



ICLEI - Local Governments for Sustainability USA

Sustainable Communities Suite

Adaptation – First Steps (2022)



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ICLEI USA Staff

- Angelica Greco, Program Officer
- Kale Roberts, Senior Program Officer
- Anna Tiajolloff, Knowledge Management Officer
- Anne Marie Cleary Rauker, Communications Officer
- Calyn Hart, Program Officer
- Hannah Miller, Program Officer

Adaptation/Resilience Technical Advisory Subcommittee

- Adrienne Greve, Cal Poly - SLO
- Alex Hill, CDP
- Amaury Berteaud, Association of Monterey Bay Area Governments (AMBAG)
- Anu Ramaswami, Princeton University
- Ben Stacey, National Resources Defense Council (NRDC)
- Brittany Sellers, City of Orlando, FL
- Chris McNamara, City of Fayetteville, AR
- Joanna Wozniak-Brown, Connecticut Institute for Resilience and Climate Adaptation (CIRCA)
- Karina Graeter, Southern Maine Planning and Development Commission (SMPDC)
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- Samantha Estabrook, Headwaters Economics
- Tommy Wells, Washington, District of Columbia

Equity Technical Advisory Subcommittee

- Anu Ramaswami, Princeton University
- Ava Richardson, City of Baltimore, MD
- Bhartendu Pandey, Princeton University
- Diamond Spratling, Greenlink Analytics
- Donald Wilborn, City of Birmingham, AL
- Galen Hardy, City of Ann Arbor, MI
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- Jen McGraw, Center for Neighborhood Technology
- Linda Arbogast, City of Oberlin, OH
- Miya Kitahara, StopWaste



Introduction

Adaptation – First Steps introduces communities to climate adaptation planning. While anyone can use this resource, it is aimed at local government staff in communities that are early on in their adaptation journey. You do not need to be an expert on climate science or adaptation to use *Adaptation – First Steps*, though some familiarity with these topics is helpful.

Working through the exercises and resources linked in this document will help you develop a basic understanding of your community's climate hazard exposure and vulnerability. This knowledge can help you **open up a conversation** about the need for adaptation, **make the case** for adaptation within your local government and community, kick off your planning process by **asking the right questions**, and **mobilize resources** to move adaptation planning forward.

It is important to note that the road to adaptation is a long one that varies among communities. *Adaptation – First Steps* does not have all the answers, nor is it intended to replace a community-driven climate vulnerability assessment, adaptation strategy, or integrated climate action plan. It can, however, be a resource in the early phases of those planning processes.

Lastly, no planning process should stand alone. ICLEI recommends pursuing adaptation as part of an integrated planning effort that addresses climate change mitigation and equity, and that is based in significant and inclusive community engagement. See other resources in the Sustainable Communities Suite for guidance and methodologies to support integrated planning.

Definitions

Adaptation:	The process of adjusting to new climate conditions in order to reduce risks to people and community assets.
Adaptive capacity:	The ability of people, systems, or community assets to adjust to a hazard, take advantage of new opportunities, or cope with change.
Community assets:	The places, services, infrastructure, ecosystems, institutions, and other resources that a community believes are important to protect. In other words, community assets are the tangible and intangible things that people and communities value.
Exposure:	The presence of people, assets, and ecosystems in places



	where they could be adversely affected by hazards.
Hazard:	An event or trend that may cause injury, illness, or death to people or damage to community assets. In this document, the term “hazard” primarily refers to climate-related physical events or trends.
Impacts:	Consequences or outcomes, which can be positive or negative. In this document, the term “impacts” primarily refers to the impacts of climate-related hazards on people and community assets (see “hazard”).
Representative Concentration Pathway (RCP):	Greenhouse gas emission concentration trajectories delineated by the IPCC. The four RCPs (RCP 2.6, RCP 4.5, RCP 6, RCP 8.5) are consistent sets of plausible future conditions used in climate models.
Resilience:	<p>The ability of people, systems, or community assets exposed to a hazard to resist, absorb, accommodate, adapt to, transform and recover from the hazards’ impacts.*</p> <p><i>*Resilience has many different—and sometimes conflicting—interpretations. The term is used in numerous fields, including ecology, engineering, climate science, and disaster risk management; its definition varies both across and within communities of practitioners. Note that the definition used in this document is one of many accepted definitions of resilience. See ASAP’s Statement on the Use of the Term and Concept of Resilience for more.</i></p>
Risk:	The potential for negative consequences where something of value is at stake. In the context of the assessment of climate impacts, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard. Risk can be assessed by multiplying the probability of a hazard by the magnitude of the negative consequence or loss.
Sensitivity:	The degree to which people, systems, or community assets are or might be affected by hazards.
Vulnerability:	The propensity or predisposition to be adversely affected by hazards. Vulnerability encompasses exposure, sensitivity, and adaptive capacity.



Guide to Symbols

The following symbols are used in *Adaptation – First Steps*:

- E** Expert: Indicates that this resource may be challenging for entry-level users
- C** Community engagement: Indicates a community engagement opportunity

Integrated Planning

Figure 1 is a high-level overview of the adaptation process mapped across ICLEI's GreenClimateCities (GCC) framework. Communities lay a foundation in the Analyze phase by making commitments, exploring data, and starting the vulnerability assessment process. In the Act phase, communities set targets, develop projects and programs, and begin implementation. In the Accelerate phase, communities scale up their efforts through reporting, networking and advocacy. *Adaptation – First Steps* covers part of the Analyze phase by helping you 1) Consider local context, 2) Explore hazards and exposure and 3) Explore vulnerability in your community.

Equitable Planning

This document includes suggested tools and resources that can help you learn more about your community's climate exposure and vulnerability. Yet tools and resources are only small pieces of the puzzle. There is no report, tool, dataset, or platform that can tell your community's story. Numbers and data have a role to play in the adaptation process, but they should be considered alongside (never in place of) community voices, lived experience, and traditional knowledge.

Tools may meet the needs of some communities while leaving others out. For example, many tools do not provide climate data on the tribal nation level. Tools focused on vulnerability often rely on data from the US Census, which is known to undercount people of color, people experiencing housing insecurity and homelessness, immigrants, people with disabilities, and tribal communities on reservations at higher rates than more advantaged groups ([O'Hare, 2019](#)). This is another reason why it is important to center community voices in the adaptation process. To build the resilience of all, it is essential that adaptation processes are—by design—equitable and community-driven.

See the Appendix for assumptions behind each tool, including available geographies and links to technical documentation.

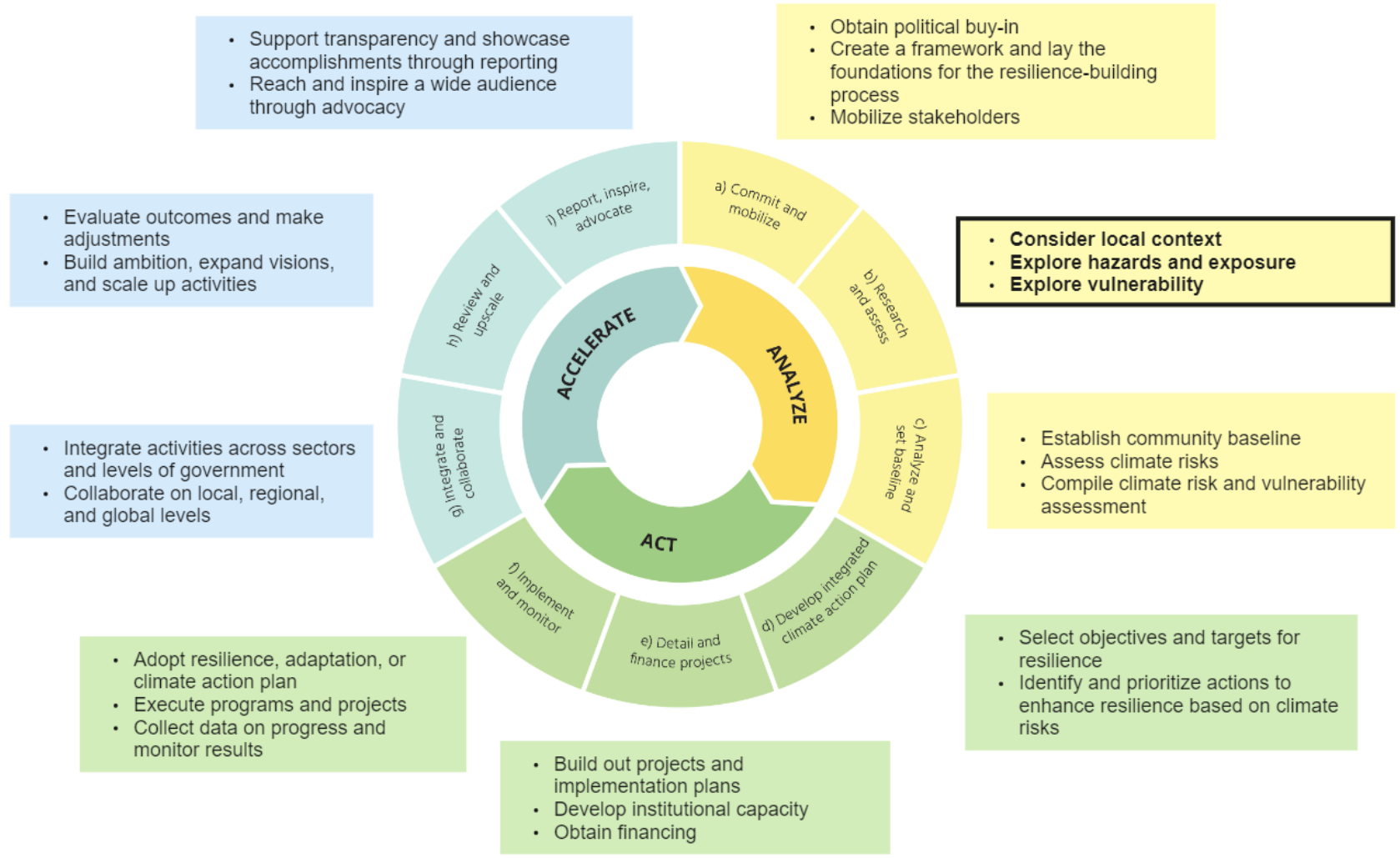


Figure 1. The GreenClimateCities Framework



Consider Local Context

Just as every community is unique, so is every adaptation process. Before taking a deeper dive on exposure and vulnerability, it is important to spend some time thinking about your local context.

■ Getting Started

What makes your community great?

Activity: Think about the question "What makes your community great" and make a list of what comes to mind. There are no limits here! This list can include everything from historic sites, public art installations, and natural features to a special local industry, your downtown, or the local vibe—feel free to be creative!

What problems is your community experiencing that might be related to the changing climate? What were the “pre-climate change” conditions like?

Activity: Think about ways that your community has changed in the recent past. Are summers getting hotter and drier? Are winters getting warmer? Has it been raining more often than you remember? Keep a list of your ideas.

Where is your community "at" with climate action?

Activity: Now is a great time to think about what your community has done to date on climate and to consider readiness for climate adaptation. Make a list of climate action your community has taken to date. This can include planning efforts (e.g. greenhouse gas inventories, sustainability plans, climate action plans), projects and programs (e.g. resilience hubs, emergency warning systems, green infrastructure), local laws and regulations (e.g. resilient building code updates, zoning), and public-facing commitments (e.g. climate emergency resolution, CDP/GCoM reporting, Race to Zero and Race to Resilience).



Explore Hazards and Exposure

What are hazards and why are they important?

A climate "hazard" is defined as an event or trend that may cause injury, illness, or death to people or damage to community assets. In this document, the term primarily refers to hazards caused or exacerbated by climate change.

One way to think about hazards is in terms of “shocks” and “stressors”. Shocks are acute events that occur suddenly and have immediate impacts (adapted from [ResilienceTools](#)). Hurricanes, floods, heat waves, winter storms, and wildfires are all examples of shocks. Stressors are climate-related trends or conditions (adapted from the [U.S. Climate Resilience Toolkit](#)); examples include decreasing rainfall, erosion, desertification, and changing seasonal conditions. While the effects of stressors often emerge gradually, they can build up and become more severe over time.

Understanding your exposure

On a basic level, if your community is in a location that may be impacted by a certain hazard, that means that it is exposed to that hazard. For example, a coastal community may be exposed to sea level rise, and an intermountain west community may be exposed to wildfires. That being said, it is important to consider how exposure varies across communities. Consider two neighborhoods: in the first neighborhood, the streets are lined with trees, creating a full tree canopy that shades the single, detached homes along it. The second neighborhood has tightly packed apartment buildings surrounded by highways. In a heat wave, the residents of the second neighborhood would have much higher exposure to dangerous heat conditions than residents of the first neighborhood.

This document helps you understand your community’s exposure to hazards by first taking a look at your community’s “present-day hazard exposure” conditions, then pointing you toward narrative-form resources that can provide an overview of how the climate is changing, and then listing resources you can use to learn more about specific hazards.



Start with Present-day Hazard Exposure

☑ Which climate hazards is your community currently exposed to?

You can (and should!) think about this question on your own, but other stakeholders should be included in this discussion too. **Tip:** the word "climate" can be perceived as jargony and inaccessible. When talking to stakeholders, consider asking about extreme or unusual weather events instead.

Talking to other staff in your local government is a great place to start. There are many ways you can approach this, including by sharing a brief survey or organizing a cross-departmental meeting. If you are not sure who to include, any staff involved in previous climate, sustainability, and hazard mitigation efforts are a good place to start. Departments to consider: water and sanitation, facilities management, emergency response, public safety, parks, public works, and transportation. Communities that do not have climate or sustainability staff should consider reaching out to parks and public works departments.

You may also want to bring this question to your community. Besides being an opportunity to listen to residents' climate-related concerns, it is also a chance for you to begin a conversation about the planning process. Distributing a survey is one option, but you may get better engagement by meeting people in person. Community events and shared public spaces (e.g. libraries) can be good locations for this.

How can I learn more?

There are a number of resources and tools out there that can help you better understand your community's "present day hazard exposure" conditions. Some are in the form of descriptive text (we call these "narrative-form" resources).

Narrative-Form Resources

A good way to start thinking about your community's hazard exposure is with written, narrative-form resources. The [State Climate Summaries](#) for your state and the summary for your region in the [Fourth National Climate Assessment](#) (NCA4) are good places to start (find your NCA region [here](#)). Two points to keep in mind:

- These resources are not tailored to your community, and are instead written about much larger geographies (i.e. your state or region).



- These resources have information about both past conditions and how conditions may change in the future. As you read, consider taking notes specifically on 1) “present day hazard exposure conditions” and 2) expected changes.

Overview of Narrative-Form Resources

Underlined text is hyperlinked.

<p><u>National Climate Assessment</u> <i>US Global Change Research Program</i></p>	<p>Development of the National Climate Assessments is overseen by the National Oceanic and Atmospheric Administration (NOAA); hundreds of experts both within and outside of the US federal government contribute to these assessments. The NCAs consider how changing conditions affect the environment, natural resources, specific sectors (like agriculture and energy), and societal factors (including human health) and review environmental trends on a 25 to 100 year timescale.</p> <p>The latest NCA addition is the Fourth National Climate Assessment (NCA4), which was released in 2018.</p> <p>Time horizons: current trends and projected trends (subsequent 25-100 years).</p> <p>Emission scenarios: both RCP 8.5 (higher emission, more warming scenario) and RCP 4.5 (lower emission, less warming scenario).</p> <p>Learn more on the <u>About</u> and <u>Guide</u> pages.</p>
<p><u>State Climate Summaries</u> NOAA</p>	<p>The State Climate Summaries were developed to supplement the NCAs, which only provide information on the region level. Each state summary covers historical conditions in the states and discusses changes that may occur under future climate conditions.</p> <p>Time horizons: current trends and projected trends (subsequent 25-100 years).</p> <p>Emissions scenarios: both RCP 8.5 (higher emission, more warming scenario) and RC P4.5 (lower emission, less warming scenario).</p> <p>Learn more in the <u>Technical Guidance</u>.</p>



FEMA Resource: National Risk Index


You can also look up your community's risk rankings for 18 different hazards on [FEMA's National Risk Index](#). These hazards were chosen based on FEMA-approved state hazard mitigation plans (note that tribal hazard mitigation plans were not included). See [technical documentation](#) for more information. The National Risk Index is only searchable by county and census tract. The tool will produce "Hazard Type Risk Ratings", which can provide an indication of your community's **current** risk to various hazards relative to that of all other U.S. communities.

Working with Hazard Mitigation Planners


Hazard mitigation professionals are natural allies for adaptation and resilience efforts. In some communities, hazard mitigation professionals may spearhead this work or have access to supportive funding or data streams as well as local or site-specific disaster risk evaluations.

If your community has a FEMA hazard mitigation plan, or is included in a geography that has one (e.g., region, group of counties), that plan is a good place to start. Hazard mitigation plans are required to include information about hazards that your community is currently exposed to; however, note that these plans are **not required to address future risk**. You can look up plans by jurisdiction by looking at the interactive map ([here](#)) or downloading the data as a CSV file ([here](#); recommended due to difficulty of navigating the interactive map).

Which hazards have impacted my community in the past?

You can look at past occurrences of significant weather phenomena in your state or county with the [NOAA Storm Events Database](#) . Note that not all hazard events are included; the database is focused on those that caused loss of life or significant property damage and that are rare, unusual, or otherwise significant. The database is searchable by state, county and hazard type; the user must enter a specific date period in the past. The database is not directly searchable by city name or tribal nation as locations; however, searches for the tribal nation or city name in the "Narrative Text Search" field may call up relevant results.

Historical Climate Data

If you feel comfortable looking at climate data, you can look up historical data for your county on the [Climate Explorer](#) . Note that the Climate Explorer does not provide data on the city or tribal nation level and that limited data is available for Alaska and Hawaii. The Climate Explorer



allows you to look at historical weather data and see when precipitation and temperature has exceeded user-defined thresholds in the past (for example, you can see how many times per year a county received more than two inches of rain in a single day in 1950).

Looking at Future Change

How will my community's climate and exposure change in the future?

As the climate changes, your community may face different hazards in the future than it does now, or that hazards will last longer and be more frequent or severe. Developing an understanding of how climate and hazards are projected to change in the future is a key early step in your community's adaptation journey.

This question can be a difficult one to approach. Tools and resources that offer insights on future projections do exist; however, their quality and availability varies by hazard and tool sponsor. Additionally, tools and resources may not be accessible to those without a technical background. In acknowledgement of this reality, the *Adaptation – First Steps* recommends starting with narrative resources like the National Climate Assessment and State Climate Summaries.

As you move forward with this process, it may be in your community's interest to seek assistance in reviewing climate data or conducting a more in-depth study informed by hyper-local conditions. See the Other Resources and Support section at the end of this document for tips on getting help.

Narrative-Form Resources

Narrative-form resources are a great place to start! Take another look at the State Climate Summaries and your region's chapter in the National Climate Assessment. This time, pay attention to how climate is expected to change in the future. What changes are expected in the next 25 years? What about in 50 years and at the end of this century?

Temperate Plug-In

The [Temperate plug-in](#) on the Climate Explorer quickly distills information from the National Climate Assessment into a list of top hazards. The Temperate plug-in is only searchable on the city and county level (data cannot be looked up on the tribal nation level, though nearby counties can be searched as a substitute). Since these top hazards are pulled from the National



Climate Assessment, that means that they reflect **region-level information**, meaning that some hazards may not apply to your specific community, while others that do may be missed.

Hazard-Specific Tools

Once you have identified specific climate hazards that may impact your community now or in the future, you may want to take a deeper dive. For some hazards, online tools exist that can help you learn more about your community’s current and/or future risks. We have linked several of these tools in the table below. A few points to note before diving in:

- Many of these tools are not intuitive for non-expert users and are marked **E**.
- This is not an exhaustive list of the resources that are out there. See the [Climate Adaptation Knowledge Exchange](#) (CAKE) and the [Georgetown Adaptation Clearinghouse](#) for a more extensive, searchable database of tools and resources.
- Online tools can change quickly. Review each tools’ “about pages” for the most up-to-date information.

Overview of hazard-specific tools

See the Appendix for an expanded version of this table that includes links to technical documentation, geographies covered, RCPs, timescales, and more. Underlined text is hyperlinked.

<p><u>The Climate Explorer</u> E <i>US Federal Government</i></p>	<p>See how climate indicators in your city or county are projected to change in the future. Results can be viewed in map or graph form.</p> <p>Relevant hazards: extreme heat, extreme cold, extreme rainfall, flooding, drought, seasonal shift</p>
<p><u>Neighborhoods at Risk</u> <i>Headwaters Economics</i></p>	<p>Allows users to overlay information about hazard exposure to identify vulnerable census tracts. Also provides climate projections for heat and precipitation.</p> <p>Relevant hazards: extreme heat, extreme rainfall, flooding, drought</p>
<p><u>Risk Factor</u> <i>First Street Foundation</i></p>	<p>Provides information about past events, present-day risk, and future risk for flooding, fire, and heat. Computes a risk ranking for residential properties, infrastructure, and cultural institutions.</p>



	<p>Relevant hazards: flood, fire, extreme heat</p>
<p>Wildfire Risk to Communities <i>USDA Forest Service</i></p>	<p>Provides interactive maps and charts on fire risk. Information provided on risk to homes, type of exposure (direct or indirect), and wildfire likelihood.</p> <p>Relevant hazards: fire</p>
<p>Sea Level Rise Viewer E <i>NOAA</i></p>	<p>Provides a mapped view of sea level rise, simulations of sea level rise under different scenarios for selected areas, marsh migration, and tidal flooding. Can be overlaid with information on social vulnerability.</p> <p>Relevant hazards: sea level rise, flooding</p>
<p>National Risk Index <i>FEMA</i></p>	<p>A map viewer that can be used to look up a ranking for current risk for 18 different (climate and non-climate) hazards. Can be overlaid with an index on social vulnerability and resilience.</p> <p>Relevant hazards: avalanche, flooding, extreme cold, drought, storms, extreme heat, extreme heat</p>
<p>Surging Seas: Risk Finder E <i>Climate Central</i></p>	<p>Information provided on exposure at various water levels, infrastructure with flood risk, 6-foot flood likelihood. Selected information also provided about valuation of assets at risk and social vulnerability.</p> <p>Relevant hazards: sea level rise, flooding</p>
<p>National Integrated Drought Information System E <i>US Federal Government</i></p>	<p>Overview of current drought conditions, short-term forecasts, and other resources to help with understanding drought risk, impacts, and preparedness.</p> <p>Relevant hazards: drought, desertification</p>

A Note on Other Hazards

There are many climate hazards that are not included in the above table. *Adaptation – First Steps* focuses on climate-related hazards but there are other natural hazards (e.g. earthquakes, tsunamis, volcanic eruptions) that are outside the scope of this document.



Furthermore, this document can make it seem like hazards are separate, isolated events or trends, yet this is rarely—if ever—reflected in reality. Hazards interact with each other and with other elements of the earth system, and can cascade in chains of interconnected events. For example, lightning from thunderstorms can ignite wildfires; once wildfires burn through a landscape, rain is more likely to cause devastating mudslides.

While the changing distribution of species, habitat and biodiversity loss, and extinction are not included in this document, they too are linked to climate change and are projected to have significant, devastating impacts on humans and the environment. Even though these phenomena are not addressed in this document, you are highly encouraged to consider them as part of your adaptation process (see this resource from the [USDA Forest Service](#)).

Explore Vulnerability

What is vulnerability, why is it important, and how is it incorporated in *Adaptation–First Steps*?

In this document, vulnerability is defined as, "The propensity or predisposition to be adversely affected by hazards. Vulnerability encompasses exposure, sensitivity, and adaptive capacity." Under this definition, vulnerability is an umbrella under which multiple components (exposure, sensitivity, and adaptive) are housed.

You can think of vulnerability to hazards in terms of people and groups: for example, low-income community members may be more vulnerable to extreme heat due to the high energy costs associated with running air conditioning. These community members are more sensitive to extreme heat as a hazard; in other words, the degree to which heat may affect them is higher compared to community members with higher income. You can also approach vulnerability in terms of community assets. For example, a school (which is a community asset) in a flood zone is more vulnerable to flooding than a nearby school that is not in a flood zone. This is because the school in the flood zone is located in a place where floods are more likely to occur; in other words, it has higher flood exposure.


Since *Adaptation – First Steps* is intended to be a resource for preliminary exploration, it is important to recognize that it does not provide the whole picture of vulnerability in your community. What it can do is help you start thinking about the following questions: Which



places and populations in my community are more likely to be negatively impacted by hazards? How does vulnerability in my community compare to nearby communities and to my state, region, or the US as a whole? What are factors that contribute to vulnerability in my community?

Understanding vulnerability is important because it can point to places and groups in your community that have greater need for adaptation, which supports equitable prioritization of capacity and resources.

How can I learn more about vulnerability in my community?

A comprehensive, equity-informed approach to vulnerability requires care, effort, and place-based knowledge. Robust engagement that centers the priorities of those in the community who are marginalized or disadvantaged is key to any assessment of vulnerability. While there can be a role for web-based tools (some are linked below), these tools should not be the only source of information. Vulnerability is about much more than specific features of the built environment and boxes checked on a census form. Opportunities to conduct community engagement are flagged with .

Getting Started: Local Government Staff and Community Partners

An inter-departmental group of local government staff can be a good place to start evaluating vulnerability. Consider sending around a survey form to collect information about both populations and community assets that may be vulnerable to hazards. If you are not sure who to include, start with any staff involved in previous climate and sustainability efforts, public safety, and hazard mitigation.

This is also a great opportunity to bring community partners to the table, including those from organizations focused on climate and environmental justice; public and environmental health; affordable housing; faith-based organizations; and houses of worship.

Community Engagement: Nothing About Us Without Us

Focus groups, open forums, online and in-person meetings and surveys, open houses, neighborhood office hours and community walks are just a few ways to connect with the public. Instead of asking about "vulnerability", ask people about their needs, priorities and aspirations for their community. For example, ask people if they are able to keep their living spaces cool and comfortable during hot weather, or about their experience with flooding on their property.



[Equity – First Steps](#), part of the Sustainable Communities Suite of resources, offers more guidance on equitable community engagement.

Resources and Tools

Below you will find a few tools and resources that can help you with this step, and some basic user guidance to help you decide whether—and how—each tool can and should be used. Remember: tools and resources may not be a good choice in your community, and they should never replace community engagement. However, in some cases, they can provide quick, easily exportable visuals to catalyze action and discussion, or be a starting step to pinpoint areas in which to focus community engagement.

How to choose between the tools? If you browse the tools below, you will notice that--while there are many commonalities--each one measures vulnerability in different ways. In other words, the "ingredients" of vulnerability are different for each tool. The tools also provide data for different geographies; census tracts and counties are the most common. If you think that using a tool is right for your community, we suggest making a decision based on each tool's output (i.e., does it create the product you want?), geography (does it provide information on the scale you need?) and ease of use (does it align with your experience and capacity?). You may also want to consider the specific indicators that go into each tool--for example, if many individuals in your community live in mobile homes, you may want to choose a tool that includes mobile homes in its assessment of vulnerability.

Overview of tools on vulnerability

For an expanded version of this table that includes a complete list of indicators used to determine vulnerability, see the Appendix. Underlined text is hyperlinked.

<p>Neighborhoods at Risk <i>Headwaters Economics</i></p>	<p>Neighborhoods at Risk lets the user compare vulnerability across census tracts within a city or county (note that this tool is not searchable by tribal areas) on an interactive map interface. The tool can highlight census tracts with higher climate risk. Climate risk is determined based on social vulnerability and exposure to 4 climate hazards: area in hurricane flood zone, area lacking tree canopy, area of impervious surface, area in 500-year floodplain.</p>
<p>Populations at Risk <i>Headwaters Economics</i></p>	<p>Populations at Risk creates customizable reports on socioeconomic data for a user-selected area or areas. Reports allow for comparison of socioeconomic information across different areas (e.g. see how your county compares to</p>



	another county, your state, or the entire US).
<u>Social Vulnerability Index (SVI)</u> <i>CDC</i>	View a composite social vulnerability score at the county and census tract level on an interactive map. Note that SVI scores are currently used to identify a community as disadvantaged for some federal grant opportunities, including the Building Resilient Infrastructure and Communities (BRIC) program.
<u>EJScreen</u> E <i>EPA</i>	EJScreen is an environmental justice mapping and screening tool created by the EPA that combines environmental and demographic indicators to create maps and reports.
<u>National Risk Index</u> <i>FEMA</i>	The National Risk Index is an interactive map platform that provides an overall "natural hazard risk score" for counties and census tracts. The value each county or census tract is assigned is calculated based on: Expected Annual Loss (for natural hazards), Social Vulnerability, and Community Resilience.

Other Resources & Support

What other resources are out there?

For Everyone

Resource Hubs

- [The U.S. Climate Resilience Toolkit](#)
- [The Georgetown Climate Center Adaptation Clearinghouse](#)
- [EcoAdapt: Climate Adaptation Knowledge Exchange \(CAKE\)](#)

Guidebooks

- [Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments](#)
- [Using Climate Information in Local Planning](#)



For Adaptation Professionals

- Practitioner's Guide (*forthcoming*)
- [Learn principles for quality climate change adaptation](#)
- [Connect with peers on key topics](#)
- [Get climate adaptation training](#)

For Tribes

- [Adaptation Planning Toolkit](#)
- [Tribal Vulnerability Assessment resources](#)
- [University of Oregon Tribal Climate Change Guide](#)
- [Tribal Climate Change Assessments and Adaptation Plans](#)

For States and Regions

- [Regional Adaptation Collaborative Toolkit](#)
- [NOAA Regional Climate Centers](#)

How do I get help?

- If your community is an ICLEI member, reach out to your membership lead, who can put you in touch with resilience technical staff.
- Check out the [Find Experts](#) map on the U.S. Climate Resilience Toolkit, and consider reaching out to your [State Climatologist](#).
- [Find an adaptation network in your region](#)
- Communities should check with their state regarding resources available through state universities, [NOAA Sea Grant](#), and environmental departments. In some cases, there may be state-level downscaled resources on hazards and vulnerability (for example, as are available in New York, Washington, California, Maryland, and New Jersey).

Finding Funding

- [ASAP Ready to Fund Resilience Toolkit](#)
- [U.S. Climate Resilience Toolkit: Funding Opportunities](#)
- [EPA: Federal Funding and Technical Assistance for Climate Adaptation](#)
- [DOE: Federal Financial Assistance Programs for Resilience Activities](#)



Appendix

Hazard-Specific Tools: Expanded Version

Online tools can change quickly. Review each tools' website for the most up-to-date information. Underlined text is hyperlinked.

<p><u>The Climate Explorer</u> E <i>US Federal Government</i></p>	<p>See how climate indicators in your city or county are projected to change in the future. Results can be viewed in map or graph form.</p> <p>Relevant hazards: extreme heat, extreme cold, extreme rainfall, flooding, drought, seasonal shift</p> <p>Area: primarily contiguous US, limited information available for Alaska and Hawaii</p> <p>Geographies: cities and counties</p> <p>Indicators: temperature, precipitation, heating and cooling degree days, growing degree days</p> <p>Time horizon: until 2100</p> <p>Emissions scenarios: RCP 8.5 and RCP 4.5</p> <p>Read the <u>Technical Guidance</u></p>
<p><u>Neighborhoods at Risk</u> <i>Headwaters Economics</i></p>	<p>Allows users to overlay information about hazard exposure to identify vulnerable census tracts. Also provides climate projections for heat and precipitation.</p> <p>Relevant hazards: extreme heat, extreme rainfall, flooding, drought</p>



	<p>Area: primarily contiguous US, limited information available for Alaska and Hawaii</p> <p>Geographies: city, county</p> <p>Indicators (future): temperature, precipitation</p> <p>Indicators (present): properties and infrastructure with flood risk, area lacking tree canopy, area of impervious surface, area in 500-year floodplain</p> <p>Time horizon: present, with some projections until 2092</p> <p>Emissions scenarios: RCP 8.5 and RCP 4.5</p> <p>Read the FAQs</p>
<p><u>Risk Factor</u> <i>First Street Foundation</i></p>	<p>Provides information about past events, present-day risk, and future risk for flooding, fire, and heat. Computes a risk ranking for residential properties, infrastructure, and cultural institutions.</p> <p>Relevant hazards: flood, fire, extreme heat</p> <p>Area: primarily contiguous US, with some information (not including street address level information) available for Alaska and Hawaii</p> <p>Geographies: City, county, zip code, street address</p> <p>Time horizon: past, present, future (15 and 30 years in the future)</p> <p>Emissions scenarios: RCP 4.5</p>




	<p>Read the Flood Factor Methodology, Fire Factor Methodology and Heat Factor Methodology</p>
<p>Wildfire Risk to Communities <i>USDA Forest Service</i></p>	<p>Provides interactive maps and charts on fire risk. Information provided on risk to homes, type of exposure (direct or indirect), and wildfire likelihood.</p> <p>Relevant hazards: fire</p> <p>Area: contiguous US, Alaska, Hawaii</p> <p>Geographies: state, county, community, tribal areas</p> <p>Time horizon: present</p> <p>Emissions scenarios: N/A</p> <p>Read the FAQs</p>
<p>Sea Level Rise Viewer E <i>NOAA</i></p>	<p>Provides a mapped view of sea level rise, simulations of sea level rise under different scenarios for selected areas, marsh migration, and tidal flooding. Can be overlaid with information on social vulnerability.</p> <p>Relevant hazards: sea level rise, flooding</p> <p>Area: contiguous US, Hawaii (does not include Alaska)</p> <p>Geographies: searchable by city and county, though the map view allows you to zoom in to most coastal areas</p> <p>Time horizon: until 2100</p>



	<p>Sea level rise scenarios: intermediate low, intermediate, intermediate high, high (derived from the 2022 Sea Level Rise Technical Report)</p> <p>Read the Overview</p>
<p>National Risk Index <i>FEMA</i></p>	<p>A map viewer that can be used to look up a ranking for current risk for 18 different (climate and non-climate) hazards. Can be overlaid with an index on social vulnerability and resilience.</p> <p>Relevant hazards: avalanche, coastal flooding, cold wave, drought, earthquake, hail, heat wave, hurricane, ice storm, landslide, lightning, riverine flooding, strong wind, tornado, tsunami, volcanic activity, wildfire, winter weather</p> <p>Area: contiguous US, Alaska, Hawaii</p> <p>Geographies: county, census tract</p> <p>Time horizon: present</p> <p>Emissions scenarios: N/A</p> <p>Read the Technical Documentation</p>
<p>Surging Seas: Risk Finder E <i>Climate Central</i></p>	<p>Information provided on exposure at various water levels, infrastructure with flood risk, 6-foot flood likelihood. Selected information also provided about valuation of assets at risk and social vulnerability.</p> <p>Relevant hazards: sea level rise, flooding</p> <p>Area: contiguous US, Hawaii, limited to no information available for Alaska</p>



	<p>Geographies: city, county</p> <p>Time horizon: until 2200 for some projections</p> <p>Emissions scenarios: RCP 2.6, RCP 4.5, RCP 6.0, RCP 8.5 (multiple sea level rise scenarios also available)</p> <p>Read the About page</p>
<p>National Integrated Drought Information System  <i>US Federal Government</i></p>	<p>Overview of current drought conditions, short-term forecasts, and other resources to help with understanding drought risk, impacts, and preparedness.</p> <p>Relevant hazards: drought, desertification</p> <p>Area: primarily contiguous US, with some information for Alaska and Hawaii</p> <p>Geographies: national, tribal, watershed, regional, state, county</p> <p>Indicators: current drought, precipitation conditions, temperature conditions, drought indicator blends, Palmer Drought Severity Index (PDSI), Evaporative Demand Drought Index (EDDI)</p> <p>Time horizon: present, with some short-term forecasts (days/months in the future); also includes data on past droughts</p> <p>Emissions scenarios: N/A</p> <p>Read the About page</p>



Vulnerability Tools: Expanded Version

Online tools can change quickly. Review each tools' website for the most up-to-date information. Underlined text is hyperlinked.

Neighborhoods at Risk *Headwaters Economics*

Neighborhoods at Risk lets the user compare vulnerability across census tracts within a city or county (note that this tool is not searchable by tribal areas) on an interactive map interface. The tool can highlight census tracts with higher climate risk. Climate risk is determined based on social vulnerability and exposure to 4 climate hazards: area in hurricane flood zone, area lacking tree canopy, area of impervious surface, area in 500-year floodplain.

Vulnerability is determined by the following indicators from the U.S. Census American Community Survey 5-year estimates: households with no car, housing units that are rentals, people who don't speak English well, people of color and Hispanics, families in poverty, people over 65 years, children under 5 years, people without health insurance, people with disabilities, housing units that are mobile homes.

Census tracts with higher climate risk relative to other census tracts in the selected area are highlighted in blue. The tool lets the user decide which criteria go into the "high climate risk" designation with sliders. For example, users can decide that only census tracts with >50% impervious surfaces should be considered high risk.

The socioeconomic data on Neighborhoods at Risk is updated frequently. Newly released ACS data is added to the tool within 90 days of publication.

Geographies: city, county

Read the [FAQs](#)

Populations at Risk

Populations at Risk creates customizable reports on socioeconomic data for a user-selected area or



<p><i>Headwaters Economics</i></p>	<p>areas. Reports also allow for comparison of socioeconomic information across different areas (e.g. see how your county compares to another county, your state, or the entire US).</p> <p>Populations at Risk is relatively easy to use, has many options for geography, and creates a report that provides explanation and context for the data. Supports export of data for multiple counties in one report (allows for regional work).</p> <p>The following indicators are included (with data from the US Census ACS): Young & Elderly Populations, Race & Ethnicity, Educational Attainment, Language Proficiency, Individuals in Poverty, Families in Poverty, Households Receiving Public Assistance, Labor Participation, Housing Affordability, Rental & Mobile Homes.</p> <p>Geographies: Census tracts, Census designated places (communities), American Indian and native areas, County subdivisions, Counties, Congressional districts, Combined statistical areas, Metro and rural portions of states</p> <p>Read the About page</p>
<p><u>Social Vulnerability Index (SVI)</u> <i>CDC</i></p>	<p>View a composite social vulnerability score on the county and census tract level on the SVI Interactive Map. Note that SVI scores are currently used to identify a community as disadvantaged for some federal grant opportunities, including the Building Resilient Infrastructure and Communities (BRIC) program.</p> <p>The <u>2018 index</u> is constructed based on the following indicators: Below Poverty, Unemployed, Income, No High School Diploma, Aged 65 or Older, Aged 17 or Younger, Civilian with a Disability, Single-Parent Households, Minority, Aged 5 or Older who Speaks English “Less than Well”, Multi-Unit Structures, Mobile Homes, Crowding, No Vehicle, Group Quarters. This tool splits up Overall Vulnerability into 4 themes: Socioeconomic Status, Household Composition & Disability, Minority Status & Language, and Housing Type & Transportation. You can view scores for each theme separately on the interactive map.</p>



	<p>Data is downloadable as a CSV or shapefile. Geographies: city, county Read the FAQs</p>
<p>EJScreen E EPA</p>	<p>EJScreen is an environmental justice mapping and screening tool created by the EPA that combines environmental and demographic indicators in maps and reports. It allows the user to create and export maps that convey information about the environment (including pollution and exposure to some environmental hazards), people (demographics, health, and access to services), and places of interest (e.g. schools). For example, you can create a map of your community that shows both schools and the 100-year floodplain, allowing you to see where the two overlap. Additionally, it can be used to generate reports on pollution exposure, demographics and public health (county-level only) for a user-defined geographic area.</p> <p>The tool includes too many indicators to list here, see the complete list. A selection is provided below:</p> <p>Environmental and Socioeconomic: Pollution and Sources (e.g., Superfund Proximity), Socioeconomic Indicators (e.g., Low Income), Health Disparities (e.g., Low Life Expectancy), Climate Change Data (e.g., Wildfire Hazard Potential), Critical Service Gaps (e.g., Food Desert).</p> <p>EJ Indexes: Additionally, EJScreen includes Environmental Justice (EJ) Indexes which highlight block groups with the highest intersection of low-income populations, people of color, and each of the Pollution and Sources indicators.</p> <p>Place Data: EPA Regulated Facilities (e.g., Superfund sites), Schools, Places of Worship, Hospitals, Parks, Other Environmental Data (e.g., Water Features), Tribal Lands (e.g., Alaska Native Allotments), Prisons, Public Housing.</p> <p>Note that this tool is not beginner-friendly (experience with geographic information systems software is an asset) and some features are buggy.</p>



	<p>Geographies: block-group, tract, city, and county levels; users are also able to create custom areas by dropping a pin and drawing a path or outlining an area.</p> <p>See indicator descriptions and data sources</p>
<p><u>National Risk Index</u> <i>FEMA</i></p>	<p>The National Risk Index is an interactive map platform that provides an overall "natural hazard risk score" for counties and census tracts. The value each county or census tract is assigned is calculated based on: Expected Annual Loss (for natural hazards), Social Vulnerability, and Community Resilience.</p> <p>To calculate social vulnerability, the tool uses a set of indicators developed by the University of South Carolina's SOVI (see below). Their interactive mapping platform provides a vulnerability score (based on the below indicators) on the county and census tract level. This can be compared to county, state, and national averages.</p> <p>The Community Resilience score may also be of interest. It is calculated from indicators from the University of South Carolina's HVRI BRIC dataset. The HVRI BRIC dataset includes a set of 49 indicators that represent six types of resilience: social, economic, community capital, institutional capacity, housing/infrastructure, and environmental. Note: indicators are only listed in a journal article behind a paywall.</p> <p>You can view the information from this tool on an interactive map and in the form of a downloadable report.</p> <p>Geographies: county, census tract</p> <p>Read the Technical Documentation</p>



Definitions with Sources

Underlined text is hyperlinked.

Adaptation:	The process of adjusting to new climate conditions in order to reduce risks to people and community assets.	Adapted from the US Climate Resilience Toolkit Glossary
Adaptive capacity:	The ability of people, systems, or community assets to adjust to a hazard, take advantage of new opportunities, or cope with change.	Adapted from the US Climate Resilience Toolkit Glossary
Community assets:	The places, services, infrastructure, ecosystems, institutions, and other resources that a community believes are important to protect. In other words, community assets are the tangible and intangible things that people and communities value.	Adapted from the US Climate Resilience Toolkit Glossary
Exposure:	The presence of people, assets, and ecosystems in places where they could be adversely affected by hazards.	US Climate Resilience Toolkit Glossary
Hazard:	An event or trend that may cause injury, illness, or death to people or damage to community assets. In this document, the term “hazard” primarily refers to climate-related physical events or trends.	Adapted from the US Climate Resilience Toolkit Glossary and the IPCC Annex II Glossary
Impacts:	Consequences or outcomes, which can be positive or negative. In this document, the term “impacts” primarily refers to the impacts of climate-related hazards on people and community assets (see “hazard”).	Adapted from the US Climate Resilience Toolkit Glossary and the IPCC Annex II Glossary
Resilience:	The ability of people, systems, or community assets exposed to a hazard to resist, absorb, accommodate, adapt to, transform and recover from the hazards’ impacts.*	Adapted from UNDRR Terminology and the ASAP Professional Guidance Resources Glossary



	<p><i>*Resilience has many different—and sometimes conflicting—interpretations. The term is used in numerous fields, including ecology, engineering, climate science, and disaster risk management; its definition varies both across and within communities of practitioners. The definition put forward here aligns with how the term is used in this document, yet it is important to note that it is only one of many accepted definitions of resilience. See ASAP’s Statement on the Use of the Term and Concept of Resilience for more.</i></p>	
<p>Risk:</p>	<p>The potential for negative consequences where something of value is at stake. In the context of the assessment of climate impacts, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard. Risk can be assessed by multiplying the probability of a hazard by the magnitude of the negative consequence or loss.</p>	<p>US Climate Resilience Toolkit Glossary</p>
<p>Sensitivity:</p>	<p>The degree to which people, systems, or community assets are or might be affected by hazards.</p>	<p>Adapted from the US Climate Resilience Toolkit Glossary</p>
<p>Vulnerability:</p>	<p>The propensity or predisposition to be adversely affected by hazards. Vulnerability encompasses exposure, sensitivity, and adaptive capacity.</p>	<p>Adapted from the US Climate Resilience Toolkit Glossary</p>