry West Nile virus (WNV) and Lyme disease-causing bacteria, respectively, and spread them to animals and humans. Factors affecting vector-borne diseases are complex; however, projections for the Northeast of warmer winters, hotter summers, and more frequent summer dry periods punctuated by heavy rainstorms are the same conditions that can set the stage for more frequent WNV outbreaks.

### IMPACTS ON FORESTS

Forests cover 60 percent of Connecticut's landscape, providing recreation and tourism opportunities, wildlife habitat, and timber, while protecting watersheds, conserving soil, and storing carbon. Climate change has the potential to dramatically alter the character of the state's forests. For example, the state's maple/beech/birch forests dazzle us with their colorful foliage each autumn, but if higher emissions prevail, climate conditions suitable for these forests are projected to disappear by late-century. Under the lower-



### Extreme Heat in Our Cities

The number of days over 90°F in large northeastern cities is projected to increase until, by late-century, Hartford could experience nearly 80 such days under the higher-emissions scenario. Projections under this scenario also show a dramatic increase in the currently small number of days over 100°F (as depicted in the inset box).

emissions scenario, climate conditions suitable for these hardwoods would be retained in parts of northern Connecticut. Long-lived trees may persist for some time even as the climate becomes unsuitable for them; however, they may also become more vulnerable to the stresses of competition, pests, and disease. As certain forest types decline, so will the populations of wildlife dependent on them, including migratory songbirds like the Baltimore oriole.

### IMPACTS ON AGRICULTURE

With its fertile river valleys and 360,000 acres of farmland, Connecticut growers turn out some of the region's finest crops, generating nearly \$350 million annually. Global warming will present both opportunities and challenges to Connecticut's growers; for example, increases in the frequency of short-term drought (see p.2) could necessitate increased irrigation and operational costs, while a longer growing season could benefit farmers seeking to invest in warmer-weather crops that are currently hard to grow in the state.

**Crops.** Connecticut is one of the nation's top producers of fruits such as wild blueberries and pears. Fruits like these require a certain number of hours each winter of adequately cold temperatures for optimal flowering and fruit development. In the next several decades, the winter chilling requirements of certain apples and native grapes, such as the Concord, would no longer be met in this state under either emissions scenario. By late-century under the higher-emissions scenario, the requirements of blueberries, raspberries, and certain varieties of apples (e.g., McIntosh, Empire), pears, and other fruit would not be met across most of the state. Under the lower-emissions scenario, in contrast, the state is projected to continue to meet the chilling requirements of these major fruit crops through this century.

Northward expansion of agricultural



Associated Press/The Herald/Lauren Tagliatela

**From skiing and snowboarding to snowmobiling, pond hockey, and sledding, many residents of Connecticut embrace winter recreation. But the state's winters are warming. Over the course of this century more winter precipitation is projected to fall as rain, and snow and lake ice are expected to melt more quickly, reducing opportunities for popular winter activities.**

pests and weeds is expected to further impede crop production during the course of the century, and potentially pressure farmers to increase their herbicide and pesticide use (or, in the case of organic farms, invest more heavily in labor-intensive weed and pest control). Under the lower-emissions scenario, Connecticut crop impacts this century are expected to be relatively small.

**Dairy.** Connecticut's dairy farmers generate \$57 million annually in milk sales. Hot conditions can, however, produce heat stress in dairy cows that depresses milk production. Under the higher-emissions scenario Connecticut is projected to reach temperatures by late-century that would reduce milk production up to 15 percent during key summer months—a significant loss to an industry with an already small profit margin. Adaptive measures such as air conditioning may curb some of these

potential losses (provided the costs are within farmers' reach).

### IMPACTS ON WINTER RECREATION

Winter recreation and tourism in the Northeast will be profoundly affected by climate change as winter temperatures continue to rise, snowfall declines, and lake ice shrinks. Warmer winters are projected to shorten the average ski season, increase snowmaking requirements, and drive up operating costs, hurting an industry that has already contracted in recent years. Even with increased snowmaking, ski resorts across Connecticut are projected to no longer be viable in the next several decades, as temperatures rise too high for reliable snowmaking. Under the higher-emissions scenario Connecticut skiing enthusiasts would be forced to travel to resorts in western Maine by late-century; under the lower-emissions

scenario, resorts across northern New England and the North Country of New York could continue to offer reliable ski seasons.

Pond hockey and outdoor skating are long-standing winter favorites. However, global warming will render lake ice cover increasingly thin and shorten its duration. Combined with fewer opportunities for sledding, snowshoeing, and other favorite outdoor activities, winter recreation as it is now known in Connecticut is at great risk.

### WHAT WE CAN DO

From establishing the principles that later formed the basis of the U.S. Constitution to pioneering inventions such as the cotton gin, steamboat engine, and submarine, Connecticut has a legacy of laying our nation's foundations. Today, the state is poised to build this legacy by leading the effort to reduce heat-trapping emissions and combat the dangerous effects of global warming. By reducing emissions today, we have an opportunity to help protect our children and grandchildren from the most severe consequences of global warming. At the same time, effective adaptation strategies are needed to help reduce the vulnerability of Connecticut's residents, ecosystems, and economies to those changes that are now unavoidable.

Here in Connecticut, the Northeast, and around the world, there is growing momentum to meet the climate challenge. Of course our actions alone will not be sufficient to avoid dangerous climate change. But as a global leader in technology, finance, and innovation and a major source of heat-trapping emissions, Connecticut (and the rest of the Northeast) is well positioned to drive national and international progress. Concerted, sustained efforts to reduce emissions in the region—on the order of 80 percent below 2000 levels by mid-century, and just over 3 percent per year on average over the next several decades—can help pull global



The Mark Twain House & Museum, Hartford, CT

**The Mark Twain Museum built in 2003 in Harford, CT, was the first LEED-certified museum in the country. The overall energy efficiency of its heating and cooling system is nearly 30 percent greater than a system designed to satisfy the building code.**

emissions below the lower-emissions scenario described here.

In recent years Connecticut has been on the forefront of state and regional climate action. Former Governor Rowland led the New England Governors and Eastern Canadian Premiers Conference where the Regional Climate Action Plan was adopted in 2001, and Connecticut developed its own state Climate Change Action Plan in 2005. State and local governments have a rich array of strategies and policies at their disposal to meet the climate challenge in partnership with other states, businesses, civic institutions, and the public. These strategies and policies can reduce emissions in the following sectors:

**Electric power.** The energy bill enacted with broad support in June 2007 contains many important and even groundbreaking provisions, including mandates that all cost-effective energy efficiency gains be prioritized over new electricity supply and that utility regulators finally sever the link between sales volume and utility profits. In addition,

its requirement that the state auction 100 percent of the emissions permits created under the Regional Greenhouse Gas Initiative (RGGI) and devote nearly all proceeds to investments in energy efficiency and renewable energy development, along with an ambitious upgrade to its renewable electricity standard, positions Connecticut to make great strides in implementing its state Climate Change Action Plan and achieving substantial emissions reductions.

**Buildings.** Connecticut's relatively old stock of residential, commercial, and industrial buildings offers major opportunities to reduce emissions associated with water and space heating. The state can support stronger enforcement of building energy codes, while local governments can amend zoning laws to encourage and/or require new construction and substantial renovation projects to achieve the U.S. Green Building Council's LEED certification and/or energy-efficiency levels that qualify for the EPA's Energy Star Building designation. Programs currently sponsored by the Connecticut Green Building Council, major utilities, and the state's Business and Industry Association that highlight the benefits and feasibility of reducing emissions from buildings can also be expanded.

**Transportation.** Cars and trucks account for 41 percent of Connecticut's total carbon emissions. The state has adopted California's tailpipe emissions standards, which require reductions of approximately 30 percent below 2002 levels by 2016, beginning with the 2009 model year (implementation is contingent upon a ruling expected from the EPA). State and local governments can further reduce vehicle emissions through sustained investment in public transportation, incentives to purchase low-emissions vehicles, and incentives and regulations that promote "smart growth" strategies such as concentrat-

ing development near existing downtowns and public transportation routes. In addition, Connecticut can adopt standards to reduce the carbon content of fuels.

**Industries and large institutions** can reduce emissions while lowering energy costs by improving the energy efficiency of their buildings and facilities, and by installing combined-heat-and-power systems and on-site renewable energy systems.

## CONCLUSION

Global warming represents an enormous challenge, but the solutions are within reach if we act swiftly. The emissions choices we make today in Connecticut, the Northeast, and globally will shape the climate our children and grandchildren inherit. The time to act is now.



Connecticut Commission on Culture and Tourism

## A Citizen's Guide to Reducing Emissions

1. **Become carbon-conscious.** The problem of global warming stems from a previous lack of awareness of our “carbon footprint” and its effect on climate. Individuals and families can start by using one of several publicly available carbon-footprint calculators that will help you understand which choices make the biggest difference.
2. **Drive change.** For most people, choosing a vehicle (and how much they should drive it) is the single biggest opportunity to slash personal carbon emissions. Each gallon of gas used is responsible for 25 pounds of heat-trapping emissions.
3. **Look for the Energy Star label.** When it comes time to replace household appliances, look for the Energy Star label on new models (refrigerators, freezers, furnaces, air conditioners, and water heaters use the most energy).
4. **Choose clean power.** Consumers in Connecticut can purchase electricity from local utilities generated from renewable resources that produce no carbon emissions. If your local utility does not offer a “green” option, consider purchasing renewable energy certificates.
5. **Unplug an underutilized freezer or refrigerator.** One of the quickest ways to reduce your global warming impact is to unplug a rarely used refrigerator or freezer. This can lower the typical family's CO<sub>2</sub> emissions nearly 10 percent.
6. **Get a home energy audit.** Take advantage of the free home energy audits offered by many utilities. Even simple measures (such as installing a programmable thermostat) can each reduce a typical family's CO<sub>2</sub> emissions about 5 percent.
7. **Lightbulbs matter.** If every U.S. household replaced one incandescent lightbulb with an energy-saving compact fluorescent lightbulb (CFL), we could reduce global warming pollution by more than 90 billion pounds over the life of the bulbs.
8. **Buy good wood.** When buying wood products, check for labels that indicate the source of the timber. Forests managed in a sustainable way are more likely to store carbon effectively—thus helping to slow global warming.
9. **Spread the word and help others.** A growing movement across the country seeks to reduce individual, family, business, and community emissions while inspiring and assisting others to do the same.
10. **Let policy makers know you are concerned about global warming.** Elected officials and candidates for public office at every level need to hear from citizens. Urge them to support policies and funding choices that will accelerate the shift to a low-emissions future.



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**For more information on our changing Northeast climate and what you can do, or to download a copy of the full report and additional state summaries, visit [www.climatechoices.org](http://www.climatechoices.org).**

