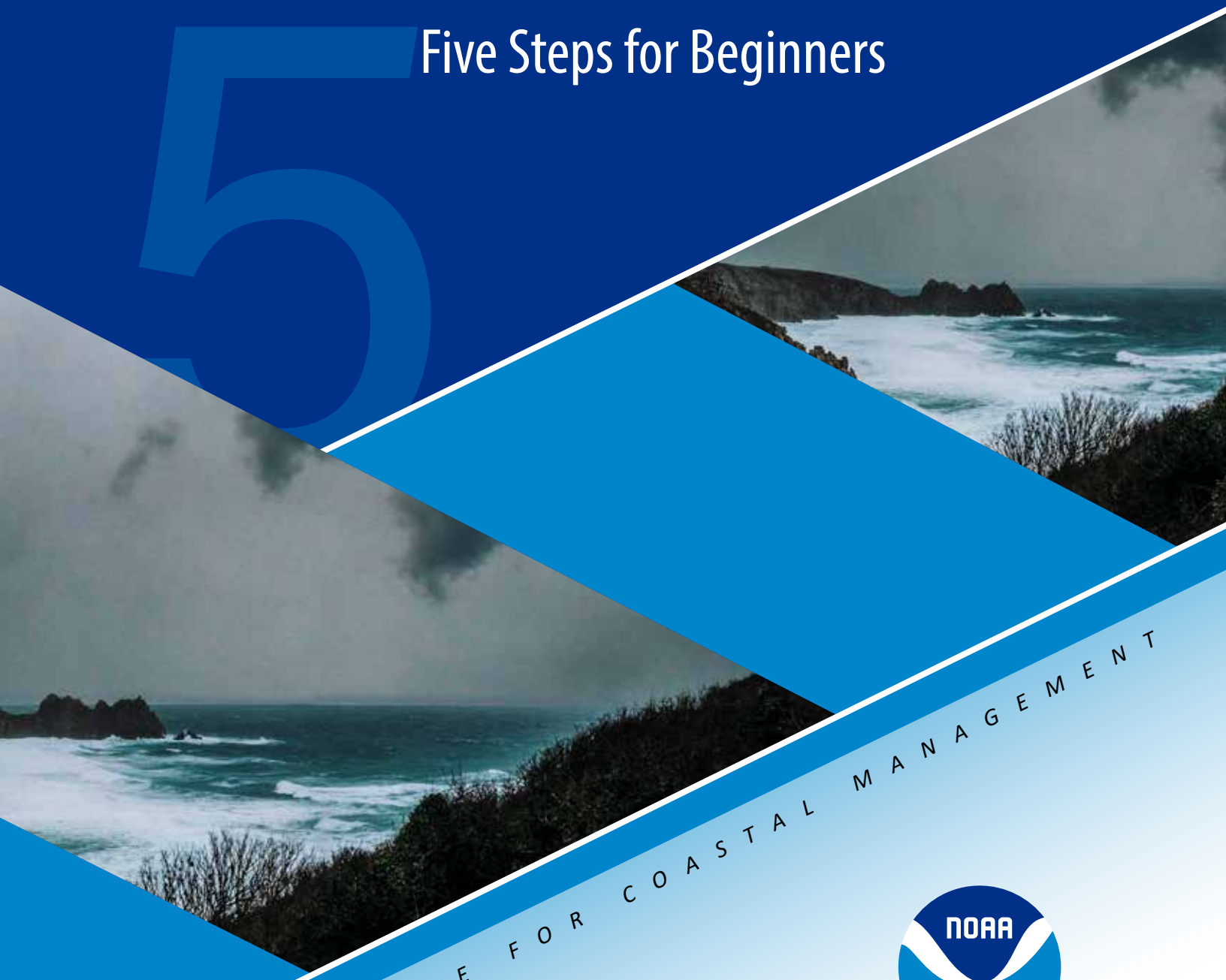
COASTAL ADAPTATION PLANNING GUIDE

Five Steps for Beginners



NOAA OFFICE FOR COASTAL MANAGEMENT

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INTRODUCTION

Since 2011, NOAA's Office for Coastal Management has delivered highly sought-after training focused on adaptation planning for the coastal management community. One of the most common challenges heard is how overwhelming it is to figure out where to start. This guide answers that question by providing beginners with an easy-to-use, modifiable process, a common sequence of steps that provides the best return on investment.

The five-step framework is provided here, along with tips and ideas to consider along the way, and a curated collection of information resources to use when a deeper dig is needed. To keep things practical, "Key Takeaways" are included with each step, as well as pitfalls to avoid. Additional components to consider for each step of the process are provided below.

Flexibility. What is offered here is a tried-and-true approach, but flexibility may be called for given local circumstances, such as funding availability and opportunities, post-disaster recovery efforts, alignment with other planning requirements, and other factors. This is a modifiable process, not a plug-and-play method that works for all.

Community Engagement. Adapting to climate change is a complex issue that involves a full spectrum of perspectives, attitudes, and beliefs. For this process to be successful, it is important to "weave in" engagement throughout to ensure that the needs and viewpoints of the community are represented. This is a critical step in the process.

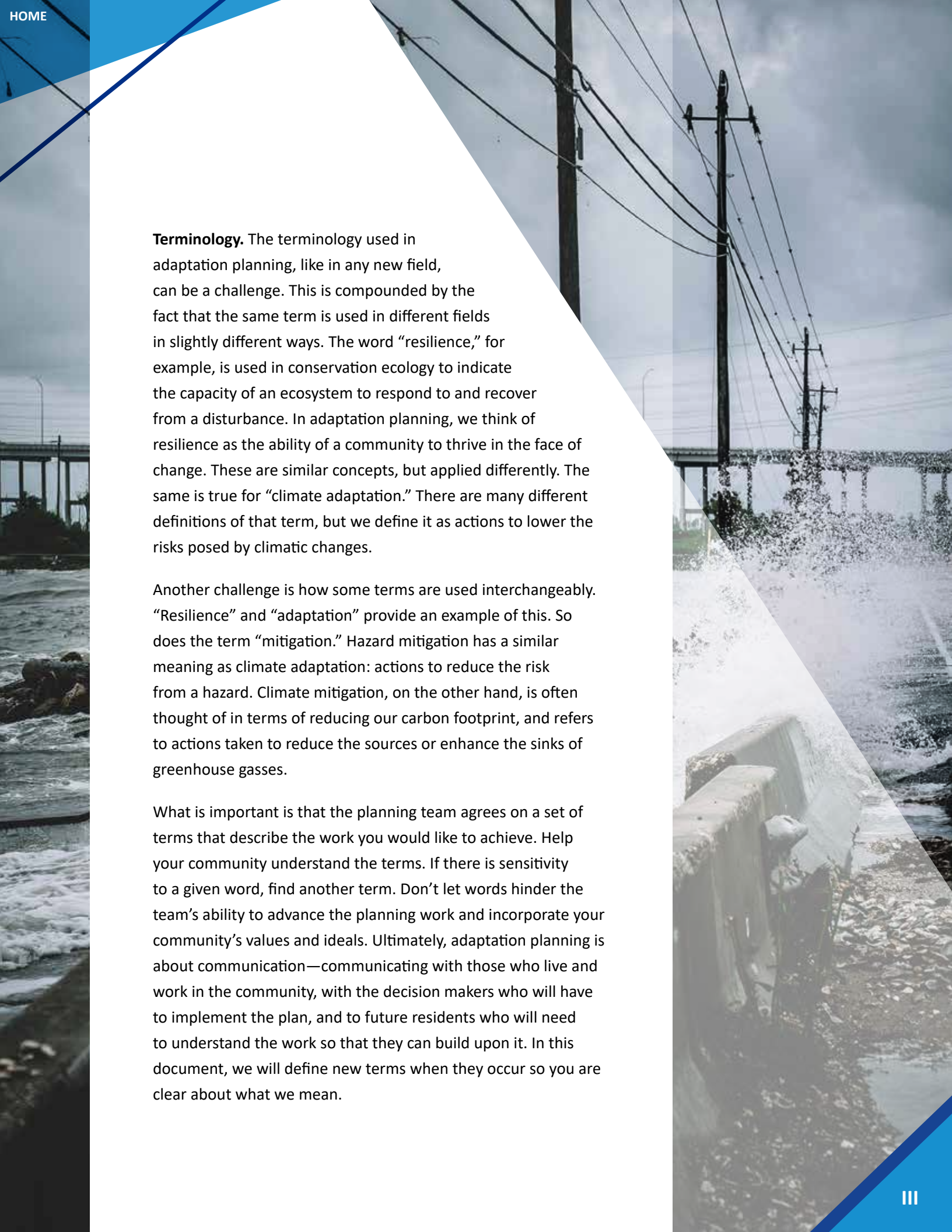
Equity. Speaking of community—climate change impacts disproportionately affect Black and Indigenous people and people of color; people with low incomes; seniors; people who live in rural areas; people in the LGBTQIA+ (lesbian, gay, bisexual, transgender, queer, questioning, intersex, asexual, and other) community; and people with disabilities. Housing discrimination policies, along with disinvestment in certain neighborhoods, often forced these communities to reside in low-lying areas prone to flooding and, in general, on the least desirable land (*NOAA*). In adaptation planning, these groups are sometimes referred to as "frontline communities" because they experience climate change impacts "first and worst."

Marginalized communities can experience a sense of isolation, have been excluded from decision-making processes, and have fewer resources or less access to public resources to deal with the risks from climate change. In this sense, these communities are also often referred to as "underserved," "underrepresented," and "under-resourced." It's important not to paint a single narrative with our language, or send a message that people who are in these communities are lesser than others. Labels matter, and ultimately it is highly recommended to use the names or titles the community members themselves use to describe their community. For the purposes of this resource, we will use the terms "underserved" and "underrepresented" to be consistent with NOAA guidance.

Delivering equitable outcomes requires a different approach to adaptation planning, which includes acknowledging environmental and socioeconomic disparities. There must be opportunities for these communities to participate in the decisions that will directly affect them. Only by acknowledging the community's history, background, and needs can we design strategies that build on community strengths and center on community priorities and needs.

Equitable climate planning considerations are provided for each of the five steps. The following resources were instrumental in guiding and informing these considerations. Please visit these resources when additional information is needed.

- *Community-Driven Climate Resilience Planning: A Framework,* prepared by the National Association of Climate Resilience Planners (2017).
- *Centering Equity in Climate Resilience Planning and Action: A Practitioner's Guide,* prepared by Antioch University for the U.S. Climate Resilience Toolkit Climate-Smart Communities Series (2022).
- *Guide to Equitable, Community-Driven Climate Preparedness Planning,* prepared by the Urban Sustainability Directors Network (2017).



Terminology. The terminology used in adaptation planning, like in any new field, can be a challenge. This is compounded by the fact that the same term is used in different fields in slightly different ways. The word "resilience," for example, is used in conservation ecology to indicate the capacity of an ecosystem to respond to and recover from a disturbance. In adaptation planning, we think of resilience as the ability of a community to thrive in the face of change. These are similar concepts, but applied differently. The same is true for "climate adaptation." There are many different definitions of that term, but we define it as actions to lower the risks posed by climatic changes.

Another challenge is how some terms are used interchangeably. "Resilience" and "adaptation" provide an example of this. So does the term "mitigation." Hazard mitigation has a similar meaning as climate adaptation: actions to reduce the risk from a hazard. Climate mitigation, on the other hand, is often thought of in terms of reducing our carbon footprint, and refers to actions taken to reduce the sources or enhance the sinks of greenhouse gasses.

What is important is that the planning team agrees on a set of terms that describe the work you would like to achieve. Help your community understand the terms. If there is sensitivity to a given word, find another term. Don't let words hinder the team's ability to advance the planning work and incorporate your community's values and ideals. Ultimately, adaptation planning is about communication—communicating with those who live and work in the community, with the decision makers who will have to implement the plan, and to future residents who will need to understand the work so that they can build upon it. In this document, we will define new terms when they occur so you are clear about what we mean.

COASTAL ADAPTATION PLANNING GUIDE

FIVE STEPS FOR BEGINNERS

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Initiate Your Effort

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- 1.2 Why
- 1.3 Where
- 1.4 When
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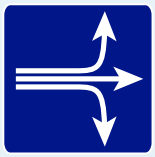

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CONSIDERATIONS IN EACH STEP

Flexibility - Community Engagement - Equity - Common Terms

STEP 1

INITIATE YOUR EFFORT

This initial step is all about establishing relationships and visioning as a team and alongside your community. We use the **5-W's: WHO, WHY, WHERE, WHEN, and WHAT** to help guide this step. You can work through these in any order, but we recommend starting with WHO. During this step you will spend time scoping the adaptation planning effort by building a team, setting goals, and laying the groundwork for meaningful community engagement.

Key Takeaways

- **Create an engagement plan.** At the beginning of the scoping effort, create an engagement plan that outlines who to engage, how each group will be engaged, and when they will be engaged in the process. Starting with an engagement plan is crucial to ensuring equitable and meaningful engagement.
- **Center people and relationships.** A project's foundation should be grounded in trust and a shared vision for the future. Use this step to establish and strengthen relationships, and ensure that everyone involved understands how best to work alongside each other to achieve common goals.
- **Elevate diverse perspectives.** Ensure that diverse experiences and perspectives are valued and integrated throughout the whole process.
- **Budget enough time and money to do this step right.** Establishing a shared vision, outlining how you will work alongside the community, and laying a foundation of trust and transparency takes time and resources. Success will be dependent on whether enough time and funds are budgeted for engagement throughout this step.
- **Be transparent and realistic.** Collaboratively outline clear expectations of how the planning team will work alongside community members and how people will be engaged. Don't promise a community-driven approach if your timeline will not allow the necessary time to build trust and strengthen relationships. Use each step of this process and subsequent projects to create systems-level changes that move closer to meaningful community-driven engagement.
- **Use the vision to ground future steps.** When this step is complete, the project team and community should have a collective vision for what they are working towards and a clear framework for how they will work together. Consistently refer back to this vision and framework when making decisions in Steps 2 through 5 and beyond. This scope will guide the whole process moving forward, so it should provide a consistent touchstone for the team when making decisions in subsequent steps.

Centering Equity in the Process

Below are a few key equity considerations drawn from *Community-Driven Climate Resilience Planning: A Framework* by the National Association of Climate Resilience Planners. Refer to this document for more in-depth guidance and case studies.

- Design a process that **balances power dynamics** and allows for **shared governance practices** to increase the capacity of marginalized communities to influence change. Specifically, consider how to remove barriers to public participation and acknowledge existing systemic practices of exclusion.
- Develop and strengthen authentic and **equitable partnerships with community-based organizations.** Recognize that they bring expertise and capacity to build community leadership and to implement climate resilience solutions.
- Use this process to support learning among the team and community. Create focused learning opportunities to build **the capacity of residents to participate and lead**, and position local champions to educate decision makers so they can more effectively represent their communities.
- Engage the community in creating a **holistic community vision** that connects climate vulnerabilities, and social and economic issues. A community vision that addresses lack of affordable housing, health and wellness, and food insecurity can incorporate climate vulnerabilities while addressing broader systemic issues.

The 5-W'S

1.1 Who

Engage and establish a core team that will lead this process, engage regularly, and be responsible for meeting milestones. Ensure that **diverse experiences and perspectives** are valued and represented as part of the core team. Identify the roles and responsibilities of each team member and outline how the team will communicate and coordinate throughout the planning process.

Once established, the core team should develop a transparent process for how they will work alongside the community. An **engagement strategy** can help outline when and how the team will engage with the broader community. First, identify community members, community-based organizations, tribes, government agencies, technical experts, and other partners that need to be engaged in the effort. Consider people and groups who:

- Have the authority, capacity, or funding to support your adaptation planning process and implement the final plan. (e.g., tribes, community-based organizations, local or state government, elected officials).
- Are disproportionately affected by climate change and often underrepresented in decision-making. Communities that are marginalized, have personal knowledge of hazards and inequities, and understand the solutions that are needed to address these challenges. (*Antioch)*
- Understand systemic oppressions in the community and have cultural competence with the community. (*Antioch*)
- Have knowledge and expertise that will be valuable in the process, including those who have lived experiences in, and generational knowledge about the community (e.g., community context, planning, natural resources, climate science and impacts, emergency management).

When developing the engagement strategy, be transparent about the purpose of engagement. Consider the spectrum of community engagement graphic below (adapted with permission from *Facilitating Power*). Strive to build towards a process that fosters community decision-making and equity and bridges the divide between community and governance (i.e., striving for a process that gets to the "Defer To" end of the spectrum) but don't over-promise. If you can only realistically "Consult" with community members, don't suggest that you will "Collaborate." This will lead to more broken promises and could damage the relationships you are trying to build. In 2021, Miami-Dade County government began *Thrive305*, the largest public engagement initiative in the county's history. The guiding principle behind Thrive305 was that government works best when it is driven, informed, and led by the people who it represents. Their efforts reflected many of the phases outlined in the community engagement spectrum, and included a countywide survey to define priorities, a series of large-scale discussions with residents to collect ideas, and a set of planning workshops to convert residents' ideas into very tangible government actions.

Spectrum of Community Engagement to Ownership

From: Facilitating Power. Engagement strategies should strive to include activities geared towards greater collaboration and community-driven decision-making.

As you develop an engagement strategy, an important consideration is fatigue. Often the same people and groups are asked to be engaged in various planning efforts, often without compensation. Work with the community to develop a process that breaks down engagement barriers, and budgets sufficient resources to make enough space and time for people to plug into the planning effort. You may need to explore ways to pay or compensate people for providing insights, time, or labor. Be transparent about time commitments and expectations within and between teams. Remember, there may be groups or people that only need to be engaged during specific milestones, such as technical experts or scientists working on local climate projections. Mapping out the purpose of engaging people, and identifying when and how they will be engaged, can reduce some of this "engagement fatigue."

1.2 Why

Establish a **collective purpose** and ensure that there is a clear understanding for why the community is undertaking adaptation planning. This can take many forms and may be multifaceted as individual motivations are combined into a collective community purpose. The WHY may be shaped by:

- Mandates or directives from management, legislation, or elected officials, or scheduled updates to local plans (e.g., local hazard mitigation plans and comprehensive plans).
- Strong public advocacy for taking action to combat the impacts of climate change, which may or may not be tied to recent or ongoing experiences with climate impacts (e.g., nuisance flooding, drought, and community water restrictions).
- Perceived tangible co-benefits with other community goals (e.g., affordable housing, community livability, improved health outcomes for residents).

Work alongside community partners to develop a **clear vision for the community** and how this effort can help to move everyone closer to that desired future. Have the community discuss:

- What they value about their community now.
- What their community's strengths are.
- What they wish they could change about their community.
- What they hope for in the future.

Building on this broader community vision, determine how the planning effort can tie in by defining clear adaptation goals that are directly linked to this vision. In King County, Washington, the *2020 Strategic Climate Action Plan* includes a *Sustainable and Resilient Frontline Communities framework* developed through a community-driven process where leaders of frontline communities established goals and guided priority areas for climate action based on climate justice values and community needs.

1.3 Where

We often see planning areas bound to specific jurisdictional boundaries, but this doesn't have to be the case. If a mandate exists to conduct planning for a specific geography, such as a city, it can be beneficial to **look beyond your jurisdiction** to better understand impacts and community connections. In defining the WHERE, think about:

- Where impacts are being experienced, or expected to be experienced.
- Where there are adjacent jurisdictions and communities that you can partner with to leverage funding and other resources.
- Where there are adjacent jurisdictions and communities that you may need to coordinate with to implement certain adaptation strategies (e.g., shared beaches, shared transportation infrastructure).
- Where there are ecological connections across jurisdictions (e.g., watershed).
- Where there are communities or groups of people who are linked through shared cultures, histories, and identities. For example, Indigenous peoples may not live in your specific jurisdiction but may have cultural and spiritual resources there. Or immigrant communities may have social connections that extend beyond jurisdictional boundaries.

1.4 When

As with any planning effort, a clear planning horizon is needed. Adaptation planning will typically look at **longer time horizons** to better understand climate impacts and uncertainties over time. Looking at a longer time horizon also helps to make space for the different implementation time frames required by a suite of adaptation solutions. Some strategies can be implemented in the short term with others taking decades to plan for, such as transportation infrastructure. It's important to ensure that the community is looking far enough into the future to inform projects that have longer implementation time horizons.

Additionally, many adaptation efforts look at multiple time frames and **scenarios** to allow for flexibility in decision-making and to address any uncertainties (e.g., how climate change will play out locally)—for instance, planning for 2050, 2075, and 2100 using both a low and high emission scenario. However your team chooses to define the WHEN, make sure you allow for flexibility. Priorities change and opportunities come and go, so you want your effort to be relevant under a wide range of possibilities.

1.5 What

This is where the team will establish desired **outcomes** by starting with the end in mind. What will this effort help you do, or what do you plan to achieve? Outcomes should reflect the community's priorities, and will reflect the vision and goals described in WHY. It is also important to consider how these efforts will be evaluated. How will you know what worked or is working, what didn't or isn't working, for whom things are or aren't working, and why? Plan now for evaluation so you can correct the course if something isn't working. Identify milestones and build into the process when and how monitoring and evaluation will occur. *Resilience Metrics* offers a toolkit of resources to help teams explore and identify adaptation evaluation components.

The WHAT also includes possible **outputs** from the planning effort. The outputs should reflect the vision and goal of the adaptation planning effort. Will you need educational, outreach, or communication materials for engagement purposes? Are you interested in developing a stand-alone adaptation plan to guide the overall community resilience-building efforts? Or, will you be incorporating new elements into existing plans (e.g., capital improvement plans or stormwater management plans).

The types of outputs may be tied to the bounds of the planning effort, namely which climate hazards and sectors the effort will focus on. A **simple approach** looks at one hazard and one sector (e.g., sea level rise's effect on residential housing). This narrow and targeted approach can help you balance priorities with capacity limits, whereas a more **complex approach** would look at multiple hazards and sectors (e.g., sea level rise and rainfall impacts on stormwater and transportation systems). One benefit of the complex approach is that you can better identify the interconnectedness and interdependencies that exist within systems and communities. For instance, if you are only looking at sea level rise, you may miss compounding impacts caused by other coastal hazards. Choosing between the simple or complex approach, or some combination of the two, can be driven by multiple factors, including community priorities, project timeline, the WHY, capacity, local context of hazards, urgency to act quickly to address impacts being experienced now, funding guidelines, and more!

Pitfalls

- **Underestimating the time needed on scoping and engagement.** Many planning efforts scope and budget a significant amount of time and financial resources for data collection and analysis (Steps 2 and 3), and assume engagement will be quick and cheap. This step almost always takes more time and funding than teams budget for. Resist the urge to skip or skimp on Step 1!
- **Not thinking through who to involve in the effort.** We have seen communities struggle with who to involve in their efforts. The *Stakeholder Analysis Worksheet* can help think through who should be engaged, and what level of involvement makes sense at each step. Note that not everyone has to be a part of each step.
- **Avoiding criticism and other viewpoints.** Don't overlook those who don't agree with your approach. Be sure to include them at the beginning of the effort so you can hear their concerns and work with them during each step of the process.
- **Not delivering on what was promised.** A sure way to damage trust with people is to promise a community-driven approach and not deliver. Be realistic about where on the spectrum of engagement your process is. Build an inclusive process and show how you are moving towards "Defer to," while being honest if you only have the resources to "Consult." The goal of every effort should be to move closer to institutionalizing practices that support deep and meaningful engagement, while also acknowledging the time and commitment needed to bring about such systematic changes.
- **Not using this step to guide the rest of the project**. When this step is complete, don't just move on to Step 2 and forget the framework and vision outlined during Step 1. This step needs to be consistently referred back to when making important decisions in the following steps. Many teams will complete this step and forget to refer back to the original vision as the guiding force behind all decisions.

Putting This Step into Action

- Convene a team and begin to outline roles and responsibilities, ensure that diverse perspectives are represented on the team, and discuss boundaries that will shape the plan's scope (e.g., funding, mandates, related efforts). Make sure to carve out time to explore the individual and collective purpose behind doing this work.
- Start outlining a strategy for engagement that describes who you want to engage, and when and how the team will engage different community members and groups during each step of the process. Be sure to plan for multiple opportunities to engage with the process at each step. For instance, scheduling one workshop does not provide enough points of entry for people to engage with the process. Consider how you will need to establish new and strengthen existing relationships to support the engagement approaches.

Want to Learn More?

- *Introduction to Stakeholder Participation* is a guide to the common techniques of stakeholder engagement and discusses some important considerations for using them.
- *The Spectrum of Community Engagement to Ownership*, from Facilitating Power, charts a pathway to assess and transform community engagement efforts to advance community-driven solutions.
- *Community-Driven Climate Resilience Planning: A Framework*, by the National Association of Climate Resilience Planners, provides a framework advocating for deepening democratic practices at the local and regional levels and offers examples of resources for community-based institutions implementing community-driven planning processes.
- *Lead with Listening: A Guidebook for Climate Migration*, by the American Planning Association, was specifically designed to advance innovative methods for inclusive and equitable community planning in climate-induced relocation—buyouts and "managed retreats."
- *Enhanced Engagement and Risk Communication for Residents in Underserved Communities: Research Findings, Best Practices, and Lessons Learned 2022* shares best practices for effective long-term engagement with communities that are most vulnerable to sea level rise. The best practice recommendations were gathered through a literature review. The report also includes case studies from three Sea Grant programs that applied the best practices discussed in the literature review directly to community engagement activities conducted by resilience experts.

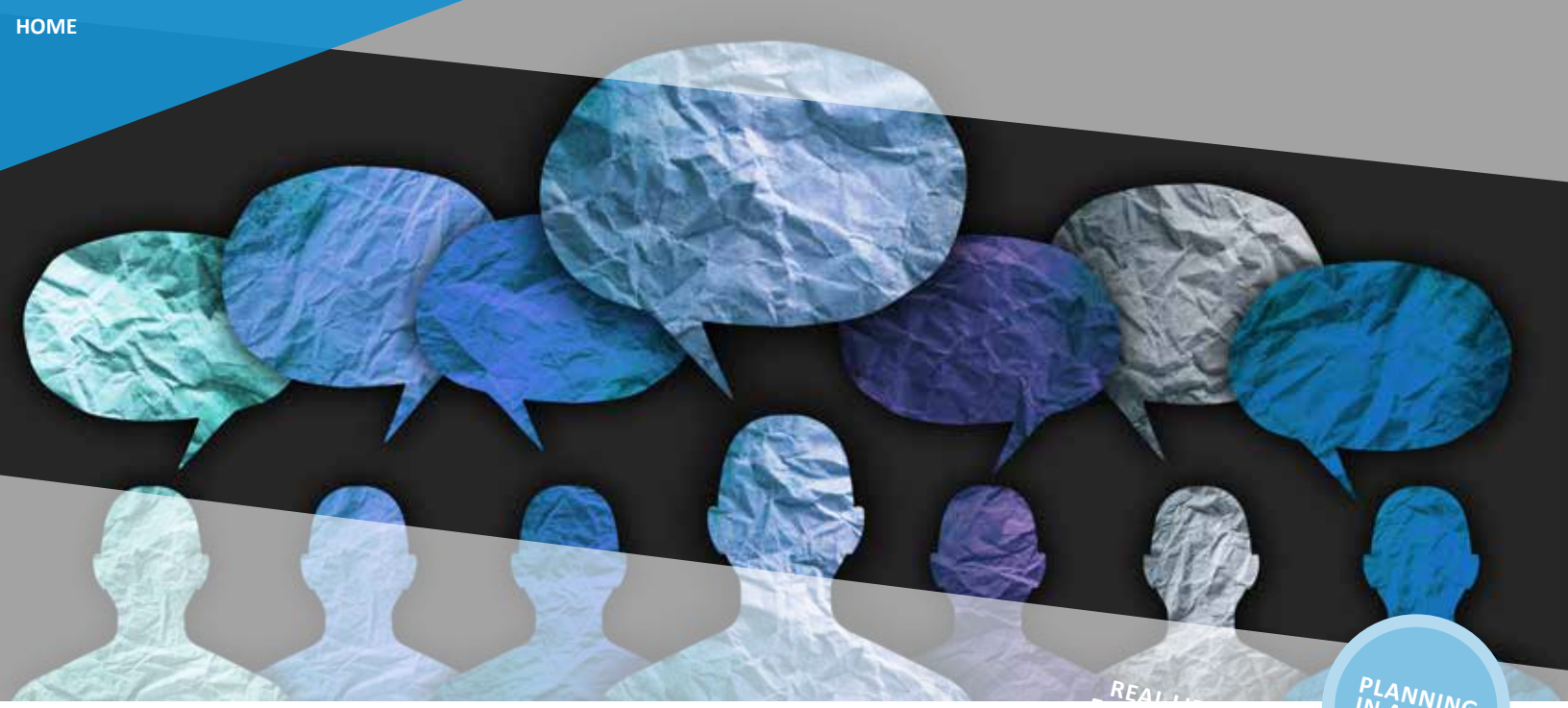
STEP 2

EXPLORE LOCAL CHANGING CONDITIONS

Climate change is a global issue, but the impacts are experienced locally. In this step of the adaptation planning framework, you will be developing an understanding of how your region's climate is changing and will change in the future. This step provides a key opportunity to gather information from the community on the changes and impacts they are experiencing, and to combine this information with the latest scientific projections of climate change. The combination of scientific information and the local context is essential to informing further steps in the adaptation planning framework.

Key Takeaways

- **Climate hazards will be experienced differently at different locations.** For example, sea level rise in New Orleans is vastly different from that in Seattle. Understanding the local context for climate hazards is critical for your adaptation planning effort.
- **Not every community will be concerned about the same climate hazards.** You might opt to focus on changes in sea level, wildfire risk, temperature, and precipitation patterns, depending on what your community is concerned about. You'll want to think through what sort of information you need to gather so that you can understand what challenges you face locally.
- **Climate data is readily available through a number of sources.** Your team may not need to invest a large amount of resources here. Start by exploring the data, tools, and information available locally and regionally, and then move to national or international resources to find what you need.
- **Consider the full suite of data.** This includes sources such as community members' lived experiences, Indigenous knowledge, and more. This step might provide a good opportunity to co-produce data for the effort.



Centering Equity in the Process

- **Value and listen to the expertise and experiences of community members** in addition to scientific and technical expertise (NACRP). Valuable information can be gleaned through people's lived experiences. Perhaps your community has a rich multi-generational fishing industry that can share 100 plus years of knowledge of a place. The Coral Triangle Initiative uses participatory methods to develop a community climate story. They combine local knowledge of the community with the latest climate science to document the past, present, and impacts from projected change. A series of activities and exercises are outlined in the second chapter of *this guide*.
- **Indigenous knowledge and science.** Indigenous peoples have expertise that has been passed down through many generations and continues to grow. Indigenous peoples have managed and adapted to environmental changes and climate variability for millennia, serving as stewards of the land and waters they oversee. Recognizing the values of Indigenous knowledge and practices and combining them with science provides a more holistic approach to evaluating and responding to climate change. Consider entering into a formal agreement where *free, prior, and informed consent* can guide you through culturally appropriate engagement with Indigenous peoples.
- **Explore ways to co-produce climate data and information.** Co-production brings together diverse communities and groups of people to develop a deeper understanding of the causes of and solutions to complex problems like climate change. In co-production efforts, problems and questions are defined together, and data may also be jointly collected and analyzed to co-create outputs. Citizen science is one example of how the public is participating in the co-production of climate science. Community volunteers in Durham and Raleigh, North Carolina, have used heat sensors mounted on cars and bicycles, or carried in their pockets, to collect data on temperature differences between city neighborhoods with and without green space and tree canopy. This data was then compiled into a heat island map, and was used to illustrate the impacts of legacy policies such as redlining and segregation. Learn more about *Raleigh's urban heat islands* and *how they aim to address race-based policies*.

Understanding Local Climate Change

2.1 Collect Local Climate Data and Information

A fundamental and ongoing part of planning for climate change impacts is understanding how climate is expected to change in your region. This requires collecting and evaluating basic information on changes in local sea levels, wildfire, temperature, extreme weather, rainfall patterns, and more.

Identify climate hazards that are relevant for your area. What weather events have caused damage in your region in the past? What significant events have happened in the last 20-50 years? You might also take note of where conditions have gone from nuisance to problematic. For example, extreme high tides may have caused your community to have road closures or storm drain back-ups a few times a year in the past. But now, those occurrences may be more and more common, causing increasing burdens on the community and its residents.

Explore current and future trends using local observations and climate projections. Try to explore the specific ways in which the region's climate is changing, in order to assess the potential impacts that you should be planning for. Collect information about how climate changes will vary with season—for example, the number of frost days during winter, the frequency of extreme rain events in the spring, or the number of days over 90 degrees. To help put the size of the projected changes into perspective, you may want to present comparisons of projected changes to conditions in the past. Take high-tide flooding in Hampton Roads, Virginia, for example. According to *NOAA's Tides and Currents*, the city experienced 13 days of flooding in 2021 compared to 5 days of flooding in 2000. And, by 2050 those numbers are projected to jump to between 85 and 125 days of flooding.

The data collected will depend on what possible futures you will plan for. This may be informed by local or state guidelines, like the Charleston, South Carolina *2019 Flooding and Sea Level Rise Strategy*. The strategy recommends planning for 2.0 to 3.0 feet of sea level rise over the next 50 years. If local or state guidelines don't exist, you may choose the common planning approach of looking at "worst-case," "best-case," and "intermediate" scenarios to provide a range of climate changes that the community may experience.

It may be sufficient to collect descriptive or qualitative information about the direction of future climate change—for example, warmer summers with more extremely high temperatures. Or, higher lake levels combined with loss of ice cover increases the erosion and damage from wind-driven storms that push huge waves up onto the shoreline. This could facilitate a high-level process or discussion that identifies potential impacts and prioritizes elements that may need further quantification.

2.2 Organize Data for Use in the Planning Process

What information is relevant for which audiences? How is the information going to be used? You may find that internal project teams need information formatted to support other steps in the planning framework. Your team might consider organizing information into data tables describing observed changes, general projected changes, a range of specific changes expected, the reference data sources' confidence, and more. For an example, check out Table 4.1 (beginning on page 38) that outlines information for the U.S. Pacific Northwest in the *ICLEI Preparing for Climate Change guidebook. The State of Nevada Climate Initiative Table 1* provides another example of how to do this. In this example, the projected changes are paired with impact statements for various sectors. Community members may find impact statements more accessible than data tables.

Table 1. Examples of the type of information your team may want to collect to understand local changes. For the examples listed, your team may want to collect current observational data and future projections for use in the planning process.

CLIMATE HAZARDS	EXAMPLES OF ISSUES TIED TO CLIMATE HAZARDS	EXAMPLES OF DATA AND INFORMATION TO COLLECT
Temperature	◈ Poor air quality days ◈ Heat-related illnesses and death ◈ Loss of habitat and species ◈ Disruption of power grid	◈ Annual average daily minimum and maximum temperatures ◈ Average seasonal daily minimum and maximum temperatures ◈ Changes in the timing of seasons ◈ Number of nights above 75°F ◈ Frequency and duration of heat waves ◈ Number of air quality alerts ◈ Vulnerable population hospitalization rates (old, young)
Precipitation	◈ Increased wildfire risk ◈ Reduced snowpack ◈ Intense rainstorms ◈ Flooding ◈ Landslides ◈ Drought ◈ Water supply shortages ◈ Agriculture production and the food supply	◈ Days per year with more than 1 inch of rainfall in a day ◈ Annual rainfall totals ◈ Seasonal rainfall totals ◈ Mean winter precipitation ◈ Number of days neighborhoods experience flooding
Sea Levels	◈ Coastal erosion ◈ Extreme high tides ◈ Inundation or long-term waterline change ◈ Saltwater intrusion ◈ High water table ◈ Loss of habitat and species	◈ Changes in mean high tide level ◈ Changes in the 100-yr floodplain ◈ Number of inches of rise by 2050 ◈ Number of inches of rise by 2100
Lake Levels	◈ More damage from wind-driven winter storms ◈ Shoreline erosion ◈ Impaired navigation and shipping ◈ Loss of coastal wetlands ◈ Hydropower generation impacts ◈ Overtopping fixed docks ◈ Impaired drinking water intake function	◈ Projected highest high and lowest low lake levels ◈ Changes in ice cover ◈ Changes in erosion rates

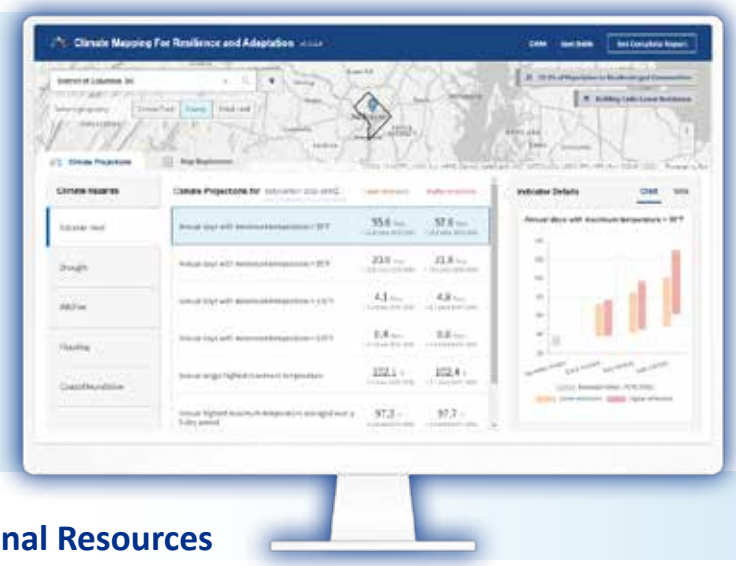
2.3 Data and Information Sources

While it would be impossible to link to every resource or tool, this section will point you towards some of the organizations and websites that are responsible for compiling, updating, and providing climate data to the public. The following resources should not be used as the sole source of information but should build on community observations, experiences, and expertise. For instance, consider the routine calls public works staff receive about issues throughout the community. They will likely have valuable information, such as location, frequency, and depth of flooding on roads. Also, consider resident observations, as their experiences may be able to add additional context around how people are being impacted by changes in their communities.

University Programs

University programs can provide expertise on climate models and help you find information on future climate projections for your area.

- *Sea Grant*, a network of 34 university-based programs, supports coastal and Great Lakes communities through research, extension and education.
- *NOAA Climate Adaptation Partnerships*, formerly known as the Regional Integrated Sciences and Assessments program, is an applied research and engagement program that expands regional capacity to adapt to climate impacts in the U.S.
- *University Extension Offices* provide vital, practical research-based information directly to the people.



National or Regional Resources

National and regional resources include geospatial data and visualization tools.

- *National Climate Assessment* contains individual chapters for each climate hazard and each geographic region.
- *Climate.gov* is NOAA's climate data and information portal that provides timely and authoritative scientific data and information about climate science, adaptation, and mitigation.
- The Climate Explorer tool (*introductory version or full version*) in the U.S. Climate Resilience Toolkit provides graphs and maps to help users get a sense of the past, present, and future climate projected for their locations.
- *Climate Mapping for Resilience and Adaptation (CMRA) Assessment Tool* is an interactive application that provides information on past, present, and future climate conditions. The tool allows users to easily access statistics, maps, reports, and summaries to help people consider their local exposure to climate-related hazards.
- *Find and download data through the Digital Coast*, a NOAA-sponsored website that links communities to the data, tools, and training they need to address coastal issues.
- *NOAA Regional Climate Centers* are federal–university cooperatives that support the operational production and delivery of climate data and information to decision makers at regional levels.
- *2022 Sea Level Rise Technical Report* provides the most up-to-date sea level rise projections available for all U.S. states and territories.
- *National Weather Service* offices provide weather, water and climate data, forecasts, warnings, and impact-based decision-support services.

State Resources

Use these general state-level resources to access information in your state.

- *State and Local Hazard Mitigation Plans* describe the natural hazards that affect the jurisdictions in the planning area.
- *State Climatologists* have a core mission to advance the development and delivery of science-based climate services on a local and state level.

2.4 Uncertainties in Climate Projections

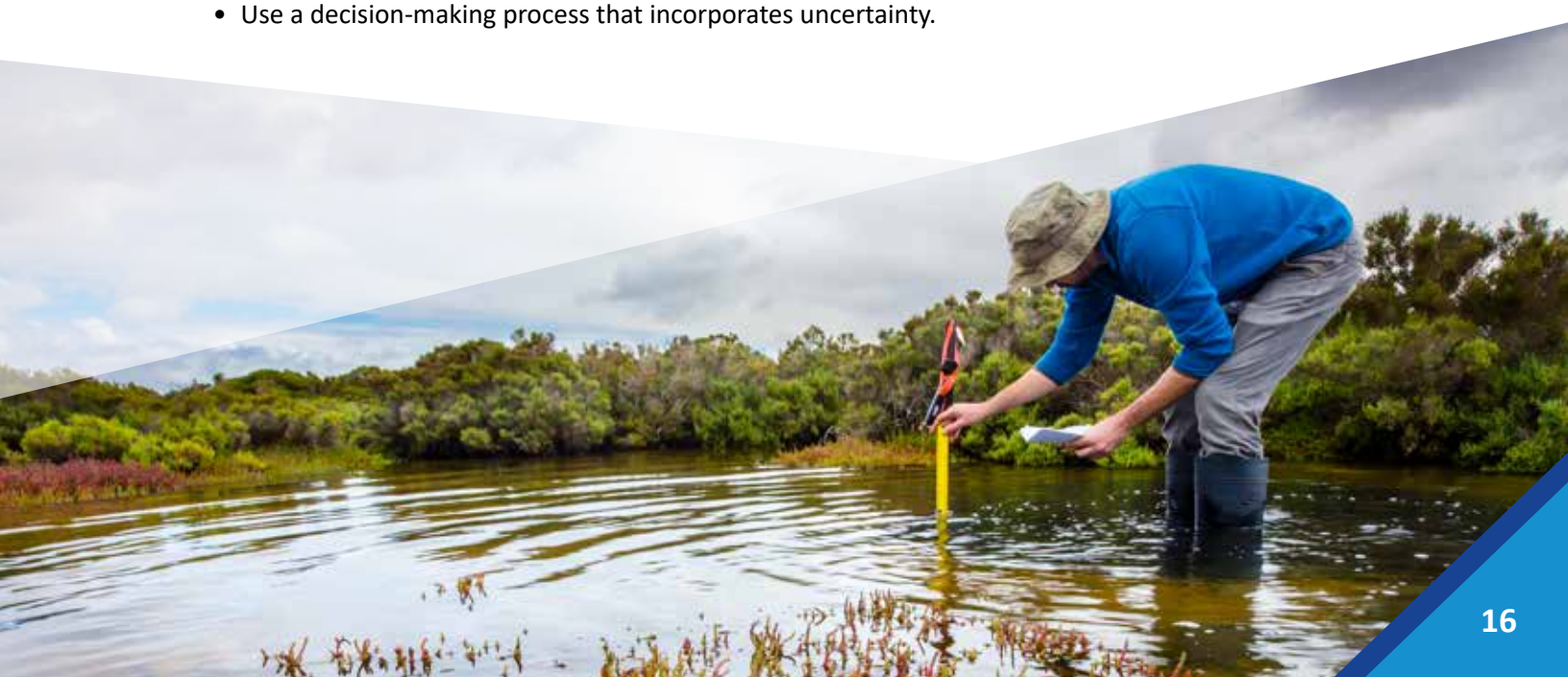
We know with certainty that climate change is happening today, and impacts are already being experienced throughout our coastal communities. But, being able to answer, “What will the future look like?” is complicated. The complex nature of the climate system, climate models, and human factors makes it difficult to determine exactly what impacts will be at any given location or time.

Understanding uncertainties associated with climate projections can make them more manageable, lead to more informed and robust decision-making, and reduce the danger of concealing potential risks. In general, uncertainty in climate projections can be linked to three main sources.

- **Natural climate variability.** Natural and sometimes periodic changes in the system lead to fluctuations from the average conditions. Variations in the sun, volcanic eruptions, and air and ocean circulation patterns (e.g., El Niño/La Niña) can affect climate worldwide.
- **Climate model uncertainty.** Despite scientific advances and huge amounts of data, simulations of certain climate phenomena remain challenging. Cloud formations, for example, are notoriously difficult to simulate in climate models.
- **Emissions scenarios uncertainty.** Greenhouse gases are tied to population growth, energy sources and consumption, land use change, and more. We can make assumptions in how society will develop and evolve, including what decisions are made to curb emissions and adapt to impacts. There are also assumptions that are made in quantifying the outcomes of those decisions on emissions.

Uncertainty is inherent in all societal issues, including public health, natural disasters, and national security. Climate change planning is no different, and there are ways to manage the uncertainties above.

- Use an ensemble of climate models instead of a single model.
- Look at different emissions scenarios to show a range of potential futures.
- Incorporate different time horizons into the planning process.
- Use a decision-making process that incorporates uncertainty.



DECISION-MAKING PROCESSES THAT INCORPORATE UNCERTAINTY

Planning in the face of uncertainty can be intimidating, but teams have used various approaches to navigate through this process of exploring "what can happen" and even "what should happen." We offer three commonly used approaches below. And, while these approaches are typically tied to later steps in the adaptation planning framework, you'll need to gather relevant climate data and projections during this step to feed into the process later.

Risk Tolerance

Risk tolerance is the level of risk a community is willing to accept. Risk tolerance should be based on socioeconomic and cultural values and be developed with local community partners to understand place-based significance and sensitivities. Your community may assign different risk tolerance levels depending upon the context in which the projections are being used. It may make sense to apply different risk tolerance levels in near-term and long-term planning because of the increased confidence in shorter time frame projections. Your community might also determine that the level of acceptable risk varies between projects for which the consequences differ. For example, you likely wouldn't apply the same sea level rise projections to deciding where to put your backyard shed as you would for siting a new multi-million dollar infrastructure investment. Taking a risk tolerance approach will require your team to compile information from multiple projections to be applied in the different contexts established.

Scenario Planning

Scenario planning is a structured process that examines a range of "future scenarios" that represent future conditions inclusive of both human and environmental changes (e.g., land use changes, rising seas, precipitation changes). It can be useful where multifaceted, interacting processes make it difficult to determine how a system will respond over time. And, this process has a long and robust history with examples from the military, natural resource management, and land use planning. Scenario planning provides opportunities for integrating community partners into the planning process, and may include characterizing the different future scenarios to explore.

For example, coastal managers from California and Alaska worked together to apply a *collaborative scenario-planning process* in Kachemak Bay, Alaska. In this instance, the team conducted one-on-one informational interviews with local leaders and researchers to develop four scenario narratives based on shallow groundwater and surface water changes.

Adaptation Pathways

Adaptation pathways is a phased planning approach that allows teams to map out a sequence of adaptation strategies in response to climate change. This approach can help a community plan for a range of uncertain futures while investing in adaptation strategies that incrementally increase resilience and allow time for financing longer-term options. This ultimately leads to greater flexibility while minimizing upfront investment costs that may be required to address a wide range of climate change possibilities. The City of Santa Cruz, for example, explored adaptation pathways to inform a more strategic and iterative adaptation approach for the beaches within city limits.

Pitfalls

- **Spending scarce financial and technical resources on downscaled data.** Many efforts think they need a lot of upfront funding for new or local data, but in many instances, this is not needed. Great strides and investments have been made to make high-quality data readily available. Use available regional and national data sets, and consider how you might engage the community in understanding the trends and changes that are being observed. Start there and work with your team to examine how much detail and analysis is truly needed to make informed decisions.
- **Assuming that one study or model will hold all the answers.** You may need to pull information from multiple sources to get the full picture. The list of resources shared in this step can steer you in the right direction.
- **Waiting to start your effort for newer modeling and data.** Climate modeling and research is an ongoing field of study. It can be overwhelming and frustrating trying to figure out how to stay on top of the latest and greatest, or to have newly released data sets to confuse your planning effort. In general, new findings usually don't result in large shifts in trends and projections. Keep your planning effort moving forward, and identify how you will track and incorporate new research findings.

Putting This Step into Action

- Start by identifying which climate hazards your planning effort will focus on. Research past events for local context. Engage the community to determine what hazards they are experiencing and are concerned about. Connect with local experts and invite them to be a part of the process.
- Identify the type of data and information that you will want to gather, and where you might obtain the information. Consider what can be provided by the community through engagement, and if your state or region provides guidance on which data sources to use.
- Consider how you will package and present the information for use in the planning process.

Want to Learn More?

- Use U.S. *Climate Resilience Toolkit* resources to access climate-relevant reports and state climate summaries, as well as find local climate science and service centers that can help you explore your local changing conditions.
- If sea level rise is a concern in your area, another great resource is the *Application Guide for the 2022 Sea Level Rise Technical Report*. When it comes to incorporating sea level rise into community planning efforts, there are many factors to consider. The guide helps you consider these factors to arrive at what's best for your community.

- The National Climate Assessment is an authoritative assessment of the science of climate change, with a focus on the United States. *Chapter 2* provides key messages for the observed and future global changes in climate hazards. For more detail on the analysis of current trends in climate change, both human-induced and natural, and projected changes to the end of this century, you may also want to check out the *Climate Science Special Report*.
- *We All Count: Data Equity Framework* is a systematic process that provides a set of tools, checklists, and practices to identify and understand each place in your work where you are embedding a worldview or prioritizing a lived experience. It equips you and your team to make those choices intentionally in a way that achieves the equity goals you have identified for your work. Use the Data Equity Framework to break up your data work into manageable parts and go through an intentional, equity-oriented process to make the key decisions along the way.
- *CitizenScience.gov* is an official government website designed to accelerate the use of crowdsourcing and citizen science across the U.S. government. The site provides a portal to three key components: a catalog of federally supported citizen science projects, a toolkit to assist federal practitioners with designing and maintaining their projects, and a gateway to a community of hundreds of citizen science practitioners and coordinators across government.

STEP 3

STEP 3: ASSESS VULNERABILITY

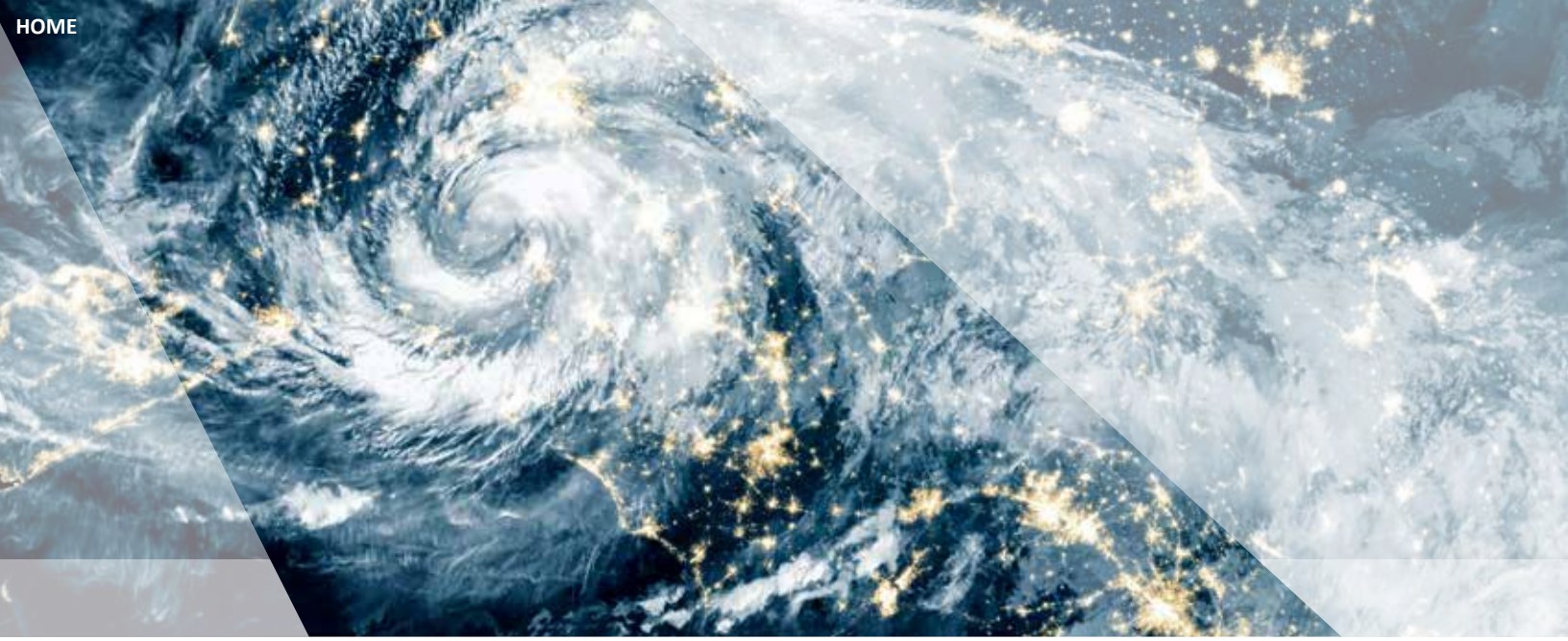
ASSESS VULNERABILITY

In this step of the planning framework, you will focus on assessing the potential impacts of climate hazards. It is an effort to gather and generate data to inform adaptation actions, and this is usually accomplished through a vulnerability assessment. Your efforts will want to answer the following:

- **Who** or **what** is vulnerable to climate hazards?
- **Where** is the community vulnerable?
- **When** or **how often** is someone or something vulnerable?
- **Why** and **how** is someone or something vulnerable or resilient?
- **How** are climate hazards related to or worsening existing issues that impact our communities?
- **What** are the expected consequences on the economy, environment, governance, society, and equity?

Key Takeaways

- **Start with the end use in mind.** Generating the information usually isn't the issue; it's figuring out how to use it. The information you compile in this step will help inform adaptation actions and investments.
- **Balance the resources you have to get an assessment done.** Revisit the decisions you made in Step 1 for the overall adaptation effort to help set the boundaries of the assessment. Not every planning effort will require an extensive assessment.
- **There are readily available data and tools to support this work.** New data and mapping tools can be costly, and in many instances are not needed. Collect all information available to your team and examine how much detail and analysis is truly needed to make informed decisions.
- **There are a variety of ways to approach this step.** Some teams will elect to hire a consulting firm or university-based researchers to complete an assessment. Others may determine they are well suited to complete an assessment using staff or by facilitating a community-based effort. Any combination of these approaches is also possible.
- **Vulnerability is more than exposure to climate hazards.** An exposure analysis will provide information on how your community may be subjected to climate hazards, but it won't tell you the challenges and problems that result from that exposure.
- **A qualitative assessment can provide valuable information.** Local knowledge and expertise can capture the nuances of vulnerability that are missed through a quantitative or spatial analysis.



Centering Equity in the Process

As noted in the *Community-Driven Climate Resilience Planning* framework, relying solely on data disconnected from lived experiences of impacted communities does not paint an accurate picture of your community's vulnerability to climate change. Instead, **draw upon the knowledge and historical wisdom of residents**, factoring in the root causes of inequities caused by policies, institutions, and cultural norms that impact marginalized communities. Additionally, "intersectional" identities can compound vulnerability concerns. Applying an intersectional lens can uncover how climate change more harshly affects individuals with multiple vulnerable identities (e.g., rural communities of color with low income, women of color, or LGBTQIA+ people with low income). Seeking to understand vulnerability through this lens will allow all residents to better leverage their strengths and provide a clearer picture of how to move towards solutions that benefit everyone.

Centering Equity in Climate Resilience Planning and Action: A Practitioner's Guide outlines a summary list from the *NAACP's Centering Equity in the Sustainable Building Sector Initiative* to help center frontline communities in impact assessments. We offer a few takeaways for a people-first approach to engagement in this step of the framework:

- Engage community members to help identify strengths and community assets, as well as define problems, assess needs, and organize additional engagement.
- Residents are community experts who bring value no one else can. They should be paid or compensated in some form when asked to provide insights, time, or labor.
- Include all burdens that impact the community both major and minor, no matter how small, and the secondary effects of any impacts. For example, if residents are worried about more traffic, consider also that more traffic leads to more air pollution, too.
- Ensure that each assessment is unique and customized to the community, including explicit considerations based on race, gender, class, and other identities that are relevant to frontline communities.

Assessing Vulnerability

3.1 Scope of the Assessment

There are many ways to approach vulnerability assessments, and many tools and guidance documents have been developed to assist groups in this stage of adaptation planning. Your community might already have done work in this area that you can use as well. Are there planning documents that already assess risks and hazards? A local hazard mitigation plan or comprehensive plan may reduce the scope of the assessment you will need to conduct because information already exists.

Some planning teams will hire consultants to do some of the more technical aspects of this work. Others will work to gather the information with in-house resources and staff, or alongside community partners. The approach might be some combination of all. Regardless, it is important that the planning team sets boundaries on this work through a considered scoping process.

Table 2. Practical considerations for the scope of the vulnerability assessment. Decisions made for these considerations will help set boundaries for the assessment and help avoid "scope creep."

ELEMENT	PRACTICAL CONSIDERATIONS
Purpose	Refer back to Step 1 to recall the goals and vision for the adaptation planning effort. The assessment should support the overall approach, and reflect the bounds placed on the effort: ◈ Project area ◈ Planning horizon(s) ◈ Climate hazards ◈ Sectors
Budget	Identifying your potential budget at the beginning of the process can help keep expectations realistic and shape your approach. ◈ Available funding may constrain the scope of an assessment or how much time you have to complete it. ◈ Available funding may direct who will do the assessment (e.g., in-house staff and community partners or consulting firms).
Expertise	The type of expertise you seek will help shape the approach of the assessment. Experts aren't limited to certain credentials, and may include: ◈ People who can manage the assessment process and budget. ◈ Asset managers and staff with expertise in the sectors included in the scope of the assessment. This might include maintenance staff, engineers, planners, etc. ◈ People with generational knowledge of place and space that can offer perspective of their lived experiences. ◈ Community members who are, or could be, seeing the greatest impacts. ◈ People who understand climate modeling and local or regional climate trends and projections. ◈ People with geospatial or mapping expertise.

ELEMENT	PRACTICAL CONSIDERATIONS
Timing	The timing of the larger adaptation effort could inform when assessment products might be needed or used. Timing can often depend on: ◈ Data access and availability. ◈ Accessibility of technical resources. ◈ Dedicated staff time. ◈ Complexity of questions being asked. ◈ Community engagement processes. ◈ Funding source requirements, such as a grant timeline.
Desired Outputs	The types of outputs should always be guided by the intended audiences, and the purpose and use of the information, so that the results are as informative and actionable as possible. For example, if engineers will be using the results to inform the design of stormwater infrastructure, they will need detailed technical data. Whereas, communications experts sharing the results with the community at large will need simple, concise, and relatable messages. Outputs can be presented in a variety of formats, such as: ◈ Reports ◈ Maps ◈ Storyboards ◈ Presentations
Data and Information	Assessments usually include a combination of **qualitative** (e.g., "what" and "how" and "why") and **quantitative** (e.g., "how often" and "how many") information. Qualitative information can be collected by interviews, workshops, and meetings. Quantitative information often uses geospatial information or more detailed analyses. Depending on the assessment approach and the hazard of concern, data might include: ◈ Climate hazards and projections data collected in Step 2 ◈ Existing hazard areas (e.g., FEMA Flood Zones, contaminated lands, high erosion areas) ◈ Socioeconomic and demographic data (e.g., Census data, *Social Vulnerability Index* data, etc.) ◈ Land use/land cover data ◈ Topographic data ◈ Natural areas and habitats (wetlands, tree cover, parks and preserved lands) ◈ Built environment characteristics (e.g., critical infrastructure, parcels, building footprints, impervious cover, first floor elevations, age of structure, maintenance schedules, etc.) ◈ Community interviews and discussions

3.2 Identify Who and What Are in Harm's Way

Many teams start with an **exposure analysis to identify where a climate hazard will occur, and what is in the path of that hazard.** This can allow your team to focus on key geographic areas, infrastructure, and populations directly at risk. Some basic approaches to data collection can apply to this step.

Engage community partners in a participatory process to help identify where current problem areas are. The co-production of data can not only produce knowledge to inform the exposure analysis, but also build capacity and social capital, create and strengthen networks, and support the implementation of

actions later in Step 5 of your adaptation planning process. This could be done through small and large meetings or focus group discussions, participatory workshops, surveys, and semi-structured interviews. Participatory mapping is a common approach used in engaging the community in identifying their resources, perspectives, and priorities. In Hampton Roads, Virginia, the *Action-Oriented Stakeholder Engagement for a Resilient Tomorrow* (ASERT) framework helped organize their engagement effort. ASERT is a participatory approach designed to help policymakers, planners, community leaders, and others ensure broad engagement beyond simple public participation. The approach asks community members to identify and map assets in the community they value, as well as the challenges (physical, social, and economic) the community faces that prevent resilience to flooding or sea level rise.

Identify necessary geospatial data layers required to conduct a desktop GIS analysis. Take sea level rise, for example. You would need the appropriate inundation data layer to get started on understanding where sea level rise will occur on the landscape. Then it's a matter of overlaying the inundation layer on top of things like critical infrastructure, demographics, parcel layers, etc., depending on the scope of your study. The goal here is to see where the hazard intersects with community assets and people.

Use existing, web-based mapping tools to visualize and analyze exposure. NOAA's Coastal Flood Exposure Mapper allows users to create 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 with local partners and experts to ground-truth results.

3.3 Beyond Exposure

The exposure analysis will provide information on how your community may be subjected to climate hazards, but it won't tell you the challenges and problems that result from that exposure. Take, for example, more frequent instances of high tide flooding resulting from rising sea levels. A city park that floods compared to the flooding of a water treatment facility will have markedly different consequences for the community. Clean drinking water can become compromised if floodwaters wash out open tanks, and the plant's short- and long-term operations could be hindered by damaged mechanical equipment such as the electrical power and controls. Additionally, a simple exposure analysis won't highlight the community's strengths that can help buffer and lessen the impacts of being exposed to climate hazards.

There are many factors that influence an individual's or the community's sensitivity to climate hazards. The degree to which something or someone is affected by the exposure to risks can be directly tied to the existing conditions. Existing conditions can include things like inflation, aging or poorly maintained infrastructure, and pollution and water quality issues, to name a few. Sensitivity can also be tied to governance issues such as how many organizations are responsible for the management of an asset or resource. This came to light, for example, during investigations of the levee failures during Hurricane Katrina. The primary cause of flooding was inadequate design and construction of the levee protection system, but was compounded by the patchwork of local levee boards, municipal authorities, and state oversight authorities responsible for management and maintenance.

Understanding potential vulnerabilities in your community also means considering strengths that provide the basis for resilience. Sometimes referred to as adaptive capacity, you will want to consider what factors into the ability of systems, individuals, institutions, and ecosystems to adjust to climate change or to moderate potential damages. Perhaps the town has made investments in an upgraded wastewater plant, or invested in new park land. Having sufficient fiscal and financing tools (e.g., taxes, bonds, grants, impact fees, withholding spending in hazard zones) for such investments can be critical in the community's ability to manage climate hazard impacts. Effective leaders and organizers, educational efforts, and community engagement can all contribute to resilience.

For the purposes of this guide, we'll break this into three main sectors (people, infrastructure, natural resources) to help you get started thinking beyond exposure.

People

Not everyone in the community will be impacted by climate hazards the same. It's helpful to consider the root causes and critical social factors that result in some people being more vulnerable and others more resilient to climate impacts. For example, all community members will be exposed to a heat wave, but elders and youth are more vulnerable because they are more sensitive to extreme heat than young adults and adults. Similarly, people that don't have access to green spaces may be at a higher risk of health challenges such as heart disease, obesity, and depression. Across the United States, communities of color by far have fewer green spaces and tree canopy when compared to predominantly white neighborhoods. Being equipped with fewer resources to prepare and respond, combined with these health disparities, can make communities of color much more vulnerable to extreme weather events and climate change.

We can also consider social factors that can buffer against negative impacts of climate change, such as high levels of community interaction and organization that can lead to a decrease in isolation and greater social connectedness. The LGBTQIA+ community, for example, has experience coming together to build strong, supportive communities. This can help offset the social stigma, higher unemployment, and housing insecurity that increases their vulnerability to weather and climate hazards (*Carbon Literacy Project*).

FACTORS CONTRIBUTING TO RESILIENCE

- **Connection to social networks**
- **Access to:**
  - **Healthcare**
  - **Safe and affordable housing**
  - **Reliable transportation**
  - **Quality education**
  - **Parks and green space**
- **Political representation**
- **Hazard insurance (e.g., flooding, earthquake)**

FACTORS CONTRIBUTING TO VULNERABILITY

- Racial segregation
- Neighborhood disinvestment
- Language barriers and isolation
- Demographic characteristics (e.g., age, economic status, race, or ethnicity)
- Overall health status (chronic and acute illnesses, mental and physical disabilities)

Infrastructure

The existing condition of infrastructure, such as roads, stormwater systems, and buildings, has an enormous influence on the vulnerability of these systems. Other elements, such as concentrated neighborhood disinvestment, underinvestment, and related decisions also contribute to vulnerability. Noting where the community has **redundancies**, or the availability of alternate or comparable infrastructure that provides the same or similar services or functions, could uncover a community's ability to withstand climate impacts. For example, a drinking water supply system that has two water sources (groundwater and surface water) is better prepared to shift between those sources if one source is affected by changing rainfall patterns than a water supply system dependent on a single water source.

FACTORS CONTRIBUTING TO RESILIENCE	FACTORS CONTRIBUTING TO VULNERABILITY
◈ Able to restore function quickly, easily, or in a low-cost manner if damaged or disabled ◈ Redundancy ◈ Key functions and services can be maintained even if damaged ◈ Management plans include future conditions ◈ Disaster or emergency response resources (e.g., on-site staff, backup power, equipment for cleanup, temporary flood protection, pumps, "friends of" organizations or volunteers)	◈ Existing conditions (e.g., age, deferred maintenance) ◈ Use that exceeds design parameters ◈ Critical water- or salt-sensitive components at or below grade ◈ Managed by multiple organizations or agencies ◈ Relies on external services, such as power, roads, clean water, and safe food supplies, to function

Natural Resources

The **existing conditions** of natural systems will have a direct influence on that system's vulnerability. A polluted wetland area is much more vulnerable to climate change than less impacted wetlands. Healthier ecosystems have a better chance to respond to extreme events and hence are more resilient to climate change. These systems can provide services to urban environments as well, such as reducing stormwater runoff, attenuating waves from storms, and providing clean air and water.

FACTORS CONTRIBUTING TO RESILIENCE	FACTORS CONTRIBUTING TO VULNERABILITY
◈ Connectivity and robustness of the ecosystem ◈ Ability for a species or habitat to migrate or expand into new zones ◈ Management plans include future conditions	◈ Environmental degradation (e.g., pollution, habitat fragmentation) ◈ Overuse or overextraction of resource ◈ Habitat or species already at or beyond environmental thresholds (e.g., temperature, pH, salt concentrations) ◈ Invasive species

3.4 Pulling It All Together to Understand Vulnerability

Once you have begun to understand how the elements of your community may be vulnerable, it is time to start thinking more holistically. Looking at these elements in isolation may be more manageable, but it simplifies the issue and does not necessarily address how these individual elements work together. For example, a power station may be on high ground and therefore not susceptible to flooding, but the roads leading to it and power lines may be in flood zones and have an indirect impact on the plant's vulnerability. Thinking about vulnerability from a systems level helps to make connections between assets to help determine what the "domino effect" may be if one element is damaged.

The Adapting to Rising Tides group in California's Bay Area used a number of interactive workshops with adaptation project participants during the vulnerability assessment phase. The *Understanding Vulnerability Engagement Exercise how-to* details a process used to explore the underlying causes and components of climate vulnerability, including relationships and dependencies among different assets that contribute to vulnerability.

Pitfalls

- **Paralysis by analysis.** It's easy to get stuck in analysis paralysis mode during this step. All too often, teams fall into the trap of feeling like they have to get every piece of data before they can move on. Every team faces limitations on resources to get this step done. Be okay with incomplete information and have a clear endpoint.
- **Depending too heavily on data and maps.** Similarly, it's common to think a GIS analysis will provide all the information you need. While helpful, relying too much on technology and tools can cause teams to sink unnecessary money and resources into developing new data sets and tools. There is a wealth of knowledge and understanding that can be gained through regional and national data sets, local knowledge, and the lived experience.
- **Thinking this step is only about hazard exposure**. It might be tempting to complete an exposure analysis, and then move on to identifying possible solutions. This step is more than identifying who and what may be vulnerable in the community. Dig deeper to the root causes of vulnerability. This WHY piece is critical for developing appropriate adaptation strategies.
- **Putting the vulnerability assessment on auto-pilot.** More and more teams are hiring consulting firms to complete the analysis but go into the process not being clear on what to "ask" for. Make sure the planning team is driving the process, engaging with the consultant throughout their work, and not falling victim to the out-of-the-box approach when it's not what is needed.
- **Not engaging with the community throughout this step.** Often teams will do this step "behind the scenes" and only engage the community to present the results. There should be consistent and iterative engagement throughout this step. If working with a consultant, be sure someone from the planning team is involved and is continuing to build relationships with community members. Don't let this aspect be fully delegated to consultants. Building long-term relationships will be important when planning turns to implementing projects in the coming decades.

- **Not budgeting for engagement.** When budgeting for this step, many teams focus on the technical components and don't budget for engagement. Engagement almost always costs more and takes more time than most teams think. When having to decide between budgeting for more tools and data versus engagement, think carefully about what will actually help the community move further through the adaptation process.

Putting This Step into Action

- Gather the team and start making some decisions on the scope of the assessment. If it's helpful, take a look at a few vulnerability assessments that have been done by other groups for ideas.
- Be sure to include how local knowledge and expertise will be incorporated into the process. Refer back to the engagement strategy from Step 1.
- If you'll be working with a consultant to complete the assessment, start working through steps to get a request for proposals (RFP) out. The RFP should include an outline of the scope of work for your specific project to help you identify potential consultants with the resources, expertise, and skills to complete the work. The more specific you can be in what you are looking to have compiled will ensure outputs that will be useful in your process.
- Take a look at some online tools to get an idea of what your hazard exposure might be. This might help you make decisions about the scope of the assessment. The NOAA Sea Level Rise Viewer, Lake Level Viewer, and Coastal Flood Exposure Mapper can help if you are looking at changing coastal water levels. Similarly, look into any regional or local online tools that could get you started.

Want to Learn More?

There's no shortage of resources available on vulnerability and resilience assessments. A simple internet search could become overwhelming. If you want to dive deeper into this topic, you may consider starting with some of the resources included below.

- *U. S. Climate Resilience Toolkit: Steps to Resilience* is a portal is a portal which provides explanations of vulnerability assessments, as well as case studies and tools that may help you in your work.
- The *Climate Adaptation Knowledge Exchange* (CAKE) is a knowledge-sharing platform that houses an extensive digital library of high-quality adaptation resources, including case studies and example vulnerability assessments. For example, you can find a link to the 2021 *Los Angeles County Climate Vulnerability Assessment*, which includes a climate hazard assessment, social vulnerability assessment, physical vulnerability assessment, and cascading impacts assessment.
- The *Adapting to Rising Tides Assessment Questions* provide a framework for collecting the data and information that lead directly to the identification of vulnerabilities, consequences, and key planning issues.

STEP 4

IDENTIFY ADAPTATION OPTIONS

This step of the adaptation planning framework centers on identifying possible solutions. It answers the question, "How can we build resilience to climate hazards to reduce vulnerability and risk in our community?" This is where you transform the community vision and goals into strategies, responses, and actions. Get creative! This brainstorming will result in a list of adaptation options that will then be carried into the next step for prioritization and implementation.

Key Takeaways

- **Stay true to the community vision.** Don't forget the community's vision created in Step 1. Consider what the community envisioned for the future and think about what actions need to be taken to make that collective vision a reality.
- **Vulnerability assessments need to be interpreted.** Using the results of a vulnerability assessment to inform decisions will take some thought and reflection as the community thinks about what vulnerabilities to develop adaptation options for. Vulnerability assessments don't give you the answers, only information that then must be applied and interpreted.
- **Build on existing efforts while creating new opportunities.** Adaptation options should both build on existing efforts and simultaneously create new opportunities and reimagine how to address vulnerabilities.
- **Adaptation is more than infrastructure projects.** Adaptation encompasses a wide range of actions, from educating people, to changing programs and operations, to developing new funding and financing mechanisms. Beyond physical infrastructure, think about capacity building, and policy and regulatory options.
- **Multiple solutions are needed.** Keep in mind that adaptation options will not be implemented in isolation and communities will need to implement a variety of solutions, which may or may not be interrelated.
- **Focus on the community's strengths.** Solutions should build on existing community strengths. Don't engage a community focusing solely on vulnerabilities and needs.
- **Don't forget about funding and financing mechanisms.** New funding and financing mechanisms may need to be developed to ultimately increase adaptive capacity of the community and implement adaptation strategies. Do this now, don't wait until the last step to think about what resources are needed to implement projects.

Centering Equity in the Process

- **Ground this step in the community engagement process** outlined in Step 1, and the work invested in balancing power dynamics. It is critical to engage the community in discussions about solutions that meet real community needs and help achieve equitable outcomes. Work to ensure that the decision-making process is grounded in equity principles and isn't undermined as the conversation shifts to where and how investments are made.
- **Build on existing strengths** by acknowledging that solutions and strategies already exist in communities. Strengthen the existing capacity that communities have already developed to overcome hardship and crises.
- **Think holistically.** Adaptation options should be holistic and address broader community goals, such as affordable housing, food security, and health and wellness. For example, weatherizing older homes would also decrease energy costs and improve housing quality, which can also generate equity benefits when actions prioritize communities of color and households with lower incomes.
- **Proactively address green and climate gentrification.** As climate impacts are experienced and investments in resilience are made, people can be displaced, ultimately deepening existing inequities. Be aware of how adaptation options can prevent or contribute to gentrification, and be proactive about identifying strategies for limiting displacement of people. (*NACRP and Greening without Gentrification*)

As the team begins considering various adaptation options, it might be helpful to identify a set of questions to ensure that equity is embedded in proposed solutions. The guiding questions included here are adapted from the NAACP's toolkit, *Our Communities, Our Power*, and *Centering Equity in Climate Resilience Planning and Action: A Practitioner's Guide*, which may provide a useful starting point for local equity considerations.

- **Addresses existing issues:** Will existing social, economic, and political inequalities in the community be helped or made worse by the adaptation option?
- **Unintended consequences:** Will the adaptation option generate burdens (including costs), either directly or indirectly, to communities of color or low-income populations? If yes, are there opportunities to mitigate these burdens?
- **Shared benefits:** Who benefits and who is negatively affected by the adaptation option? Will the disproportionate impacts of climate change be lessened or made worse by the adaptation option?
- **Engagement:** Does the adaptation option reflect the knowledge, priorities, and needs of the communities and people who are most affected by climate change? Were the most impacted communities involved in the shaping of this solution?

- **Capacity building:** Does the adaptation option help build community capacity through funding, an expanded knowledge base, or other resources?
- **Economic opportunity:** Does the adaptation option support communities of color and low-income populations through workforce development and contracting opportunities?
- **Accountability:** Does the adaptation option have appropriate accountability mechanisms to ensure that communities of color, low-income populations, or other vulnerable communities will equitably benefit and not be disproportionately harmed?

Explore Adaptation Options

4.1 Consider Which Issues to Respond To

Think about the vulnerabilities you identified in Step 3. Depending on the type of assessment, and what outputs you generated, you likely identified a number of issues that your community may want to address. Deciding how to move forward can be a tricky step in the adaptation planning process.

Will you be developing actions for ALL vulnerabilities identified? The advantage is that everything is considered equally. The disadvantage is that it takes a lot of time and resources to do this approach, and could result in hundreds of actions to sift through and manage.

Will you only develop actions for some select vulnerabilities? This means you will likely need to establish a method for prioritizing vulnerabilities, such as ranking or scoring. This approach requires the development of criteria to assess which vulnerabilities will be the focus of your efforts. Examples of criteria might include assets or areas that will likely experience impacts first, assets or areas that are most susceptible to impacts, or assets or areas that serve a critical function for the community or broader region. Another approach might be to focus on assets or areas that are less vulnerable and therefore might require a lower level of effort and investment to successfully adapt and become resilient in the face of climate change.

Will you group similar vulnerabilities and assets to address them together? A lot of information may be gathered during the assessment, and looking for similarities can make the process more manageable. Often, you might find that a number of vulnerabilities will have similar characteristics, conditions, and challenges—for example, facilities that have critical water- or salt-sensitive components at or below grade, or residents that rely on public transportation and are in flood risk zones. Understanding the underlying vulnerabilities of specific assets and addressing them together can help find synergistic solutions; however, this also can be quite complex and complicated.

4.2 Look at an Array of Adaptation Options

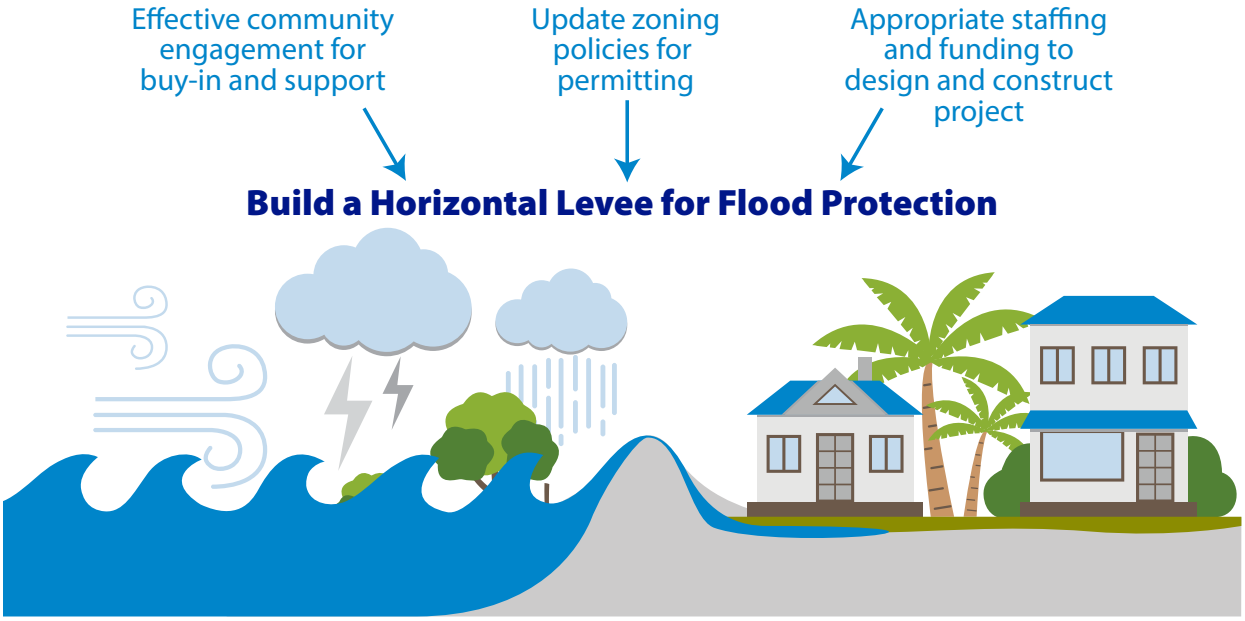
When beginning to consider potential adaptation options, it is important to think broadly and find creative approaches to the vulnerabilities you identified in Step 3. You don't necessarily need to start from scratch. Check out adaptation ideas from other communities and groups that have done this work already (some resources are shared in the "Want to Learn More?" section below). And this is a great opportunity to engage the community about possible solutions.

Adaptation options can build on your community's existing strengths and work towards broader societal goals, such as sustainable development, affordable housing, disaster risk reduction, or improvements in quality of life. Adaptation is a mix of strengthening existing community efforts while also reimagining and creating new ways of doing habitat restoration, land use planning, transportation planning, stormwater management, economic development, social justice and equity work, and more.

Reflect on your community's vision from Step 1 and think about how to move from vulnerabilities towards that desired future. Ensure that the adaptation options you are developing are not only addressing vulnerabilities identified in Step 3, but the holistic vision the community laid out at the beginning of the process.

You will likely need to assemble a collection of actions that may or may not be interrelated. Unfortunately, there is no single adaptation option that will address all your vulnerabilities. Often, the option you are considering will require a series of actions to be taken in order to get to implementation. For example, you may need to begin with working on political consensus for a new policy, program, or financing mechanism. Or, you may need to take steps to pave the way or adjust the policy or programmatic landscape so that a project can move forward.

ACTIONS WORKING TOGETHER



Not all adaptation options will need to be implemented at the same time. Depending on your planning time frame, you may want to consider developing short-, mid-, and long-term adaptation options. There may be an opportunity to address some of your vulnerabilities right away through shorter-term solutions. In the future, there may come a time when the climate hazards have progressed to the point that additional measures will be required.

Don't leave funding and financing to the last step. You need to be thinking about how your community will finance adaptation options. Don't leave this to the end. There may be anticipated funding opportunities on the horizon that may help shape your list of adaptation options. There may also be specific funding or financing mechanisms that need to be developed to support implementation, so some of your adaptation options may actually be creating these new funding pathways (e.g., stormwater fees to pay for infrastructure upgrades). The City of Duluth included an appendix in its *2022-2027 Climate Action Work Plan* that lays out possible funding and financing solutions for its climate actions.

Table 3. **Three Categories of Adaptation Options**. Adaptation encompasses a wide range of actions, and is more than getting projects built. As a start, consider adaptation options from three categories: **capacity building, physical infrastructure,** and **policy and regulatory options**. The purpose of categorization is to help you and the planning team, communities, and stakeholders conceptually think about different types of actions and not get stuck only thinking about infrastructure.

Capacity building options increase the ability to problem-solve and implement action.	Examples: ◈ Community outreach ◈ Building understanding of the issues through further studies and research ◈ Increasing access to information ◈ Building institutional capacity ◈ Building or reinforcing human and social capital
Physical infrastructure options implement risk-reduction projects.	Examples: ◈ Gray and green infrastructure projects ◈ Floodproofing ◈ Designing parks to act as buffers to floods ◈ Affordable housing ◈ Managed realignment or relocation of assets
Policy and regulatory options establish or revise policies and regulations.	Examples: ◈ Adaptation plans ◈ Updates to management or comprehensive plans ◈ Zoning and building codes ◈ Developing guidelines to address climate hazards

Pitfalls

- **Jumping into identifying adaptation options without interpreting vulnerability assessment results.** Many communities come out of a vulnerability assessment and assume they will have a clear path forward, and don't expect how challenging and time-consuming this transition can be. Vulnerability assessments can provide valuable information, but will not make any decisions for you. You still need to do the hard work of identifying what to develop adaptation responses for. This is why the vision, priorities, and engagement established in Step 1 is so critical. It will take time for everyone to process the results and think about what it means for them and their community. Don't expect this to happen quickly!
- **Approaching adaptation as a "plug-and-play" exercise.** There isn't a top-10 list of adaptation actions that will work everywhere and for every set of issues, because local impacts, environmental concerns, and social and political contexts vary from location to location. Exploring other adaptation plans can inform what options you may want to consider, but you'll likely need to reimagine the adaptation option through the lens of your community's unique characteristics.

- **Focusing on adaptation options only related to built infrastructure.** Putting projects in the ground is only one way to build resilience. Don't forget to consider options that create conditions for adaptation to move forward. Community capacity may need to be built or enhanced. Policies may need to be adopted to pave the way for other adaptation options, or regulations may need to be changed to allow for certain adaptation options.

Putting This Step into Action

- **Assemble the team and dive into the vulnerability assessment results.** Make sure the core team and the community understand the information presented in the assessment. Allocate ample time for this activity.
- **Identify which vulnerabilities you are going to focus on.** Work with the team to design an inclusive, transparent process to determine what vulnerabilities you will develop adaptation options for. It might be helpful to talk with other groups that have successfully worked through this phase to learn what approaches may have been used.
- **Revisit the community's vision.** Use the community vision your community created in Step 1 to begin conversations about what actions, policies, or projects may help address vulnerabilities and move the community closer towards its desired future.
- **Look to other communities for ideas.** There are similarities in adaptation options across regions and sectors, so look around for case studies highlighting what other communities are doing. Let other communities inspire you with new ideas, and then work to develop adaptation options that are relevant and local. Dig into local, state, and national resources to get ideas. Start with some of the resources highlighted below.

Want to Learn More?

- The *Center for Climate Strategies Adaptation Guidebook* includes a catalog of adaptation actions (Appendix 3) drawn from existing and planned adaptation efforts in U.S. states and municipalities, as well as other countries. They are organized by sector and include infrastructure and the built environment, natural systems, health and society, economic activities, and cross-cutting issues.
- The *Climate Adaptation Knowledge Exchange* (CAKE) is a knowledge-sharing platform that houses an extensive digital library of high-quality adaptation resources, including state and local plans. You can also find reports such as the 2022 National Academies of Sciences, Engineering, and Medicine's *Equitable and Resilient Infrastructure Investments* report that explores partnerships for equitable infrastructure development; systemic change toward resilient and equitable infrastructure investment; and innovations in finance and financial analysis.
- *Georgetown Climate Center Adaptation Clearinghouse* is a rich online database that allows the user to search resources by sector, and provides quick access to local plans in every state on their main website.
- *Climate Ready Estuaries: Synthesis of Adaptation Options for Coastal Areas* is a guide that provides a review of on-the-ground adaptation options in estuaries to reduce their systems' vulnerability to climate change impacts.
- *Climate Adaptation: The State of Practice in US Communities* is a report that examines efforts to develop and implement climate adaptation projects in 17 cities across the U.S., and includes efforts underway, motivations for action, and how communities went from planning to implementation.
- *Adapting to Rising Tides: Summarize Findings* resources help teams summarize assessment findings into clear, outcome-oriented vulnerability and consequence statements.
- The Greening without Gentrification policy report outlines numerous parks-related anti-displacement strategies that are used to ensure the development of parks and green spaces as part of equitable community development.
- The *Funding and Financing Coastal Resilience* training series builds foundational knowledge about funding and financing approaches used to support coastal resilience activities. The series includes presentations from experts who demystify this complex topic by sharing traditional and emerging approaches, project examples, and lessons learned, and by answering your questions.

STEP 5

PRIORITIZE AND TAKE ACTION

This step of the adaptation planning framework focuses on determining what actions to implement and how implementation will happen. The outputs of Step 4 will likely be a large menu of adaptation options to consider. It is unrealistic to expect that this full list could ever, or should ever, be implemented. You will need some way to decide what to tackle, and when.

Key Takeaways

- **There is no one right way to do this.** You will likely employ some method to compare and select which adaptation options to prioritize for implementation. Some planning approaches may use combinations of multiple methods.
- **Tough decisions will need to be made.** No matter what method you use, prioritizing where investments get made can be challenging and uncomfortable. Allow time for productive dialogue and collective understanding.
- **Opportunity favors the prepared community.** Sometimes a funding opportunity or an infrastructure upgrade may provide an opportunity to implement one of the identified adaptation options. Having a pipeline of projects ready to go will allow you to be ready when these opportunities arise.
- **An implementation plan provides a roadmap for action.** This is an opportunity to outline how adaptation options will be integrated into existing plans and regulations, day-to-day operations, and decision-making processes. It also provides accountability by identifying who will be responsible for which actions.
- **Establish how you will track progress and monitor conditions.** This will set you up to recognize when conditions have changed in the community, and to have an iterative process that is responsive and adaptive. It also allows the implementation plan to be monitored and reviewed to ensure that the adaptation actions taken are producing the intended outcomes, including progress towards social equity.

Centering Equity in the Process

- **Allow enough time to engage the community in determining what adaptation options to prioritize.** It takes time to be inclusive, and to consider and reconsider all options. This type of decision-making takes longer than anticipated and is not likely to be a linear process. A slow, deliberate, inclusive process may seem inefficient but in the long run results in a plan with more buy-in and better implementation. (Antioch)
- **Center equity criteria in the evaluation process.** In Step 4, you considered various guiding questions to determine whether the adaptation options being considered were equitable. In this step, consider how to prioritize strategies that deliver the most co-benefits for frontline communities, and address the most immediate needs within those communities.
- **Support community implementation of adaptation options as much as possible.** Local implementation can draw on local knowledge about a community to avoid pitfalls and draw on resources that only the community knows about (Antioch). One approach is to consider a community advisory board to help guide implementation and communication of the plan and adaptation options (USDN).
- **Measure and analyze for equity.** As implementation moves forward, ensure that a process is put in place to regularly evaluate the policies, grants, projects, and initiatives for equity successes and challenges to improve the effort going forward (Greenlining). You may find it helpful to establish equity-specific metrics and indicators to track progress.

Getting to Action

5.1 Gather Relevant Information on Adaptation Options

When it comes to selecting and prioritizing adaptation options for implementation, it's important to remember that there are several viable options, and combinations of options, for effective adaptation. Collecting some basic information about the options could help set the team up for evaluation in this step.

- ☐ **Costs.** What are the fiscal costs to plan, prepare for, and implement the adaptation option? What are the possible funding sources now and in the future? How long will it take to line up funding? Are the costs distributed equitably?
- ☐ **Acceptability.** What is the current public and political support for the option? How might public opinion evolve in the future with expanded community engagement?
- ☐ **Technical complexity.** Is the option technically feasible now? Are there anticipated technological advancements that may make it feasible in the future?
- ☐ **Regulatory climate.** Can the option be permitted under existing rules? Are there anticipated regulatory changes that may make a project permittable in the future?
- ☐ **Time to implement.** How much time is needed to plan, conduct necessary studies, secure financing, design the project, and engage the community in order to implement? What is the urgency of the climate hazard that the option aims to address? Some actions will be suited for implementation in the short term, while others will require lengthy preparation and planning.
- ☐ **Benefits.** What are the damage costs avoided by the option? Who benefits?
- ☐ **Longevity.** How long or under what conditions does the option provide benefits? Are there performance metrics that document the usefulness of the option?
- ☐ **Equity.** Does the option place additional burdens on communities that are already facing discrimination and social, political, or economic exclusion because of systemic inequity? Does the option prioritize equitable distribution of benefits?
- ☐ **Environmental impacts.** Does the option comply with environmental regulations? What negative environmental impacts might result from the option?

5.2 Prioritization

There are a number of methods for comparing, prioritizing, and selecting adaptation options now and in the future. In the next section, we share some general information on three methods we commonly see groups use to prioritize options for implementation

- Multi-Criteria Analysis
- Benefit-Cost Analysis
- Adaptation Pathways

Let's take a closer look at each of these approaches, and some of the benefits and challenges for each.

Multi-Criteria Analysis

This approach provides teams with a systematic way to compare a set of options across a number of criteria, and isn't limited to economic calculations. Criteria should be developed and agreed upon by the team and the community. One example is the STAPLEE evaluation method, which uses seven criteria for comparing options: Social, Technical, Administrative, Political, Legal, Economic, Environmental. This worksheet uses a scoring method of "favorable" and "less favorable," but your team can use various scoring approaches (e.g., letter grades; or positive, negative, and neutral types of responses). This approach can be applied to initiate conversations about trade-offs and further explore the consequences or implications of choosing certain options over others.

BENEFITS	CHALLENGES
Can consider a wide set of criteria, even where quantification is challenging or limited. **Relatively simple and transparent and can be done at relatively low cost and within a limited time.** **Provides a structured framework for combining a range of expertise (e.g., community members, academia, traditional knowledge).** **Perhaps most importantly, by allowing decision makers to incorporate a variety of different criteria, it creates a space for dialogues that consider varying perspectives, priorities, and values.**	Subjectivity can be high. Giving consistent scores can be difficult. Analysis of uncertainty is often highly qualitative.

Benefit-Cost Analysis

This approach allows for comparison of costs and benefits of a project or adaptation option, often primarily in monetary terms. The outputs of this analysis can be used to determine which alternative has the greatest net benefits (i.e., the difference between benefits and costs), the higher benefit-cost ratio, or the greatest rate of return on investment. This approach is widely used in decision-making.

Adaptation costs can include planning, preparing for, facilitating, and implementing adaptation options. Adaptation benefits can include avoided damage costs, changes to ecosystem services (e.g., water filtration, shade and heat, carbon storage, social and cultural values, etc.), changes in habitat health and wildlife populations, increased recreation benefits, changes in real estate values, and other accrued benefits following the adoption and implementation of adaptation options. The Conservation Strategy Fund has a collection of introductory videos on the basics of economics, including benefit-cost analysis, on their YouTube Channel.

BENEFITS	CHALLENGES
◈ **Structured and thorough consideration of costs and benefits, which can be monetized, quantified, or qualitatively described to make adaptation-related decisions more transparent.** ◈ **Provides a systematic outlining of discounted costs and benefits, ultimately offering a framework for comparison.** ◈ **Can support decisions to protect high-value investments, infrastructure, or properties.**	◈ Monetizing, quantifying, or describing costs and benefits can be seen as morally questionable (e.g., assigning monetary value to human lives). ◈ Can be a lengthy, complex analytical process that is resource heavy – requires economics expertise, data on costs and benefits, knowledge of potential future conditions, and outreach. ◈ Choice of time horizon and scales can dramatically change results. ◈ Does not always incorporate equity issues, natural resource preservation, and intrinsic values. ◈ No universally agreed-upon rate at which net benefits accrue over time.

Adaptation Pathways

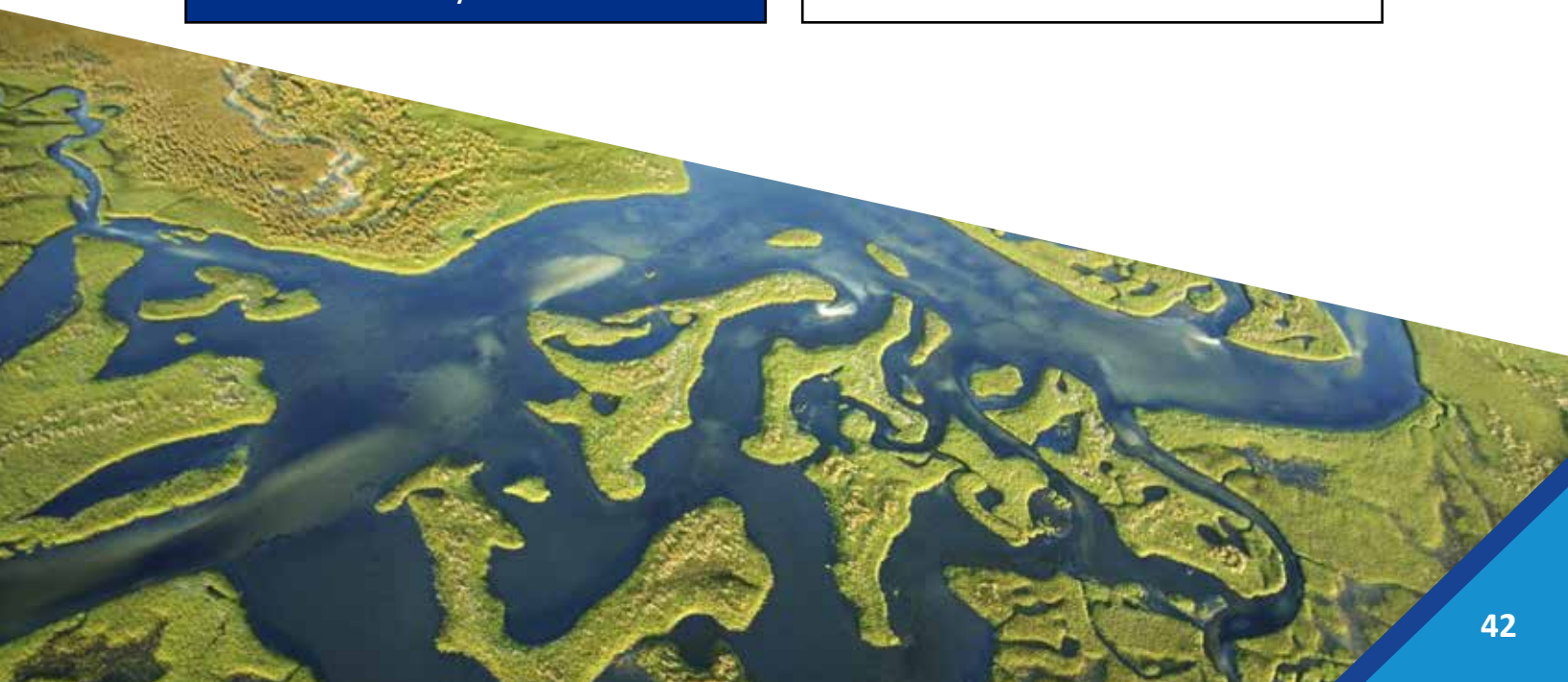
A decision-making process for exploring and sequencing a set of adaptation options in both the short and long term to avoid potential impacts. The community identifies social conditions and impacts to avoid or manage for, referred to as tipping points. It is based on the premise that adaptation options have a lifespan and then will no longer function as designed. As conditions change, new adaptation options will need to be implemented. These changes in direction are predetermined to account for the time needed to implement new options, known as decision-points. Because of this, monitoring for signals that may trigger this change in course is essential in this approach. The Adaptation Pathways Network has developed a guide outlining these aspects, and is designed to be used as an add-on to various planning processes.

BENEFITS

- **Phased approach gives you time to finance options, conduct pilot projects, gather additional information (e.g., scientific, economic, legal), and work with the community to further shape a vision of the future.**
- **Doesn't shut down early consideration of difficult and expensive options due to sticker shock, lack of precedence, or emotional responses (e.g., relocation or buy outs).**
- **Acknowledges that not all decisions can be made now, but they can be planned, prioritized, and prepared for.**
- **Useful approach in cases where the uncertainty may reduce over time (e.g., improved estimates of future local sea level rise). New information and opportunities may arise over time and you can account for these.**

CHALLENGES

- Identifying when a change in strategy is needed may not be quantitative and therefore difficult to establish.
- Some adaptation options require long lead time before implementation is complete. Aligning timelines for when future impacts will occur with the necessary lead time for implementing adaptation actions can be challenging.
- Approach requires agreement in what conditions are unacceptable (e.g., how many times a road is flooded per year) and reaching agreement can delay progress.
- It can be difficult to develop a plan for how conditions are monitored and tracked to inform subsequent decisions. If no one is looking for them to occur, then they may happen without any action being taken.



Your team might choose to work through one of these prioritization processes, but they **can also be used in combination.** For example, in New Zealand community members developed the *Clifton to Tangoio Coastal Hazard Strategy* that used two methods for prioritization. First, they developed six adaptation pathways for their priority areas, and working with the community, used the multiple-criteria analysis to compare and identify which pathway to implement.

Additionally, it's also important to **acknowledge there may be times when you won't use one of these processes—when you will need to be opportunistic**. Sometimes weather and climate events create funding opportunities, such as post-disaster programs. For example, the National Fish and Wildlife Foundation's *Emergency Coastal Resilience Fund* was established to increase resilience of coastal communities located in federally declared disaster areas impacted by hurricanes and wildfires. The City of Charleston is using the funds they received through this program to implement the Church Creek Habitat Restoration and Flood Protection Project, a component of their Climate Action Plan. Additionally, some state programs have been developed and offer funding for projects that are ready for design and engineering, or are shovel-ready. The Resilient Florida Grant Program, for example, offers funding assistance for implementing adaptation projects. The *Little River Adaptation Action Area* was awarded $12.2 million for projects outlined in their adaptation plan.

5.3 Moving from Prioritization to Implementation

Once you have prioritized options, the final component of Step 5 is to outline exactly how each option will be implemented. Implementation plans often include details about what actions are to be taken, timeline for implementing the action, what organization is responsible or accountable to complete the actions, the source of funding, and how progress will be tracked.

There are many formats and approaches to implementation plans, and it might be helpful to explore what other teams have used. The *Sacramento, California, Climate Implementation Work Plan* includes two key sections. The first introduces tasks nested within 10 topic areas, describing the tasks and associated costs and rationale behind the tasks. The second is a table that presents details for the fiscal year work plan such as 2021 outcomes, responsibilities, and resource details (e.g., outstanding resource needs). In contrast, the Building Resilience Against Climate Effects Adaptation and Evaluation Plan *Template* from the Centers for Disease Control outlines a more narrative approach that encourages consideration and documentation of how the climate and health adaptation actions will be planned, implemented, communicated, evaluated, and managed.

Integrating adaptation options into day-to-day operations, decision-making processes, and established plans and regulations can ensure greater efficiency compared with managing adaptation initiatives separately. Of course, every community is unique and your team will need to determine the best path forward given your adaptation goals and options identified. Additionally, you should keep in mind that some options won't be implemented in isolation, but will require bundling or a series of actions in order to get to implementation. These should all be outlined in the implementation plan.

Implementation will likely require partnering with other departments and organizations to be successful. Your team will want to identify departments and community partners, including nongovernmental organizations, community-based organizations, and private-sector contractors, that can contribute to the implementation of specific actions. Make sure to include not only the partners involved, but also which party will be responsible for leading implementation. This will also include identifying who will track progress across the suite of options being implemented.

Create a mechanism to track progress towards adaptation goals. This aspect of the implementation plan may be as easy as creating a checklist or tracking spreadsheet outlining whether the status of actions is completed, in progress, or upcoming. However you decide to format the information, it is essential to establish when, how, and how often you report back to leadership and the public on the status of each action. Regular reports on accomplishments can help to celebrate successes, and maintain momentum, support, and buy-in. This can also afford the community opportunities to adjust planning and be responsive as new funding revenues become available. The 2021 *Miami-Dade County Sea Level Rise Strategy*, for example, committed to an annual implementation report to tell the story of adaptation progress each year. The 2022 Progress Update tracks progress on 10 key actions and includes examples of successful projects and initiatives.

Include a way to monitor conditions in the community. It is important to track how conditions within your community are evolving to inform whether a shift in adaptation approaches may be needed. A reporting mechanism can help track changes and ensure that the implementation plan is a living document. The *Maryland Coastal Adaptation Report Card*, for example, provides a snapshot of 15 indicators to evaluate the state's adaptation work in the coastal zone and establishes a framework for measuring future progress.

Pitfalls

- **Not acknowledging assumptions.** Prioritization is a complex activity that requires a series of assumptions to be made about costs, impacts, effectiveness, and other elements. For the public to be able to understand these various options being prioritized, it is best to be transparent about what assumptions are being made and why. This is often where people who feel more comfortable making quantitative decisions (e.g., data, numbers) end up being at odds with people who feel comfortable embracing more qualitative information (e.g., social experiences, value of nature). Think through how you will successfully engage both types of people in this process.
- **Attempting to implement all adaptation options at the same time.** In many cases, communities will need to implement several adaptation options in the near term to address current and chronic issues and impacts. Other options may not be needed until a later date, but shouldn't be excluded from the planning process. For example, a community may choose to elevate or relocate a few homes that are currently experiencing flood issues. In the long term, however, there may be a tipping point when sea level rise, combined with changes in precipitation, will call for additional measures such as a levee to address the increased flood levels.
- **Speeding through the prioritization step.** When looking to consider social, environmental, and economic dimensions of adaptation, acknowledge that this process takes time and compromises will need to happen along the way.
- **Inflexible implementation plans.** Once adaptation options are prioritized, you have created a roadmap for how your community may go about implementing projects; however, this roadmap needs to reflect dynamic and changing communities. Ensure that you build in flexibility in the implementation plan by making it a living document that is referred to and updated frequently.
- **No accountability.** To get things done, someone needs to be responsible. Therefore, it is important to make sure responsibility for the prioritized adaptation options is clearly defined with clear milestones. Consider having a periodic reporting mechanism to keep things moving.

Putting This Step into Action

- Reflect back on the engagement strategy in Step 1. How are you engaging the community? Do you need technical or facilitation assistance to complete this step?
- Explore the different methods of how to prioritize and implement options. What might work in your community? Developing a tailored approach for your community may be necessary to get community buy-in and participation.
- Look for examples of how prioritization has been done in other communities. Talk to other communities that have been through this process to see if they have any lessons learned that will advance your work.

Want to Learn More?

There are many approaches to evaluating adaptation options and moving to implementation. It is important to have a sense of what those other approaches are and how they have been applied. Below are a few resources that can help you.

U. S. Climate Resilience Toolkit: Steps to Resilience is a portal which provides case studies and tools that may help you in your work. Steps 4 and 5 provide examples and guidance for prioritizing adaptation options and ideas about how to best implement them over time. The steps in this website are also available in a stand-alone publication: *Implementing the Steps to Resilience: A Practitioner's Guide.*

Adapting to Rising Tides' Developing Evaluation Criteria provides guidance for developing a set of criteria that will help you assess the effectiveness of your adaptation strategies in achieving your resilience goals.

NOAA's Office for Coastal Management has a number of products to support decision-making for coastal resilience.

- *Economic Guidance for Coastal Management Professionals* training provides information about a benefit-cost analysis, economic impact analysis, cost-effectiveness analysis, and more.
- *Nature-Based Solutions: Benefits, Costs, and Economic Assessments* includes three quick references to gain information about nature-based solutions, ecosystem services, installation and maintenance costs, and tips for assessing the costs and benefits of reducing coastal hazard impacts.

NOAA OFFICE FOR COASTAL MANAGEMENT