Fifth National Climate Assessment: Vermont Climate Council

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National Chapter author – Water – Fifth National Climate Assessment

Lead author – Northeast chapter – Fourth National Climate Assessment

Vermont Climate Council Meeting – Waterbury – 29 January, 2024

Our conversation today

National Climate Assessment (NCA)

- NCA4 & NCA5
- new chapters
- new tools
- supporting products

Vermont Climate Action Plan

- updates
- contributing to the regional & national conversations

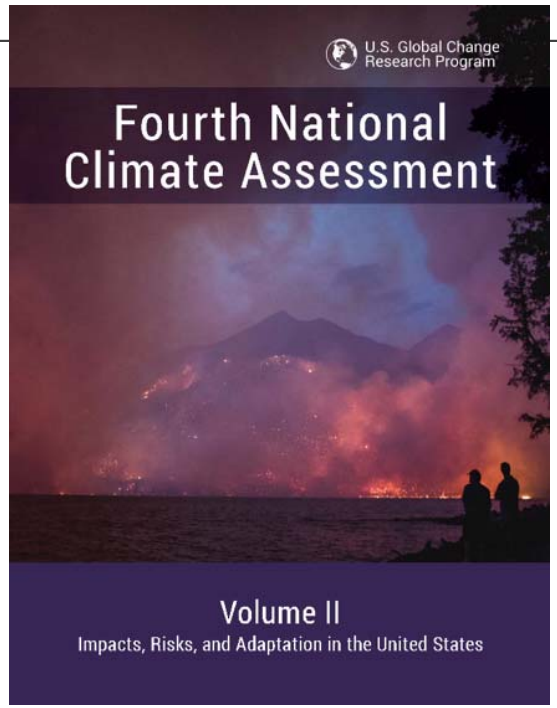
NCA4 Vol II: *Impacts, Risks, and Adaptation in the U.S.*

Policy relevant, but not policy prescriptive

Places a strong emphasis on regional information

Assesses a range of potential impacts, helping decision makers better identify risks that could be avoided or reduced

Uses case studies to provide additional context and opportunities to showcase community success stories



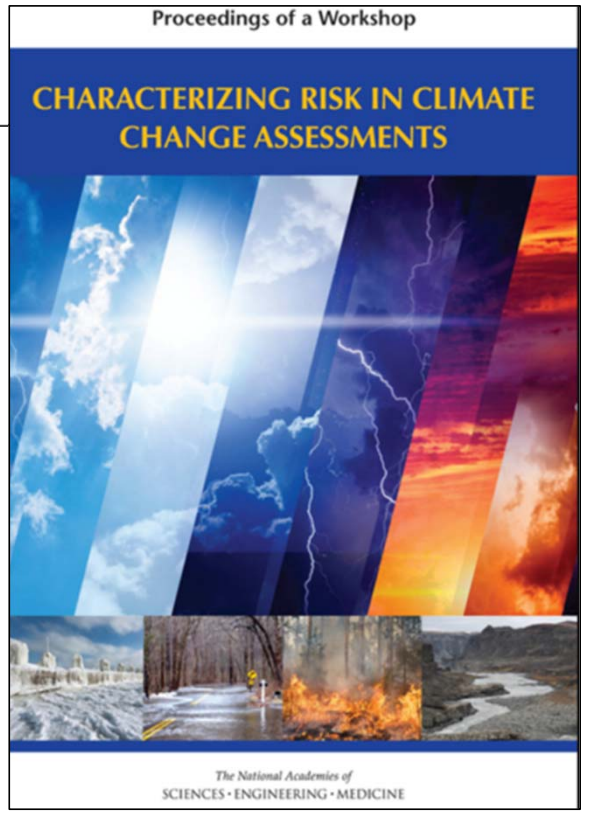
NCA4 Vol II is available at
nca2018.globalchange.gov

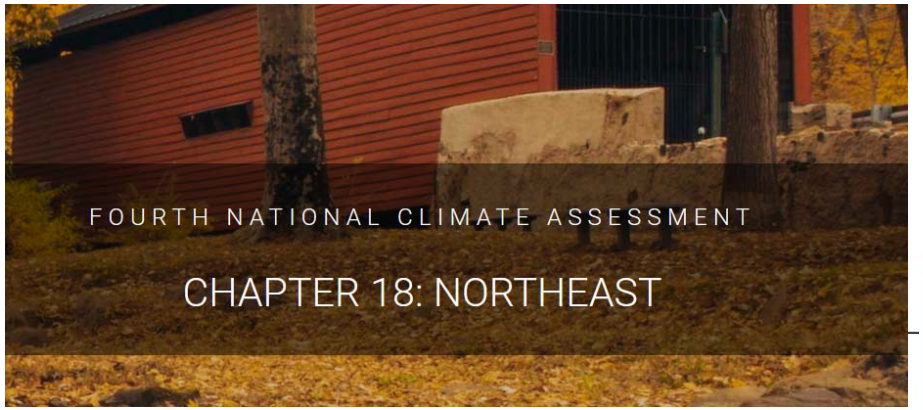
Risk Framing in Key Messages

A **"risk-based framing"** is used to ensure NCA4 focuses on issues of high importance to decision-making and to help with communicating assessment outcomes

In response to audience needs and with guidance from a workshop of the National Academies, NCA4 Key Messages addressed:

- ✓ What do stakeholders value/what is at risk in a given sector or region?
- ✓ What outcomes do we wish to avoid with respect to these valued things?
- ✓ What do we expect to happen in the absence of adaptive action and/or mitigation?
- ✓ How bad could things plausibly get/are there important thresholds or tipping points in the unique context of a given region, sector, etc.?





KEY MESSAGES

1 2 3 4 5

Key Message 1: Changing Seasons Affect Rural Ecosystems, Environments, and Economies

The seasonality of the Northeast is central to the region's sense of place and is an important driver of rural economies. Less distinct seasons with milder winter and earlier spring conditions (very high confidence) *are already altering ecosystems and environments* (high confidence) *in ways that adversely impact tourism* (very high confidence), *farming* (high confidence), *and forestry* (medium confidence). *The region's rural industries and livelihoods are at risk from further changes to forests, wildlife, snowpack, and streamflow* (likely).

Major uncertainties

Warmer fall temperatures affect senescence, fruit ripening, migration, and hibernation, but are less well studied in the region[98] and must be considered alongside other climatic factors such as drought. Projections for summer rainfall in the Northeast are uncertain,[4] but evaporative demand for surface moisture is expected to increase with projected increases in summer temperatures.[3,4] Water use is highest during the warm season;[141,400] how much this will affect water availability for agricultural use depends on the frequency and intensity of drought during the growing season.[302]

https://nca2023.globalchange.gov/

Mitigation, Adaptation and Resilience

Box 1.1. Mitigation, Adaptation, and Resilience

Throughout this report, three important terms are used to describe the primary options for reducing the risks of climate change:

Mitigation: Measures to reduce the amount and rate of future climate change by reducing emissions of heat-trapping gases (primarily carbon dioxide) or removing greenhouse gases from the atmosphere.

Adaptation: The process of adjusting to an actual or expected environmental change and its effects in a way that seeks to moderate harm or exploit beneficial opportunities.

Resilience: The ability to prepare for threats and hazards, adapt to changing conditions, and withstand and recover rapidly from adverse conditions and disruptions.

https://nca2023.globalchange.gov/

Five Adaptation Stages and Progress

Adaptation entails a continuing risk management process. With this approach, individuals and organizations become aware of and assess risks and vulnerabilities from climate and other drivers of change, take actions to reduce those risks, and learn over time. The gray arced lines compare the current status of implementing this process with the status reported by the Third National Climate Assessment in 2014; darker color indicates more activity.

From Figure 28.1, Ch. 28: Adaptation (Source: adapted from National Research Council, 2010. Used with permission from the National Academies Press, © 2010,National Academy of Sciences. Image credits, clockwise from top: National Weather Service; USGS; Armando Rodriguez, Miami-Dade County; Dr. Neil Berg, MARISA; Bill Ingalls, NASA).

What is new in NCA5?

- Increased understanding of observed and projected climate change
- Economics + Social Systems and Justice
- Environmental justice and equity as cross-cuts
- Local and state climate mitigation and adaptation

NCA 5 ABOUT CHAPTERS DOWNLOADS ART × CLIMATE NCA ATLAS

https://nca2023.globalchange.gov/chapter/21/

NCA5 NORTHEAST CHAPTER

21.2: Examples of State and Local Responses to Extreme Weather

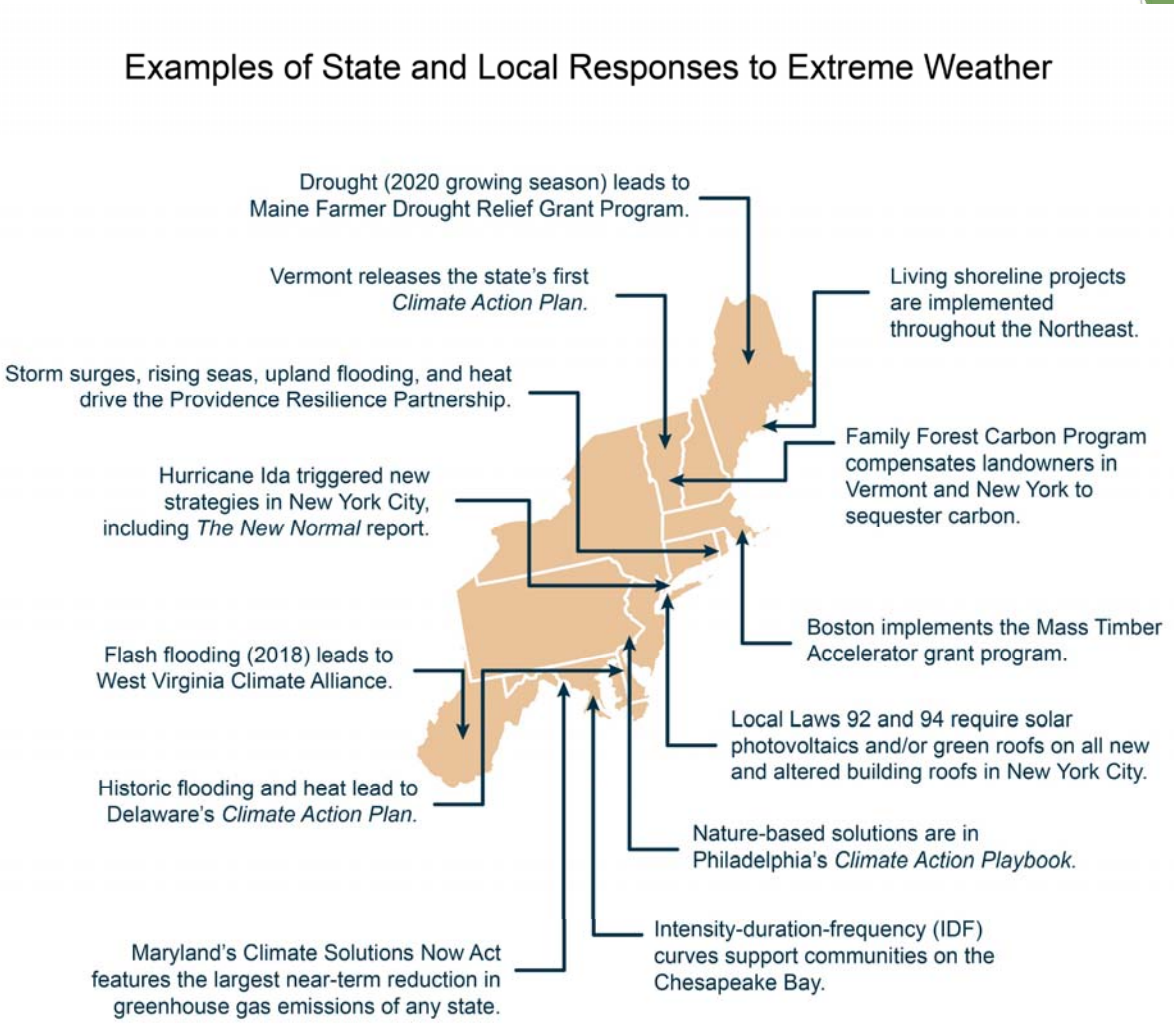
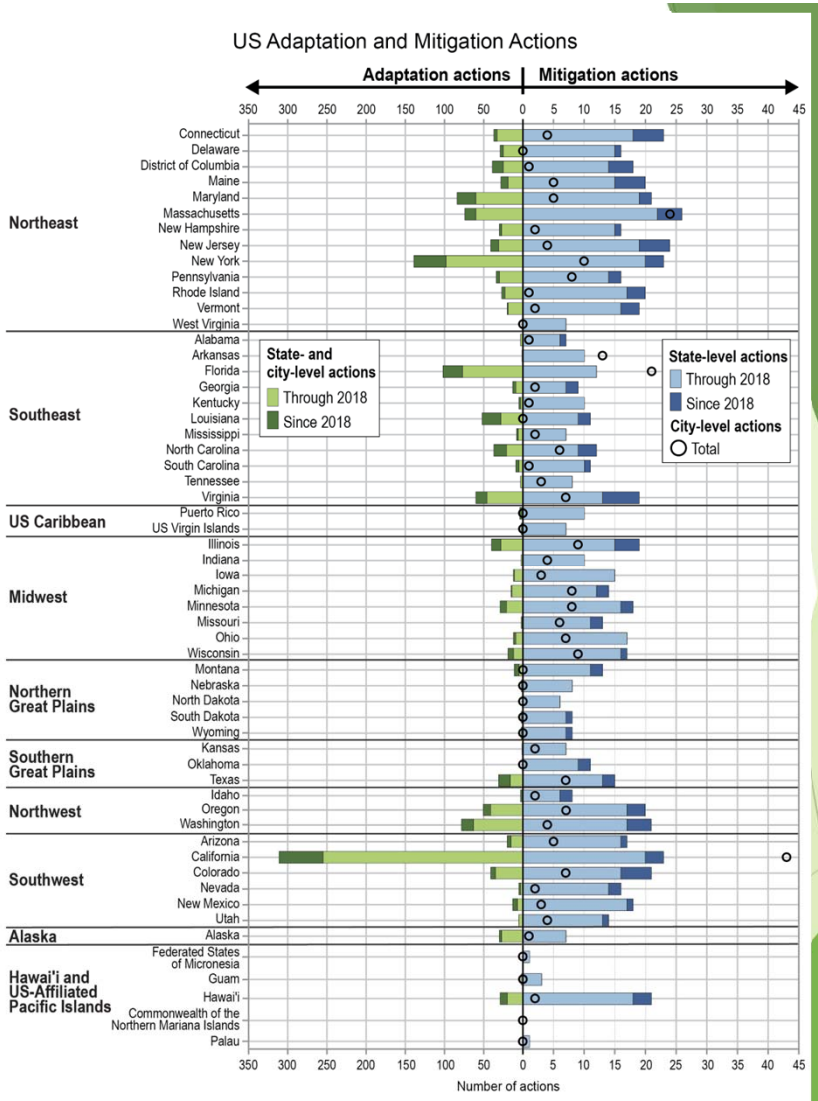
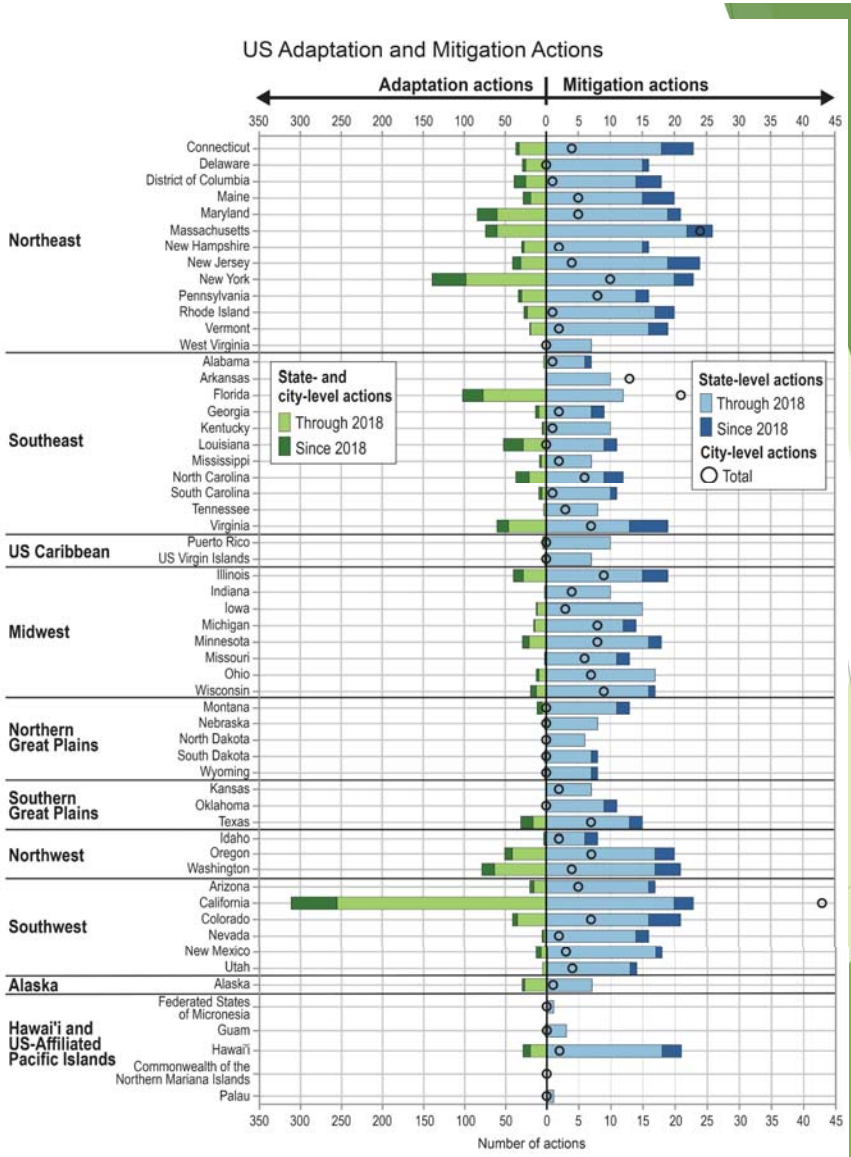


Figure 1.3. Cities and states are acting on climate change, with a substantial increase in new activities underway since 2018.



US Adaptation and Mitigation Actions

- FIGURE 1_3
- Caption: Since 2018, city- and state-level adaptation plans and actions (green bars, left) increased by 32%, complemented by a 14% increase in the total number of new state-level mitigation activities (blue bars, right; 69% have updated their policies). In 2021 there were 271 city-level mitigation actions in place (open circles, right), according to the Global Climate Action Tracker. Renewable energy and energy efficiency projects on Tribal lands have also expanded (not shown). {16.4, 31.1, 32.5; Table 1.1} Figure credit: US Army Corps of Engineers, EPA, Pennsylvania State University, NOAA NCEI, and CISESS-NC.



What is new in NCA5?

- Increased understanding of observed and projected climate change
- Economics + Social Systems and Justice
- Environmental justice and equity as cross-cuts
- Local and state climate mitigation and adaptation
- The Arts
- Increased public engagement
- NCA Atlas

Art in NCA5 - from STEM TO STEAM

NCA 5 NCA Interactive Atlas Home About the Atlas Data Access

https://atlas.globalchange.gov/

ATLAS

of the 5th National Climate Assessment

To help Americans anticipate how changing climate conditions might affect their homes and businesses, the United States Global Change Research Program conducts a comprehensive review of scientific information on climate trends and impacts in our country every four years. The 5th National Climate Assessment – often referred to as NCA5 – was published in 2023.

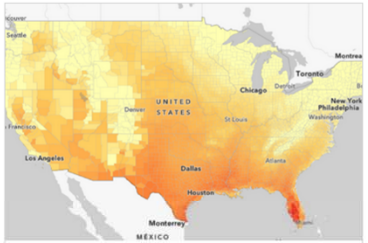
This site taps into the power of maps and stories to share information from NCA5.

NCA 5 NCA Interactive Atlas Home About the Atlas Data Access

NCA5 Atlas Global Warming Level 1.5 deg C

This layer provides county summaries from the 5th Natio...

Access Data



NCA5 Atlas Global Warming Level 2 deg C

This layer provides county summaries from the 5th Natio...

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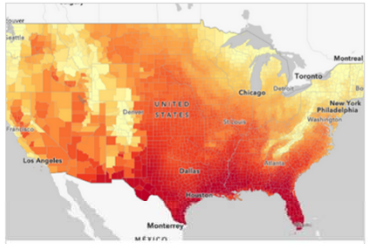
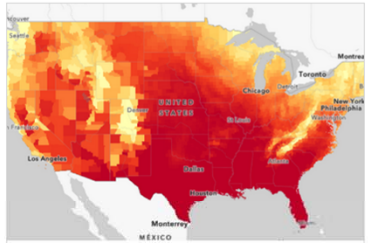


NCA5 Atlas Global Warming Level 3 deg C

This layer provides county summaries from the 5th Natio...

Access Data



NCA5 Atlas Global Warming Level 4 deg C

This layer provides county summaries from the 5th Natio...

Access Data

https://atlas.globalchange.gov/

Change in the Number of Days with Freezing	Days per year when the lowest temperature dips below freezing	Temp Days Min 32 F
Change in the Number of Days below 0°F	Days per year when the lowest temperature drops well below freezing	Temp Days Min 0 F
Change in Annual Precipitation	Cumulative total precipitation over a full year	Precip Annual
Change in Extreme Precipitation Amounts	Total precipitation that arrives on days in the top 1% of historical precipitation totals	Precip Above 99th pctl
Change in Days with Extreme Precipitation	Days per year with precipitation in the top 1% of historical rainfall events	Precip Days 99 pctl
Change in Precipitation on the Wettest Day of the Year	Highest daily precipitation total of the year	Precip 1-day max
Change in the Wettest Day in 5 Years	Highest daily precipitation total over five years	Precip 5-year max

Purpose of the NCA Interactive Atlas

The NCA Interactive Atlas provides digital access to downscaled climate projections maps used in the Fifth U.S. National Climate Assessment (NCA5). The Atlas is an extension of NCA5, offering interactive maps that show projections of future conditions in the United States.

NCA5 is a static report of limited length, and sample maps were presented within each chapter. With the NCA Interactive Atlas, users can access and explore climate data for locations across the United States, even if those data were not explicitly presented in NCA5.

The NCA Interactive Atlas also includes features to help users interpret and compare maps. Click an area of interest on any map to see a plain-language summary of what the map is showing, or select the swipe feature to compare projected conditions at various levels of global warming.

HEALTH

Climate change exacerbates existing health challenges and creates new ones

Climate change is already harming human health across the US, and impacts are expected to worsen with continued warming. Climate change harms individuals and communities by exposing them to a range of compounding health hazards, including the following:

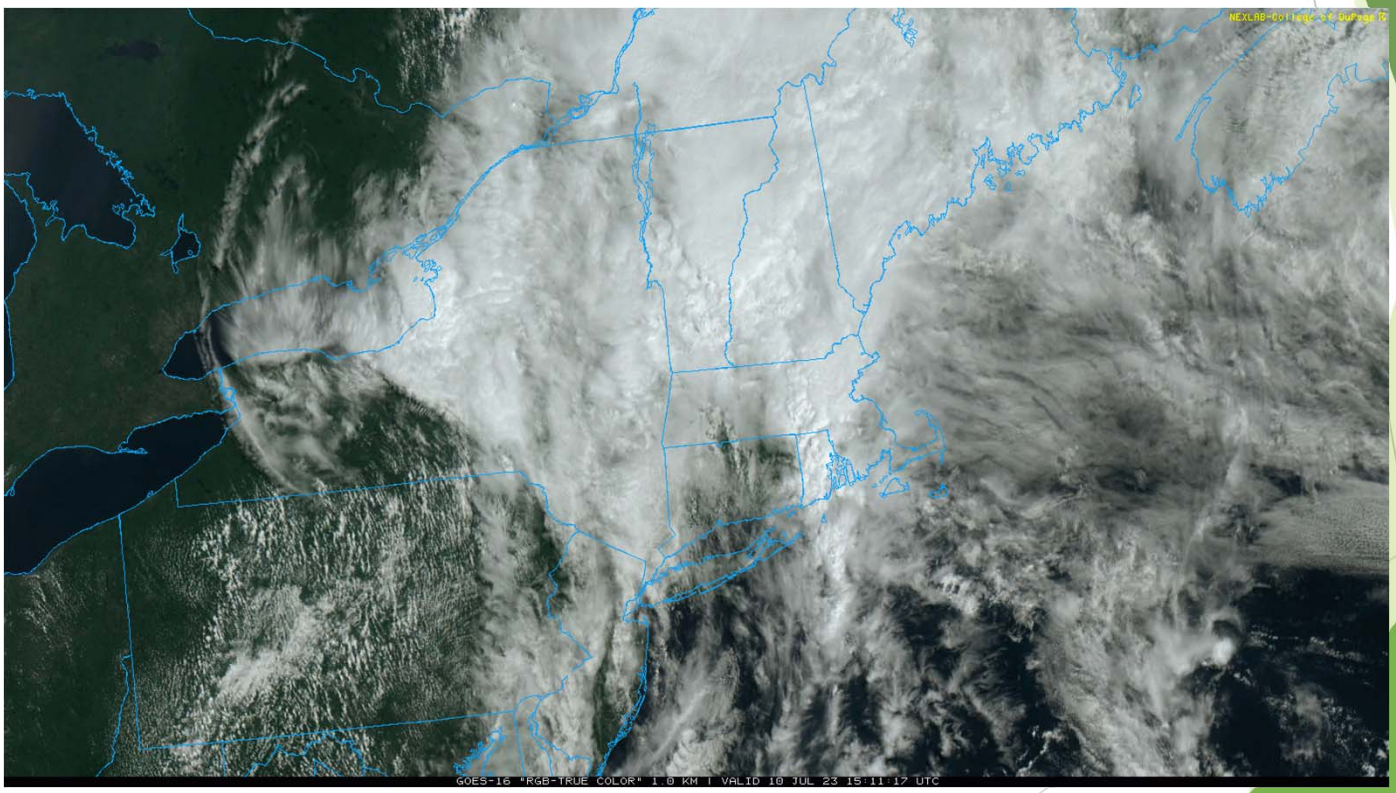
- More severe and frequent extreme events {2.2, 2.3, 15.1}
- Wider distribution of infectious and vector-borne pathogens {15.1, 26.1; Figure A4.16}
- Air quality worsened by smog, wildfire smoke, dust, and increased pollen {14.1, 14.2, 14.4, 23.1, 26.1}
- Threats to food and water security {11.2, 15.1}
- Mental and spiritual health stressors {15.1}

Box 1.3. Indigenous Ways of Life and Spiritual Health

Indigenous communities, whose ways of life, cultures, intergenerational continuity, and spiritual health are tied to nature and the environment, are experiencing disproportionate health impacts of climate change. Rising temperatures and intensifying extreme events are reducing biodiversity and shifting the ranges of culturally important species like Pacific salmon, wild rice, and moose, making it more difficult for Indigenous Peoples to fish, hunt, and gather traditional and subsistence resources within Tribal jurisdictions. Heatwaves can prevent Tribal members from participating in traditional ceremonies, while flooding, erosion, landslides, and wildfires increasingly disrupt or damage burial grounds and ceremonial sites. {16.1, 15.2, 27.6}

Indigenous Peoples are leading numerous actions in response to climate change, including planning and policy initiatives, youth movements, cross-community collaborative efforts, and the expansion of renewable energy (Figure 1.11). Many of these efforts involve planning processes that start with place-based Indigenous Knowledge of local climate and ecosystems. {16.3}

10 July 2023



KEY MESSAGE

5 Policies Can Reduce Greenhouse Gas Emissions and Improve Air Quality Simultaneously

Substantial reductions in economy-wide greenhouse gas emissions would result in improved air quality and significant public health benefits (*very likely*, *high confidence*). For many actions, these benefits exceed the cost of greenhouse gas emission controls (*likely*, *high confidence*). Through coordinated actions emphasizing reduced fossil fuel use, improved energy efficiency, and reductions in short-lived climate pollutants, the US has an opportunity to greatly improve air quality while substantially reducing its climate impact, approaching net-zero CO_2 emissions (*high confidence*).

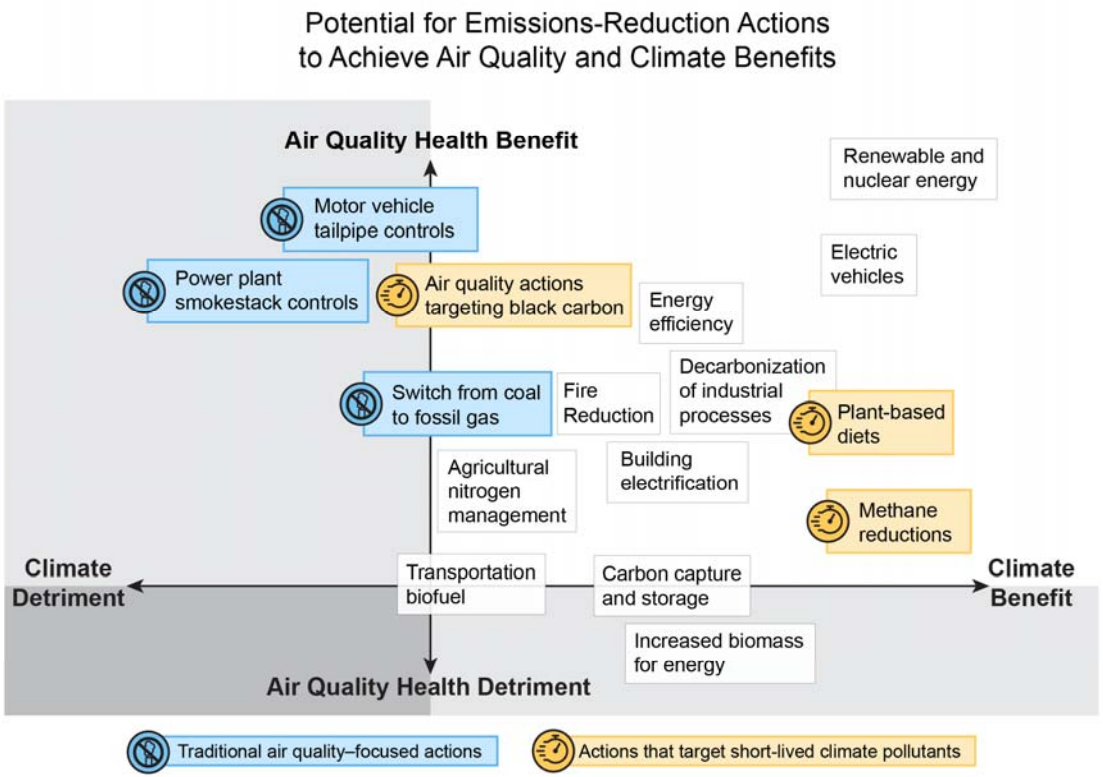


Figure 14.7. Many emissions-reduction actions can achieve multiple benefits for climate, air quality, and health.

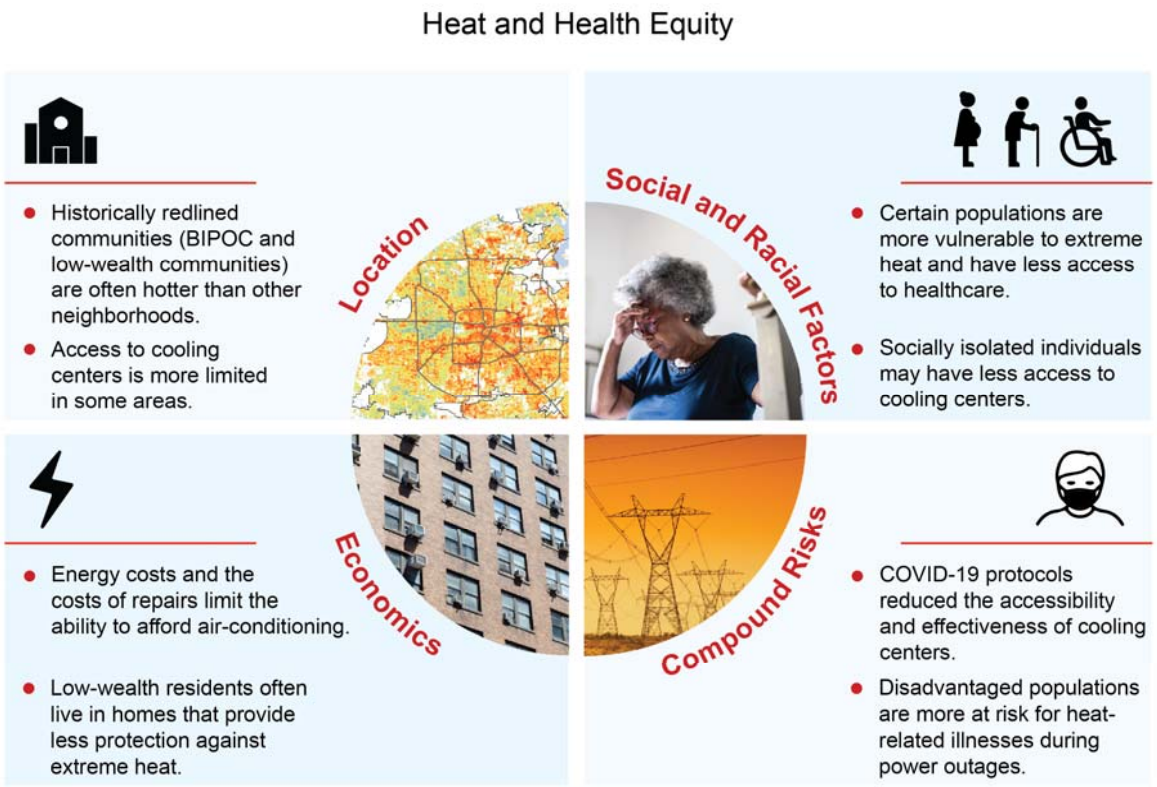


Figure 15.1. Heat does not impact all communities equally.

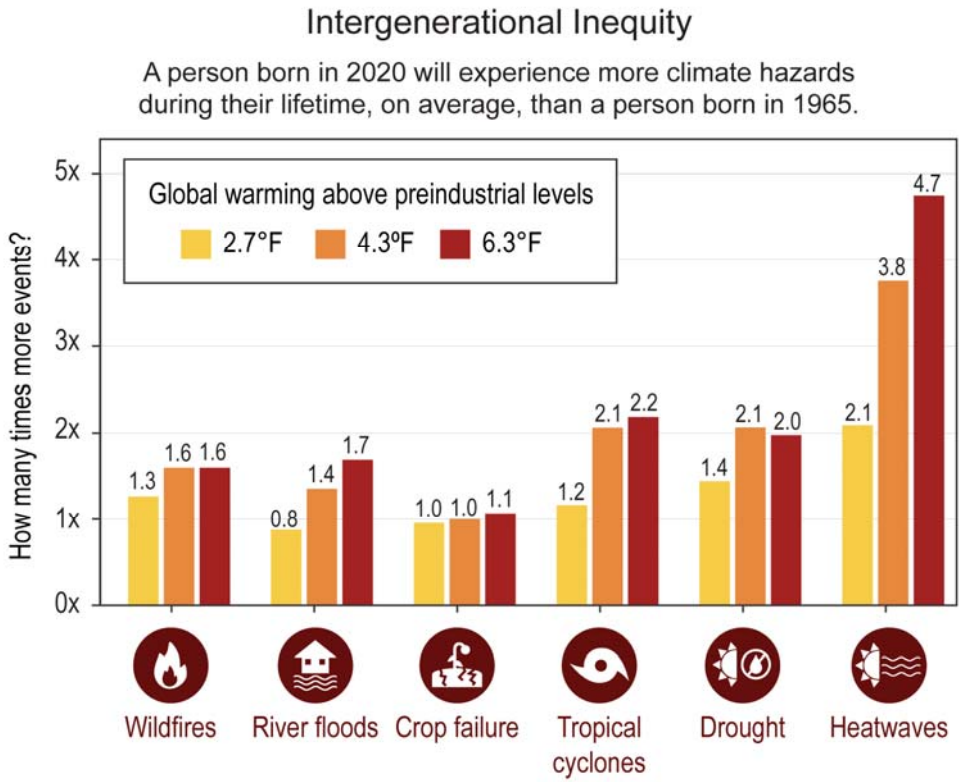
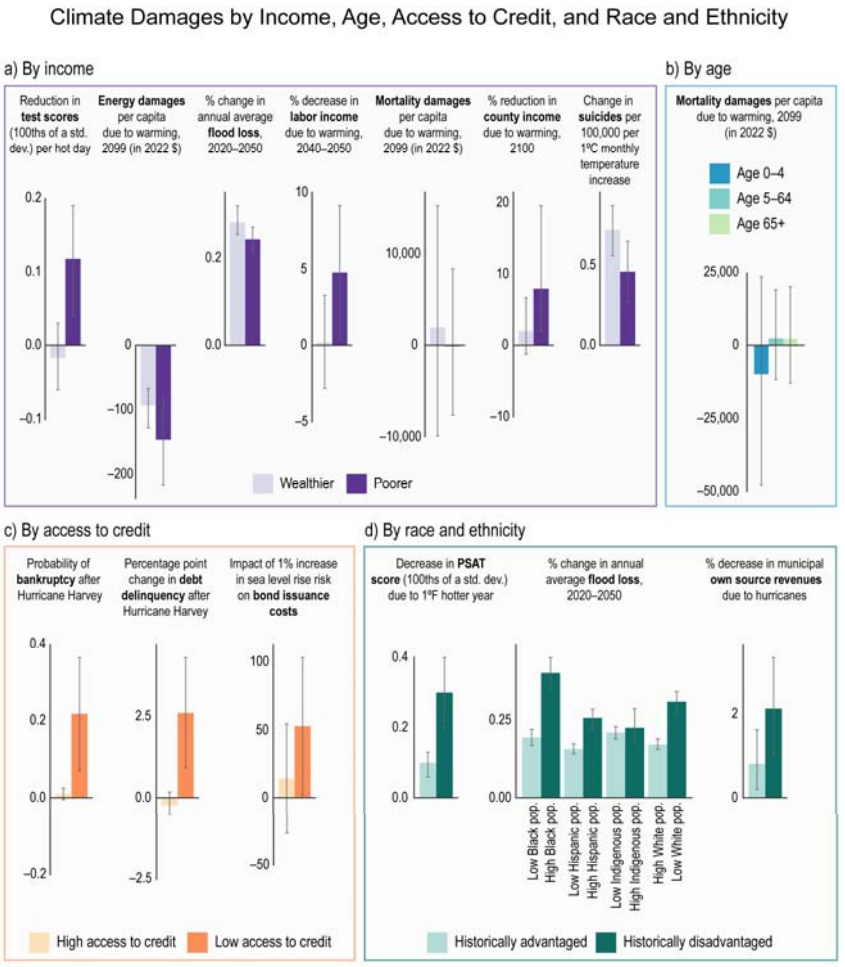


Figure 15.4. The number of climate hazards a person born in North America will experience during their lifetime depends on how much Earth warms above preindustrial levels.

ECONOMICS

Figure 19.2. The effects of weather and climate change are often experienced differently by populations according to income, age, access to credit, and race and ethnicity.



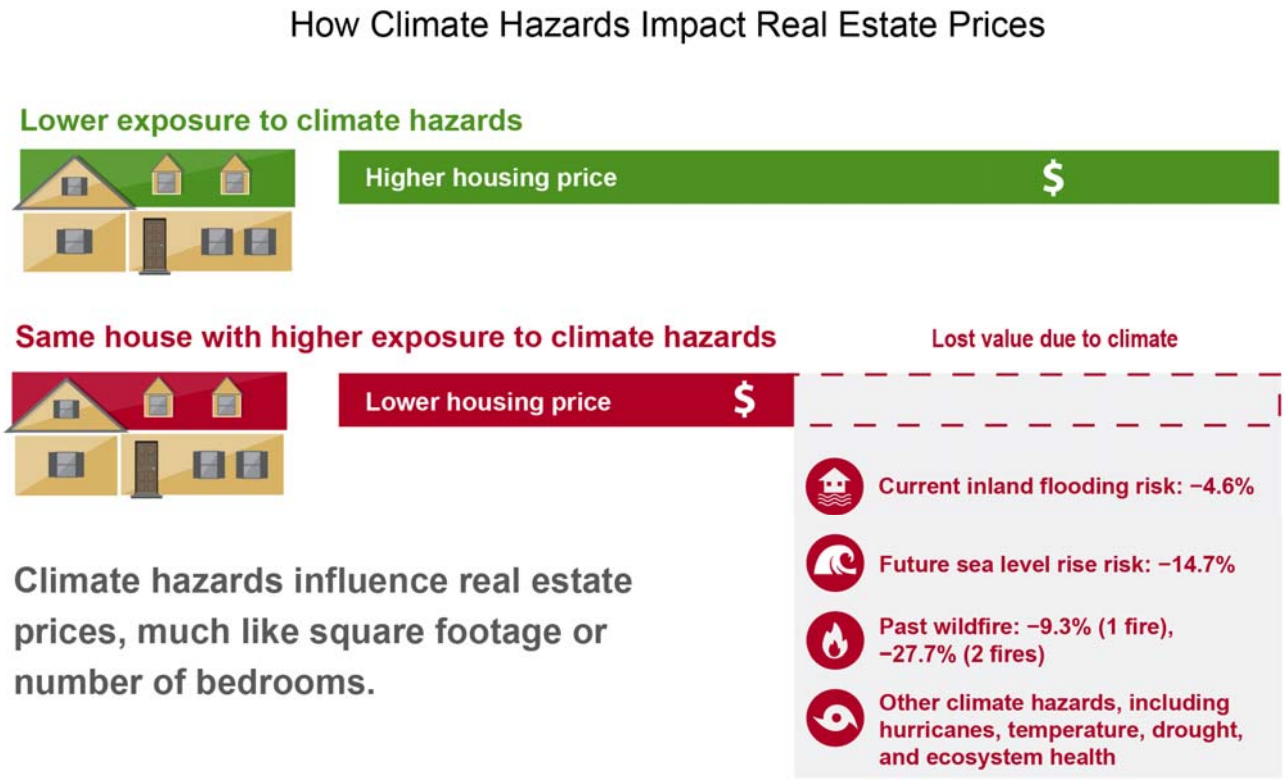


Figure 19.3. Exposure to climate hazards has a negative effect on real estate values.

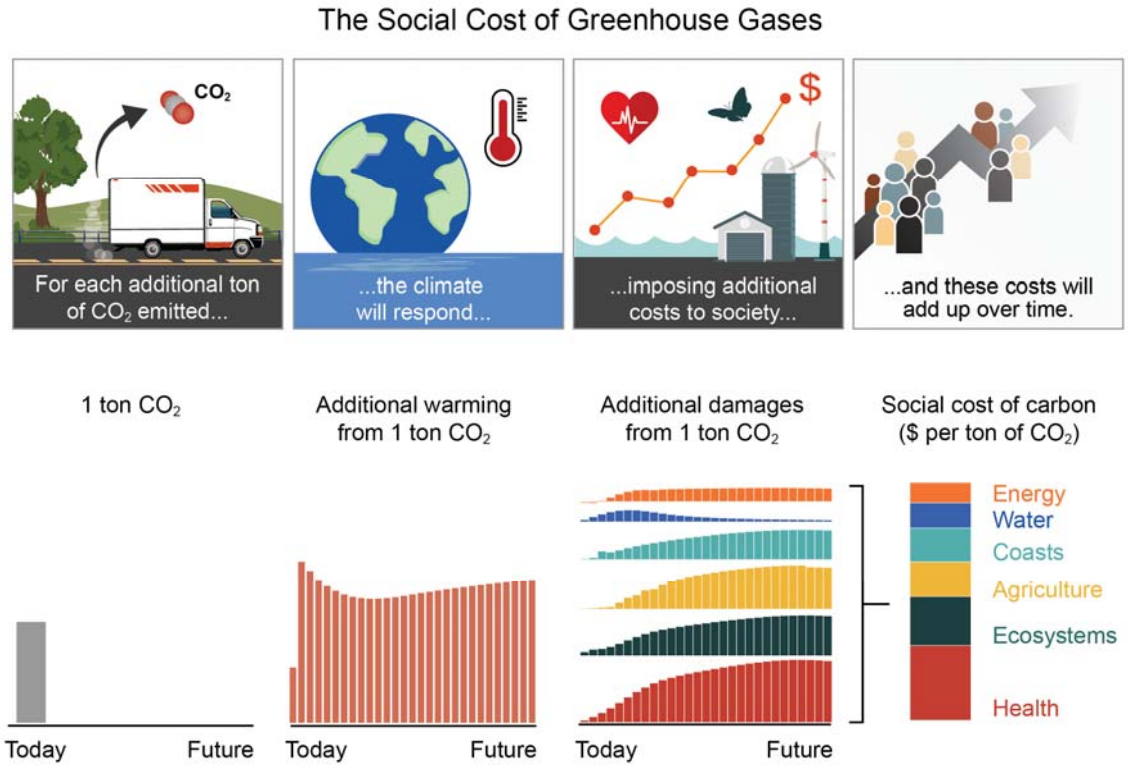


Figure 19.5. The social cost of greenhouse gases is a monetary estimate of the total economic impact of an additional greenhouse gas emission today.

Job opportunities are shifting due to climate change and climate action

Many US households are already feeling the economic impacts of climate change. Climate change is projected to impose a variety of new or higher costs on most households as healthcare, food, insurance, building, and repair costs become more expensive. Compounding climate stressors can increase segregation, income inequality, and reliance on social safety net programs. Quality of life is also threatened by climate change in ways that can be more difficult to quantify, such as increased crime and domestic violence, harm to mental health, reduced happiness, and fewer opportunities for outdoor recreation and play. {11.3, 19.1, 19.3}

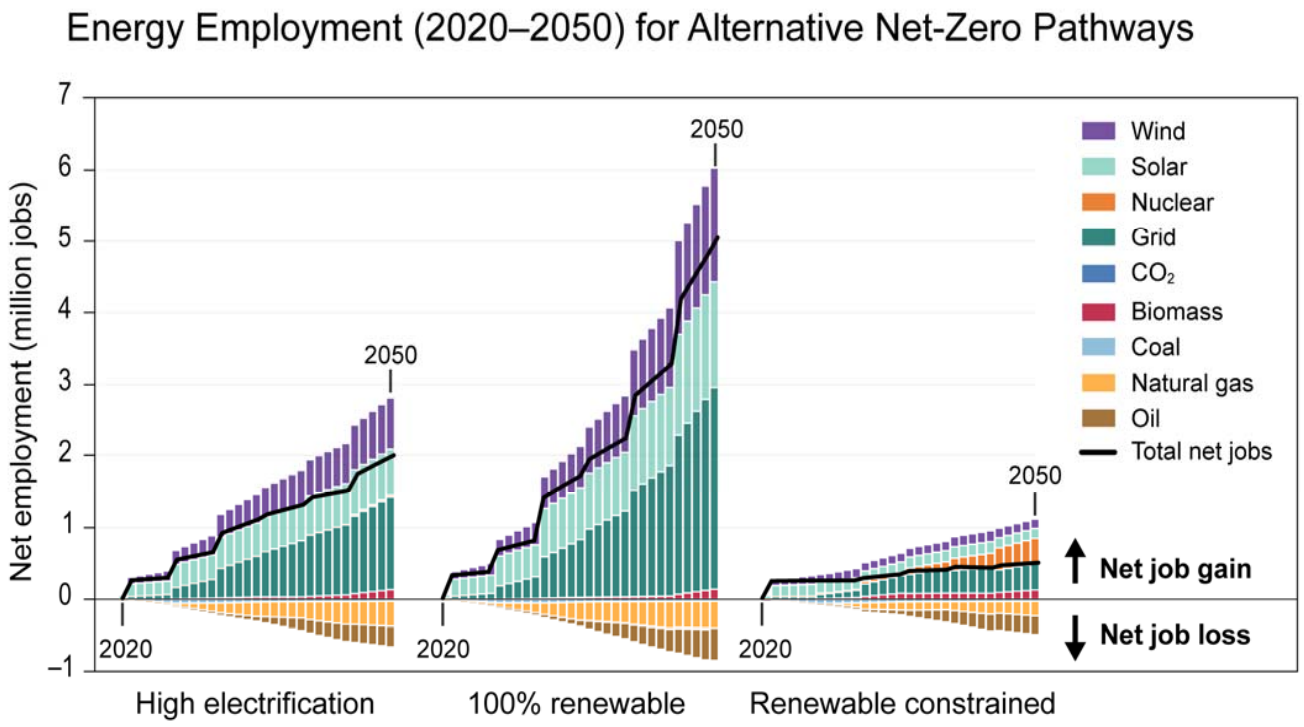


Figure 1.12. Employment gains in electrification and renewable energy industries are projected to far outpace job losses in fossil fuel industries.

Photo: L-A. Dupigny-Giroux

AGRICULTURE

KEY MESSAGE

3 Rural Communities Face Unique Challenges and Opportunities

Rural communities steward much of the Nation's land and natural resources, which provide food, bioproducts, and ecosystem services (*high confidence*). These crucial roles are at risk as climate change compounds existing stressors such as poverty, unemployment, and depopulation (*likely*, *medium confidence*). Opportunities exist for rural communities to increase their resilience to climate change and protect rural livelihoods (*high confidence*).

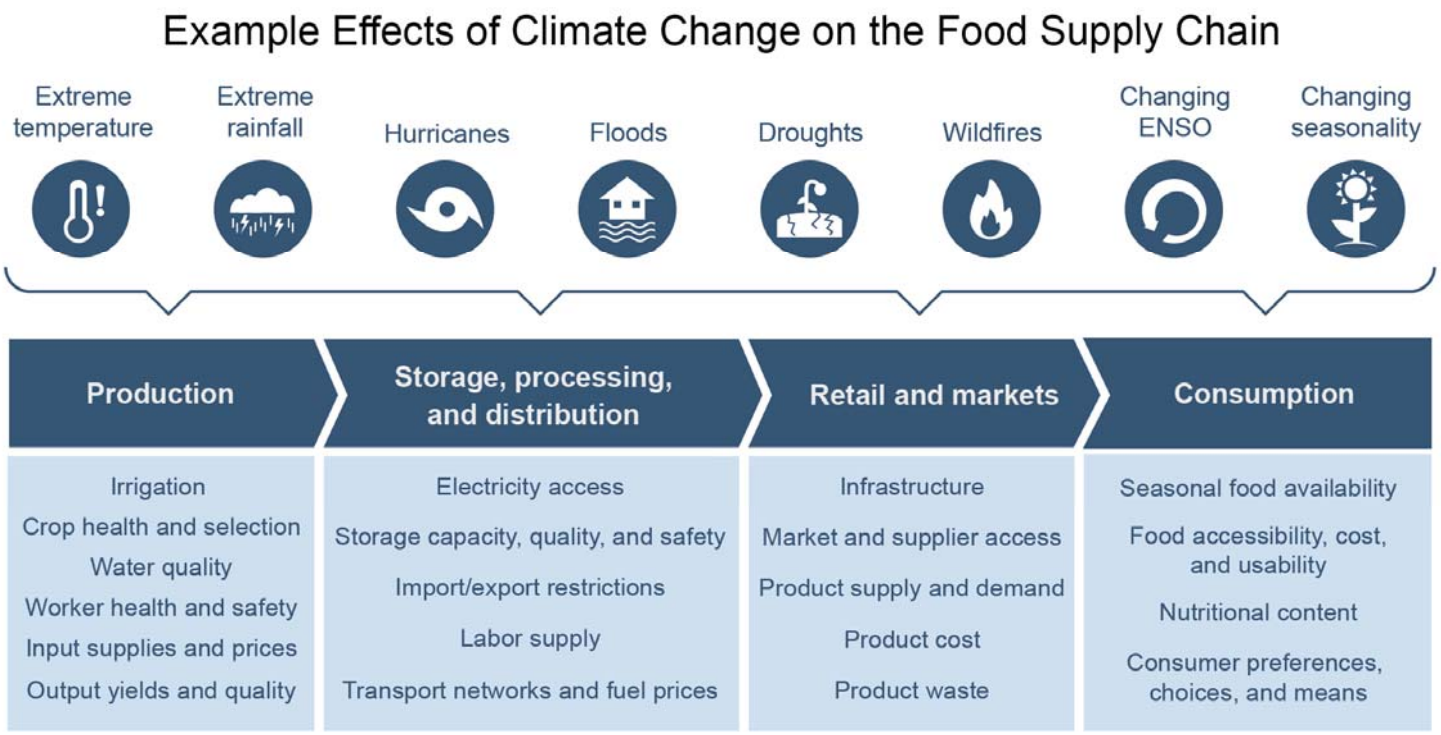


Figure 11.10. Climate change has cascading and compounding effects on all stages of the food supply chain.

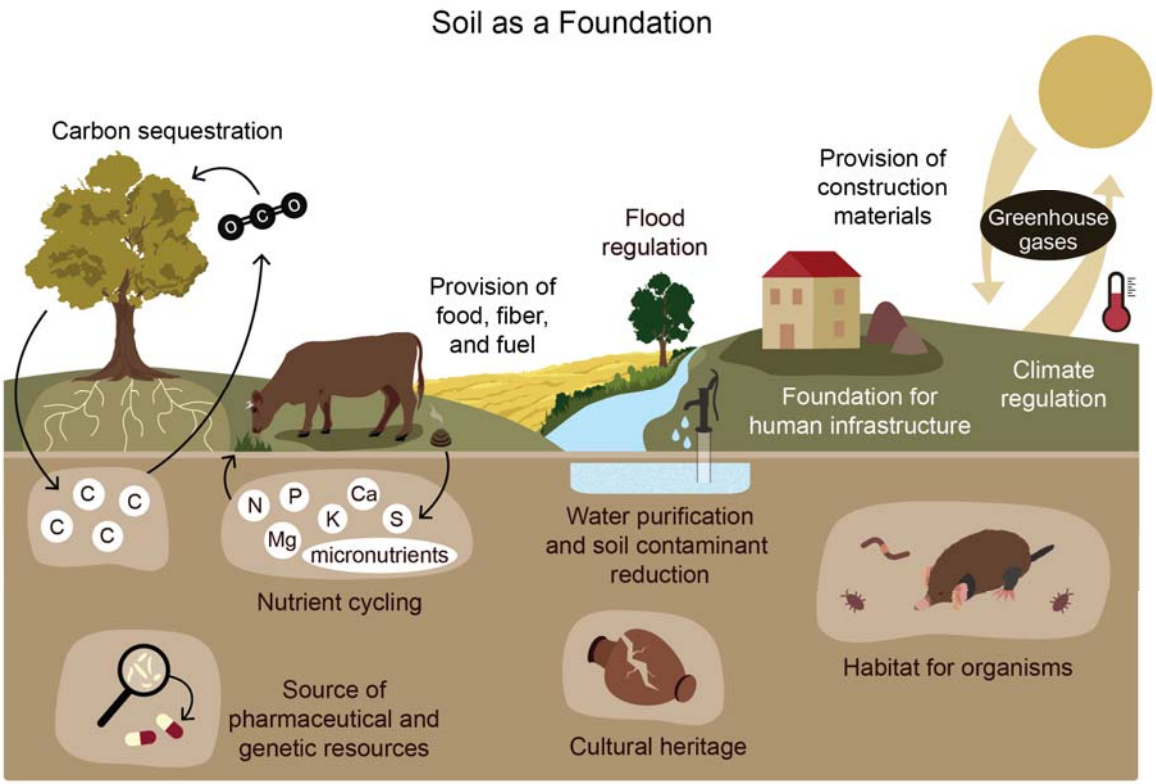
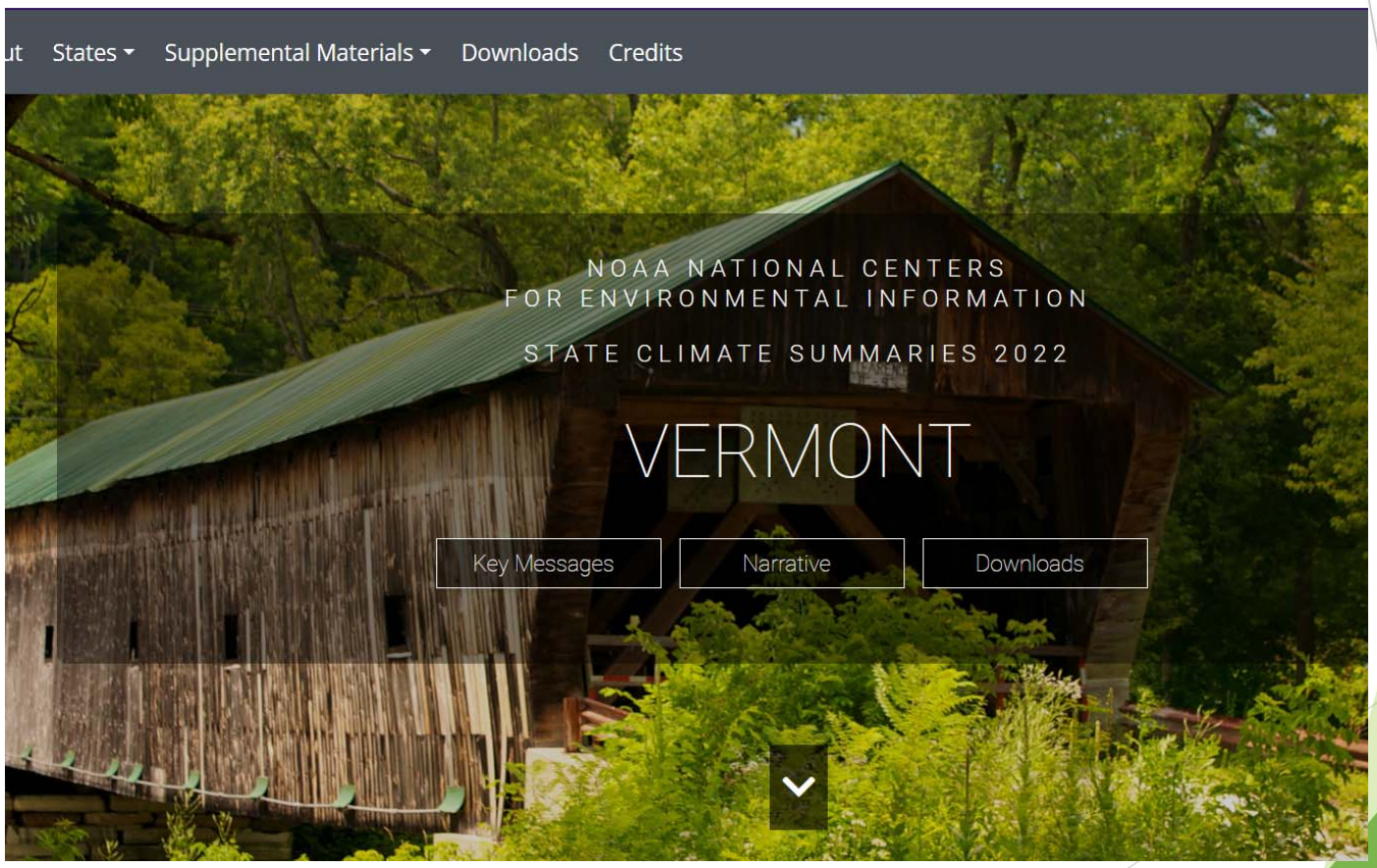


Figure 11.4. Healthy soil plays a foundational role in agriculture, ecosystems, society, and culture.

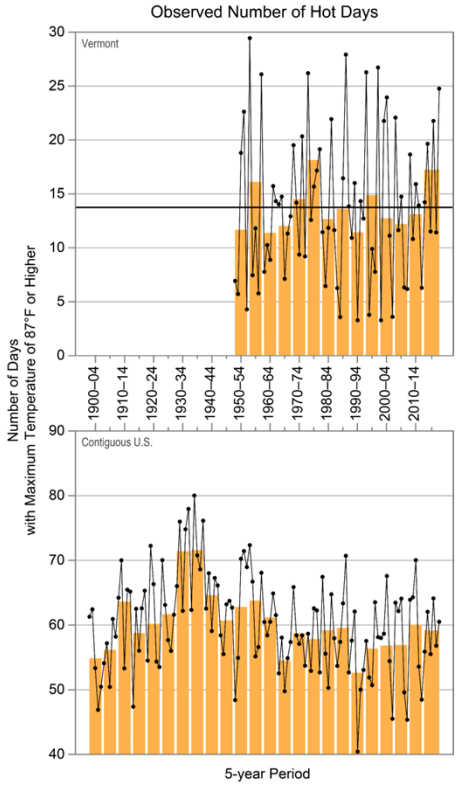
Products that complement the NCA

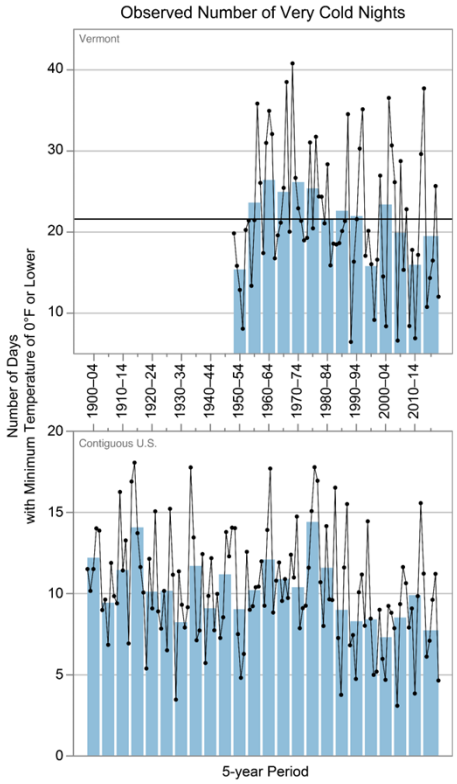
NOAA State Climate Summary for Vermont



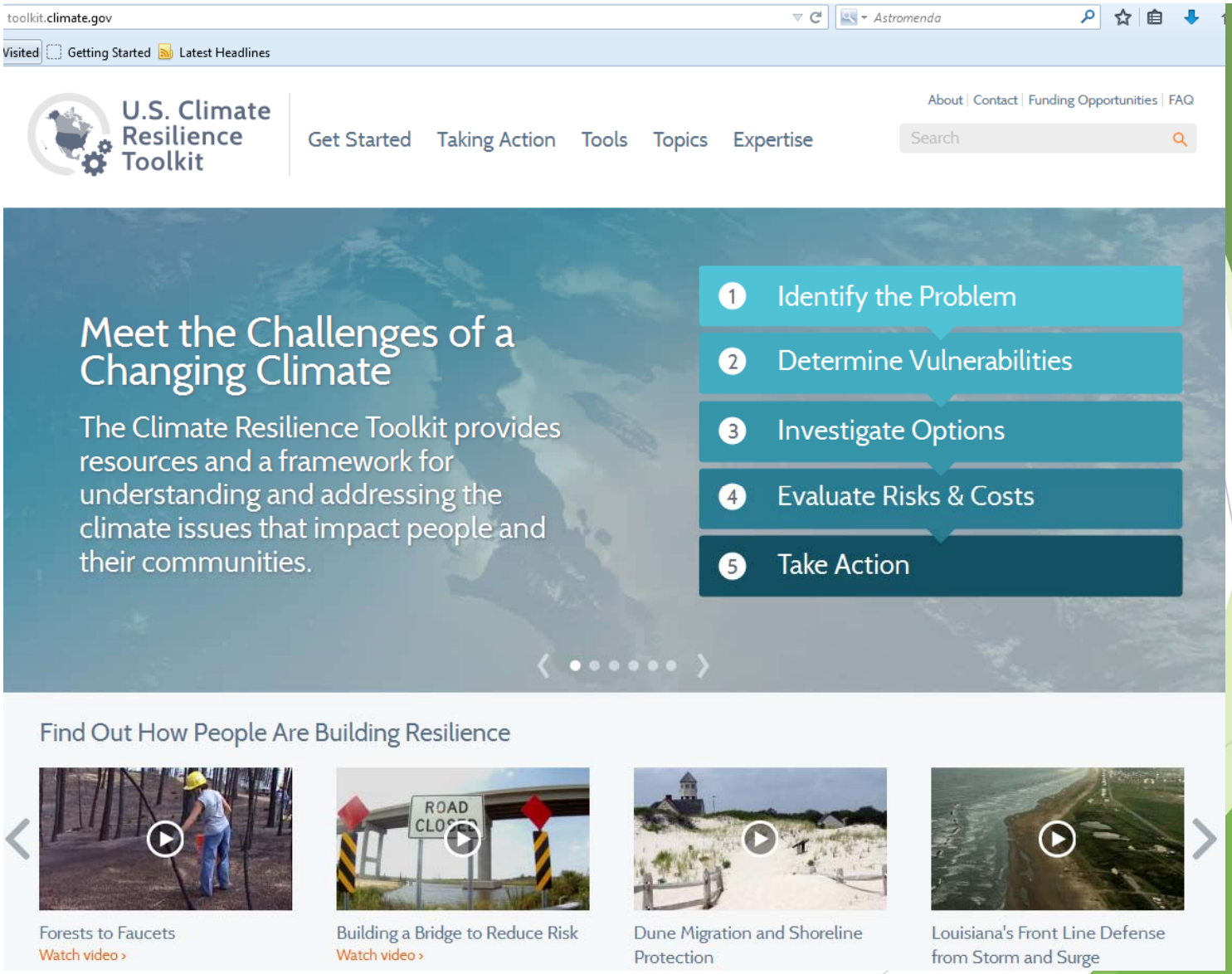
https://statesummaries.ncics.org/chapter/vt/

There is no trend in the number of hot days, while the number of very cold nights has been below average over the last 16 years (2005–2020). Sources: CISESS and NOAA NCEI. Data: (a, b) GHCN-Daily from 6 (VT) and 655 (CONUS) long-term stations; (c, d) nClimDiv; (e) GHCN-Daily from 11 (VT) and 832 (CONUS) long-term stations.





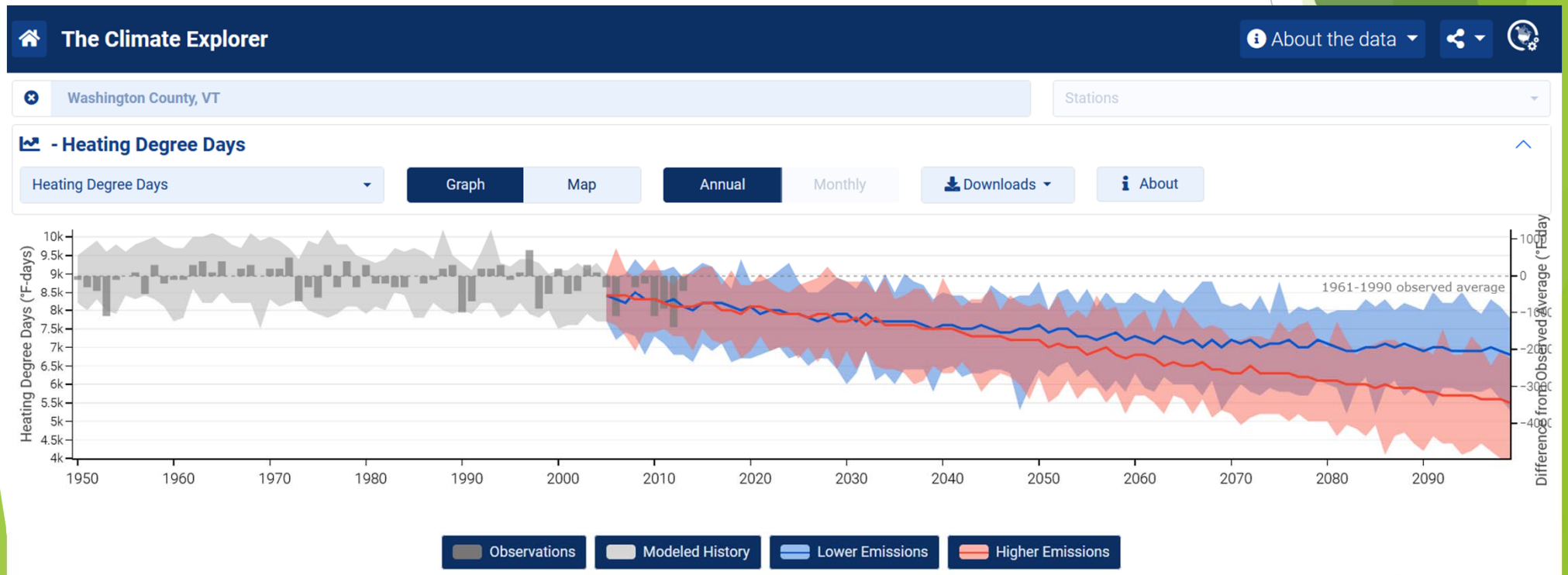
https://statesummaries.ncics.org/chapter/vt/



https://toolkit.climate.gov/reports/vermont-climate-action-plan

Climate change for Waterbury, Washington County

Heating degree days (HDDs) are a measure of how cold the temperature was on a given day or during a period of days.
https://www.eia.gov/energyexplained/units-and-calculators/degree-days.php



https://crt-climate-explorer.nemac.org/

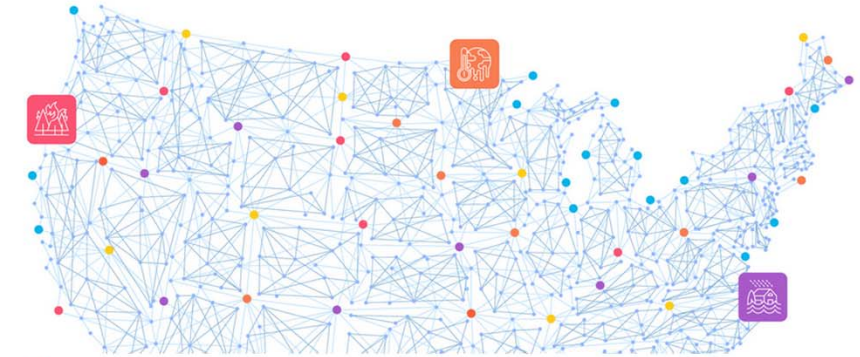
CMRA

https://resilience.climate.gov/

Knowing which climate-related hazards could harm the things you care about is the first step in building climate resilience.

Climate Mapping for Resilience & Adaptation

Get Started | Steps to Resilience

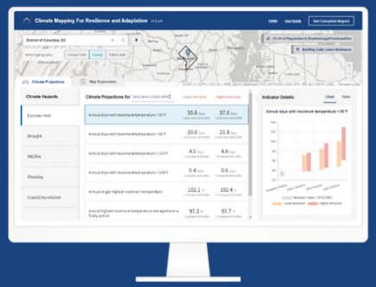


CMRA

CMRA Assessment Tool

Check how conditions related to common climate hazards are projected to change over the next several decades. Results can help you understand if people, property, and infrastructure could be exposed to climate-related hazards.

Launch the CMRA Assessment Tool | Explore the User Guide



Click the image to open CMRA Assessment Tool.

Leveraging & sharing the Vermont Climate Action Plan

Vermont Climate Action Plan

Published: December 2021

SHARE

TWEET

PRINT

The Vermont Climate Action Plan aims to dramatically reduce greenhouse gas emissions, help protect Vermont communities and landscapes from the greatest risks of climate change, and create new clean energy industry and jobs. The Climate Action Plan includes strategies to:

1. Reduce greenhouse gas emissions from the transportation, building, regulated utility, industrial, commercial, and agricultural sectors;
2. Encourage smart growth and related strategies;
3. Achieve long-term sequestration and storage of carbon and promote best management practices to achieve climate mitigation, adaption, and resilience on natural working lands;
4. Achieve net zero emissions by 2050 across all sectors;
5. Reduce energy burdens for rural and marginalized communities;
6. Limit the use of chemicals, substances, or products that contribute to climate change; and
7. Build and encourage climate adaptation and resilience of Vermont communities and natural systems.

https://outside.vermont.gov/agency/anr/climatecouncil/Shared%20Documents/Guiding%20Principles%20for%20a%20Just%20Transition%20-%20Final%20Approved%208.2021.pdf

Just Transitions subcommittee

GUIDING PRINCIPLES FOR A JUST TRANSITION

Vermont Climate Council, Just Transitions Subcommittee

August 2021

Table of Contents

What this looks like (in Vermont)

Equity-centered data/information/ways of knowing & visualizations

Land Use Land Cover – public/private, Nature-based solutions

Fairness to all living and non-living beings

Governance & planning – scale, barriers to resilience

Climate-resilient zones, human and species movements, access & equity

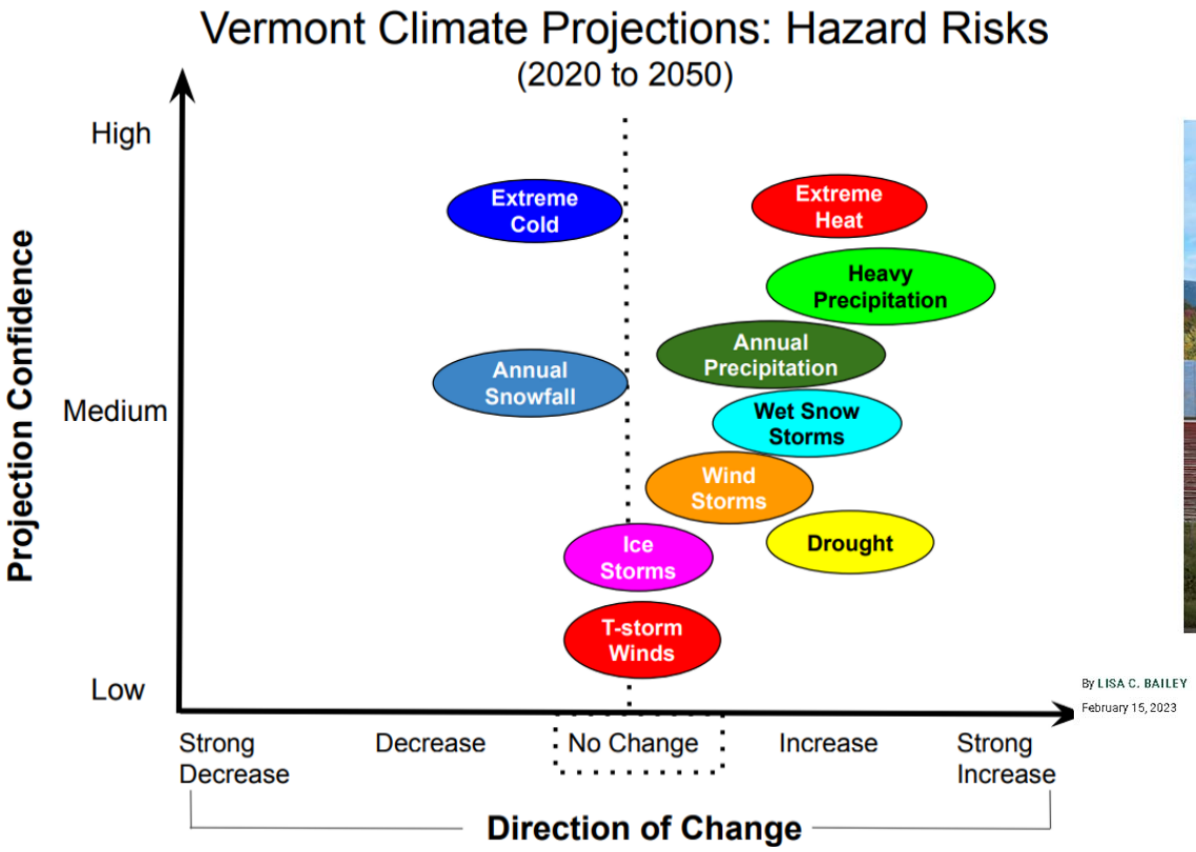
Future projections of changes in the statistics of: HDDs, CDDs, heat waves, seasonal precipitation metrics, air quality, growing season, thresholds (e.g., days >87°F), all natural hazards

Residential energy use, changes in amps, grid stability; human & environmental impacts

Identify existing data gaps, sources of uncertainty, potential system changes in the future

Adapted from L-A. L. Dupigny-Giroux slide for Vermont Climate Council – June 2021

Case Study – Underhill, Vermont (pop 3,129)



UVM Students Offer Real-World Climate Recommendations to Vermont Town

By LISA C. BAILEY
February 15, 2023

The town of Underhill, Vermont, is considering climate-change recommendations developed and presented by some intrepid University of Vermont (UVM) students. As part of an upper-level seminar in the

Thank you!

For more information contact:

Dr. Lesley-Ann L. Dupigny-Giroux

ldupigny@uvm.edu

802-656-2146

Information for presenters

- NCA5 Website: https://nca2023.globalchange.gov
- Chapter Website: https://nca2023.globalchange.gov/chapter/11 (AGRICULTURE)
- NCA5 Atlas: https://atlas.globalchange.gov
- Figure captions can be found in the slide notes of this deck
- Social media: @usgcrp, #NCA5

Chapter QR code