



CLIMATE DATA TOOLS: TELL YOUR COMMUNITY'S STORY.

Predicting the impacts of climate change is challenging. Finding easy-to-access data for your community can seem difficult, too. But did you know that there are a number of climate-related data tools for locations across the U.S. that are free and easy to use?

Use this guide to find a set of tools to help you understand and describe your community's "story" with regard to natural hazards. These tools are designed to help you examine, illustrate, and plan for the risks posed by natural hazards that threaten communities, both now and in the future.

WHAT CAN I DO WITH THESE TOOLS?

You can use this information to develop and update the risk and capability assessments that form the basis of local hazard mitigation plans (HMPs) and community resilience-building efforts. These tools can also help you complete grant applications for funding from FEMA and other agencies by explaining your community's risk.

Look for these icons throughout this guide for tools that address specific hazards and special conditions.



FLOODING



HURRICANE



EXTREME
TEMPERATURES



WILDFIRE



DROUGHT



SOCIAL
VULNERABILITY



FUTURE
CONDITIONS



WHAT IS THIS
TOOL GOOD FOR?



HOW IS THIS
TOOL LIMITED?



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ARE YOU ABOUT TO UPDATE YOUR HAZARD MITIGATION PLAN (HMP)?

If you are about to update your HMP, please note that you must address the impact of future conditions. According to FEMA's new Local Mitigation Planning Policy Guide (released April 19, 2022; effective April 19, 2023), you must take into account the impact of future conditions. These include the effects of long-term climate change, population patterns, community development, and land use. Using the latest climate data can give you a stronger understanding of the risks threatening your community, county, or region. These data tools can help you more clearly pinpoint the threats to people, buildings, and lifelines such as water, health services, utilities, and communications.

Once you have a clear picture of the hazards your community faces, you can develop mitigation strategies to address your current and future risks. These wide-ranging strategies could include: green infrastructure, climate adaptation projects, resilient building codes, and changes in land use rules. Communities can also use this information to explore other resilience efforts.

Here are the HMP elements that have new future conditions and climate change requirements.

ELEMENT B1-E.

Requires that the Risk Assessment address the likelihood of future events for each identified hazard. It must take into account “the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature and sea levels), on the type, location and range of anticipated intensities of identified hazards.”

ELEMENT B2-B.

Requires the plan to describe the potential impacts on each participating jurisdiction and its listed assets. Impacts must include the effects of climate change; changes in population patterns (migration, density, or the makeup of socially vulnerable populations); and changes in land use and development.

ELEMENT E1-A.

Requires the plan to describe changes in development that have occurred in hazard-prone areas. The plan must spell out how these changes have increased or decreased the vulnerability of each jurisdiction since the last plan was approved. Changes in development mean recent development; potential development; conditions that may affect the risks and vulnerabilities of the jurisdictions (for instance, climate change, declining populations, projected increases in population, or foreclosures); shifts in the needs of underserved communities; or gaps in social equity.



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CLIMATE DATA TOOLS THAT YOU CAN USE.

The following list of tools is not all-inclusive, as there are many more tools available, but it is a good starting point to gather climate data for your community. Each description includes the organization(s) that developed and manage the tool. Please note that FEMA does not require, endorse or prescribe any resource for use in HMPs.

The tools are grouped by their level of difficulty. If your organization has a limited capacity, start with the tools labeled “**Basic**.” If you have GIS technicians on staff and want to perform advanced analyses, try the tools labeled “**Intermediate**” or “**Advanced**.”

BASIC



CLIMATE AND ECONOMIC JUSTICE SCREENING TOOL (CEJST)

White House



This online interactive map uses datasets for eight categories: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development, which are indicators of burdens experienced by the communities. The tool uses percentiles to show how much burden each census tract experiences compared to other tracts. A community is “disadvantaged” on the CEJST map if it is (1) at or above the threshold for one or more environmental, climate, or other burdens, and (2) at or above the threshold for an associated socioeconomic burden.

- + Census tract boundaries are from 2010. Combining this data with other census tract data (such as NRI) can be tricky, because it uses an older set of census tracts relative to other data.

Tool: [Explore the map - Climate & Economic Justice Screening Tool \(geoplatform.gov\)](#)



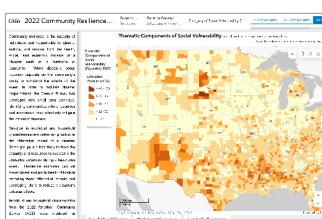
COASTAL FLOOD EXPOSURE MAPPER

NOAA



This tool creates a collection of user-defined maps that show the people, places, and natural resources exposed to coastal flooding. The maps can be saved, downloaded, or shared to communicate flood exposure and potential impacts.

Tool: [Coastal Flood Exposure Mapper \(noaa.gov\)](#)



COMMUNITY RESILIENCE ESTIMATES (CRE)

Census Bureau

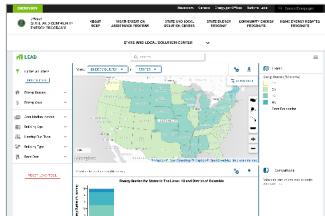


The CRE tracks how socially vulnerable every single neighborhood in the U.S. is by measuring the capacity of individuals and households to absorb, endure, and recover from the external stresses of a disaster. This interactive application uses 2022 American Community Survey (ACS) data and population estimates.

Tool: [Community Resilience Estimates \(arcgis.com\)](#)



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LOW-INCOME ENERGY AFFORDABILITY DATA (LEAD) TOOL

DOE/EERE



This interactive tool allows users to build their own national, state, city, or county profiles with estimated, locally-specific, low-income household energy characteristics. Users can visualize the profiles, compare differences among profiles, save their profiles, and download visualizations and data. The tool includes filters such as building age, building type, rent/own, and energy burden by Area Median Income (AMI).

Tool: [Low-Income Energy Affordability Data \(LEAD\) Tool and Community Energy Solutions | Department of Energy](#)



FIFTH NATIONAL CLIMATE ASSESSMENT (NCA5) INTERACTIVE ATLAS

National Climate Assessment



The Atlas is an extension of the National Climate Assessment (NCA5), offering interactive maps that show projections of future conditions in the U.S. Maps include:

- Change in Number of Days over 100°F
- Change in Number of Days Below 0°F
- Change in Extreme Precipitation
- Coastal Inundation from Sea Level Rise
- + The climate maps and data can be used directly in hazard mitigation plans or local analyses, while the StoryMap feature helps people understand broad climate projections and their impacts.
- * The data may only be available at the county level, which would be less helpful for some municipalities.

Tool: [National Climate Assessment Interactive Atlas \(globalchange.gov\)](#)



WILDFIRE RISK TO COMMUNITIES

USDA/USFS



This tool features interactive maps to help communities better understand their risk of wildfire and explore ways to reduce their risk. Data are available for every city, county, and state in the U.S. 15 data layers can be downloaded as tables and GIS files.

Tool: [Wildfire Risk to Communities](#)

U.S. CLIMATE RESILIENCE TOOLKIT

The U.S. Climate Resilience Toolkit is a [website](#) designed to help people find and use tools, information, and subject matter expertise to build climate resilience. The Toolkit offers information from across the U.S. federal government in one easy-to-use location.



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INTERMEDIATE



CLIMATE MAPPING FOR RESILIENCE AND ADAPTATION (CMRA)

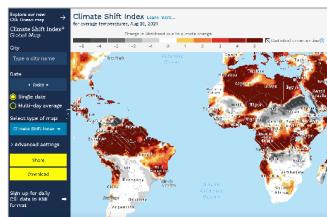
White House/NOAA



CMRA can help users understand what climate-related hazards they face now and in the future. The interactive assessment tool combines statistics, maps, and reports that explore five climate-related hazards: heat, drought, wildfire, flooding, and coastal inundation. CMRA is part of the U.S. Resilience Toolkit. It integrates FEMA's National Flood Hazard layer and tracking of current hazard-resistant building codes.

- + CMRA is available at the census tract level or county level. The graphs and charts could be helpful when creating a hazard mitigation plan. The tool provides context for certain data points. CEJST disadvantaged status and building code adoption information are also built into CMRA.

Tool: [Climate Mapping for Resilience and Adaptation](#)



CLIMATE SHIFT INDEX (CSI)

Climate Central



The CSI reveals how much climate change influences the temperature on a particular day. The index ranges from -5 to +5, with positive levels indicating temperatures that are becoming more likely due to climate change. (Negative scores indicate conditions that are becoming less likely.)

Tool: [CSI Average Temperature Map | August 2, 2024 \(climatecentral.org\)](#)



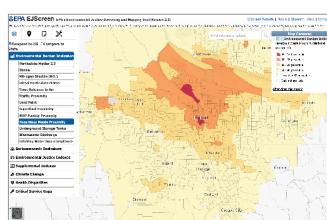
COASTAL RISK SCREENING TOOL

Climate Central



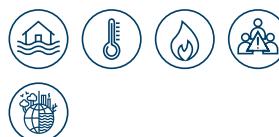
The Coastal Risk Screening Tool is an easy to use, interactive map tool that shows areas threatened by sea level rise and coastal flooding. Maps combine an advanced global model of coastal elevations with the latest projections for future flood levels and can be downloaded easily.

Tool: [Coastal Risk Screening Tool](#)



ENVIRONMENTAL JUSTICE SCREENING & MAP TOOL (EJSscreen)

EPA

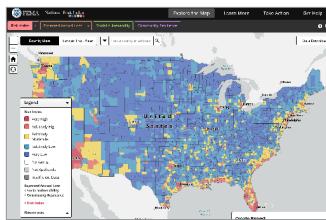


EJSscreen is an environmental justice mapping and screening tool based on nationally consistent data. It was developed by EPA to highlight places that may be candidates for further review, analysis, or outreach to support the agency's environmental justice work. EJSscreen users choose a geographic area; the tool then provides demographic, socioeconomic, and environmental information for that area.

Tool: [EJSscreen: Environmental Justice Screening and Mapping Tool | US EPA](#)



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NATIONAL RISK INDEX (NRI)

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The NRI is a dataset and online tool to illustrate communities that are most at risk for 18 natural hazards. Users may create reports to capture risk details for a community, conduct community-based risk comparisons, and export data for analysis using other software. Hazards profiled: Avalanche, Coastal Flooding, Cold Wave, Drought, Earthquake, Hail, Heat Wave, Hurricane, Ice Storm, Landslide, Lightning, Riverine Flooding, Strong Wind, Tornado, Tsunami, Volcanic Activity, Wildfire, and Winter Weather.

- + The National Risk Index (NRI) considers three factors: Expected Annual Loss, Social Vulnerability, and Community Resilience.
- * Data for Social Vulnerability are only available for Puerto Rico, and Risk scores for U.S. Territories cannot be calculated due to the lack of data for Social Vulnerability and Community Resilience. Additionally, climate change is not yet factored into the NRI, but an update is expected in late 2024.

Tool: [National Risk Index | FEMA.gov](#)



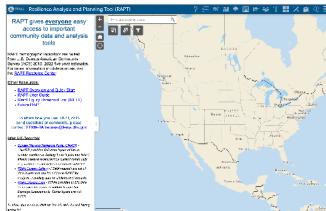
NEIGHBORHOODS AT RISK

Headwaters Economics



This interactive data tool allows users to filter and explore census tracts based on socioeconomic and climate exposure variables to show where people may experience unequal impacts from flooding and extreme heat. It also provides climate projections for changes in temperature and precipitation at the selected location. Users can download customized reports showing socioeconomic data for selected census tracts.

Tool: [Neighborhoods at Risk: About - Headwaters Economics](#)



RESILIENCE ANALYSIS & PLANNING TOOL (RAPT) *INCLUDES COMMUNITY CHALLENGES RESILIENCE INDEX

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RAPT is a free, publicly available Geographic Information System (GIS) web mapping application that includes over 100 pre-loaded data layers and easy-to-use analysis tools to help users visualize and analyze critical community data, including Community Lifelines. Population, infrastructure, hazards, and projected climate data are available, in addition to FEMA's Community Resilience Challenges Index (CRCI). The CRCI includes 22 indicators related to population and household characteristics, housing, healthcare, economic factors, and connection to community.

- + The tool integrates real-time weather forecasts and an extensive array of data layers, enabling users to overlay information for a more comprehensive view of their community's risk.
- * While RAPT provides a national overview, its ability to reflect highly localized conditions may be limited.

Tool: [Resilience Analysis and Planning Tool \(RAPT\) | FEMA.gov](#)



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SEA LEVEL RISE VIEWER

NOAA



This web mapping tool helps visualize community-level impacts from coastal flooding or sea level rise (up to 10 feet above average high tides). Photo simulations of how future flooding might impact local landmarks are also provided, as well as data related to water depth, connectivity, flood frequency, socio-economic vulnerability, wetland loss and migration, and mapping confidence.

Tool: [Sea Level Rise Viewer \(noaa.gov\)](http://SeaLevelRiseViewer.noaa.gov)

ADVANCED



CLIMATE RISK AND RESILIENCE PORTAL (CLIMRR)

Argonne Nat'l Lab/
AT&T/FEMA



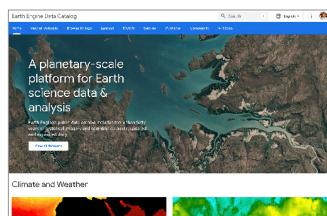
This free online tool integrates over 60 climate variables to model future climate projections for the United States. Reports, maps, and data can be downloaded and easily used to inform a wide array of climate risk analyses and adaptation planning efforts.

ClimRR climate projections can be combined with data from the RAPT tool, which allows users to understand local-scale climate risks in the context of existing community demographics and infrastructure.

Tool: [ClimRR \(anl.gov\)](http://ClimRR.anl.gov)



Check out the walkthrough of this tool at the end of this guide.



GOOGLE EARTH ENGINE

Google



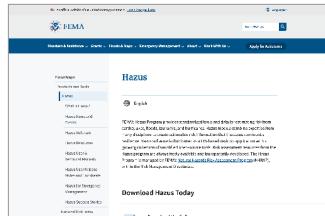
Earth Engine provides easy, web-based access to an extensive catalog of satellite imagery and other geospatial data in an analysis-ready format. Because it is part of the Google Cloud public data program, it is easier and more efficient to use for large-scale data sets, allowing for global scale analysis and visualization.

- ⊕ Imagery and data from third-parties may be imported into Earth Engine for analysis.
- ✳ Available for commercial use; free for academic and research use.

Tool: [Google Earth Engine](https://earthengine.google.com)



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HAZUS

FEMA



Hazus identifies areas with a high risk for natural hazards and estimates physical, economic, and social impacts of earthquakes, hurricanes, floods, and tsunamis. The free, downloadable modeling software is GIS-based and can also be used to model the cost-effectiveness of common mitigation strategies.

- Requires ESRI ArcGIS installed with Spatial Analyst extension.

Tool: [Hazus | FEMA.gov](#)



NOAA ATLAS 14

NOAA



NOAA Atlas 14 contains volumes of precipitation frequency estimates produced by the National Weather Service (NWS) Office of Water Prediction (OWP). These estimates are defined as the precipitation depth at a particular location, for a given storm duration, that has a statistically-expected 1-in-YY chance of being exceeded in any given year, where YY is the statistical annual recurrence interval. This information is used to design, plan, and manage much of the nation's infrastructure for a variety of purposes under federal, state, and local regulations.

Tool: [NOAA Atlas 14](#)



NOAA Atlas 15 is now in development. It will provide spatially continuous coverage over the entire U.S. and, for the first time, will also account for climate change (through the year 2100).



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DATA TOOL DEMO: CLIMATE RISK AND RESILIENCE PORTAL (CLIMRR)

ClimRR Portal: <https://climrr.anl.gov/>

Here is a quick demonstration of how a climate projections report can be produced easily with the ClimRR Portal and used by a local municipality. We set up a scenario to walk through a real-world example.

The ClimRR portal has 3 elements: the Local Climate Projections tool creates climate projections reports; National Map Explorers offers interactive web maps of each climate projection variable; and the Data Catalog contains raw downloadable data.

Scenario: Your local municipality, Bucks County, PA, is updating its hazard mitigation plan. Your task is to develop a hazard risk analysis for extreme heat. Use the ClimRR Local Climate Projections tool to pull information on historic and future conditions to determine the possible risk posed by climate change on extreme heat for your community.

INSTRUCTIONS:

1.

Resources:

- Easy to understand breakdown of climate modeling: <https://climrr.anl.gov/climatemodeling>
- Use cases: <https://climrr.anl.gov/usecases>



WHAT IS THIS TOOL GOOD FOR?

ClimRR data layers can be uploaded to RAPT for a more in-depth community analysis. ClimRR stands out among climate risk and projection applications due to its comprehensive suite of features tailored to a wide range of users, from researchers to policymakers.

Key features include:

- Tailored geographic reports
- Interactive Climate Variable Maps:
 - Precipitation Projections
 - Temperature Projections
 - Data Accessibility
 - User-Friendly Interface
 - Integration with Other Tools:
 - Regular Updates and High-Quality Data

First, go to the ClimRR Portal online:
<https://climrr.anl.gov/>

You will see the three elements of the ClimRR portal on the landing page. These can also be accessed in the website header.

Local Climate Projections National Map Explorers Data Catalog

Click on the “View Your Community: Local Climate Projections” tab.

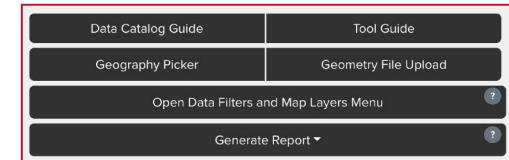
2.

Click a point on the map to generate statistics.

Data Catalog Guide	Tool Guide
Geography Picker	Geometry File Upload
Open Data Filters and Map Layers Menu	
Generate Report ▾	

User Instructions
Click a point on the map, or use the search bar in the top right to select the location for which statistics will be generated.
Click on "Open Data Filters and Map Layers Menu" to open the Data Filter and Map Layers selection menu.
Use the "Generate Report" drop-down menu to generate a report for the selected climate variable and location in PDF format, or export all statistics for the selected location.

There are a lot of features in the Local Climate Projections tool. For this walk-through, we will focus on the basics to learn how to use the tool to access data, develop graphics, and create a report for a hazard mitigation plan.



3.

Click a point on the map to generate statistics.

Data Catalog Guide	Tool Guide
Geography Picker	Geometry File Upload
Open Data Filters and Map Layers Menu	
Generate Report ▾	

User Instructions
Click a point on the map, or use the search bar in the top right to select the location for which statistics will be generated.
Click on "Open Data Filters and Map Layers Menu" to open the Data Filter and Map Layers selection menu.
Use the "Generate Report" drop-down menu to generate a report for the selected climate variable and location in PDF format, or export all statistics for the selected location.

To begin, click on the Open Data Filters and Map Layers Menu.

This will open up a list of climate variables to visualize in the map along with infographics and reports.

To keep it simple, we will use the “Data Filters” on their default settings (displaying “Temperature” variables at “Mid Century” on an “Annual” level). Under “Map Layers,” select the “Historical” variable under the “Maximum Avg Temperature.”

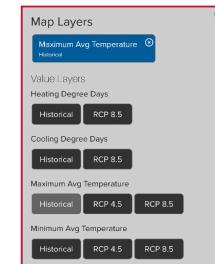
4.

Click a point on the map to generate statistics.

Data Catalog Guide	Tool Guide
Geography Picker	Geometry File Upload
Open Data Filters and Map Layers Menu	
Generate Report ▾	

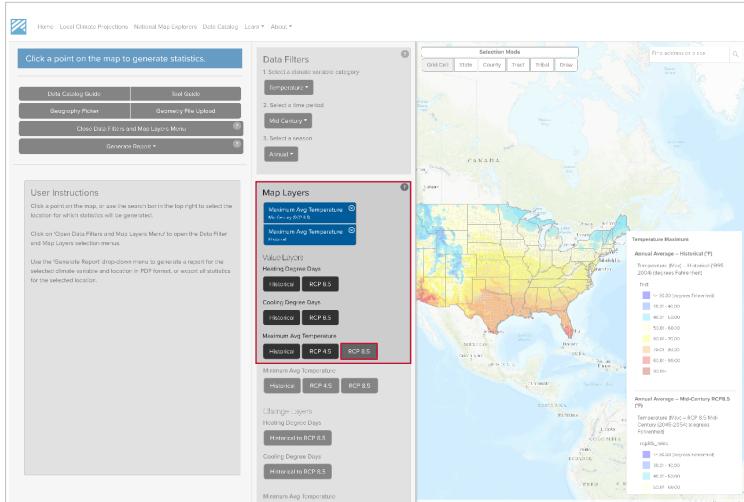
User Instructions
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Click on "Open Data Filters and Map Layers Menu" to open the Data Filter and Map Layers selection menu.
Use the "Generate Report" drop-down menu to generate a report for the selected climate variable and location in PDF format, or export all statistics for the selected location.

A blue box will appear under “Maps Layers.” This indicates which layers are displayed in the map with a corresponding legend. The selected layers will form the basis of the report we will generate in later steps.

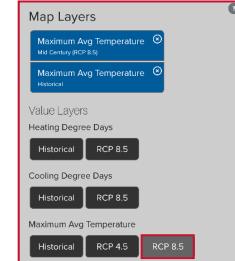


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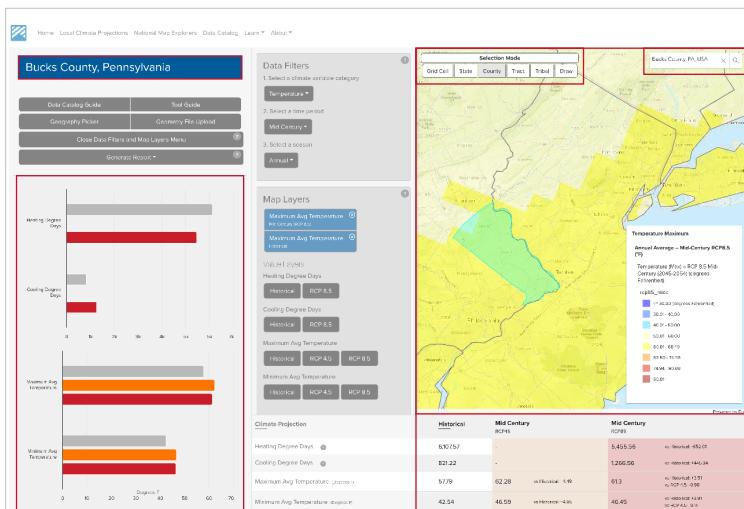
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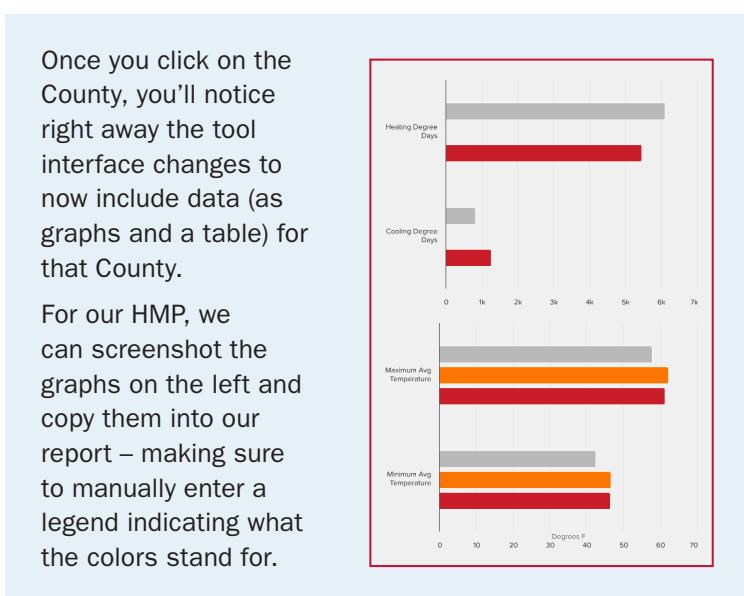
Now select the Maximum Avg Temperature for RCP 8.5, which is the extreme scenario projection. We can use this comparison to determine the risk of future conditions of extreme heat across the study area.



6.

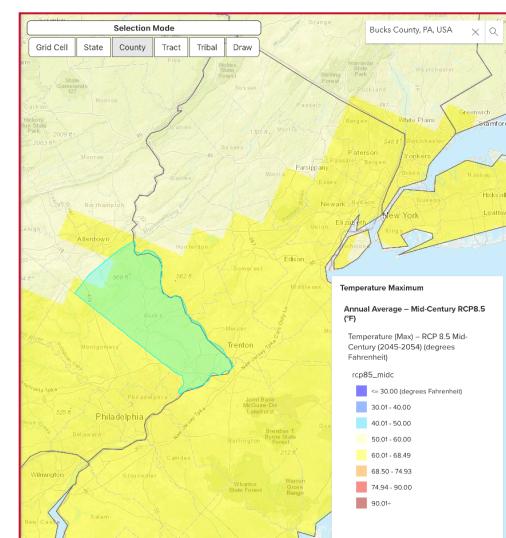


The next step is to select a geographic extent for the report. In this example, we're looking for data for Bucks County, Pennsylvania. First, select "County" under "Selection Mode," then type "Bucks County" in the search menu. Use your cursor to highlight and select Bucks County, PA.



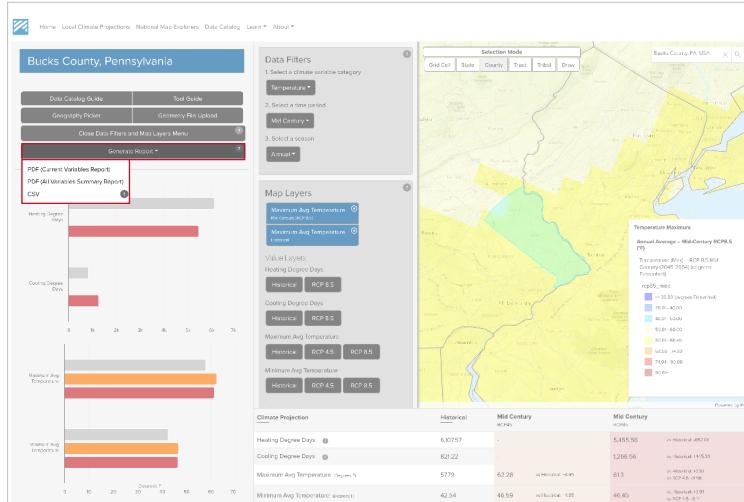
Once you click on the County, you'll notice right away the tool interface changes to now include data (as graphs and a table) for that County.

For our HMP, we can screenshot the graphs on the left and copy them into our report – making sure to manually enter a legend indicating what the colors stand for.



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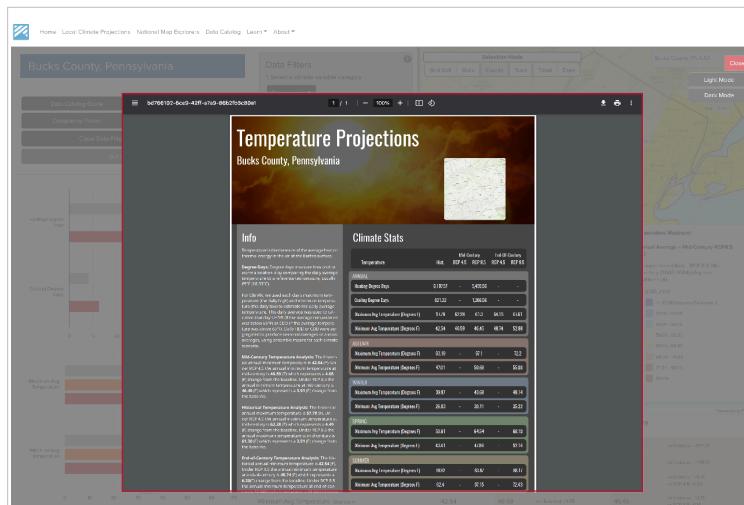
7.



Now we can generate a report for Bucks County to include in our hazard mitigation plan and presentations. **Click on the “Generate Report” button and then select PDF (Current Variable Report).** This will limit the report to the variables we selected related to temperature.



8.



The generated report includes text that can be pulled directly into the hazard mitigation plan and other materials. It also includes values in a table that can be copied and pasted into the plan as a screenshot. You will see in the highlighted table that the Maximum and Minimum Average Temperatures are projected to increase by mid-century. This can be detrimental to all populations within Bucks County, particularly those that are more vulnerable.

Climate Stats						
	Temperature	Hist.	Mid-Century	RCP 4.5	RCP 8.5	End-of-Century
ANNUAL						
Heating Degree Days	6,107.57	-	5,455.56	-	-	-
Cooling Degree Days	821.22	-	1,266.56	-	-	-
Maximum Avg Temperature (Degrees F)	57.79	62.28	61.3	64.15	67.61	
Minimum Avg Temperature (Degrees F)	42.54	46.59	46.45	48.74	52.88	

STATE AND DISTRICT FLOOD TOOLS AND ADDITIONAL RESOURCES

The FEMA Region 3 Mitigation GIS and Data Hub houses a collection of web map applications focused on floodplain management, which are created and maintained by state and district partners. Visit the [State and District Tools page](#) to learn more.



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