



NOAA

Climate Change Education with NOAA B-WET



Welcome to the session!

- 1) If you are having technical difficulties:
 - a) Try opening the Adobe Connect via the application (not the browser)
 - b) Join audio via telephone (dial in to the toll-free conference number: [1-866-663-4994](tel:1-866-663-4994),
[Access Code: 2728068](https://www.adobe.com/emea/online/online-meetings/faq.html))
- 2) Mute your speaker in Adobe Connect (click on the green microphone icon to make it grey)
- 3) This webinar will be recorded.
- 4) Slides are available to download in the “Files” pod in Adobe.
- 5) You will be muted for the presentation portion of the webinar. We will collect questions at the Padlet below and refer to this at a couple points throughout the presentation. During the live Q&A at the end of the session we will also give you the opportunity to raise your hand so we can unmute you to ask your questions.

Keep an eye out for responses to your submitted questions throughout the presentation!

Q&A PADLET:

<https://padlet.com/bronwenrice/gf9awa4fvw5n4r7y>

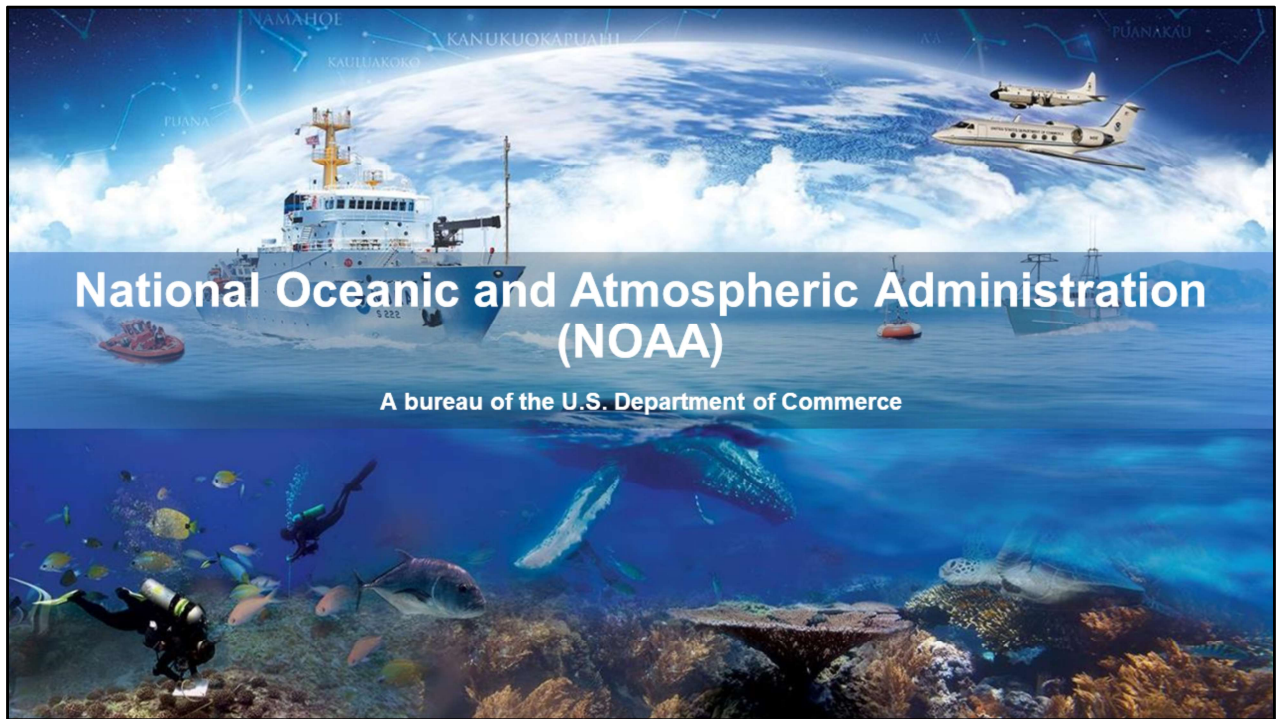




NOAA

Climate Change Education with NOAA B-WET

Frank Niepold, NOAA Climate Program Office
Seaberry Nachbar, California B-WET and NOAA
Office of Marine Sanctuaries



NOAA B-WET

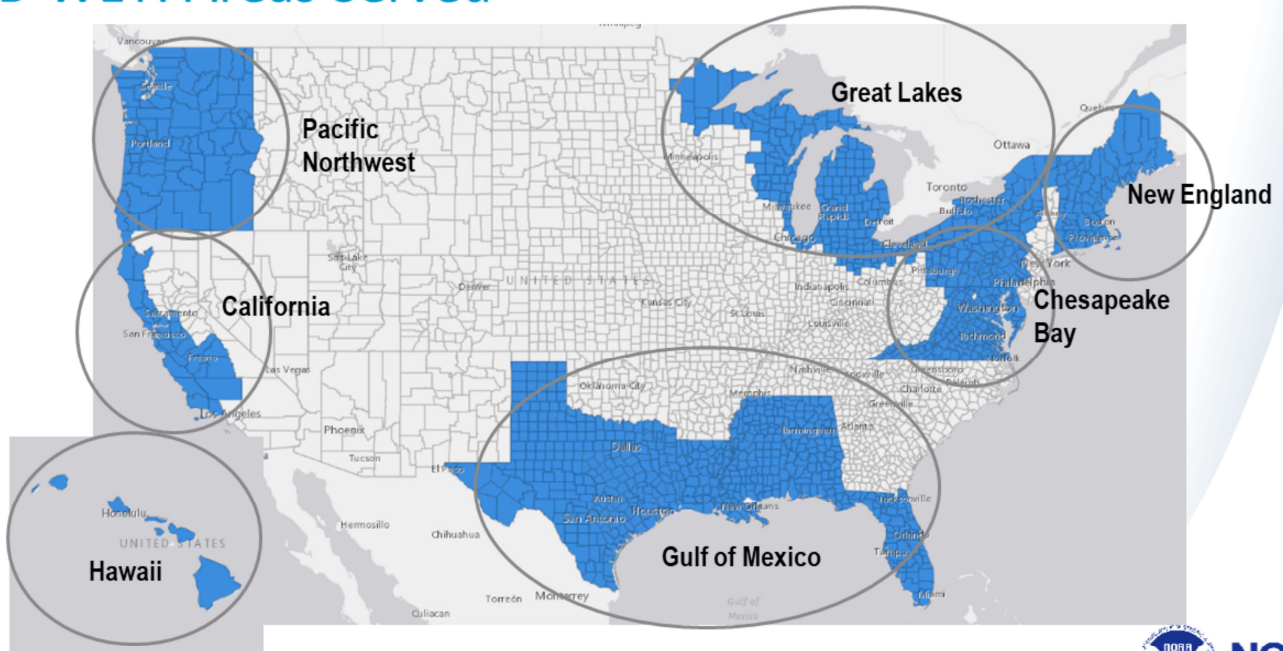
Bay Watershed Education and Training Program

The NOAA B-WET program supports Meaningful Watershed Educational Experiences (MWEEs) for students and related professional development through competitive grants.

noaa.gov/office-education/bwet



B-WET: Areas Served



Applying for B-WET

Always refer to the specific Notices of Funding Opportunity for complete details. (see [Grants.gov](https://www.grants.gov))

For more information on current competitions and resources for applicants please visit:

<https://www.noaa.gov/office-education/bwet/apply>

Upcoming informational webinar for California B-WET Opportunity:
January 13, 2022 at 2:00 PM Pacific Time.

Register here: <https://attendee.gotowebinar.com/register/3304028462275053327>

Upcoming informational webinars for the Hawaii B-WET Opportunity:

Thursday, January 13, 2022 from 2:00 to 3:00pm HST; and Tuesday, January 25, 2022 from 2:00 to 3:00pm HST. Sign up at this link: <https://forms.gle/ySLa994hGhS3YJ2MA>



Why Focus on Climate?

According to the 2021 Intergovernmental Panel on Climate Change report and most recent National Climate Assessment, communities in the U.S. are experiencing **growing challenges to human health and safety as a result of changes in climate.**

Education has the power to help students develop meaningful personal **connections** to climate **solutions**, a sense of **personal agency** and **empowerment**, and ultimately impact their **behaviors** and **decision-making** in relation to climate change.

Climate Education and MWEEs






<https://www.youtube.com/watch?v=F-ZUB2FbrV0&list=PLRa28NrZJAF7ztHBPbKscgRqxUhTX7sg8>


<https://www.noaa.gov/education/explainers/noaa-meaningful-watershed-educational-experience>





MWEE Resources

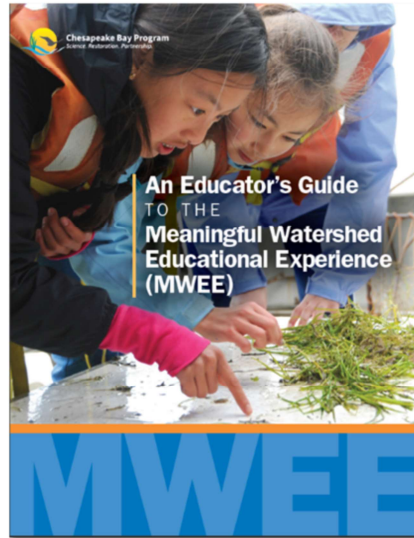
- <https://www.noaa.gov/office-education/bwet/resources/mwee-resources>
- <https://www.baybackpack.com/>

 Download the MWEE Guide

 Download the MWEE Evaluation Tool

 View the MWEE Online Courses

 Download the Facilitator's Guide





STEPS TO RESILIENCE

This framework helps you document climate hazards that could harm the things you care about, decide which situations you most want to avoid, and come up with workable solutions to reduce your climate-related risks.

- 1 Explore Hazards
- 2 Assess Vulnerability & Risk
- 3 Investigate Options
- 4 Prioritize & Plan
- 5 Take Action

How to specifically include it in teacher PD in ways that are easy for teachers at multiple grade levels to implement, within the framework of MWEE's?

Did you know?

Why should we care?

What can we do about it?

Engaging K-12

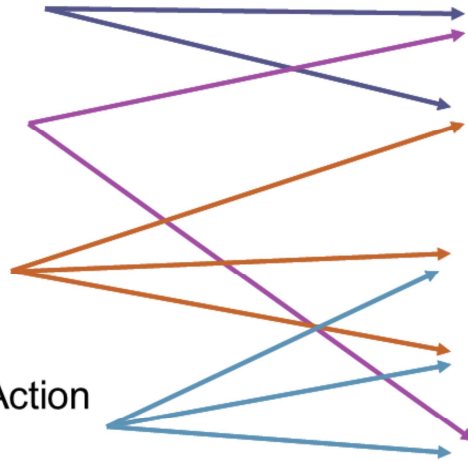
Youth can be an agent of change!

MWEE

- Issue Definition
- Outdoor Field Experiences
- Synthesis and Conclusions
- Environmental Action Projects

Steps to Resilience

- Explore Hazards
- Assess Vulnerability and Risk
- Investigate Options
- Prioritize and Plan
- Take Action



MWEE for Resilience to Accelerated Sea Level Rise and Flooding Risk

Students in the Pascagoula (MS) School District used climate tools to conduct classroom research on sea level rise, coastal issues and hazards, and climate change.

Students visited their local National Estuarine Research Reserve to conduct research and meet scientists to learn how NOAA and the state of Mississippi are working to understand and model changes in the ecosystem.

Projects culminated in presenting student-developed solutions to community leaders and resilience professionals.



Read the full story here:

<https://www.noaa.gov/education/stories/mississippi-students-tackle-sea-level-rise-using-noaa-digital-coast>

Related curriculum available here:

https://www.usm.edu/marine-education-center/classroom_course_in_community_resilience.pdf

Energy Efficiency to Mitigate Climate Change and Ocean Acidification (ECCOA)

ECCOA is a project-based science education program of the MERITO Foundation that provides NGSS aligned energy, climate and ocean literacy services and products to teachers and their students. It empowers students to address climate change by providing them with the tools to research, design, promote or implement Energy Efficiency, Water Conservation, or Waste Reduction models in their schools. Every year the MERITO Foundation conducts an [ECCOA Challenge Project](#) to reduce the carbon footprint of the student's school campus.



Proyecto de Energía by Crystal Castillo (R.J. Frank)

Crystal proposed to save energy at home by turning the lights off when not in use, and buying motion sensor switches for a couple of rooms in her house. By implementing energy-saving methods in her home, Crystal noticed a decrease of \$23 from January to February.

Cost of 4 Motion Sensor Switches + Installation: \$270

Climate kNOWledge: Student Research & Action to Reduce the Impacts of the Climate Emergency

This grant will develop and implement a district-wide climate change curriculum to engage every sixth grade Howard County Public School System (HCPSS) student and teacher in robust hands-on climate science.

- In-Depth Teacher Professional Development
 - Climate Science
 - Environmental Justice
 - Climate-related field investigations
 - Climate Action
- Piloting and testing the program with small cohorts of students and teachers. By year 3 system-wide implementation



Sixth-grade students make their way to the "Carbon Cafe" learning station at The Howard County Conservancy. (Jeffrey F. Bill/Baltimore Sun Media)
Learn more about this project through this [photo story](#).

NOAA's Environmental Literacy Program (ELP) Supports Community Resilience Education

Explore awards

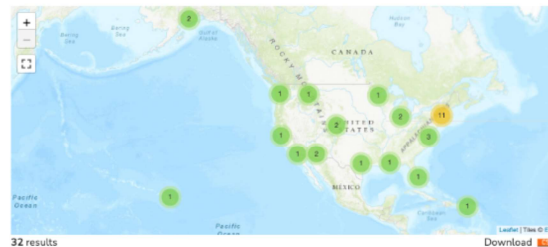
Use the filter menu and interactive map to explore the past competitions offered and grants awarded through the Environmental Literacy Program.

To learn more about project findings and outcomes, view the summaries of our grantees' summative evaluation reports.

Search

Enter keyword(s)

Search



- Filter by Reset Filters
- State +
 - Year +
 - Recipient +
 - Competition +
 - Status +

32 results

Download

<https://www.noaa.gov/office-education/elp/resilience-hub>

Questions

Q&A PADLET:

<https://padlet.com/bronwenrice/gf9awa4fvw5n4r7y>



Approaches and Resources for Climate Change Education

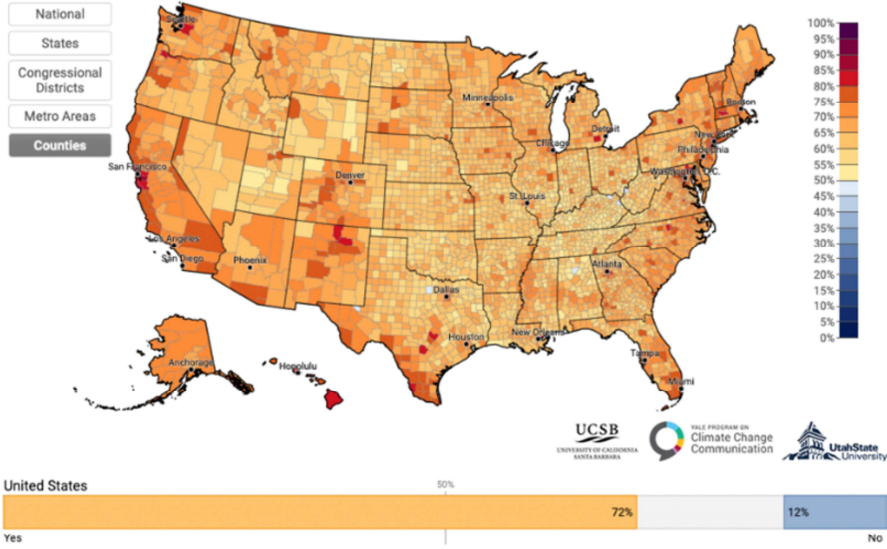






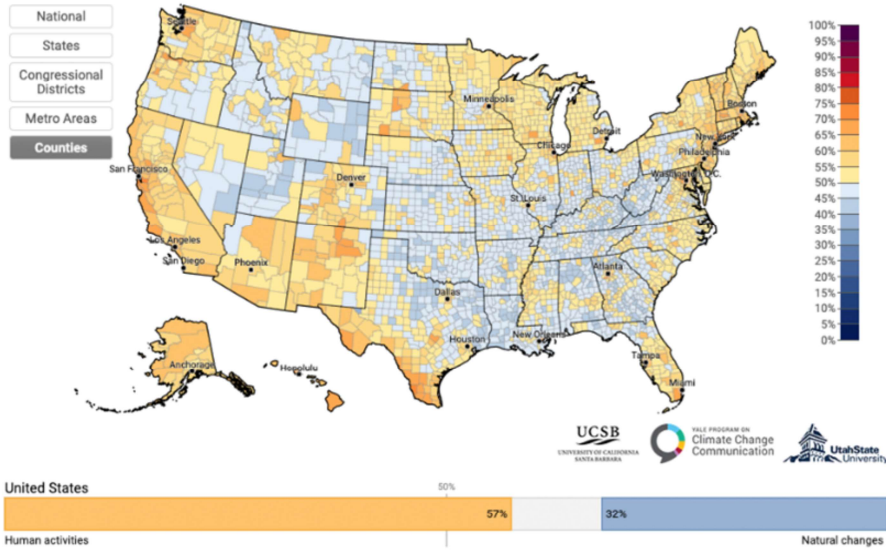
Estimated % of adults who think global warming is happening (72%), 2020

Select Question: Global warming is happening | Absolute Value
Click on map to select geography, or: Select a State | Select a County



Estimated % of adults who think global warming is mostly caused by human activities (57%), 2020

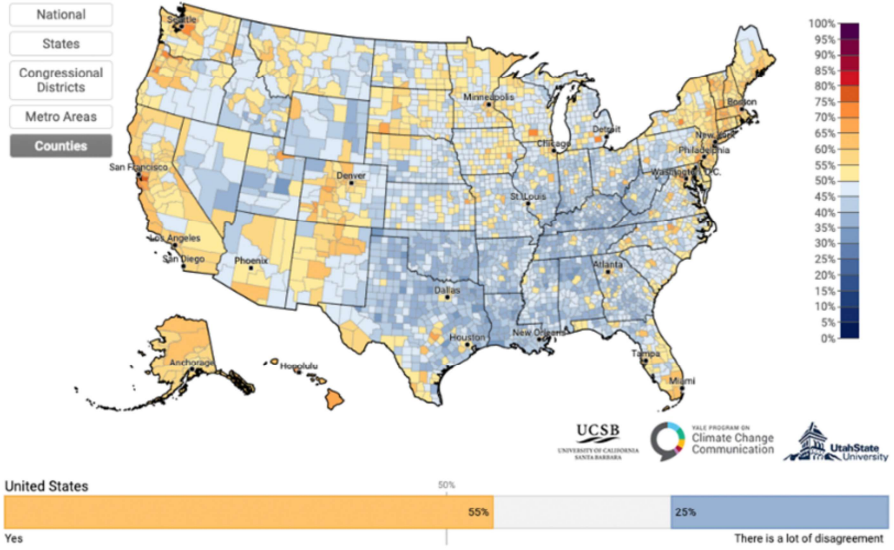
Select Question: Absolute Value
Click on map to select geography, or:



<https://climatecommunication.yale.edu/visualizations-data/ycom-us/>

Estimated % of adults who believe most scientists think global warming is happening (55%), 2020

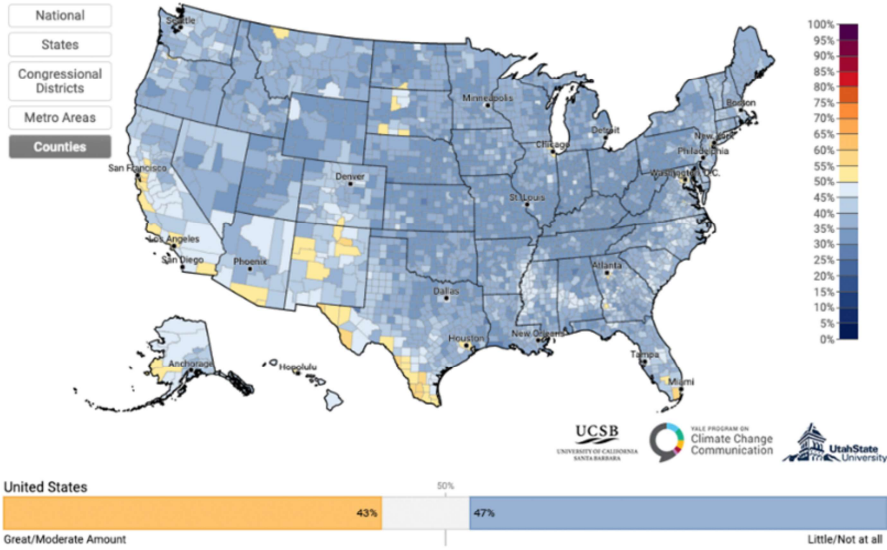
Select Question: Absolute Value
Click on map to select geography, or:



<https://climatecommunication.yale.edu/visualizations-data/ycom-us/>

Estimated % of adults who think global warming will harm them personally (43%), 2020

Select Question: Absolute Value
Click on map to select geography, or:

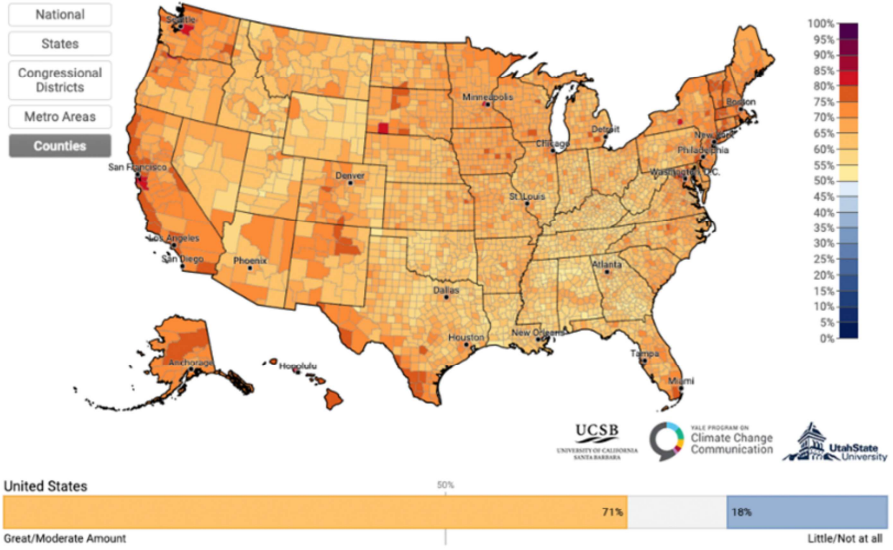


<https://climatecommunication.yale.edu/visualizations-data/ycom-us/>

Estimated % of adults who think global warming will harm future generations (71%), 2020

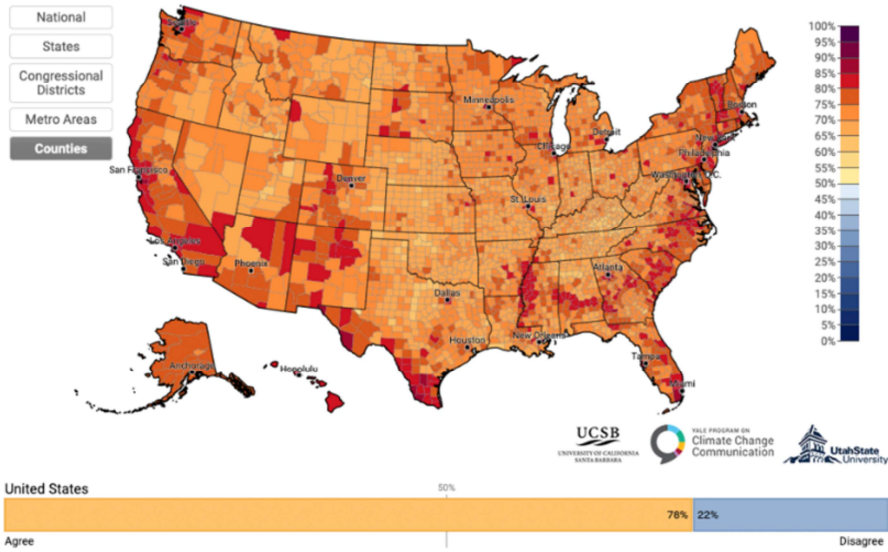
Select Question: Absolute Value

Click on map to select geography, or:



Estimated % of adults who believe schools should teach about the causes, consequences, and potential solutions to global warming (78%), 2019

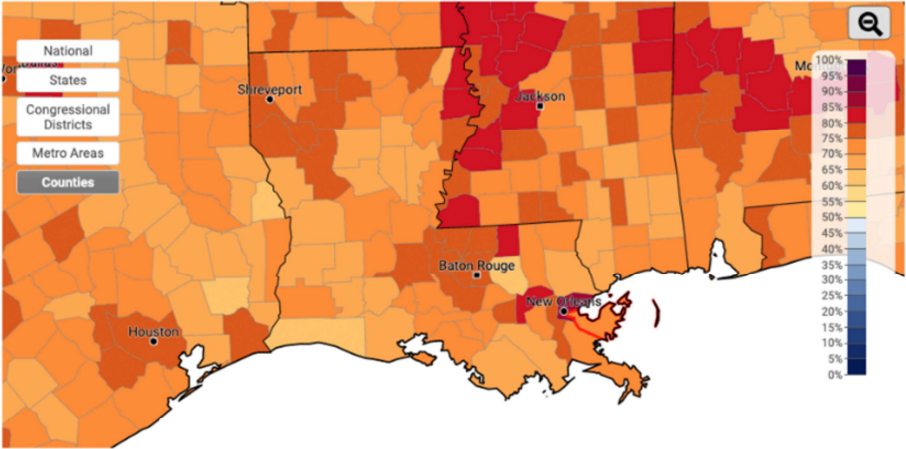
Select Question: Absolute Value
Click on map to select geography, or:



<https://climatecommunication.yale.edu/visualizations-data/ycom-us/>

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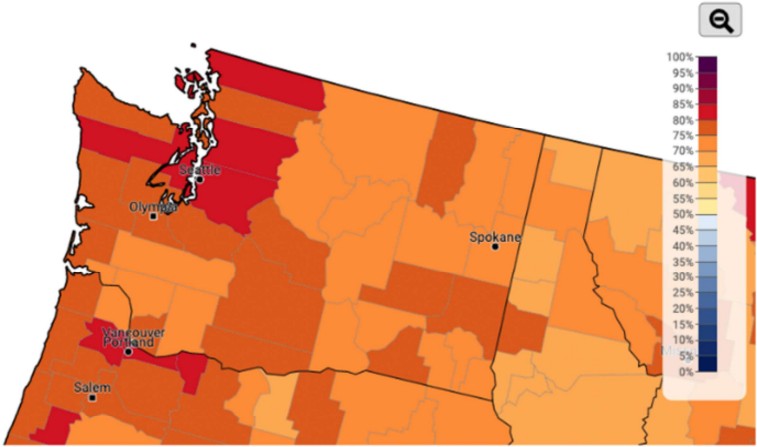
Select Question: Schools should teach about global warming Absolute Value
Click on map to select geography, or: Louisiana St. Bernard Parish, Louisiana Un-Select



Estimated % of adults who believe schools should teach about the causes, consequences, and potential solutions to global warming (78%), 2019

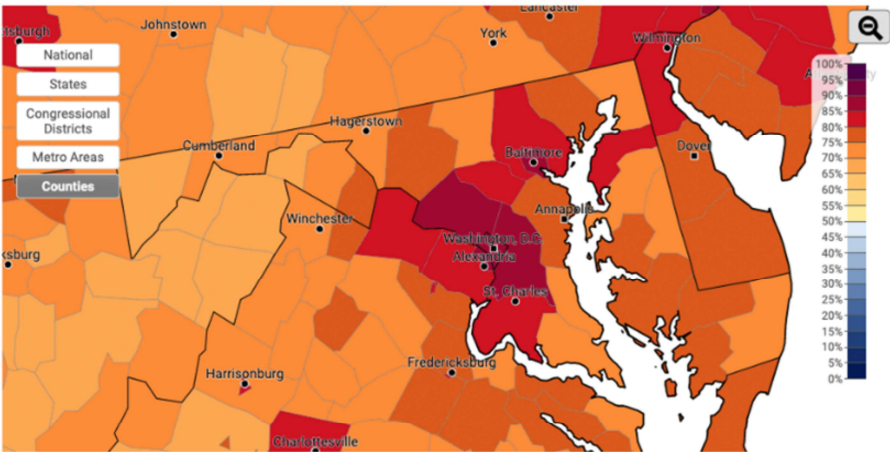
Select Question: Schools should teach about global warming Absolute Value
Click on map to select geography, or: Washington Select a County Un-Select

- National
- States
- Congressional Districts
- Metro Areas
- Counties**



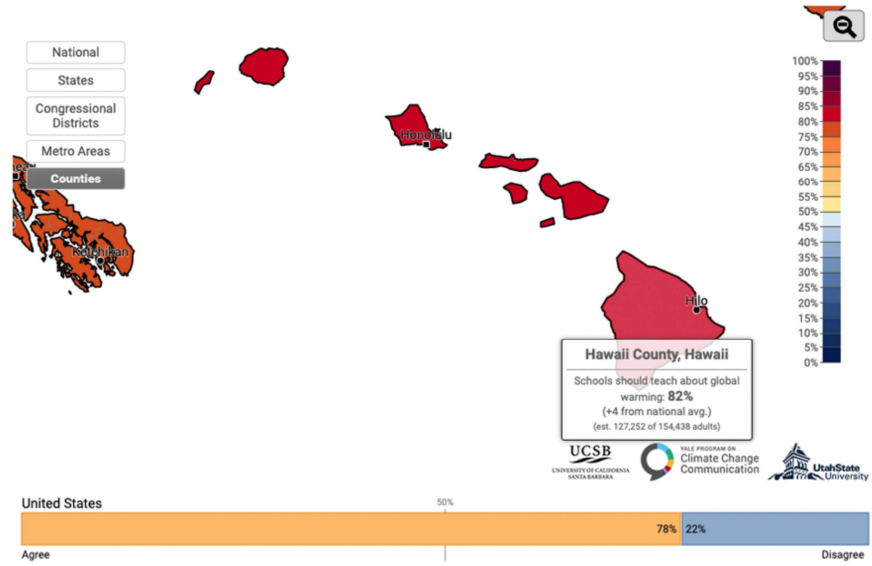
Estimated % of adults who believe schools should teach about the causes, consequences, and potential solutions to global warming (78%), 2019

Select Question: Schools should teach about global warming Absolute Value
Click on map to select geography, or: Maryland Select a County Un-Select



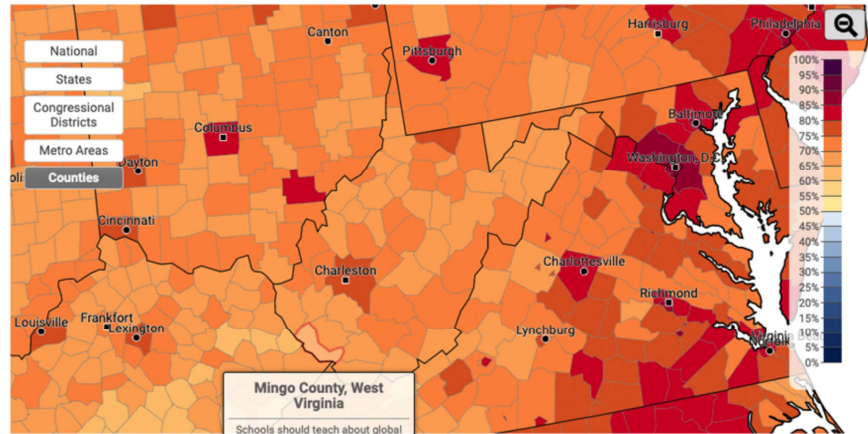
Estimated % of adults who believe schools should teach about the causes, consequences, and potential solutions to global warming (78%), 2019

Select Question: Schools should teach about global warming Absolute Value
 Click on map to select geography, or: Hawaii Select a County



Estimated % of adults who believe schools should teach about the causes, consequences, and potential solutions to global warming (78%), 2019

Select Question: Schools should teach about global warming | Absolute Value
Click on map to select geography, or: West Virginia | Select a County



UCSB UNIVERSITY OF CALIFORNIA SANTA BARBARA | YALE PROGRAM ON CLIMATE CHANGE COMMUNICATION | Utah State University



The Climate Change Education/Solutions Gap

Americans recognize that educators should teach climate change, with 78% supporting teaching climate change in school (Cheskis et al., 2018).

In spite of this support, an **education gap** exists, akin to the formidable 'emissions gap' between the aspirational goals of the Paris Climate Agreement or Project Drawdown and the real-world pledges and actions of signatory nations.



http://catalyst.greenschoolsnationalnetwork.org/gscatalyst/december_2018/MobilePagedArticle.action?articleId=1452362&app=false#articleId1452362

The Climate Change Education/Solutions Gap

This 'education gap' represents a gap between scientific and societal understanding; that is, addressing climate change effectively will require transfer and use of knowledge (i.e., education) to enable informed decision-making at all levels in society.

This education gap is magnified by a gap in hope when it comes to engagement on issues pertaining to climate change.



http://catalyst.greenschoolsnationalnetwork.org/gscatalyst/december_2018/MobilePagedArticle.action?articleId=1452362&app=false#articleId1452362

The Climate Challenge in our Communities

Low Priority

Few issues facing our society are more **urgent** than reducing our vulnerability to climate impacts and preparing for the **staggering** transitions to a low-carbon economy.

Making the Case

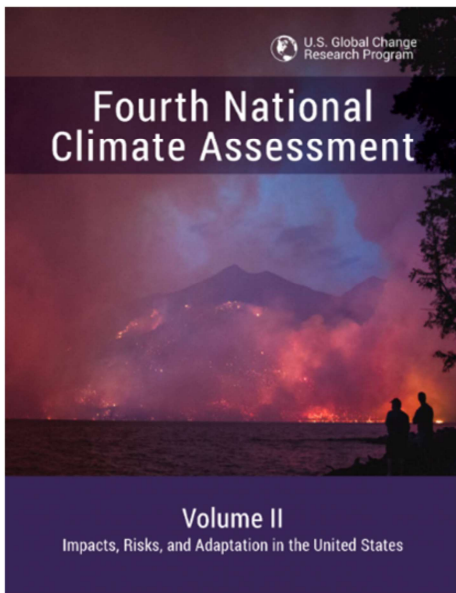
Making the case for climate action is one of the leading challenges that cities face in undertaking ambitious **urban** climate action. (C40 Benefits, 2015)

Possible Capabilities

U.S. city and state schools, higher education, and free choice learning institutions can **become better prepared or focused on building societal capacity and social will to support climate actions.**

<https://issuu.com/c40cities/docs/benefitsofclimateaction>

Fourth National Climate Assessment (NCA4 and NCA5)



The Fourth National Climate Assessment (NCA4), completed in November 2018, is a comprehensive and authoritative report on climate change and its impacts in the United States.

Development of the Fifth National Climate Assessment (NCA5) is currently underway, with anticipated delivery in 2023.

NCA4 Vol II: Impacts, Risks, and Adaptation in the United States

[Explore on the web](#)
[Download the report and related materials](#)
[View or request a free copy of the Overview](#)
[View or request a free copy of the Report-in-Brief](#)
[Ver o solicitar una copia impresa gratuita del Informe Resumido](#)

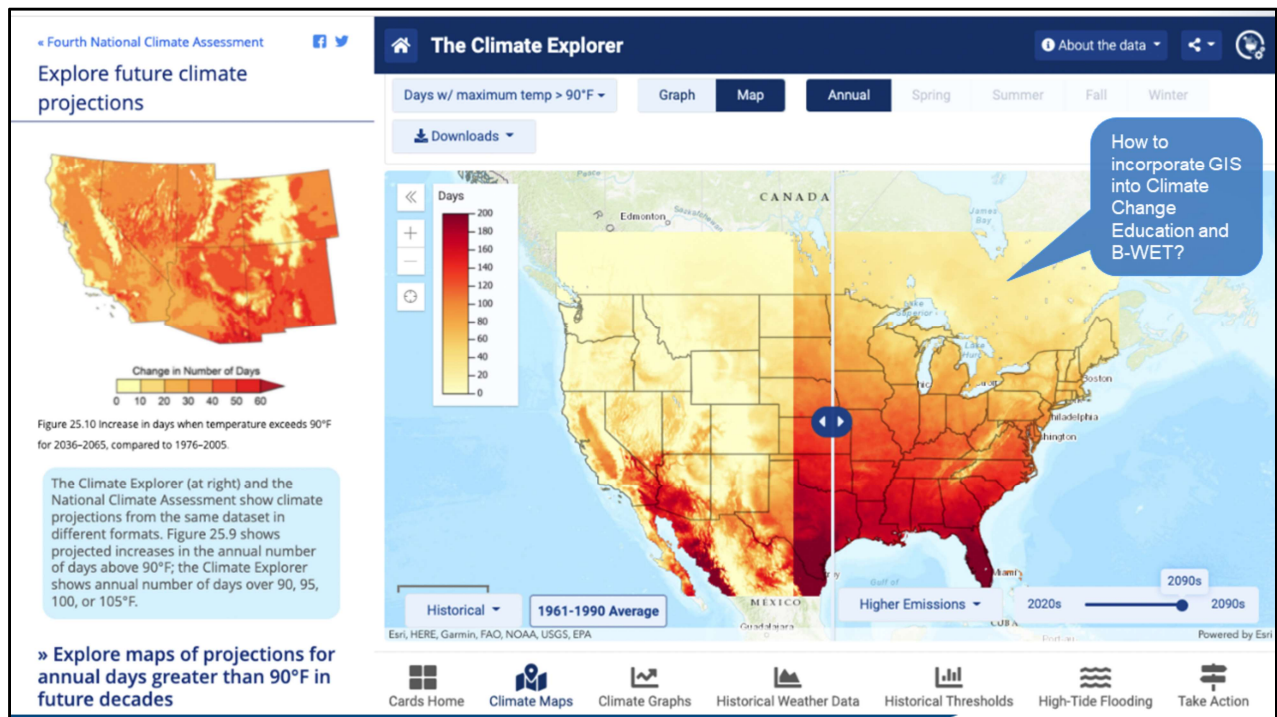
How climate change is impacting the Bay?

NCA4 Vol I: Climate Science Special Report

[Explore on the web](#)
[Download the report and related materials](#)
[View or request a free copy of the Executive Summary](#)

Great Lakes examples

<https://www.globalchange.gov/nca4>



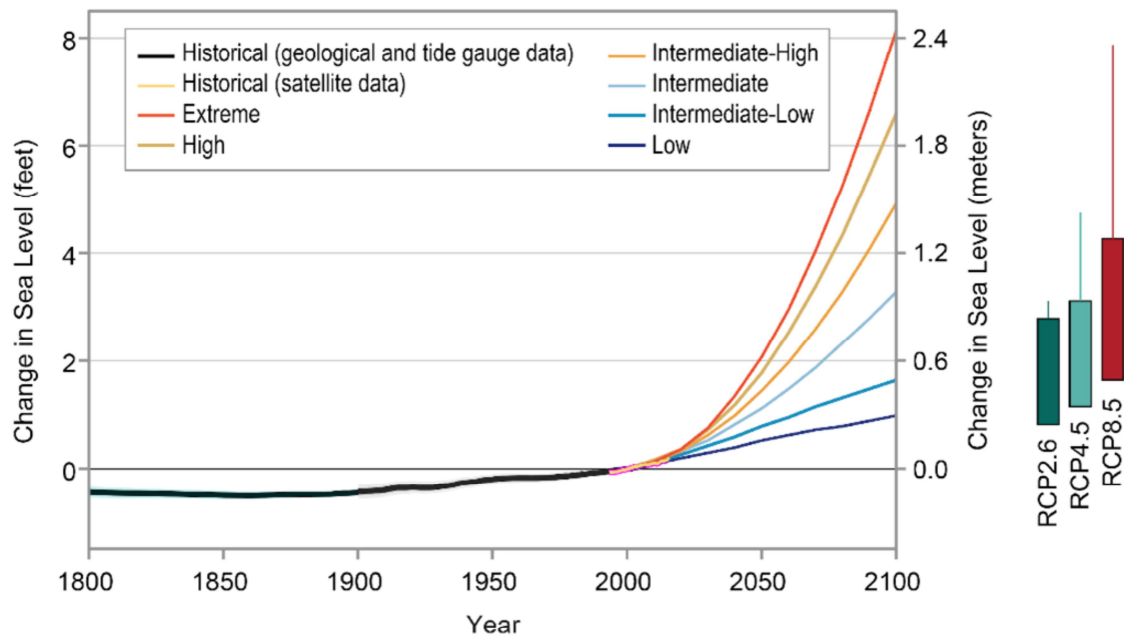
Explore future climate projections

These pages will help you find and read maps and graphs showing how climate conditions are projected to change in coming decades. You'll be using The Climate Explorer, a tool developed by climate experts who work for U.S. government agencies.

Follow steps in this side-panel to explore maps and graphs related to figures in the Fourth National Climate Assessment.

<https://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=92260a6bcf154d72bab62e50231e64c8§ion=3>

Historical and Projected Global Average Sea Level Rise (NCA 2018)



<https://nca2018.globalchange.gov/chapter/2#fig-2-3>

Emerging Best Practice in Climate Change Education: Use Your Communities Climate Action Plans



Breaking Down OneNYC

Example Activities

Description: This lesson presents students with real-world strategies for addressing climate change here in **New York City**. With this lesson, students will play the role of city policy-makers by modeling the creation of OneNYC for their local school community. **They will take a systems-thinking approach to small-scale problem solving and consider stakeholder engagement along the way.**

Breaking Down OneNYC

Description:

This lesson presents students with real-world strategies for addressing climate change here in New York City. With this lesson, students will play the role of city policy-makers by modeling the creation of OneNYC for their local school community. They will take a systems-thinking approach to small-scale problem solving and consider stakeholder engagement along the way.

Objectives:

- Introduce students to OneNYC
- Engage students in conversations with peers on solutions for their school community
- Manipulate data from surveys to identify stakeholder interests

Vocabulary:

Policy, resiliency, stakeholder, sustainability

Materials:

- Computers, laptops, or tablets with internet access

Background Information:

In order to address concerns regarding sustainability and resiliency, New York City created OneNYC. First published in April 2015 under Mayor Bill de Blasio, OneNYC aims to create a "strong and just city" through inclusive growth and climate action. OneNYC focuses on addressing eight themes, including: A Vibrant Democracy, An Inclusive Economy, Thriving Neighborhoods, Healthy Lives, Equity and

Excellence in Education, A Livable Climate, Efficient Mobility, and Modern Infrastructure. The Livable Climate topic is the most connected to concepts explored in this module, but because climate change is an intersectional issue, it is helpful to familiarize yourself with the main goals and strategies within each theme.

OneNYC 2050 is a bold strategic plan and New York City's Green New Deal to confront the climate crisis, achieve equity, strengthen our democracy, and build a strong and fair city that works for all New Yorkers.

This lesson explores the most recent iteration of the strategic plan, OneNYC 2050, released in April 2019.

Method:

- Familiarize your students with the purpose and goals of OneNYC. Students should read parts of the document (either the executive summary or climate specific sections like [A Livable Climate](#)). You may choose to do so by synthesizing it for your students in a handout or PowerPoint presentation.
- Discuss the following questions: Why is it important for New York City to have this plan? What does OneNYC set out to accomplish? Who are the stakeholders involved in developing OneNYC? Who is impacted by OneNYC? Be sure to write the responses to these questions on the board.
- Tell the class that they are going to develop their own version of OneNYC for their school community. To do so, they will model the process that the OneNYC team underwent. This process is outlined in the "How New Yorkers Shaped OneNYC 2050" section of

<https://www1.nyc.gov/site/dep/environment/climate-change-education-module.page>

Adaptation Clearinghouse
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SITE SEARCH
Enter a keyword

RESOURCES SECTORS NETWORKS MY CLEARINGHOUSE ABOUT **ADAPTATION PLANS & PROGRESS**

TOOLS
SHARE
PRINT

Growing Stronger: Toward A Climate-Ready Philadelphia

Growing Stronger is a climate adaptation plan for the City of Philadelphia, Pennsylvania. The plan describes Philadelphia's impacts from climate change and presents the City's strategies to respond and reduce those impacts.

The plan categorizes the primary effects of climate change into three categories:

1. New normals – changes in precipitation patterns and temperature will mean that the typical climate of Philadelphia will not be the same as the one that informed building and infrastructure choices in the past;
2. Changing extremes – extreme events including heat waves, intense rain and snow, tropical storms, and hurricanes may become more frequent and severe; and
3. Rising seas – higher sea levels will raise water levels in the

AMERICAN SOCIETY OF ADAPTATION PROFESSIONALS

This resource was featured in the May 20, 2016, ASAP Newsletter.

"The City of Philadelphia exemplifies how a collection of small actions can provide the opportunity to develop a comprehensive, longer-term plan. In 2015, the City of Philadelphia published its first climate adaptation plan: Growing Stronger: Toward a Climate-Ready Philadelphia, in partnership with ICF International. The process of developing the plan showed how much Philadelphia is already doing to build resilience to changes in climate, extreme events, and sea level, including:

—The Department of Public Property and the Streets Department are both acquiring asset

GROWING STRONGER:
TOWARD A CLIMATE-READY PHILADELPHIA

GO TO RESOURCE


Average Rating
★★★★★

Your Rating
☆☆☆☆☆

Click the stars above to add your rating

One way to find your communities climate plans.

40 U.S. Department of Commerce | National Oceanic and Atmospheric Administration



<https://www.adaptationclearinghouse.org/resources/growing-stronger-toward-a-climate-ready-philadelphia.html>



Meet the Challenges of a Changing Climate

Learn about potential climate hazards so you can protect vulnerable assets.

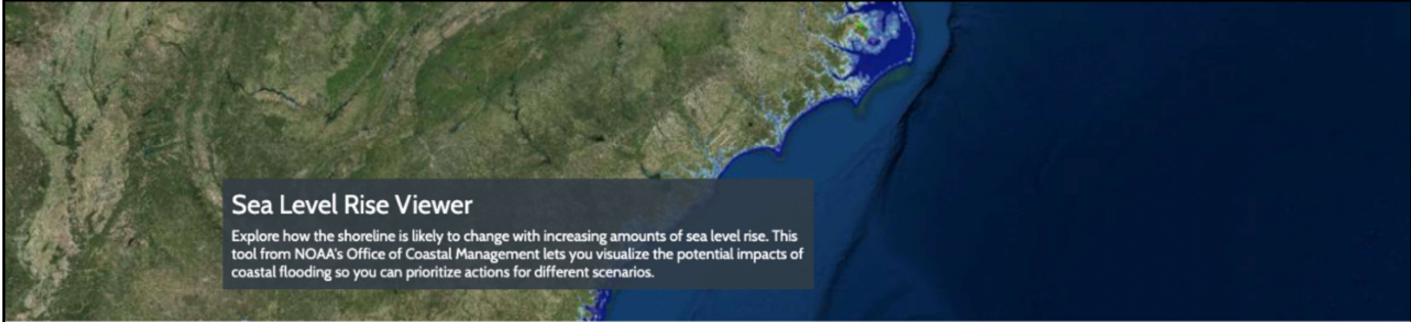
LEARN ABOUT THE STEPS TO
RESILIENCE, OUR RISK
MANAGEMENT FRAMEWORK >

READ CASE STUDIES DESCRIBING
ON-THE-GROUND EFFORTS TO
BUILD RESILIENCE >

USE THE CLIMATE EXPLORER TO
CHECK CONDITIONS PROJECTED
FOR THE FUTURE >

TOUR THE TOOLKIT ▾

<https://toolkit.climate.gov/>



Sea Level Rise Viewer

Explore how the shoreline is likely to change with increasing amounts of sea level rise. This tool from NOAA's Office of Coastal Management lets you visualize the potential impacts of coastal flooding so you can prioritize actions for different scenarios.

Tools > Sea Level Rise Viewer >

- [SHARE](#)
- [TWEET](#)
- [PRINT](#)

Being able to visualize potential impacts from sea level rise is a powerful teaching and planning tool. The Sea Level Rise Viewer, developed by the NOAA Office for Coastal Management, offers access to data and information about the risks of sea level rise, storm surge, and flooding along the coastal United States. The web-based map lets community planners, city officials, and coastal residents identify flood-prone locations in their area.

The tool offers hard-to-find data and information regarding the flood risks due to various possible scenarios of sea level rise. Community planners can assess what infrastructure is vulnerable under these conditions, and the tool enables business- and homeowners along the coasts to make decisions regarding their livelihoods and see how rising sea levels may affect them in the future.

Users adjust a slider bar to visualize how various levels of sea level rise will impact coastal communities. This

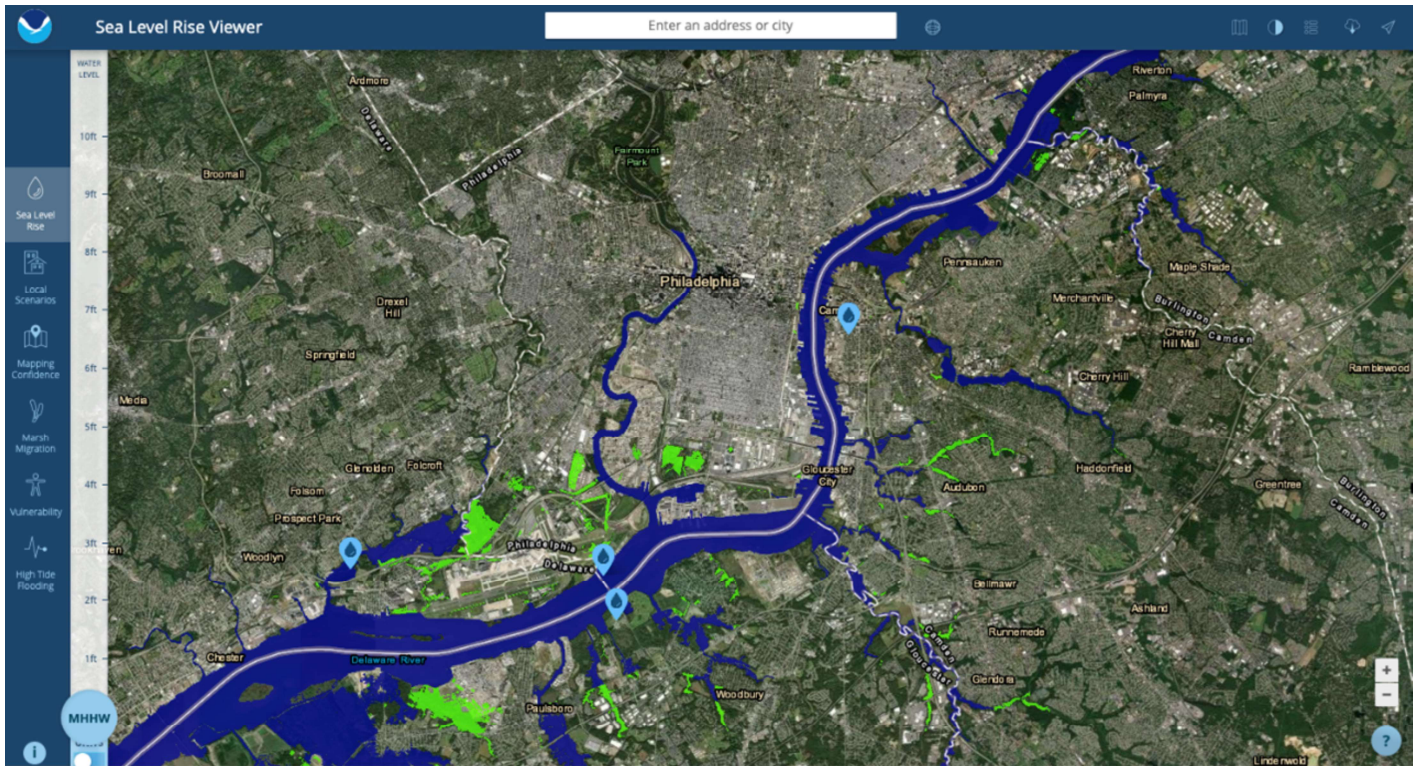
Steps to Resilience

This content supports the highlighted step.

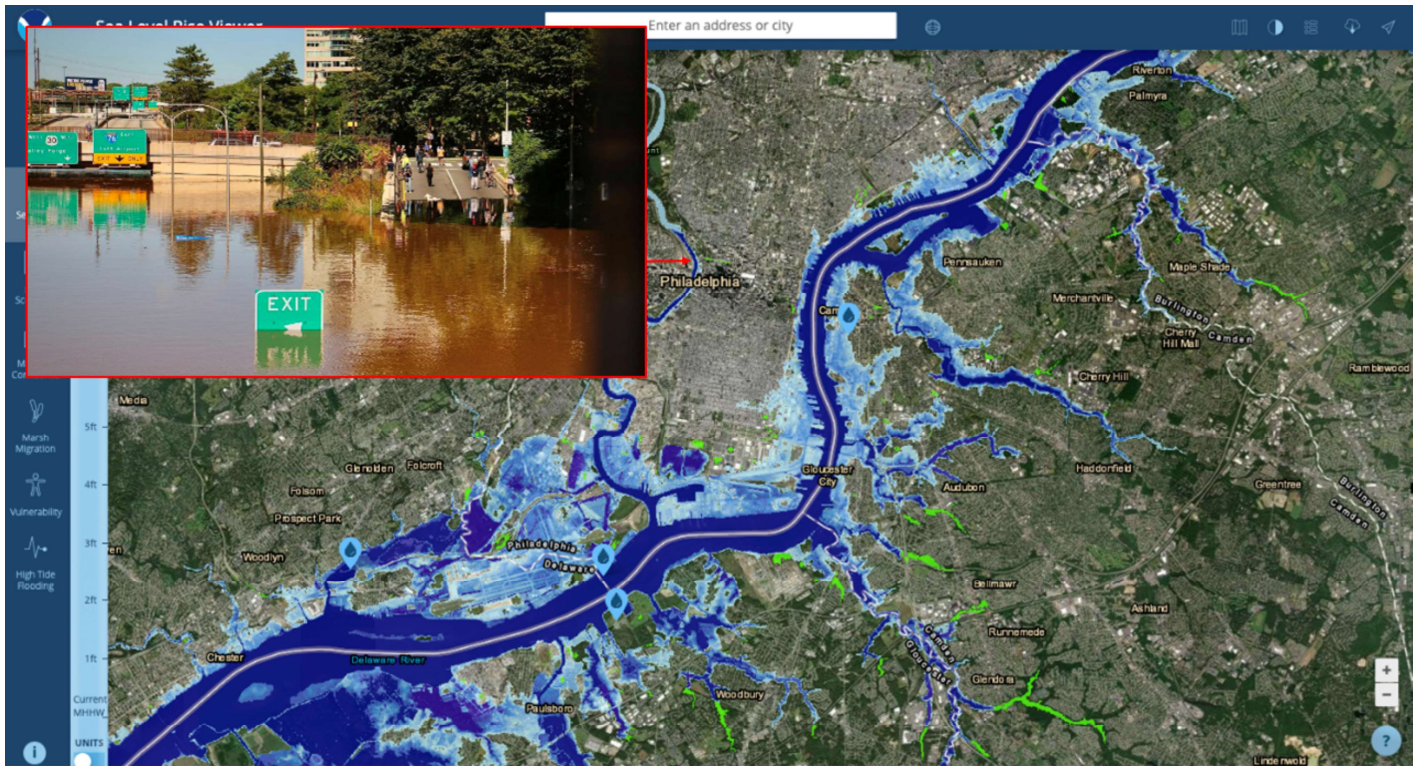
- 1 Explore Hazards
- 2 Assess Vulnerability & Risks
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- 5 Take Action

Tool Webpage

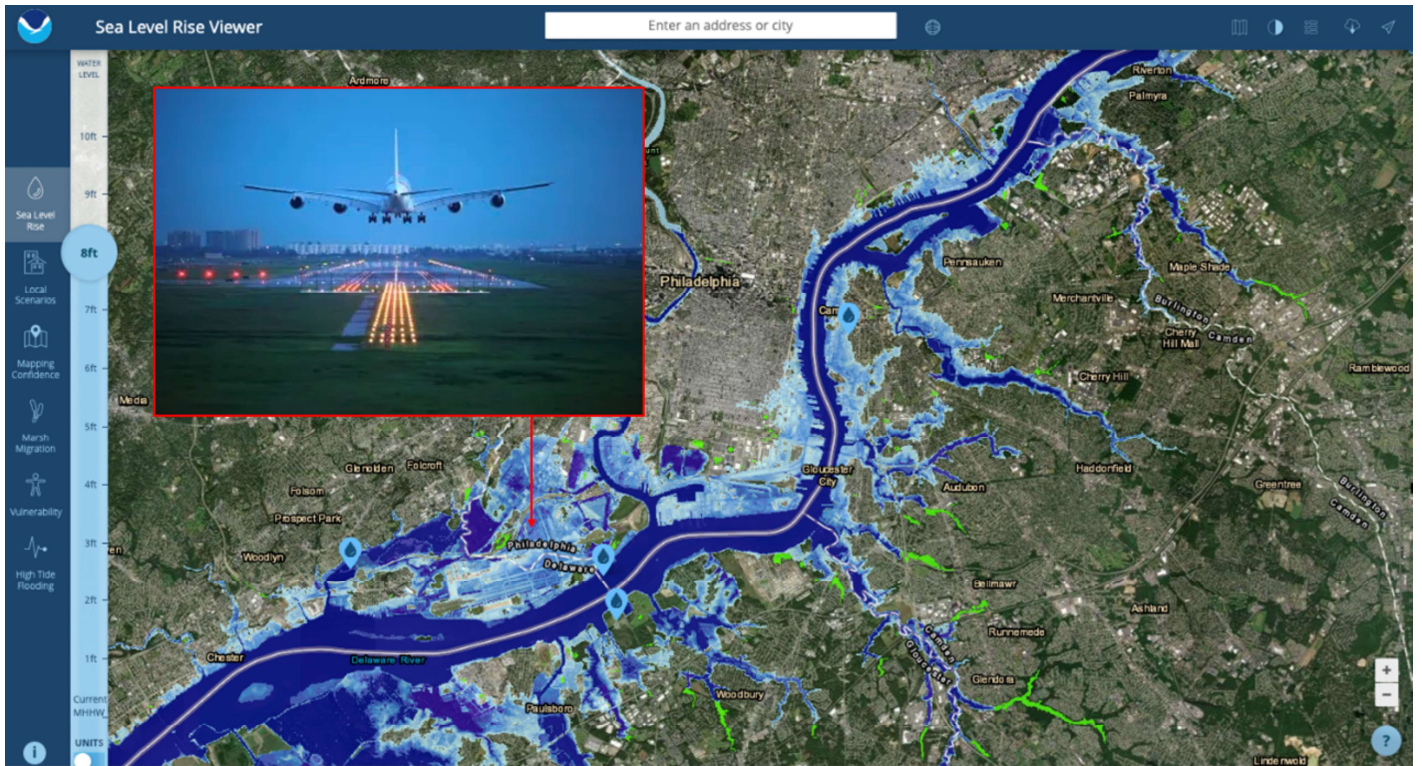
[Digital Coast: Sea Level Rise Viewer >](#)



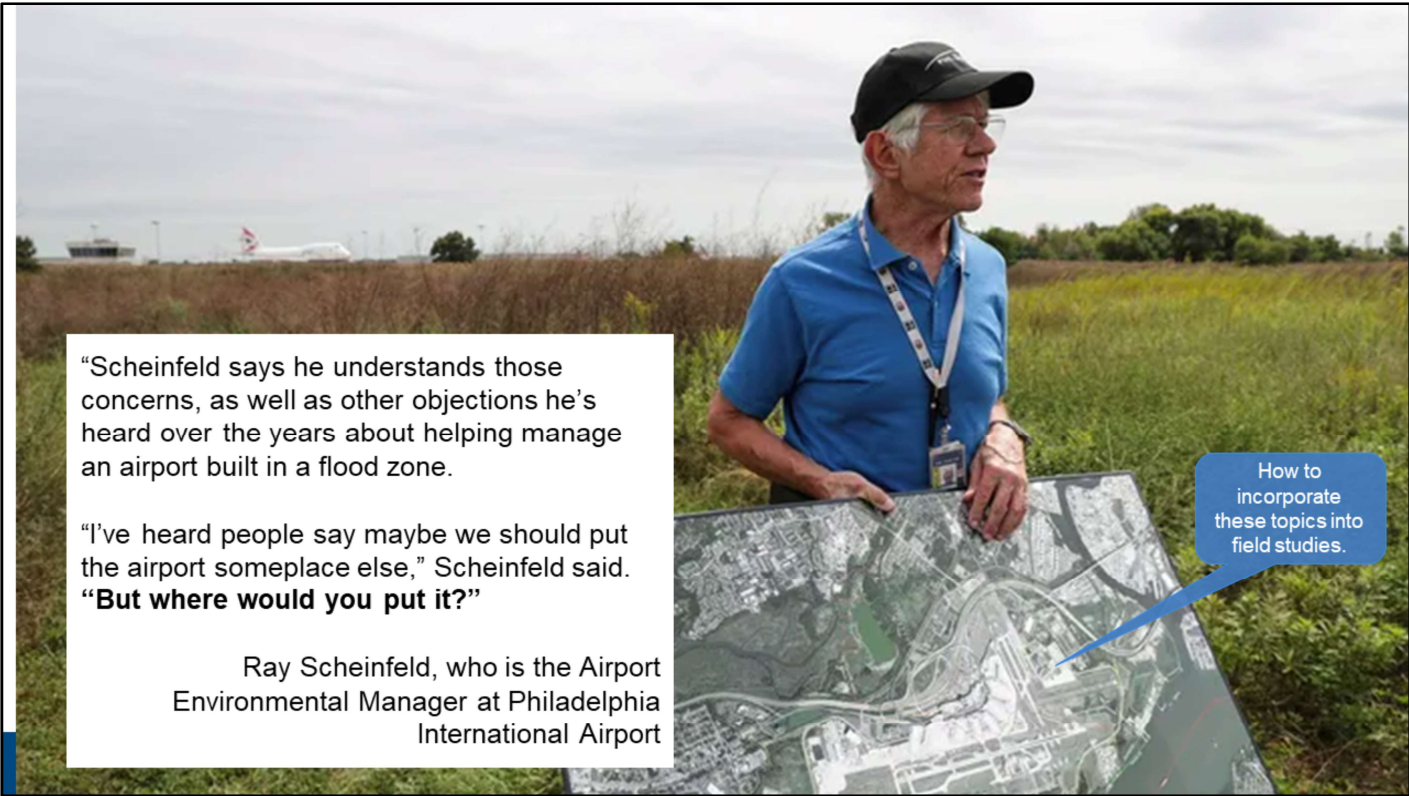
<https://coast.noaa.gov/slr/>



<https://www.nytimes.com/video/us/10000007953622/philadelphia-flooding-ida-aftermath-destruction.html>



<https://www.nytimes.com/video/us/10000007953622/philadelphia-flooding-ida-aftermath-destruction.html>



“Scheinfeld says he understands those concerns, as well as other objections he’s heard over the years about helping manage an airport built in a flood zone.

“I’ve heard people say maybe we should put the airport someplace else,” Scheinfeld said. **“But where would you put it?”**

Ray Scheinfeld, who is the Airport Environmental Manager at Philadelphia International Airport

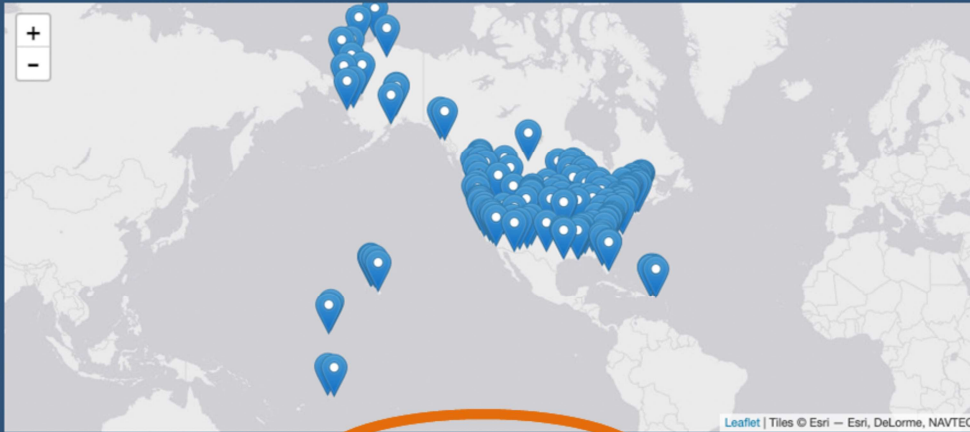
How to incorporate these topics into field studies.

<https://www.inquirer.com/science/climate/philadelphia-international-airport-climate-change-sea-level-rise-flooding-delaware-river-20190917.html>



CASE STUDIES

Explore case studies to see how people are building resilience for their businesses and in their communities. Click dots on the map below to preview case studies, or browse all case studies by clicking the button below the map.



BROWSE ALL CASE STUDIES >

<https://toolkit.climate.gov/#case-studies>

Hope is a Precondition to Action

As educators, we need to know that hope is a precondition to action. Research by Nicholas Smith and Anthony Leiserowitz indicates that hopeful emotions (paired with a **healthy** dose of worry) are among the strongest predictors of an individual's support for policy and actions to address climate change (Smith and Leiserowitz, 2014).

However, survey data from Yale University and George Mason University show that Americans' feelings of hope about global warming have declined over the past two years while feelings of worry have increased (Ballew et al., 2018).



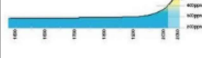
http://catalyst.greenschoolsnationalnetwork.org/gscatalyst/december_2018/MobilePagedArticle.action?articleId=1452362&app=false#articleId1452362

100 SOLUTIONS TO REVERSE GLOBAL WARMING BY 2050

RANKED BY IMPACT

drawdown.org

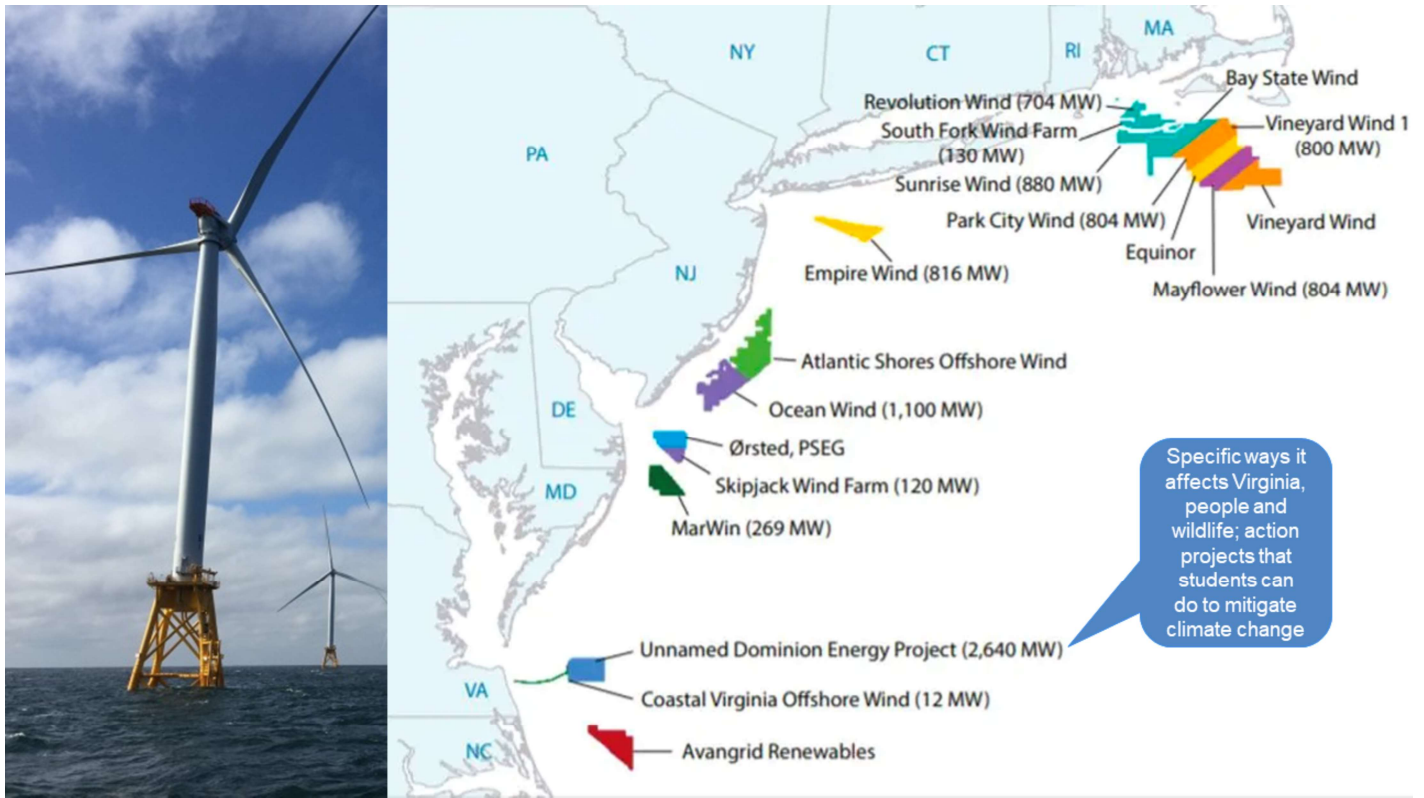
DRAWDOWN IS THAT POINT IN TIME WHEN THE CONCENTRATION OF GREENHOUSE GASES IN THE ATMOSPHERE BEGINS TO DECLINE ON A YEAR-TO-YEAR BASIS.



Project Drawdown is the most comprehensive plan ever proposed to reverse global warming. Our organization did not make or devise the plan—we found the plan because it already exists. We gathered a qualified and diverse group of researchers from around the world to identify, research, and model the 100 most substantive, existing solutions to address climate change. What was uncovered is a path forward.

<p>Food BIODIVERSITY</p> <p>Greater yields from already existing crops can be increased by growing a wider variety of crops. Expanding crop diversity can reduce the need for fertilizers and pesticides, which are sources of greenhouse gas emissions.</p> <p>15.06 GT REDUCED CO2E #72</p>	<p>Food BIOMETHANE</p> <p>Production of biogas from manure and crop residues can be used for cooking, heating, and electricity. This process can reduce methane emissions from landfills and improve energy efficiency.</p> <p>4.30 GT REDUCED CO2E #47</p>	<p>Buildings and Other BUILDING AUTOMATION</p> <p>Building automation systems can optimize energy use by adjusting lighting, heating, and cooling based on occupancy and weather conditions.</p> <p>4.62 GT REDUCED CO2E #45</p>	<p>Concrete CONCENTRATED SOLAR</p> <p>Concentrated solar power uses mirrors to focus sunlight on a receiver tower, generating heat to produce electricity. This technology can be used in arid regions with high solar potential.</p> <p>10.90 GT REDUCED CO2E #25</p>	<p>Construction BUILDING WITH WOOD</p> <p>High-performance wood products can be used for building construction. Wood is a renewable resource that can store carbon and has a lower embodied energy than steel and concrete.</p> <p>4.00 GT REDUCED CO2E #49</p>	<p>Transport CARS</p> <p>Hybrid and electric vehicles can reduce greenhouse gas emissions from transportation. Improving fuel efficiency and promoting public transit can also reduce emissions.</p> <p>4.00 GT REDUCED CO2E #49</p>	<p>Food CLEAN COOKSTOVES</p> <p>Efficient cooking practices, such as improved wood stoves and induction cooktops, can reduce emissions from household energy use.</p> <p>15.61 GT REDUCED CO2E #21</p>	<p>Land Use FORESTAL WETLAND</p> <p>Wetlands and forests are important carbon sinks. Protecting and restoring these ecosystems can help reduce atmospheric carbon levels.</p> <p>3.99 GT REDUCED CO2E #52</p>
<p>Energy COGENERATION</p> <p>Power plants can produce both electricity and heat simultaneously. Cogeneration increases energy efficiency and reduces emissions by utilizing waste heat.</p> <p>3.07 GT REDUCED CO2E #50</p>	<p>Food COMPOSTING</p> <p>Composting food waste and agricultural residues can produce nutrient-rich soil and reduce methane emissions from landfills.</p> <p>2.26 GT REDUCED CO2E #80</p>	<p>Energy DISTRICT HEATING</p> <p>Centralized heating systems can provide energy more efficiently than individual home heating systems. District heating can use a variety of energy sources, including biomass and geothermal.</p> <p>0.38 GT REDUCED CO2E #27</p>	<p>Transport ELECTRIC BIKES</p> <p>Electric bikes are a low-carbon mode of transportation. They can reduce emissions from short-distance travel and promote active lifestyles.</p> <p>0.94 GT REDUCED CO2E #69</p>	<p>Transport ELECTRIC VEHICLES</p> <p>Electric vehicles can significantly reduce greenhouse gas emissions from the transportation sector. Improving battery technology and charging infrastructure can accelerate adoption.</p> <p>10.80 GT REDUCED CO2E #26</p>	<p>Energy ENERGY STORAGE (BATTERIES)</p> <p>Batteries can store energy for later use, enabling renewable energy sources to provide power when needed. Advances in battery technology are making storage more affordable.</p> <p>10.80 GT REDUCED CO2E #26</p>	<p>Energy ENERGY STORAGE (HYDROGEN)</p> <p>Hydrogen can be used as a clean energy carrier. It can be produced from renewable sources and used in industrial processes and transportation.</p> <p>10.80 GT REDUCED CO2E #26</p>	<p>Energy ENERGY STORAGE (THERMAL)</p> <p>Thermal energy storage systems can store heat from renewable sources for use during periods of high demand. This technology can help stabilize renewable energy output.</p> <p>10.80 GT REDUCED CO2E #26</p>
<p>Food FARMLAND RESTORATION</p> <p>Restoring degraded farmland can improve soil health and carbon sequestration. Sustainable farming practices can reduce emissions and increase resilience.</p> <p>14.06 GT REDUCED CO2E #23</p>	<p>Land Use FOREST PROTECTION</p> <p>Protecting primary forests and other carbon-rich ecosystems is crucial for climate change mitigation. Reforestation and afforestation can also help restore carbon sinks.</p> <p>6.20 GT REDUCED CO2E #38</p>	<p>Women and Girls EDUCATING GIRLS</p> <p>Education lays a foundation for vibrant lives for girls and women, their families, and their communities. It also avoids emissions by curbing population growth.</p> <p>59.60 GT REDUCED CO2E #6</p>	<p>Energy GEOTHERMAL</p> <p>Geothermal energy harnesses heat from the Earth's interior to generate electricity. It is a reliable, low-carbon energy source that can provide baseload power.</p> <p>16.63 GT REDUCED CO2E #18</p>	<p>Buildings and Other GREEN ROOFS</p> <p>Green roofs can reduce building energy use by providing insulation and shading. They also improve air quality and reduce urban heat island effects.</p> <p>0.77 GT REDUCED CO2E #73</p>	<p>Energy HYDROGEN</p> <p>Hydrogen can be used as a clean energy carrier. It can be produced from renewable sources and used in industrial processes and transportation.</p> <p>10.80 GT REDUCED CO2E #26</p>	<p>Food IMPROVED RICE CULTIVATION</p> <p>Efficient rice cultivation practices can reduce methane emissions from wetlands. Improving water management and crop yields can also reduce emissions.</p> <p>11.34 GT REDUCED CO2E #24</p>	<p>Energy IN-STREAM HYDRO</p> <p>Small-scale hydroelectric power can generate clean energy from flowing water. It is a renewable energy source that can provide baseload power.</p> <p>4.00 GT REDUCED CO2E #42</p>
<p>Buildings and Other HEAT PUMPS</p> <p>Heat pumps can provide efficient heating and cooling for buildings. They can reduce emissions by using renewable energy sources and improving energy efficiency.</p> <p>4.29 GT REDUCED CO2E #42</p>	<p>Transport HIGH-SPEED RAIL</p> <p>High-speed rail can provide a fast, low-carbon mode of transportation. It can reduce emissions from air travel and promote sustainable development.</p> <p>1.62 GT REDUCED CO2E #68</p>	<p>Material HOUSEHOLD RECYCLING</p> <p>Recycling household waste can reduce emissions from landfills and conserve resources. Improving recycling infrastructure can increase participation.</p> <p>2.77 GT REDUCED CO2E #55</p>	<p>Energy HYDROGEN (SOLAR)</p> <p>Solar-powered hydrogen production can provide clean energy for industrial and transportation uses. Advances in solar technology are making production more cost-effective.</p> <p>10.80 GT REDUCED CO2E #26</p>	<p>Energy HYPERLOOP</p> <p>Hyperloop is a proposed mode of rapid, low-carbon transportation. It would use vacuum-sealed tubes to move pods between cities, significantly reducing travel time and emissions.</p> <p>10.80 GT REDUCED CO2E #26</p>	<p>Energy INCREASED WIND ENERGY</p> <p>Expanding wind energy production can reduce greenhouse gas emissions from electricity generation. Improving turbine efficiency and siting can increase output.</p> <p>10.80 GT REDUCED CO2E #26</p>	<p>Energy INCREASED SOLAR ENERGY</p> <p>Expanding solar energy production can reduce greenhouse gas emissions from electricity generation. Improving panel efficiency and reducing costs can increase adoption.</p> <p>10.80 GT REDUCED CO2E #26</p>	<p>Land Use INDIGENOUS PEOPLES' LAND MANAGEMENT</p> <p>Indigenous land management practices can help restore carbon sinks and protect biodiversity. Supporting indigenous communities can improve sustainability outcomes.</p> <p>6.79 GT REDUCED CO2E #20</p>





<https://www.masscec.com/offshore-wind>

Challenge of West Coast Floating Offshore Wind Power



One significant challenge to building offshore wind turbines in the United States is the depth of the waters along many coastal areas.

While most European installations to date have occurred in shallow waters, most (roughly 60%) of our nation's [offshore wind resources](#) are situated in deep waters — more than 60 meters down (or nearly 200 feet).

This means traditional bottom-mounted foundations aren't economically viable in these areas.

<https://www.energy.gov/eere/articles/wind-waves-floating-wind-power-becoming-reality>

NOAA funded Resilient Schools Consortium (RiSC)

- The aim of the RiSC program and curriculum is to educate youth in NYC schools about climate change science and climate impacts, as well as natural and built solutions that increase climate resiliency.
- RiSC engages students in knowledge-sharing through a variety of communication campaigns and provides access to hands-on projects.
- The program also creates opportunities for meaningful interactions with community members, resilience practitioners and decision makers in NYC.



RISC 1.0 CURRICULUM

The goal of the Resilient Schools Consortium (RiSC) program and curriculum is to increase the climate science and resilience knowledge, and critical thinking skills, of middle and high school teachers and students and empower them to build resilience in their communities. Resilience can be thought of as adapting to changing conditions in a way that increases the well-being of communities and improves the health of the natural environment.

The RiSC 1.0 curriculum, written and tested by teachers, enables students to understand the fundamentals of climate science and extreme weather risks. The accompanying RiSC Vulnerability Assessment, helps students to assess their schools and neighborhoods' vulnerability to these risks. An updated version of the curriculum, also written and tested by teachers, educates students about the value of Nature-Based Features as tools for coastal defense and resilience to extreme heat; it engages them in understanding how issues of equity and justice - often neglected in urban planning

Example Activities

What others are doing! and how they are incorporating NOAA resources into this work!

Tips and tricks specific to middle school age or afterschool programs

<https://www.riscnyc.org/>

Climate Summits target, and equip, youths to confront climate their way


What are some of the most successful projects for students and the community.




Above: Students from Kurt Hahn Expeditionary Learning School in East Flatbush, N.Y., attend climate action planning workshop on issues ranging from climate assemblies to community service projects. (Photo: Courtesy of Climate Initiatives, The Wild Center)

Left: A three-day leadership retreat for youths, focusing on public speaking skills, problem-solving, project management, climate justice and sustainability. (Photo: Courtesy of Climate Initiatives, The Wild Center)

<https://www.wildcenter.org/our-work/youth-climate-program/>
<https://www.wildcenter.org/our-work/youth-climate-program/resources/>
<https://yaleclimateconnections.org/2021/03/summits-target-and-equip-youths-to-confront-climate-their-way/>






National Oceanic and Atmospheric Administration
 U.S. Department of Commerce

Search NOAA sites 

[Home](#) / [Office of Education](#) / [Environmental Literacy Program](#) / [Resilience hub](#)

Office of Education home	Environmental Literacy Program home	Grants	Impacts	Partnerships	Resources for community resilience education
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Education resources developed by NOAA's community resilience education grantees

Share:    

NOAA's Environmental Literacy Program grantees have created products that support community resilience education. From curricula to peer reviewed publications, these products may be used or considered as models for those working in the field.

Educational resources

[Hazard Education Awareness and Resilience Task Force \(HEART Force\) !\[\]\(d14aa1ab9e6e6ce79eaba1af6f7aa0a9_img.jpg\)](#)


Lead institution: University of Colorado Boulder / Cooperative Institute for Research in Environmental Sciences (CIRES)

Project Title: HEARTForce: Hazard Education, Awareness & Resilience Taskforce

Project Description

This resource collection includes a curriculum, videos, and professional development opportunities related to environmental hazards in Colorado, such as wildfire, flood, and drought. The curriculum consists of hazard lessons, scenario-based role-play games, and a community resilience expo. This website also connects teachers to professional development workshops, a network of teachers around the state, and general support.

56 U.S. Department of Commerce | National Oceanic and Atmospheric Administration <https://www.noaa.gov/office-education/elp/resilience-hub/grantee-resources>



<https://www.noaa.gov/office-education/elp/resilience-hub/grantee-resources>



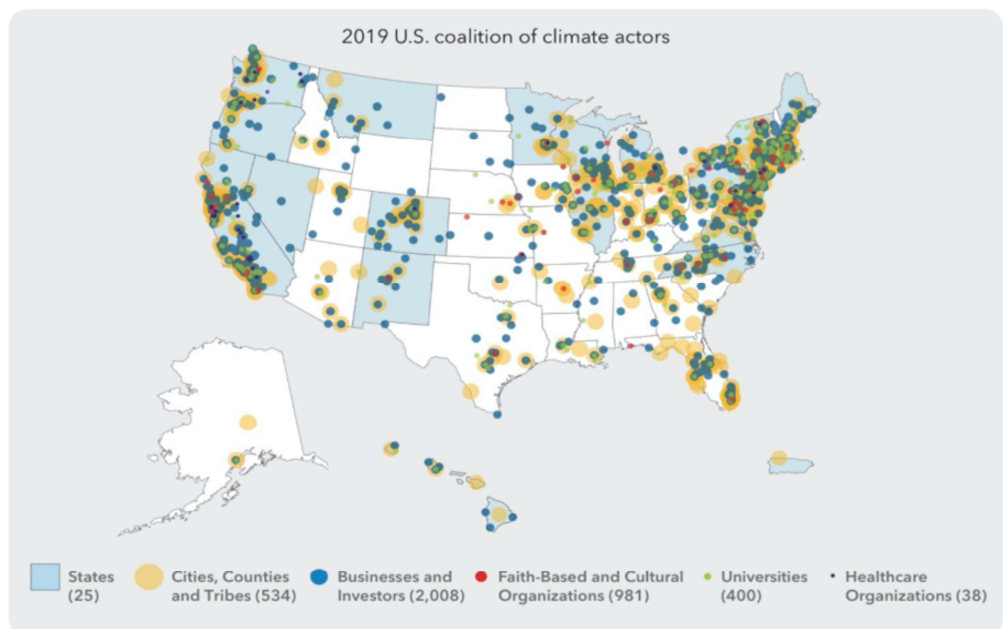
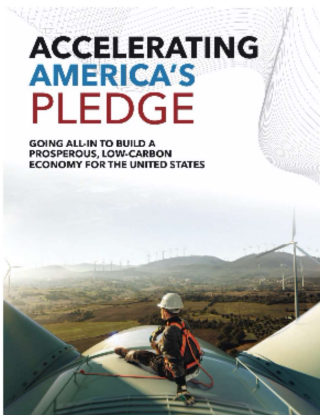
“I’m a former local official. And I get the reason it’s important to have local representation. And local voices involved in discussions with respect to what happens in their communities.”

“As I’ve said before, you have 351 cities and towns in Massachusetts, they all have different issues with respect to resiliency and adaptation, **And we want to make sure whatever it is we do is supported at the local level. If you don’t have local support for it, it’s not going to succeed whatever it is you’re pursuing. And it won’t be **sustained** over time.**”

Massachusetts Governor Charlie Baker (R),
House Natural Resources Committee Hearing
on Climate Change, February 6, 2019



<https://www.c-span.org/video/?457612-1/house-natural-resources-committee-hearing-climate-change&start=2900>



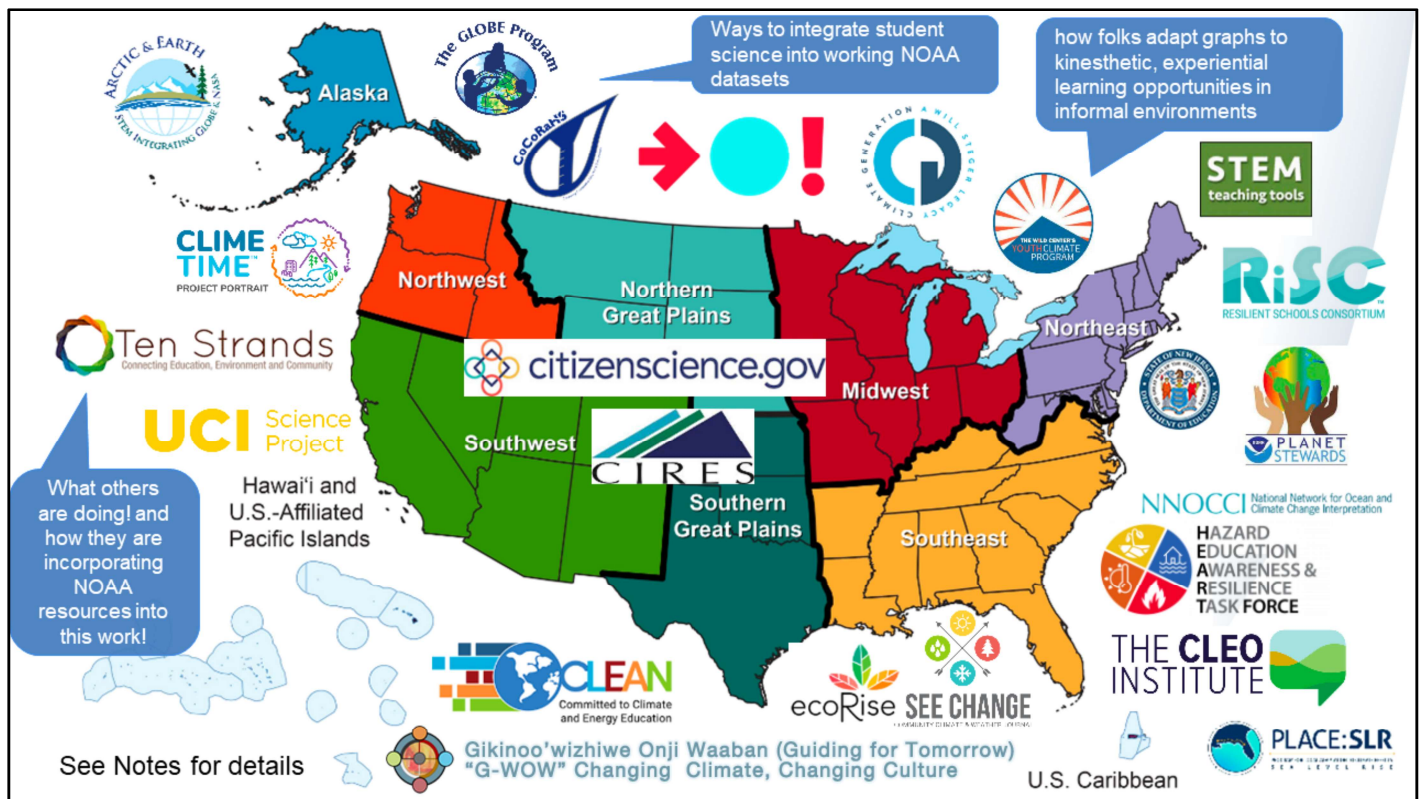
Our climate solution transition is well underway, but we don't know it. Connect your students learning with your communities climate action.



Empowerment is key to Building our Nation to be a Resilient, Low-Carbon Society

- Our climate solution transition is well underway, but we don't know it.
- Scale up targeted support, including economic and workforce development, to ensure all Americans benefit from the low-carbon energy transition.
- Education is critical to support the design equitable and just social systems and to speed up these actions.
- 68% of the nation's GDP is already committed to the Paris Agreement goal (America's Pledge, 2019)

<https://www.americaspledgeonclimate.com/accelerating-americas-pledge-2/>



National:

- <https://www.climategen.org/our-core-programs/climate-change-education/>
- <https://acespace.org/>
- <https://www.wildcenter.org/our-work/youth-climate-program/>
- <https://climateinterpreter.org/about/projects/NNOCCI>
- <https://www.iseechange.org/>
- <https://www.riscnyc.org/>
- <http://stemteachingtools.org/sp/climate-learning>
- <https://www.ecorise.org/green-building-academy/equitable-internships/>
- <https://cires.colorado.edu/outreach/programs/heart-force>
- <https://cleoinstitute.org/>
- <https://cleanet.org/index.html>
- <https://www.globe.gov/>
- <https://www.cocorahs.org/>
- <https://www.citizenscience.gov/>
- <https://sites.google.com/alaska.edu/arcticandearthsigns/>
- <http://g-wow.org/en-us/default.aspx>

- <https://oceanservice.noaa.gov/education/planet-stewards/>

Regional programs:

- **California** — open
 - a. CA: <https://scienceproject.cfep.uci.edu/teaching-climate-change/>
 - b. CA: <https://tenstrands.org/education/california-approves-6m-to-develop-climate-change-and-environmental-justice-curriculum/>
- **Chesapeake** — open
 - a. <https://www.nj.gov/education/standards/climate/>
- **Great Lakes**
- **Gulf of Mexico** — open
 - a. <https://placeslr.org/>
- **Hawaii** — open
- **New England**
- **Pacific Northwest** — open
 - a. <https://www.climetime.org/>



Climate.gov



- Promote awareness, appreciation, and support for CPO's investments in climate science and services
- Promote public climate literacy and help people find and use NOAA's maps, data, and information services through [Climate.gov](https://climate.gov) and associated products
- Help U.S. communities & businesses understand & manage their climate-related risks & opportunities, including building resilience to climate-related hazards, through the U.S. Climate Resilience Toolkit ([CRT](https://climate.gov/resilience)) and associated engagements



Meet the Challenges of a Changing Climate

Learn about potential climate hazards so you can protect vulnerable assets.

LEARN ABOUT THE STEPS TO RESILIENCE, OUR RISK MANAGEMENT FRAMEWORK >

READ CASE STUDIES DESCRIBING ON-THE-GROUND EFFORTS TO BUILD RESILIENCE >

USE THE CLIMATE EXPLORER TO CHECK CONDITIONS PROJECTED FOR THE FUTURE >

TOUR THE TOOLKIT ▾

<https://toolkit.climate.gov/>





REGIONS

Not all U.S. regions are currently represented on the site. To date, we have developed sections for the regions listed below. We are in the midst of developing content for additional regions, and are actively seeking volunteers who will gather teams of experts for the remaining regions. If your region is not listed below, you can find useful information on the rest of the site, including our [Topic pages](#). For [case studies](#) and [tools](#), you can use the [Filter by region >](#) links at the top of each page to find available information for all regions.



ALASKA AND THE ARCTIC >



GREAT LAKES >



HAWAII AND PACIFIC ISLANDS >



MIDWEST >



NORTHEAST >



NORTHERN GREAT PLAINS >



SOUTHEAST >

MORE

TOPICS



BUILT ENVIRONMENT >



COASTS >



ECOSYSTEMS >



ENERGY >



FOOD >



HEALTH >



MARINE >



TRANSPORTATION >



TRIBAL NATIONS >



WATER >

MORE
▼





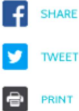
Water

Municipal water supplies are increasingly vulnerable due to variable precipitation and aging water infrastructure. Greater evaporation and earlier snowmelt promote drought conditions. At the same time, increases in the frequency of heavy precipitation events increase the risk of flooding.

Takeaway messages

Topics > Water >

Key points:



- *Rising temperatures and changing precipitation patterns are leading to significant changes in the quantity and quality of water available for humans and nature in the United States.*
- *Deteriorating infrastructure for flood control and water supply exacerbates risks from changing conditions. Current infrastructure is not typically designed for the increased risks of flooding that come with increases in heavy precipitation.*
- *Planning ahead to face drought, floods, and changes in water quality can help maintain water supply systems and the health of ecosystems through extreme events. Enhancing risk management strategies to incorporate the potential for cascading impacts or the possibility for two or more events to occur at the same time could improve resilience.*
- *Water management strategies are only a partial solution for reducing water- and climate-related risks of the future. To be effective, strategies must be flexible and change over time. Though promising new approaches to water management are emerging through research, implementation of new solutions remains a challenge.*

[Adapted from the Fourth National Climate Assessment](#)

Changes in the water cycle

Reference

Browse Topics

- Built Environment
- Coasts
- Ecosystems
- Energy
- Food
- Health
- Marine
- Transportation
- Tribal Nations
- Water**
 - Municipal Water Supply
 - Flooding
 - Drought
 - Ecosystems
 - Water Resources Dashboard

Table of Contents



Flooding

Increasing frequency of heavy precipitation events—especially where rain falls over large areas of impermeable surfaces—is one factor that increases the threat of urban flooding

Topics > Water > Flooding >

- SHARE
- TWEET
- PRINT

Climate-related changes in precipitation patterns have increased the threat of flooding in some inland regions. The frequency and intensity of very heavy precipitation events have increased across most of the nation, and scientists project that these trends will continue. For instance, by late this century heavy precipitation events that historically occurred once in 20 years may occur as frequently as every 5 to 15 years. Consequently, the frequency of floods associated with heavy precipitation events is expected to increase. This includes urban floods, where relatively large areas of impermeable surfaces increase the volume of runoff, and flash floods that occur in relatively steep or small watersheds.



Homes on a floodplain in Libertyville, Illinois, suffered heavy damage in September, 2014.



The volume of runoff associated with increasingly heavy precipitation events has the potential to

Browse Topics

- Built Environment
- Coasts
- Ecosystems
- Energy
- Food
- Health
- Marine
- Transportation
- Tribal Nations
- Water
 - Municipal Water Supply
 - **Flooding**
 - Drought
 - Ecosystems
 - Water Resources Dashboard

Case Studies

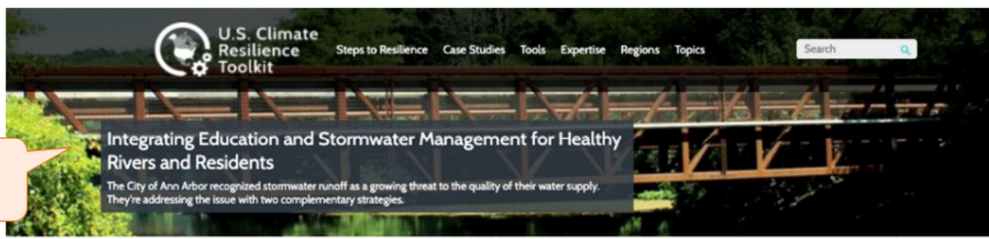
- [A Climate for Resilience >](#)
- [After Record-Breaking Rains, a Major Medical Center's Hazard Mitigation Plan Improves Resilience >](#)
- [All Hands on Deck: Creating Green Infrastructure to Combat Flooding in Toledo >](#)

detailed data/analysis explanation

Narrative Text & References

Topic & Subtopics

All relevant Case Studies & Tools



Case Study Summary

Narrative text

You are here in StR

All relevant Topics

- SHARE
- TWEET
- PRINT

The challenge

Situated on the Huron River in southeastern Michigan, the city of Ann Arbor is a leader in sustainable planning and climate action. However, changes in both average precipitation and the intensity of extreme storm events over the last century threaten the health of the city's residents and the community's treasured environmental features.

The Huron River provides 85 percent of the city's drinking water, and when it rains nearly 100 percent of the city's stormwater flows back into the river. Pollution from stormwater runoff decreases the quality of water available for human use, and also has a negative impact downstream on aquatic and wetland ecosystems.

Over the last sixty years (1950–1981 versus 1981–2010), Ann Arbor's average annual precipitation increased by 25 percent. This dramatic increase, along with an increase in the severity of extreme rain events across the region, creates a need for more on-site stormwater management solutions to reduce runoff and maintain a healthy and vibrant river system.

The solution

In 2006, the City of Ann Arbor updated the rate structure for its stormwater utility. To encourage property owners to manage stormwater on-site, they set new rates based on the amount of impervious surface on each property. The new, more equitable rate structure provides an incentive to manage stormwater on-site.

The utility, which generates over \$5 million per year, funds operations and maintenance projects for the stormwater system, water quality improvement projects, stormwater education, implementation of environmental regulatory or remediation plans, and green infrastructure projects that reduce strain on the stormwater system. Additionally, the city offers stormwater credits to both commercial and residential property owners who take steps to reduce stormwater runoff on their property.

Steps to Resilience

- 1 Explore Hazards
- 2 Assess Vulnerability & Risks
- 3 Investigate Options
- 4 Prioritize & Plan
- 5 Take Action

Regions

- Great Lakes > People and Communities >
- Great Lakes > Infrastructure and the Built Environment >
- Great Lakes > Building Resilience in the Great Lakes >
- Midwest > Transportation and Infrastructure >
- Midwest > Biodiversity and Ecosystems >
- Midwest > Community Vulnerability and Adaptation >

Topics

- Built Environment > Water and Wastewater >
- Health > Building Health Care Sector Resilience >
- Element 5: Environmental Protection and Strengthening of Ecosystems >
- Water > Municipal Water Supply >
- Water > Ecosystems >

The screenshot shows the 'Hazus-MH' page within the 'U.S. Climate Resilience Toolkit'. The page features a header with navigation links, a search bar, and a map of the United States. The main content area includes a title 'Hazus-MH', a brief description, social sharing options, a 'Steps to Resilience' sidebar with five steps (the second step is highlighted), a 'Tool URL' section, a 'Tool Webpage' link, and a 'Topics' section with various sub-topics. Four callout boxes are overlaid on the page: 'Tool Overview' points to the title and description; 'Summary text' points to the main descriptive paragraph; 'Tool's relevance to the StR' points to the 'Steps to Resilience' sidebar; and 'Tool's online address' points to the 'Tool URL' section. A fifth callout box, 'Topics & Subtopics of relevance', points to the 'Topics' section.

Tool Overview

Summary text

Tool's relevance to the StR

Tool's online address

Topics & Subtopics of relevance



U.S. Climate
Resilience
Toolkit

[Steps to Resilience](#) [Case Studies](#) [Tools](#) [Expertise](#) [Regions](#) [Topics](#)

Search

Meet the Challenges of a Changing Climate

Learn about potential climate hazards so you can protect vulnerable assets.

LEARN ABOUT THE STEPS TO
RESILIENCE >

READ CASE STUDIES OF BUILDING
RESILIENCE >

CHECK CONDITIONS PROJECTED
FOR THE FUTURE >

TOUR THE TOOLKIT >

MORE
>



STEPS TO RESILIENCE

This framework helps you document climate hazards that could harm the things you care about, decide which situations you most want to avoid, and come up with workable solutions to reduce your climate-related risks.



How to specifically include it in teacher PD in ways that are easy for teachers at multiple grade levels to implement, within the framework of MWEE's?

Did you know?

Why should we care?

What can we do about it?



- The “**Steps to Resilience**” is a risk assessment and planning framework by which participants with diverse backgrounds (policy makers, city planners, resource managers, business leaders, data analysts, GIS specialists and etc.) can participate in an inclusive, deliberative dialog aimed at making and implementing a plan for making their valued assets more resilient.
 - People can compare and build upon each others' experience
 - Templates allow effectiveness and efficiency
 - Move from exposure to vulnerability to taking action
 - Scale from national to regional to local
- Recognizes that users must deal with complex systems when making decisions
 - Whole systems approach compared to topic-based silos
- Helps people deal with **risk** and **uncertainty**

Online at <https://crt-climate-explorer.nemac.org>

U.S. Climate Resilience Toolkit

Menu

Tour This Page
About
Definitions
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Credits

THE CLIMATE EXPLORER

Explore graphs and maps of historical and projected climate variables for any county in the contiguous United States.

SHARE

Select a location

View by variable

Weather & Tidal Stations

New here? Take the tour

GlobalChange.gov
U.S. Global Change Research Program

DESIGNER OF NEMAC

USGS
NASA

Designed by Habitat Seven

detailed data/analysis explanation

Balancing complexities of user needs with the enormity of available data & information

LESSONS LEARNED:

1. Start at the audience interface by getting inside their problem space and work backward from there into the science domain.

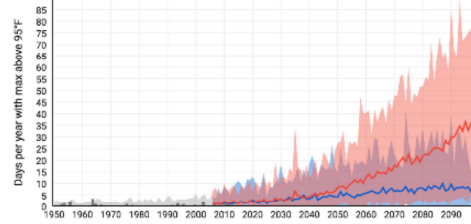
2. Focus attention only on those resources that are useful and relevant to the audience's needs & motivations.
3. Carefully consider hierarchy of information — generally, “where” trumps “what” and “why” trumps “who.

The number of very hot days in Manchester, NH, is projected to increase dramatically this century

Temperature

- Avg Daily Max Temp (°F)
- Avg Daily Min Temp (°F)
- Days w/ max > 90°F
- Days w/ max > 95°F
- Days w/ max > 100°F
- Days w/ max > 105°F
- Days w/ max < 32°F
- Days w/ min < 32°F
- Days w/ min > 80°F
- Days w/ min > 90°F

Chart: Hillsborough County
Annual Days w/ max > 95°F

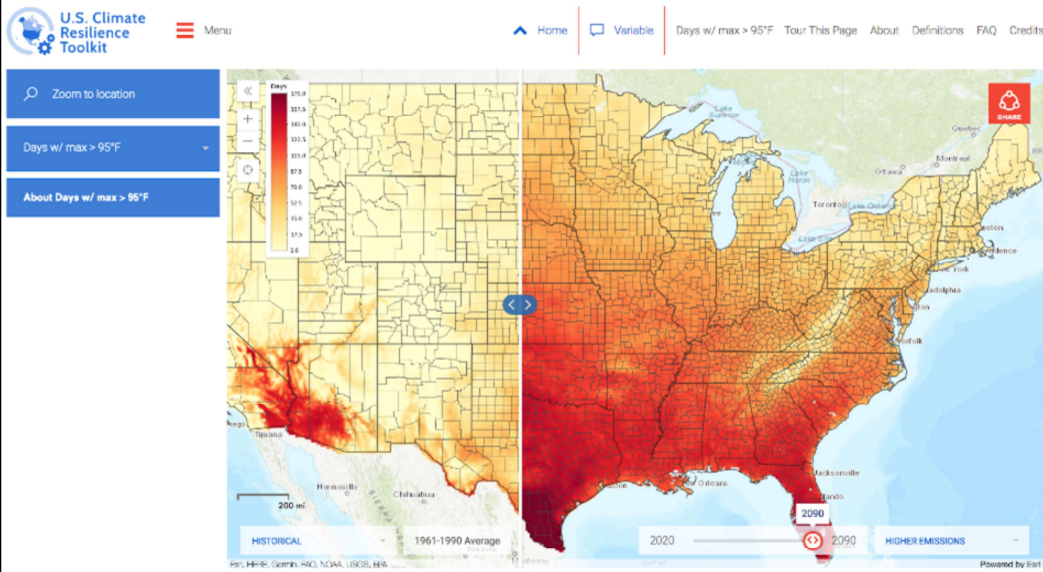


Observations Historical (Modeled) Lower Emissions Higher Emissions Average

1950 2100



Ditto for the entire nation. Colors show days >95°F
Dark red represents 175 days per year.



CLEAN

Nationally renowned, award-winning, online clearinghouse featuring:

- . Collection of 800+ high-quality, peer-reviewed climate and energy education resources
- . Pedagogic support/classroom readiness guidance (K-16)
- . Vibrant community of practice (CLEAN Network)

Example
Activities



3 pillars of CLEAN –

The **CLEAN Collection** contains 700+ vetted educational resources including activities, lab demonstrations, visualizations, videos for grades K-16. Resources are organized by the climate and energy literacy principles, and are aligned with the Next Generation Science Standards.

Guidance for Teaching Climate Literacy and Energy Science provides pedagogical support for teaching climate and energy topics using the collection. Guidance pages are background, Toolkit provides resources like unit guides, PD support through newsletter & webinars

The **CLEAN Network** is a professionally diverse community of climate and energy literacy community members/partners. Anyone is welcome to join the CLEAN network

NOAA Teaching Climate

CLEAN is syndicated to NOAA's Teaching Climate portal:

- Manages resources
- Develops support pages and PD
- Coordinates PD Calendar

The screenshot shows the NOAA Climate.gov website. At the top left is the NOAA logo and the text 'Climate.gov SCIENCE & INFORMATION FOR ALL PARTS OF THE WORLD'. To the right are social media icons and a search bar. Below the header is a navigation menu with links for 'News & Features', 'Maps & Data', 'Teaching Climate', 'Resilience Toolkit', and 'About'. The main heading is 'Teaching Climate'. In the center is a circular graphic made of concentric dashed lines in green and blue, with the text 'global weirding with Katharine Hayhoe' below it. To the right is a 'FEATURED' section with a list of articles: 'The Essential Principles of Climate Literacy', 'Climate Wisconsin Adaptation-Mitigation', 'Climate Change at the Doorstep', 'Next Generation Climate Lesson 5 - In what ways can the repercussions of climate change be minimized?', and 'Thermal Expansion of Water'. A blue callout box on the right contains the text 'Example Activities'. At the bottom of the featured section is a link 'See All Teaching Climate >'. Below the featured section is a video player for the article 'I Live in the Eastern US - Does Climate Change Matter to Me? | Global Weirding'.

Mention climate.gov site – official government site for teaching about climate & energy. CLEAN is syndicated to NOAA Teaching Climate meaning all resources are on both pages because the websites talk to each up and update regularly.



CLEAN COLLECTION

- Community Reviewed
- Classroom Ready
- Expert Scientist Reviewed
- Curated
- Online, free resources
- Aligned with NGSS, Literacy Frameworks
- Filter Search Options

Alignment of climate change education to NGSS practices and standards

Focus on listed bullet points to describe the collection.

The image compares two search engines: Google Search and CLEAN Search. On the left, the Google Search interface shows a search for 'hurricane lesson plan' with 887,000 results. On the right, the CLEAN Search interface shows a search for 'hurricane' with 37 matches. A vertical banner on the right side of the image reads 'Benefits of CLEAN'.

Google Search

hurricane lesson plan

About 887,000 results (0.67 seconds)

CLEAN Search

Climate and Energy Educational Resources

The CLEAN Collection is a high-quality and rigorously reviewed collection of climate and energy educational resources aligned with the Next Generation Science Standards, Literacy and the Energy Literacy frameworks, and the Next Generation Science Standards. Through the peer-review process scientists and educators ensure scientific accuracy, pedagogical soundness, and alignment with standards.

Explore the Collection

hurricane search

Current Search Limits: Text Search hurricane

Results 1 - 10 of 37 matches

Benefits of CLEAN

Why would we need a collection? Everyone has google and can find a million resources fast – but who has time to go through that?

CLEAN allows teachers to search easily and know the resources they get are scientifically and pedagogically sound.

Connecting with science standards and suggested activities

Major Storms and Community Resilience

<https://www.clemson.edu/collegeofeducation/departmentofscience/educationresearchcenter/unit1.html>
Lisa Dwyer, Lorraine Meinhart, Patricia Stapleton, Science Education Research Center at Clemson College

This is Unit 1 of a larger module and centers on the fundamental concepts of major storms and community resilience. In this unit, students acquire a vocabulary related to storm systems and risk, engage in practical exercises on event probability and frequency, and complete written activities and oral presentations that reinforce these concepts, using two case studies as examples.

This learning activity takes two or three 90 minute class periods.

[Learn more about Teaching Climate Literacy and Energy Awareness](#)

[See how this Activity supports the Next Generation Science Standards](#)

Jump to this Activity

Notes From Our Reviewers

These reviewers' feedback and comments received for scientific accuracy and classroom effectiveness. Read what our reviewers had to say about this resource's content and how it can be used in your classroom.

[View](#) [Download](#) [Additional Items](#)

Teaching Tips

- Teaching tips and suggested resources for more information are provided throughout unit.
- The instructor should test all links and request limited access materials well in advance of teaching this unit, as there may be a time lag in receiving those materials.
- Instructors can modify the activities to include in a variety of courses.

About the Science

- This unit is designed to help students calculate frequency and probability of natural hazards using data from the New Hampshire Multi-Hazard Mitigation Plan (2011) as a case study. It also helps students analyze risk associated with natural hazards using a Hazards Vulnerability Analysis (HVA), and then critique a Hazard Mitigation Plan (HMP) using New Orleans as a case study.
- There is opportunity for the instructor to bring in local data instead of using the provided case studies.
- Passed initial science review - expert science review pending.

About the Pedagogy

- The unit provides clear learning goals, materials to achieve those goals, and assessments to evaluate if the learning goals were met.
- Both required and supplemental readings (e.g., government reports) are provided to support the learning activities. The materials and activities can be adapted and modified as necessary for geoscience courses, as well as use in non-science courses such as emergency management or urban planning.
- Students without background knowledge or familiarity with the relevant vocabulary, HVAs, and HMPs would benefit from additional instruction to introduce these concepts.
- Instructors should be familiar with systems thinking and using concept maps. Additional resources for these topics are suggested.

Technical Details/Ease of Use

- Instructors should be aware that there are currently several broken links (e.g., Hazard Mitigation Plan for the City of New Orleans, Word version of some documents) and that some materials (e.g., pre-survey rubric) are only available by request.

Related URLs

These related URLs were noted by our reviewers but have not been reviewed by CLEAN.

[U.S. Climate Resilience Toolkit](#)

Grade Level
College Lower (13-14)
See more on this grade level.
College Upper (15-16)
See more on this grade level.
Graduate/Professional
See more on this grade level.
Regional Focus
North America
See more on this topic.

Topics
Find resources on these topics:
Extreme Weather
See more on this topic.
Public Health
See more on this topic.
Climate Impacts
See more on this topic.
Mitigation Strategies
See more on this topic.
Adaptation Strategies
See more on this topic.
Human Responses to Climate
See more on this topic.

Climate Literacy
This Activity builds on the following categories of climate literacy:
Click a box below for supporting information, teaching ideas, and sample activities.
Humans can take actions to reduce climate change and its impacts.
Climate change will have consequences for the Earth system and human lives.

Description

Resource information

Source information

Link to resource

Tags

Grade Level

Topics

Literacy Principles

CLEAN Resource Page

Notes from Reviewers

Teaching tips

Science involved

Pedagogy included

Technical details

Related URLs

It's a pointer collection so each page links back to resource. Our summary allows you to scan and get a glimpse of what it is.

Then more info is provided from reviewers about the science and pedagogy and tags for searching.

Resource Type
 Activity
 Video
 Visualization
 (simulation, animation, interactive, static)

Grade Level
 Elementary
 Middle
 High School
 College
 Informal

NGSS
 Performance Expectations
 Disciplinary Core Ideas
 Cross-Cutting Concepts
 Sci & Engineering Practices

Topics
 Literacy Principles
 Climate Topics
 Energy Topics

Dataset use, Regional Focus, Online Readiness, etc.

Refine the Results ↓

Resource Type
 Activity [13 matches](#)
 Teaching Guidance [10 matches](#)
 Video [8 matches](#)
 Visualization [6 matches](#)

Grade Level
 Intermediate (3-5) [2 matches](#)
 Middle (6-8) [19 matches](#)
 High School (9-12) [22 matches](#)
 College Lower (13-14) [16 matches](#)
 College Upper (15-16) [9 matches](#)
 Graduate/Professional [3 matches](#)
 Informal [5 matches](#)
 General Public [2 matches](#)

NGSS Performance Expectations
 Grades 3-5 [1 match](#)
 Middle School [8 matches](#)
 High School [7 matches](#)

NGSS Disciplinary Core Ideas
 Grades 3-5 [1 match](#)
 Middle School [20 matches](#)
 High School [20 matches](#)

NGSS Cross-Cutting Concepts
 3-5 [1 match](#)
 Middle School [16 matches](#)
 High School [17 matches](#)

NGSS Science and Engineering Practices
 3-5 [1 match](#)
 Middle School [13 matches](#)
 High School [15 matches](#)

Regional Focus
 Africa [1 match](#)
 Islands, Oceans (Global) [3 matches](#)
 No Regional Focus [6 matches](#)
 North America [2 matches](#)
 Polar Regions [1 match](#)

Dataset Use
 Students Use Scientific Dataset [6 matches](#)

Other Categories
[Climate and Energy Topics \(add this category\)](#)
[Climate Literacy Principles \(add this category\)](#)
[Energy Literacy Principles \(add this category\)](#)
[Environmental Education Guidelines \(add this category\)](#)
[Climate Systems and Solutions \(add this category\)](#)
[Online Readiness \(add this category\)](#)
[Elementary Subject \(add this category\)](#)

Tools for undergraduate students

Search the Collection

I am interested to know how we can incorporate current data sets into the classroom.

Teachers can search in multiple ways – open search vs. tags. (open search looks for text anywhere on page – filters are tagged by humans so can help with searching by topics). Focus on the listed search tags, but point out that the dataset use tag might be especially useful

Guidance in Teaching About Climate and Energy

Climate and energy are complex topics, with rapidly developing science and technology. These pages offer easy-to-read explanations of science and policy, designed to step students through the key principles of climate and energy. Each page is illustrated with examples to bring these topics alive in your classroom.

- A summary of each of the climate and energy literacy principles
- Ideas to support learners
- Suggested teaching approaches, selected for various grade levels
- Relevant resources from the CLEAN collection

Teaching Climate
Walk students through key components of the climate system: the Sun, the atmosphere, life on Earth, human impacts, how scientists study climate, and actions humans can take.

Teaching Energy
Trace the story of energy in our lives, beginning with the physics of energy and how energy flows throughout the earth system. Explore energy's influence on human society, sources of energy, the ways we use energy, how we make decisions about energy, and the impacts of energy use.

Guidance in Elementary Teaching About Climate and Energy
The fundamentals of Earth's climate are exciting to teach to any audience. Find advice, ideas, and strategies for elementary educators for teaching climate and energy in grades K through 5.

Culturally Relevant Climate Teaching
This climate course from the Living Landscapes project is a NASA-funded set of educational resources designed to integrate traditional knowledge (Native science) about the climate with current climate science research. The materials follow the climate literacy principles (similar to the CLEAN Teaching Climate section), and are framed within traditional ways of knowing.

Check out the Educator Toolbox to find more teaching resources
Explore tools for teaching about climate and energy, including pedagogical approaches, activities, and instructional ideas:

- Creating Your Own Climate and Energy Units
- Earth Systems Investigations
- Teaching with the National Climate Assessments
- Newsletters
- Webinars
- Workshops

Teaching Guidance

Strategies and projects k-8

Features:

- Background pages
 - Spanish translations
 - Quizzes
- Elementary teaching support
- Culturally relevant teaching resources
- Toolkit
- And much more...

What do we know about teachers' professional development needs regarding effective climate change education, esp. linking climate and ocean/aquatic science?

What level is appropriate for the various grade levels? What do students really need to understand?

Background pages for teachers focusing on climate and energy literacy principles. These have Spanish versions and quizzes to test your or student knowledge. Elementary teaching guidance includes strategies, fundamental concepts to address, links to NGSS, and a resource collection. Culturally relevant resources introduce a project similar to CLEAN but with a culturally relevant focus on the climate literacy principles considering Indigenous knowledge and regional specificity. Toolkit of support and resources - will talk more about others later.

Practice Brief 68 -- Topics: Equity Instruction

Keeping Climate Science Learning and Instruction Focused on Creating Solutions and Building Community Resilience

[Tweet](#) [SAVE](#) [Like](#) [PDF](#) [EMAIL FEEDBACK](#) [-BACKGROUND](#)



Just ideas to make it fun, hopeful and empowering

How climate change education can inspire action at individual, family, and community levels?

<http://stemteachingtools.org/brief/68>



Teaching Tools for Science, Technology, Engineering and Math (STEM) Education

HOME

TOOLS

PD MODULES

CLIMATE LEARNING

NEWS

NEWSLETTER

ABOUT

Practice Brief 44 -- Topics: Teaching Climate

Addressing controversial science topics in the K-12 classroom


[Tweet](#) [SAVE](#) [Like](#) [PDF](#) [EMAIL FEEDBACK](#) [-BACKGROUND](#)




How to incorporate climate change in an inclusive and non-confrontational way to student bodies with conflicting beliefs or non-scientific views?

How to approach this topic in politically sensitive environments?

<http://stemteachingtools.org/brief/44>




Educators' Tools




Curriculum Guides

- CLEAN & NGSS
- Understanding Global Change
- Earth System Investigations




NCA Resources

Guidance and resources for addressing the National Climate Assessment




Managing Controversy

Guidance and resources for addressing climate change with resistant audiences




STEM Flash

- Biweekly newsletter
- Connect CLEAN resources to current events
- Archive of past newsletters



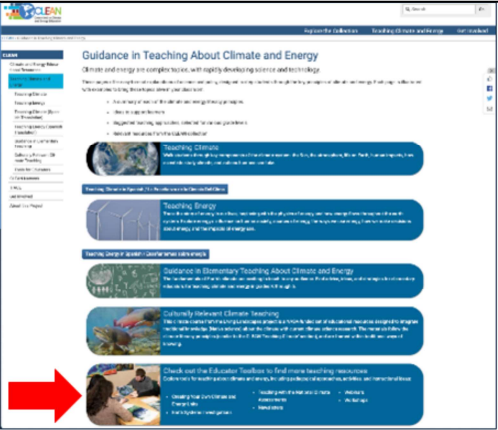
PD Webinars

- 6 webinar series every semester
- Special webinars
- Recordings of all webinars



Virtual Teaching

- Tips for searching collection
- Highlighted virtual education resources



Educator Toolbox

Three unit development guide templates – two based on NGSS and one from partner UGC, resources for teaching the National Climate Assessment, a page with resources and ideas for dealing with resistant audiences, virtual teaching resources (a page for searching CLEAN & another highlighting good resources from collection). Ongoing PD support through newsletter & webinars.

Virtual teaching box can change to 'other' in the future and include virtual teaching, humanities-based teaching, and DEI resource pages

Rising to the Challenge



NOAA programs have evolved over the years to coherently build environmentally literate communities

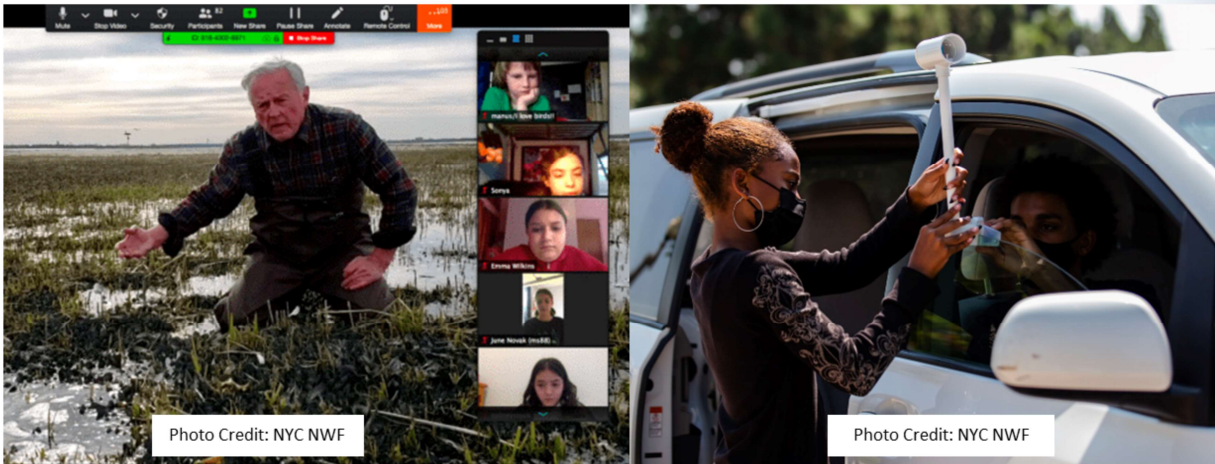


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- NYC A three-day leadership retreat for youths, focusing on public speaking skills, problem-solving, project management, climate justice and sustainability. Multiple NOAA programs and partners contributed to the event.
<https://yaleclimateconnections.org/2021/03/summits-target-and-equip-youths-to-confront-climate-their-way/>
- San Diego tracking 'urban heat islands' in low-income neighborhoods as temperatures rise, Funded by NOAA CPO and building on an OEd grant;
<https://www.sandiegouniontribune.com/news/environment/story/2021-09-13/san-diego-citizen-scientists-extreme-heat> , Kera Norris and Bryant Baker, 11th grade students at High Tech High, demonstrate how heat sensors are installed on a car. Students drove around various San Diego neighborhoods with the sensors to track how temperatures can vary.(Kristian Carreon/For The San Diego Union-Tribune)
- Science On a Sphere® Users Collaborative Network Workshop builds partnership across NOAA; <https://research.noaa.gov/article/ArtMID/587/ArticleID/1465/Learning-Science-the-SOS-Way-Science-On-a-Sphere174-Celebrates-10-years>

NOAA works collaboratively in diverse and innovative ways

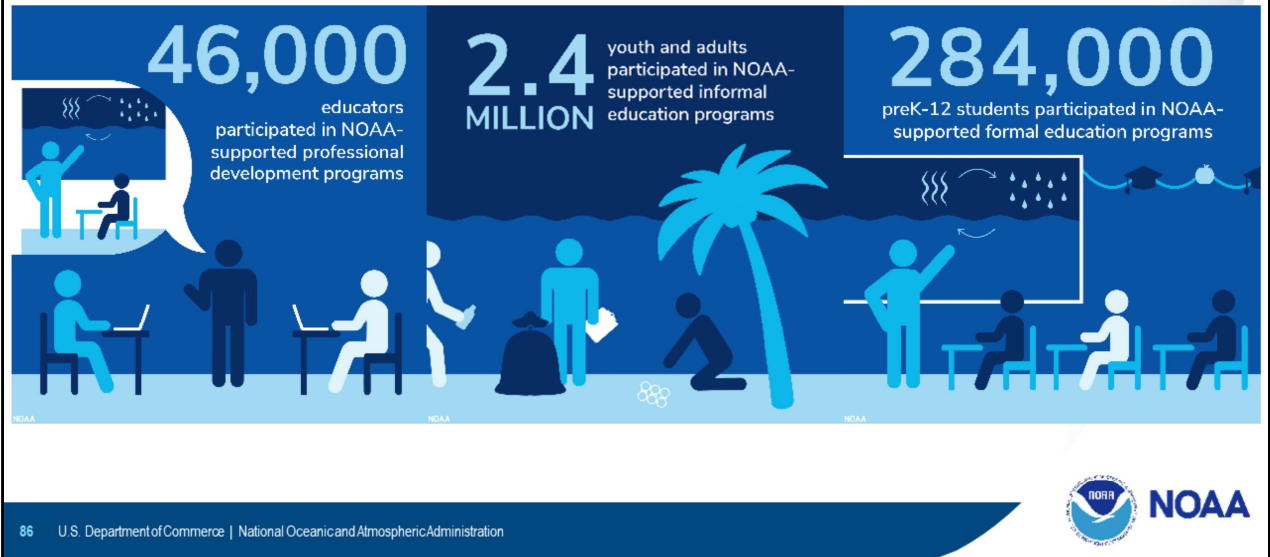


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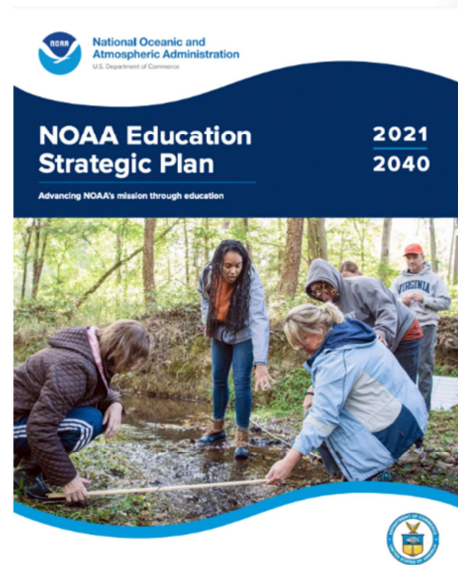
- NYC Students Learn How to Build a Climate Resilient Future; RISC, <https://blog.nwf.org/2020/09/nyc-students-learn-how-to-build-a-climate-resilient-future/>, RiSC students take a virtual trip into Jamaica Bay with Don Riepe of the American Littoral Society. Photo: National Wildlife Federation.
- San Diego tracking 'urban heat islands' in low-income neighborhoods as temperatures rise, Funded by NOAA CPO and building on an OEd grant; <https://www.sandiegouniontribune.com/news/environment/story/2021-09-13/san-diego-citizen-scientists-extreme-heat>, Kera Norris and Bryant Baker, 11th grade students at High Tech High, demonstrate how heat sensors are installed on a car. Students drove around various San Diego neighborhoods with the sensors to track how temperatures can vary. (Kristian Carreon/For The San Diego Union-Tribune)

To address the challenges, NOAA and partners educational programs are having a collective impact



- <https://www.noaa.gov/office-education/noaa-education-council/accomplishments>

NOAA'S EDUCATION MISSION:
To educate and inspire the nation to use science toward improving ocean and coastal stewardship, increasing safety and resilience to environmental hazards, and preparing a future workforce to support NOAA's mission.



- <https://www.noaa.gov/office-education/noaa-education-council>
- <https://www.noaa.gov/sites/default/files/2021-07/Report-EducationStrategicPlan2021-2040-07162021-OfficeOfEducation.pdf>

Science is cool!



noaa.gov/education

Ways to connect with NOAA
Education:

noaa.gov/education

@NOAAEducation



NOAA

- You can connect with NOAA too! See our education portal for resources and opportunities.
- Follow us on social media.

Questions

Q&A PADLET:

<https://padlet.com/bronwenrice/gf9awa4fvw5n4r7y>



Thank You!

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Thanks everyone for your participation today!

We will keep the Padlet up for the rest of the day if you would like to add additional questions.

Once the webinar has been posted we will email all of the webinar registrants with the link and any follow up materials.

Thanks again for your time and attention and for all that you do to support climate and environmental education around the country!