

## INTRODUCTION

Local government has an important role to play in efforts to reduce greenhouse gas (GHG) emissions and limit the impacts of climate change. The State of California provides resources to local governments to support local action on climate change. The *California Adaptation Planning Guide* (APG) continues this effort by providing guidance to support communities in addressing consequences of climate change.

To support local and regional adaptation planning efforts, the state has developed an integrated set of policies and tools:

- *California Adaptation Planning Guide* (this guide)
- *Safeguarding California Plan: California's Climate Adaptation Strategy* (2018 Update)
- Cal-Adapt 2.0 (released October 2017 and updated continuously with new tools and data from California's research community)
- *California's Climate Change Assessment* (most recently updated in 2018)
- *State of California General Plan Guidelines* (updated periodically, most recently updated in 2017)
- Adaptation Clearinghouse
- *State Hazard Mitigation Plan* (2018 Update)

*While California's state government proudly advances initiatives to mitigate and adapt to the effects of climate change, local and regional government agencies are critical partners implementing and pushing forward climate action. To best serve the people of California on responding to the challenges of climate change, coordination across different levels of government is necessary. Local, regional, and federal agency partners have key jurisdictional responsibilities that must be integrated to achieve resilience to climate change in every area of the state, and California's administration is a committed and engaged partner for those agencies' adaptation efforts.*

- from *Safeguarding California*, page 14.

## What Is the APG?

The APG provides guidance to local governments on local adaptation and resiliency planning. As illustrated in Figure 1 and described in Table 1, the APG presents an updated, step-by-step process that communities can use to plan for climate change. The APG is designed to be flexible and guide communities in adaptation planning that best suits their needs, whether taking a preliminary broad look at adaptation issues or conducting a detailed formal planning process. The APG also provides the most recent summaries of statewide information and guidance on where to find and how to use key adaptation planning tools.

Since the state's release of the first APG in 2012, it has been widely used by communities, government agencies, tribal governments, nongovernmental organizations, institutions, and others throughout California to help guide adaptation planning efforts. In 2020, the state updated the APG to reflect the latest best practices; to integrate recent updates to state plans, policies, programs, and regulations (see Figure 2); and to ensure that communities have guidance on using the best available science and information.

**Figure 1. Adaptation Planning Process**

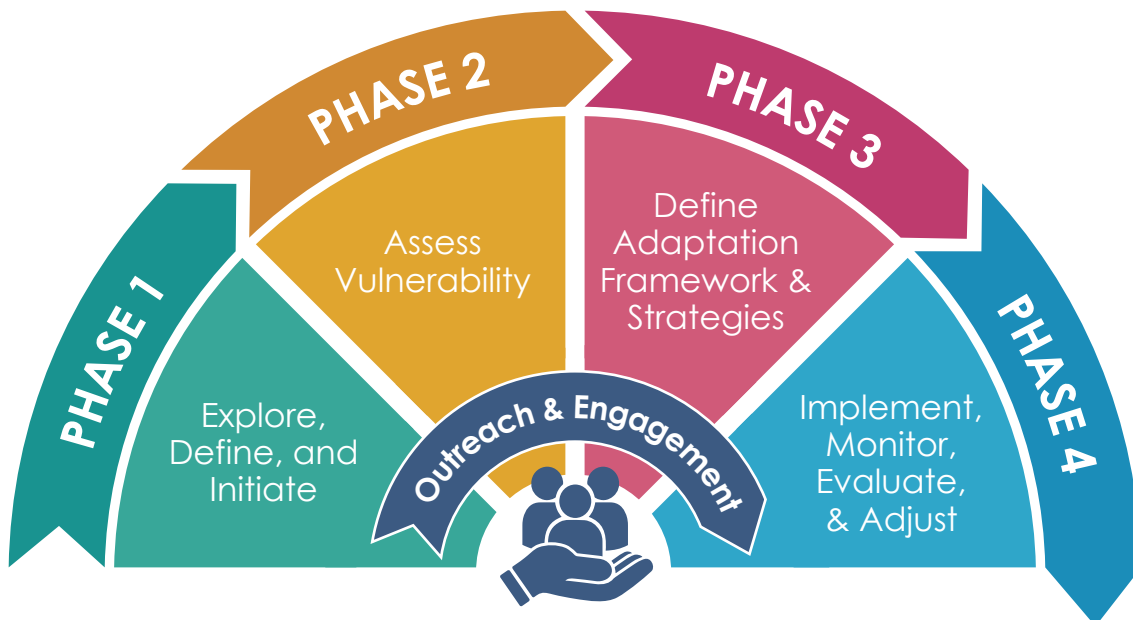
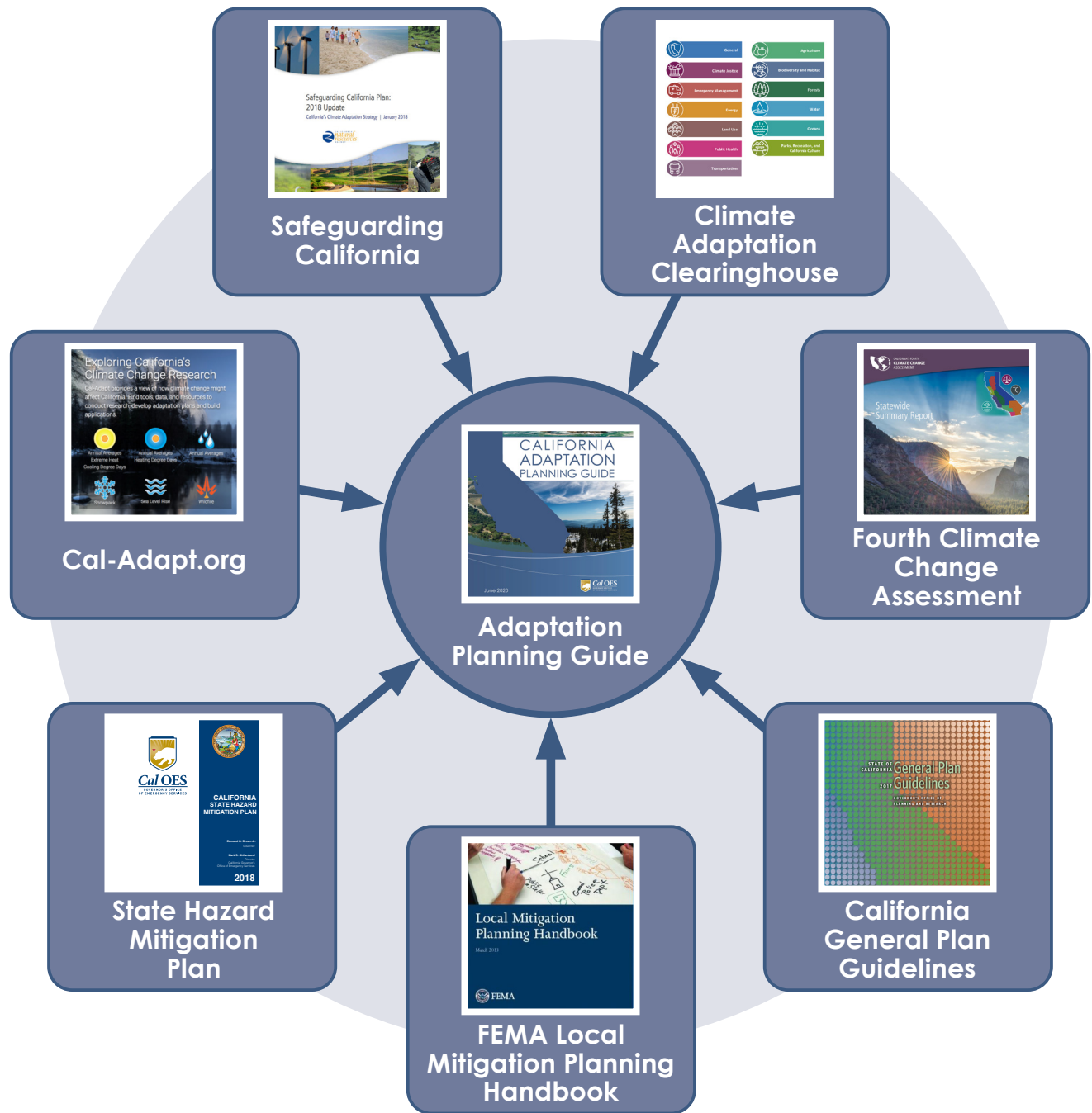


Figure 2. State and Federal Resources Related to the APG



**TABLE 1. WHAT IS THE CALIFORNIA ADAPTATION PLANNING GUIDE**

USE THE APG AS	THIS DOCUMENT IS NOT	RELATED RESOURCES
Guidance for local governments on how to plan for and adapt to climate change.	Guidance for state agencies.	<p><u><a href="#">Safeguarding California Plan: 2018 Update</a></u> is a roadmap of the ongoing actions and next steps currently being taken by California's state government on climate resilience and adaptation. Agencies may also consult the State Hazard Mitigation Plan which incorporates climate change into the state's hazard mitigation strategies. The guidebook, <u><a href="#">Planning and Investing for a Resilient California</a></u>, provides guidance to state agencies on how to incorporate climate change into state planning and state investment in decisions.<sup>1, 2</sup></p>
<p>This update focuses on guidance for use by city, county, tribal, and regional governments in California. This update supports consistency between state, regional, and local adaptation planning efforts.</p>		
A planning process for developing local climate adaptation and resilience policies, programs, and actions.	A clearinghouse of case studies, guidance, and resources for adaptation practitioners.	<p>The Governor's Office of Planning and Research hosts the <u><a href="https://resilientca.org">Adaptation Clearinghouse</a></u> (<a href="https://resilientca.org">https://resilientca.org</a>) as part of its Integrated Climate Adaptation and Resiliency Program. The Adaptation Clearinghouse is California's centralized collection of adaptation and resilience resources intended to guide decision-makers at the state, regional, and local levels.</p>
<p>This update provides a four-phase process for local governments to develop specific adaptation and resilience strategies at the local level.</p>		
A framework for local, solutions-oriented initiatives based in climate science.	A compendium of science on climate impacts and vulnerabilities.	<p><u><a href="#">California's Climate Change Assessments</a></u> provide extensive information about climate impacts and vulnerabilities based on the latest climate change research. The underlying climate data for the assessments is made available on Cal-Adapt.org. <u><a href="#">Cal-Adapt</a></u> provides tools and data for assessing local climate change impacts.</p>
<p>This update references the most recent climate science and provides guidance to obtain data and use California-specific climate science tools. It is not a comprehensive collection of science or research on hazards and vulnerabilities in California.</p>		

**TABLE 1. WHAT IS THE CALIFORNIA ADAPTATION PLANNING GUIDE**

USE THE APG AS	THIS DOCUMENT IS NOT	RELATED RESOURCES
<p>A framework for integrating an array of local government climate adaptation policies and programs, including local hazard mitigation plans and general plans.</p>	<p>Guidance on how to systematically prepare local hazard mitigation plans and general plan elements, such as safety elements.</p>	<p>FEMA's <a href="#"><i>Local Mitigation Planning Handbook</i></a> provides guidance on preparing a local hazard mitigation plan. State of California's <a href="#"><i>General Plan Guidelines</i></a> provide guidance on incorporating climate considerations into general plans. The Office of Planning and Research provides guidance on the preparation of general plans, including safety elements, and associated LHMP incorporation guidance in the <a href="#"><i>General Plan Guidelines</i></a>.</p>
<p>This update provides guidance to complete a vulnerability assessment and adaptation framework that can be used in a variety of local government plans. The APG's guidance includes considerations for different plans and plan integration of climate where applicable. It is not a comprehensive guide for updating a local hazard mitigation plan or safety element.</p>		

## Phases of the Adaptation Planning Process

- **Phase 1, Explore, Define, and Initiate:** This phase includes scoping the process and project, such as identifying the potential climate change effects and important physical, social, and natural assets in the community. It also identifies the key stakeholders in the local government and throughout the community.
- **Phase 2, Assess Vulnerability:** This phase includes analysis of potential impacts and adaptive capacity to determine the vulnerability for populations, natural resources, and community assets. The vulnerability assessment identifies how climate change could affect the community.
- **Phase 3, Define Adaptation Framework and Strategies:** This phase focuses on creating an adaptation framework and developing adaptation strategies based on the results of the vulnerability assessment. The adaptation strategies are the community's response to the vulnerability assessment—that is, how the community will address the potential for harm identified in the vulnerability assessment, given the community's resources, goals, values, needs, and regional context.
- **Phase 4, Implement, Monitor, Evaluate, and Adjust:** In this phase, the adaptation framework is implemented, consistently monitored and evaluated, and adjusted based on continual learning, feedback, and/or triggers.



### Who Developed the APG and Why?

The California Governor's Office of Emergency Services (Cal OES) prepared the first APG in 2012 through a partnership with California Polytechnic State University (San Luis Obispo), other state agencies, and experts from local jurisdictions and nongovernmental organizations. From 2018 to 2020, Cal OES led an update, which resulted in this APG. Cal OES updated the APG in collaboration with a consultant team, the Governor's Office of Planning and Research (OPR), and an interagency working group made up of state agencies, nongovernmental organizations, and experts from local and regional jurisdictions.

In 2015, the governor signed Senate Bill 246 (SB 246), which required Cal OES to update the APG within one year of an update to the *Safeguarding California Plan* and also established the Integrated Climate Adaptation and Resiliency Program (ICARP) in OPR. The *Safeguarding California Plan* integrates the ICARP vision and principles, which represent the overarching vision and priorities for statewide adaptation planning (See ICARP's Adaptation Vision and Principles text box on the next page). This APG follows the requirements of SB 246 and explains the connections between climate adaptation, community resiliency, public safety, and security; provides information and planning support for assessing climate vulnerabilities across sectors and regions; and supports tools to create and implement adaptation strategies that can be tailored to meet local needs.

Since the development of the 2012 APG, the state enacted requirements for local adaptation planning, which are summarized in the following section. This APG provides helpful resources to local governments as they comply with these requirements and provides recommendations and advice on community-level climate change adaptation planning—such as the preparation of vulnerability assessments and adaptation strategies. The APG also explains how these plans and processes can be integrated with other local and tribal government planning and operations.

#### OES Mission

*The mission of Cal OES is to protect lives and property, build capabilities, and support communities for a resilient California. With funding from the Federal Emergency Management Agency and the California Energy Commission, the state developed the 2012 APG to assist local and regional government agencies with planning for climate change adaptation.*

## CLIMATE ADAPTATION AND RESILIENCE REQUIREMENTS FOR LOCAL GENERAL PLANS

California Government Code § 65302 was amended by SB 379 and SB 1035 to require that local cities and counties include climate adaptation and resiliency and new information relating to flood and fire hazards in the safety element of their general plans.

In 2015, SB 379 revised § 65302(g)(4) to require that cities and counties update their safety elements to address climate adaptation and resiliency strategies applicable to their jurisdiction. The updates are required at the next update of their local hazard mitigation plan (LHMP) on or after January 1, 2017. Local jurisdictions without an LHMP must update their safety elements beginning on or before January 1, 2022. The safety element update must include:

1. A vulnerability assessment identifying the risks that climate change poses to the local jurisdiction.
2. A set of goals, policies, and objectives based on a vulnerability assessment for the protection of the community.
3. A set of feasible implementation strategies to carry out the goals, policies, and objectives.

## ICARP Adaptation Vision and Principles

### Vision

All Californians thrive in the face of a changing climate. Leading with innovation, California meets the challenge of climate change by taking bold actions to protect our economy, our quality of life, and all people. The state's most vulnerable communities are prioritized in these actions. Working across all levels of government, the state is prepared for both gradual changes and extreme events. Climate change adaptation and mitigation is standard practice in government and business throughout the state. California meets these goals with urgency, while achieving the following long-term outcomes:

- All people and communities respond to changing average conditions, shocks, and stresses in a manner that minimizes risks to public health, safety, and economic disruption and maximizes equity and protection of the most vulnerable.
- Natural systems adjust and maintain functioning ecosystems in the face of change.



- Infrastructure and built systems withstand changing conditions and shocks, including changes in climate, while continuing to provide essential services

### Principles

- Prioritize integrated climate actions, those that both reduce greenhouse gas emissions and build resilience to climate impacts, as well as actions that provide multiple benefits.
- Prioritize actions that promote equity, foster community resilience, and protect the most vulnerable. Explicitly include communities that are disproportionately vulnerable to climate impacts.
- Prioritize natural and green infrastructure solutions to enhance and protect natural resources, as well as urban environments. Preserve and restore ecological systems (or engineered systems that use ecological processes) that enhance natural system functions, services, and quality and that reduce risk, including but not limited to actions that improve water and food security, habitat for fish and wildlife, coastal resources, human health, recreation, and jobs.
- Avoid maladaptation by making decisions that do not worsen the situation or transfer the challenge from one area, sector, or social group to another. Identify and take all opportunities to prepare for climate change in all planning and investment decisions.
- Base all planning, policy, and investment decisions on the best-available science, including local and traditional knowledge, including consideration of future climate conditions out to 2050 and 2100, and beyond.
- Employ adaptive and flexible governance approaches by utilizing collaborative partnership across scales and between sectors to accelerate effective problem solving. Promote mitigation and adaptation actions at the regional and landscape scales.
- Take immediate actions to reduce present and near future (within 20 years) climate change risks for all Californians; do so while also thinking in the long term and responding to continual changes in climate, ecology, and economics using adaptive management that incorporates regular monitoring.<sup>3</sup>

Section 65302(g)(4) identifies resources and considerations in support of the requirements, including the APG. Section 65302(g)(4)(D) allows local jurisdictions to meet this requirement in the safety element of the general plan or with an adopted LHMP, stand-alone climate adaptation plan, or a similar document if it “fulfills commensurate goals and objectives and contains the information required.” If a local jurisdiction elects to meet this requirement with other stand-alone plans or equivalent content in other portions of the general plan, it “shall summarize and incorporate by reference into the safety element the other general plan provisions, climate adaptation plan or document, specifically showing how each requirement of this subdivision has been met.”

In 2018, SB 1035 further revised § 65302 to require that after 2022 the safety element be reviewed and updated upon each revision of the housing element or LHMP, but no less than once every eight years, to address climate adaptation and resiliency and identify new information relating to flood and fire hazards.

## Who Should Use the APG?

The state prepared the APG with a community focus to guide local governments, regional planning agencies, and tribal governments in the development and integration of climate adaptation and resilience components of stand-alone climate action and/or adaptation plans, hazard mitigation plan updates, and general plan updates consistent with state statutes.

While the primary audience for the APG is local and tribal government public agencies, the process and many of the resources can also be of value to nongovernmental and private-sector planning efforts. Additionally, formally engaging businesses, community-based organizations, and other private entities is key to achieving comprehensive results and implementing adaptation actions. Additional guidance on local and regional collaboration and public-private partnerships is presented in the Regional Collaboratives and Adaptation Planning text box and Public-Private Partnership section in Phase 1.

### How Should the APG Be Used?

Communities throughout California have different needs and capabilities. Regardless of the size, capacity, or resources of the community, the APG provides a four-phase process that can increase resilience and support compliance with state requirements (see Figure 1). Communities can use the APG as a step-by-step guidance document for conducting adaptation planning processes, preparing vulnerability assessments, and developing and implementing communitywide adaptation strategies.

The APG provides a standard approach to adaptation planning that can be modified to suit the unique needs of each community. Although each phase has unique steps for completing the process, the APG allows flexibility in the commitment of time, staffing, money, and scope. Communities can follow a basic process that draws on readily available data and minimizes staff commitment or they can follow a more in-depth approach. The logic is the same—what will differ is the sophistication of the vulnerability assessment and the extent of the adaptation strategy development.

The APG includes an introduction that will help orient users to adaptation planning in California. This introduction introduces key terms used in the APG in text boxes and directs users to the Definitions section between Phase 4 and the Appendices for reference when using the APG. The primary content of the APG, the four phase planning process, is presented in four sections with four supporting appendices. The Endnotes section provides sources and supporting notes. Text boxes throughout the APG provide examples, summaries of key resources, or other supportive information. In each phase, the APG further provides outreach and engagement tools to help local planners and staff collaborate with the local community and stakeholders throughout the process.

As illustrated in Figure 2, the APG integrates with other key state resources to support local adaptation planning. In addition, when using the APG, communities can tap state, regional, and local entities, including academic institutions and collaboratives, for specialized information. For example, in communities where wildfire occurrence or intensity is expected to increase, the California Department of Forestry and Fire Protection can provide tools, guidance, and coordination. Likewise, a Bay Area community facing sea level rise may utilize data resources from the Ocean Protection Council, California Coastal Commission, and the San Francisco Bay Conservation and Development Commission (BCDC) to support and facilitate adaptive efforts.

## Key Terms

The APG uses the following key terms. For detailed definitions of key terms, please refer to the glossary.

**Climate change** refers to a change in the climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer.<sup>4</sup>

A **climate change effect** is any consequence, generally a negative one, that is caused by climate change.

A **hazard** is an event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss. A **climate change hazard** is a dangerous or potentially dangerous condition created by the effects of the local climate.

An **extreme (climate) event** occurs when a weather or climate variable exceeds the upper or lower thresholds of its observed range.<sup>5</sup>

**Climate change adaptation** is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, and which moderates harm or exploits beneficial opportunities.<sup>6</sup> Climate change adaptation is focused on long-term threats to human life, property, economic continuity, ecological integrity, and community function.<sup>7</sup>

**Resilience** is the “capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience.”<sup>8</sup> Adaptation actions contribute to resilience, which is a desired outcome or state of being.

**Mitigation** is an act or sustained actions to reduce, eliminate, or avoid negative impacts or effects. **Hazard mitigation** is a sustained action taken to reduce or eliminate the long-term risk to human life and property through actions that reduce hazard, exposure, and vulnerability.<sup>9</sup> Hazard mitigation can be one component of climate change adaptation.<sup>10</sup> **Climate change mitigation**, also referred to as **GHG mitigation** or **GHG reduction**, refers to actions to reduce GHG emissions to reduce the severity of climate change.

**Vulnerability** is the exposure of human life and property to damage from natural and human-made hazards. Climate vulnerability describes the degree to which natural, built, and human systems are at risk of exposure to climate change impacts. Differences in exposure, sensitivity, and adaptive capacity affect an individual's or community's vulnerability to climate change. Vulnerability can increase because of physical (built and environmental), social, political, and/or economic factor(s). Vulnerability is considered a function of exposure, sensitivity, and adaptive capacity.<sup>11</sup>

**Exposure** is the presence of people, infrastructure, natural systems, and economic, cultural, and social resources in areas that are subject to harm.<sup>12</sup>

**Sensitivity** is the degree to which a species, natural system, or community, government, and other associated systems would be affected by changing climate conditions.

**Impact** is a specific negative result of a climate change effect, generally on a particular population or asset. Impact is often determined by the combination of exposure and sensitivity. For example, if the effect of climate change is that droughts are likely to become more frequent and severe, a potential impact to farmers is that less water could be available for irrigation.

**Adaptive capacity** is the “combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts [or] moderate harm or [to] exploit beneficial opportunities.”<sup>13</sup> Simply stated, it is the ability to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.<sup>14</sup>

**Risk** is the potential for damage or loss created by a hazardous condition that affects populations or community assets. For example, a freeway in an area that can experience flooding can be labeled as “at risk” of flooding. Sometimes a level of risk will be assigned, which can be either qualitative or quantitative (e.g., a house that faces a “high risk” from wildfires, or a community that faces a 30 percent chance of a major earthquake in the next 40 years).



## What Is Climate Adaptation Planning?

Climate adaptation planning allows communities to identify ways that they might be harmed by future conditions, including those unique to their communities, and to prepare for these conditions before they happen. Climate adaptation planning can be conducted on its own or integrated with other planning efforts across programs, department, and sectors to develop a comprehensive and connected adaptation system. (Integration of climate adaptation into and across sectors, disciplines, and municipal programs and departments is also referred to as “mainstreaming.”) Examples include climate action or GHG reduction planning, local comprehensive land use and environmental planning, and local hazard mitigation planning.

An integrated approach to climate change and resilience will involve both adapting to future climate conditions and reducing GHG emissions. Climate adaptation activities can also have several benefits, such as increased public health and safety, reduced GHG emissions, greater economic stability, reduced cost savings of healthcare and infrastructure, increased resiliency of housing, improved air and water quality, and better stormwater management.

This APG's adaptation planning process includes four phases, and each one has a dedicated chapter and supporting resources to detail key steps and considerations (see Figure 1). At the end of the process, the outcome ideally is a locally focused, easy-to-follow framework that includes vulnerabilities in a community as well as strategies and implementation actions. The framework can be integrated into general plans, local hazard mitigation plans, and other planning efforts or be a stand-alone document.

### **CLIMATE CHANGE ADAPTATION AND MITIGATION**

Addressing climate change relies on two high-level approaches. One is adaptation, the focus of this guide, which is about reducing harm from the effects of a changing climate. The other is reducing GHG emissions that are responsible for causing climate change, also called climate change mitigation, GHG mitigation, or climate action. Figure 3 illustrates the relationship of these approaches. Communities should take advantage of strategies that support both goals. For example, homes that install solar panels and battery storage systems are better protected against climate-related disruptions to the electricity supply (an adaptation effort), but solar panels also generate electricity without any GHGs and allow homes to use less energy from GHG-emitting power plants (a reduction effort). However, there is potential for conflict. Consider a program to install air conditioning systems in homes. While this will help protect residents against extreme heat (an adaptation effort), these systems will



require more energy to run and could increase GHG emissions if the energy source is not carbon-free (working against reduction efforts).

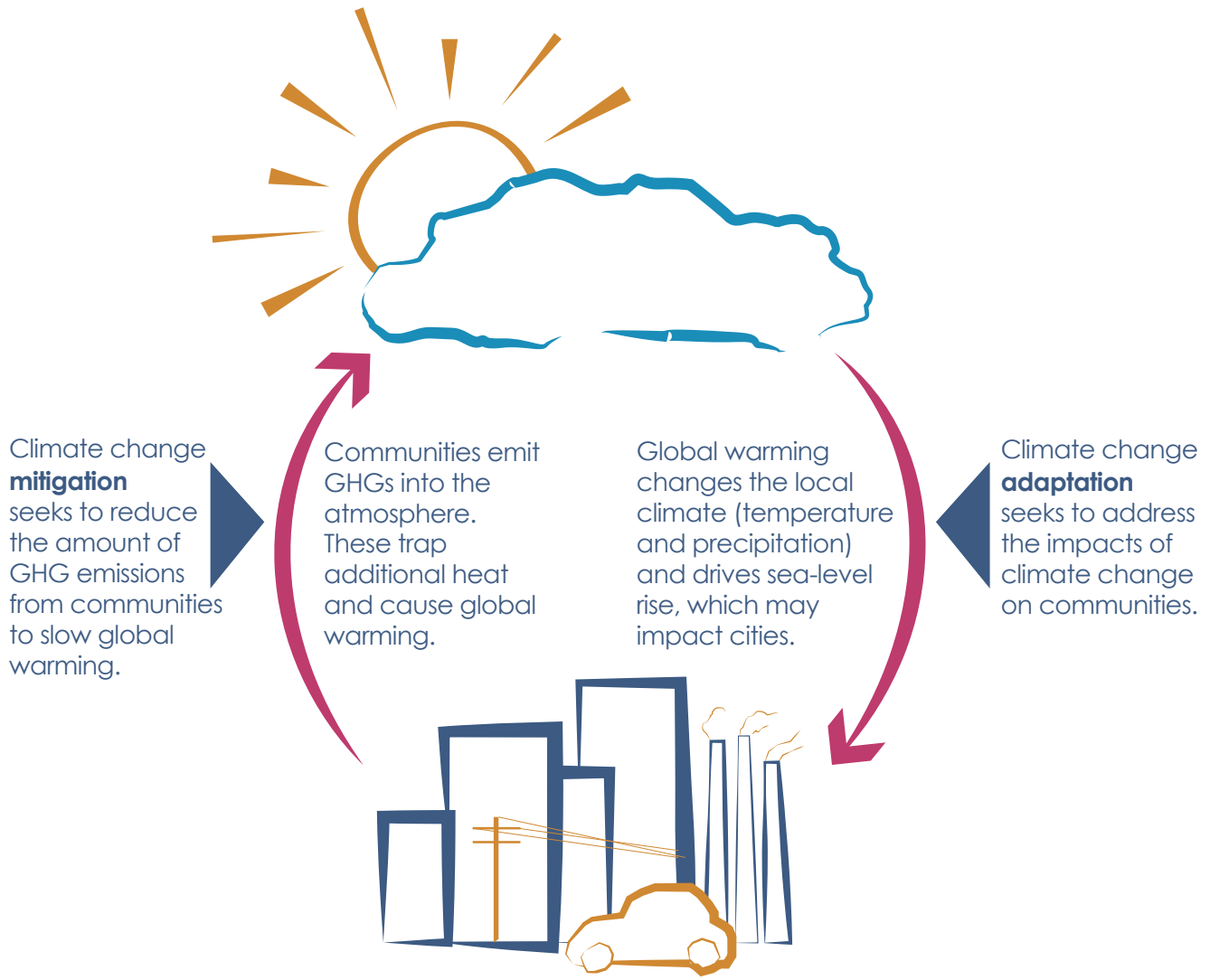
State law requires communities to address GHG emissions (and reductions) in local planning and environmental review processes and climate adaptation in local long-range planning processes, such as general plans (or acceptable alternative). Communities should evaluate their specific needs and priorities when deciding how best to balance these strategies. Communities can prepare one stand-alone plan to address GHG reduction and climate adaptation, prepare separate stand-alone plans for each topic, or integrate the topics into other plans and planning processes. While there are numerous co-benefits between climate adaptation and GHG reduction, there are also instances where there may be trade-offs. These trade-offs should be considered and balanced in the context of a broader planning framework that addresses community goals and needs. It is essential to reduce emissions and plan for impacts simultaneously because efforts to adapt will be overwhelmed by the harm done by climate change if emissions are not reduced.

### Resilience and Adaptation

Adaptation and resilience are not the same thing, although they are related. According to the State's Planning and Investing for a Resilient California guidebook, **adaptation** is "an adjustment in natural or human systems to a new or changing environment"<sup>15</sup> (such as the increased frequency and intensity of climate-related hazards or other climate-related conditions). An adaptation adjustment "moderates harm or exploits beneficial opportunities" brought about by the change.

**Resilience** is "the capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience."<sup>16</sup> A community's resilience is determined by its ability to survive, adapt, and thrive no matter what acute shock or chronic stressor it experiences.

Figure 3. Illustration of the Roles of GHG Emissions Reduction and Climate Adaptation in Combating the Sources and Effects of Climate Change



### HOW DOES ADAPTATION PLANNING RELATE TO OTHER COMMUNITY PLANNING PROCESSES?

The ways to integrate climate adaptation into other community planning processes vary by the needs of the community and how local adaptation and resilience fit within those needs. Adaptation and resilience policies can be integrated into local policy and programs in a variety of ways—for example, development of a stand-alone climate action or adaptation plan, update of a general plan safety element, preparation of an LHMP, or integration of adaptation strategies into any number of local planning and policy documents.

Although there are options for addressing climate adaptation and resilience, local jurisdictions in California, as noted earlier, must incorporate climate adaptation and resilience in the next update of their general plans (individual element update or comprehensive update) and/or address it in a stand-alone plan or LHMP update, as directed by California Government Code § 65302(g)(4). Communities may determine that one plan, implementation mechanism, or outcome is not sufficient to meet their vision and goals and opt to pursue multiple plans. For example, communities may want to develop a stand-alone climate adaptation plan in response to community values and to support strategic implementation and to provide guidance for implementation across other plans, programs, and policies; to provide more in-depth analysis than required in the general plan or LHMP; and/or to elevate the importance of the issues. State law also requires local agencies to consult California Native American tribes to aid in the protection of traditional tribal cultural places through local planning processes. Local agencies should consider following the OPR Tribal Consultation Guidelines for any climate adaptation-related update to the General Plan or other planning documents as early as possible in the planning phase.

Local governments can choose the best way to implement and monitor the adaptation effort depending on their own capabilities and those of their community. The APG's guidance includes considerations for different plans and plan integration where applicable. However, communities should consider using the adaptation planning process to develop a comprehensive, integrated plan that guides implementation of adaptation and resilience policies. Regardless of the choice of adaptation framework, the ultimate goal should be to consider climate adaptation and resilience in all local-government, regional-sector, and policy-making processes.

One of the biggest challenges to developing climate adaptation strategies is the diversity in the potential effects on community services, equity, public health, economic vitality, ecosystem health, water supply, etc. Fortunately, many existing local and regional plans, such as general plan safety elements and LHMPs, already address some of these impacts, meaning that communities are likely to have a good

idea of the types of strategies that would be most effective. In some cases, developing adaptation policy can mean simply integrating and bolstering existing policies and strategies through the periodic plan update process.

## HOW SHOULD COMMUNITIES TAKE ACTION?

Communities have a range of possibilities for taking action on climate change adaptation. Some common municipal plans and programs include:

- **Administrative policy, procedures, and initiatives.** Some strategies may be implemented by agency staff without first needing authorization by a governing board.
- **Climate action plan (CAP) / climate change action plan / climate adaptation plan / climate adaptation and resilience plan / climate mitigation and adaptation plan.** A community can choose to create a stand-alone plan focused on climate change. Stand-alone climate action plans (including climate adaptation plans and related documents) are strategic plans to address climate change. They can include GHG reduction and climate adaptation together or separately. Many California communities have climate action plans, and though some focus exclusively on climate mitigation, many address climate mitigation and climate adaptation. Stand-alone climate adaptation plans contain background data and analysis, adaptation strategies, and often an implementation program. A community with a stand-alone plan would achieve an integrated approach to adaptation and resilience through subsequent revisions to community plans and programs through normal, periodic updates.
- **General plan, comprehensive plan, community specific plan, or community area plan.** The community general plan, comprehensive plan, or community specific plan, or community area plan, especially the safety element of a general plan, is an appropriate document for codifying goals, objectives, and policies related to climate change adaptation and environmental justice. Other relevant policy areas in the general plan usually include land use, transportation, conservation, recreation and open space, public safety, and noise.
- **Local hazard mitigation plan.** LHMPs are an important example of a community planning process that already includes mitigation for natural hazards. These plans should be developed and updated in light of potential climate change effects, and climate change should be integrated into the assessment of hazards risk. Ideally, measures identified in an LHMP address both current hazards and future, climate change–affected hazards. However, natural hazard impacts are only one area that may be affected by climate change. Other areas include agricultural, forestry, and fisheries productivity; ecosystem structure and function; and public health. Planning in all these areas should be done in light of potential climate change impacts.

If the community has adopted an LHMP (including a multi-jurisdictional hazard mitigation plan) pursuant to the federal Disaster Mitigation Act of 2000, it is an appropriate document for codifying adaptation strategies related to the mitigation of natural or human-caused hazards such as wildfire, flooding, coastal storms and erosion, drought, and heat emergencies.

- **Zoning code and other land development codes, ordinances, and resolutions.** Adaptation strategies that affect zoning and land use can be acted on through adjustments in the regulations and procedures governing these areas.
- **Local coastal program (LCP).** Local governments in the coastal zone must prepare policies and standards for development in the coastal zone consistent with the Coastal Act and certified by the Coastal Commission. Local coastal programs contain the ground rules for future development and protection of coastal resources. Climate change issues, particularly sea-level rise and associated effects should be addressed in the LCP for both the short and long term.
- **Capital improvement plan/program.** For adaptation strategies that require capital expenditures (relocating a wastewater treatment plant, building a cooling center, etc.), the community capital improvement plan is an appropriate place to address priorities, funding, and scheduling of adaptation strategies.
- **Integrated regional water management plan.** Integrated regional water management groups (48 in the state) are collaborative efforts to address regional water resources. The regional approach supports local jurisdictions by providing coordination and information. The associated grant funding for these programs supports adaptation strategy development and implementation.
- **Emergency operations plan.** Climate analyses could affect the scope of wildfire, flood, and extreme heat events. Emergency operations plans should consider how increased frequency and intensity of climate change hazards will affect emergency response and evacuations.
- **Tribal and indigenous community plans.** Tribal plans, both sector specific and comprehensive, are appropriate plans for goals, objectives, and policies related to climate change adaptation and environmental justice. These plans ensure effective and efficient program administration and service delivery to communities and citizens.
- **Community health assessments and community health improvement plans.** Strategies that address impacts on human health, public health systems, and medical services can be integrated into a community health improvement plan (or CHIP), which is required as part of accreditation for local health departments.

- **Historic or cultural preservation plans.** Strategies that address vulnerabilities of historic, cultural, and tribal cultural resources can be included in the goals and objectives of preservation plans. Adaptation strategies can also be integrated into general plans, community plans, and specific plans.

The four phase planning process and guidance presented in this APG support integration of climate adaptation into multiple plans and programs.

## COMMUNICATING THE FACTS OF CLIMATE CHANGE

Communicating the facts on climate change can be daunting, to say the least.

Climate change is inherently abstract; “climate” is the average of weather, not weather itself. Moreover, scientists predict a changing climate based on global climate models, which are quite abstract to the layperson. When scientists qualify their findings with error bars and offer various “uncertainties,” people can become even more confused.

In addition, climate trends move slowly. It can take 20 to 30 years for the emissions from a tailpipe or smokestack to affect the weather. The glacial pace of climate change creates “[shifting baselines](#),” where one generation only perceives risk related to the climate they inherited and fails to perceive shifts underway over the course of a century or longer.

Climate change can also be emotionally fraught. Climate change threatens health and longevity, and the actions required to reduce emissions and prepare for climate impacts can be overwhelming since they can include significant changes and transitions, such as shifting from the fossil fuel that has traditionally powered our society to carbon free, renewable options.

Research on climate communications has basic dos and don'ts. The group [ecoAmerica](#) has published a helpful guide, [15 Steps To Create Effective Climate Communications](#),” on discussing climate change. [Climate Nexus](#) and the [George Mason University Center for Climate Change Communications](#) also have resources to support climate change communications. In addition, OPR's Facts and Metrics webpage (<http://opr.ca.gov/facts/>) includes climate change facts and metrics that can be helpful in discussions and presentations.



### How Is California Vulnerable to Climate Change?

Climate change is already impacting California and will continue to affect it for the foreseeable future.<sup>17, 18</sup> For example, the average temperature in most areas of California is already 1°F higher than historical levels, and some areas have seen average increases in excess of 2°F. Similarly, sea levels along the coast of central and southern California increased over 15 centimeters (5.9 inches) during the 20th century.<sup>19</sup> Current and projected climate changes include increased temperatures, sea level rise, a reduced winter snowpack, altered precipitation patterns, increases in wildfires, and more frequent storm events. Over the long term, reducing GHG emissions can help make climate change less severe.

Differences in exposure, sensitivity, and adaptive capacity affect an individual's or community's vulnerability to climate change. Exposure is the presence of people; infrastructure; natural systems; and economic, cultural, and social resources in areas that are subject to harm. Sensitivity is the susceptibility to harm and can be attributed to underlying social, economic, demographic, and physical factors. Both sensitivity and exposure are directly affected by population growth, development patterns, and success in addressing underlying vulnerabilities, including equity and social vulnerability.<sup>20</sup> Chapter 2 of the *Fourth Climate Change Assessment* discusses how climate change will affect people, infrastructure, and natural systems. Moreover, the *Fourth Climate Change Assessment's* "Climate Justice" report shows that some vulnerable populations already bear a disproportionate burden of climate impacts, and the report provides strategies so that they do not bear the costs of mitigation and adaptation as well.<sup>21</sup>

The effects of a changing climate vary based on location. However, primary climate change effects include:

- Increases in temperature
- Increases in extreme storms/events
- Changes in precipitation
- Sea-level rise
- Ocean acidification

Primary climate change effects can exacerbate hazards seen at local and regional levels, such as wildfires and associated smoke, drought, landslides, flooding, and human health hazards.

## STATE CLIMATE CHANGE IMPACT SUMMARY

The *California Fourth Climate Change Assessment* identifies the following climate change impacts of concern to the state under a business-as-usual emission scenario, also known as “representative concentration pathway” (RCP) 8.5.

Table 2 shows the historical and expected climate change effects in California as presented in the [California Fourth Climate Change Assessment Summary Report](#).

- Climate change is already affecting temperatures throughout California. Annual average daily high temperatures are expected to rise by 2.7°F by 2040, 5.8°F by 2070, and 8.8°F by 2100 compared to observed and modeled historical conditions. These changes are statewide averages. Heat waves are projected to become longer, more intense, and more frequent.
- Warming temperatures are expected to increase soil moisture loss and lead to drier seasonal conditions. Summer dryness may become prolonged, with soil drying beginning earlier in the spring and lasting longer into the fall and winter rainy season.
- High heat increases the risk of death from cardiovascular, respiratory, cerebrovascular, and other diseases.<sup>23</sup>
- Droughts are likely to become more frequent and persistent through 2100.
- Climate change is projected to increase the strength of the most intense precipitation and storm events affecting California.
- Mountain ranges in California are already seeing a reduction in the percentage of precipitation falling as snow. Snowpack levels are projected to decline significantly by 2100 due to reduced snowfall and faster snowmelt.
- Marine layer clouds are projected to decrease, though more research is needed to better understand their sensitivity to climate change.

### Representative Concentration Pathways<sup>22</sup>

Representative concentration pathways, or RCPs, are different scenarios for the future severity of climate change. The global scientific community usually use four scenarios: RCP 2.6, RCP 4.5, RCP 6, and RCP 8.5. The greater the number, the more severe future climate change conditions are projected to be. RCP 8.5, a “business as usual” projection assumes that global GHG emissions continue to increase until at least the end of the 21st century.

- Extreme wildfires (i.e., fires larger than 10,000 hectares or 24,710 acres) would occur 50 percent more frequently. The maximum area burned statewide may increase 178 percent by the end of the century.
- Exposure to wildfire smoke is linked to increased incidence of respiratory illness.
- Sea level rise is expected to continue to increase erosion of beaches, cliffs, and bluffs.

**TABLE 2. QUALITATIVE DESCRIPTION OF HISTORICAL AND EXPECTED CLIMATE EFFECTS IN CALIFORNIA**

CLIMATE EFFECT	HISTORICAL TRENDS*	FUTURE DIRECTION OF CHANGE	CONFIDENCE FOR FUTURE CHANGE
Temperature	Warming	Warming	Very High
Sea levels	Rising	Rising	Very High
Snowpack	Declining	Declining	Very High
Annual precipitation	No significant trends	Unknown	Low
Intensity of heavy precipitation events	No significant trends	Increasing	Medium-High
Frequency of droughts	No significant trends	Increasing	Medium-High
Frequency of intensity of Santa Ana and similar winds	No significant trends	Unknown	Low
Marine layer clouds	Some downward trends; mostly not significant	Unknown	Low
Acres burned by wildfire	Increasing	Increasing	Medium-High
Soil moisture	Decreasing	Decreasing	Low

Source: Louise Bedsworth, Dan Cayan, Guido Franco, Leah Fisher, and Sonya Ziaja (California Governor’s Office of Planning and Research, Scripps Institution of Oceanography, California Energy Commission, California Public Utilities Commission), Statewide Summary Report, California’s Fourth Climate Change Assessment, Publication number: SUMCCCA4- 2018-013, 2018, Table 3.

\*Over the past 30 to 100+ years, depending on the effect.

## What Are the State's Climate Resilience Efforts?

The State of California advances climate adaptation and resilience in a variety of ways. The state's current adaptation plan is *Safeguarding California*, which specifies integrated state adaptation strategies for a variety of strategic sector areas. Updating the APG is one strategy in the plan. *Safeguarding California Plan: 2018 Update* establishes a vision for the state and identifies principles, goals, and policies primarily directed to state agencies. *Safeguarding California* also establishes a "critical" role for California's local and regional government agencies.

The Governor's [Office of Planning and Research](#) administers the [Integrated Climate Adaptation and Resiliency Program](#) to coordinate regional and local efforts with state climate adaptation strategies to adapt to the impacts of climate change. The program has two components: the [State Adaptation Clearinghouse](#) and the [Technical Advisory Council](#). The Adaptation Clearinghouse is California's centralized collection of adaptation and resiliency resources designed to guide decision-makers at the state, regional, and local levels. The Technical Advisory Council supports the [Office of Planning and Research](#) in its goal to facilitate coordination among state, regional, and local adaptation and resilience efforts with a focus on opportunities to support local implementation actions that improve the quality of life for present and future generations. The Council adopted an adaptation vision and principles in September 2017 (see text box on page 8) and approved a revised charter and a definition for [vulnerable communities](#) in April 2018.

Additional examples of the state's climate adaptation and resilience plans and programs include:

- The Governor's Office of Emergency Services manages the state's hazard mitigation activities and projects, including preparation of the State Hazard Mitigation Plan and Adaptation Planning Guide, and assists local and tribal governments with preparation and implementation of their local hazard mitigation plans.
- The California Energy Commission released [Cal-Adapt](#) ([cal-adapt.org](#)) in 2011 as a web-based tool that enables city and county planners, government agencies, and the public to identify changes to climate conditions and associated hazards in specific areas throughout California. Since that time, grant funding continues to keep the data current with California's climate change assessment process, improve flexibility of visualizations and data download options at a local level, and provide improved descriptions of visuals and data. Funding from the Strategic Growth Council now extends Cal-Adapt beyond energy-related needs. Examples of the accessible data include annual temperature and precipitation

averages, extreme precipitation events, extreme heat, snowpack, wildfire, and extended drought scenarios.

- The Office of Environmental Health Hazard Assessment's [\*Indicators of Climate Change in California\*](#) tracks trends for 36 indicators that show how climate change is affecting California today.
- The [\*Climate Change and Health Equity Program's California Building Resilience Against Climate Effects Project\*](#) (CalBRACE), at the California Department of Public Health, provides data, tools, and templates for local agencies to assess the health equity impacts of climate change and increase resilience.
- [\*The Ocean Protection Council\*](#) has produced guidance on sea level rise and ocean acidification with the goal of building coastal resilience. Guidance topics include sea level rise science, adaptation strategies, sound policy development, and partnership engagement.
- The state conducts comprehensive climate change assessments regularly to assess the impacts and risks from climate change and to identify potential solutions to inform state policy actions. Preparation of the assessments has been a collaborative effort of state agencies, researchers from public universities, federal agencies, and the private sector. The *Fourth Climate Change Assessment*, led by a state agency management team from the California Natural Resources Agency, California Energy Commission, and Governor's Office of Planning and Research, published in 2018, has four statewide reports: 1) Climate Justice, 2) Tribal and Indigenous Communities within California, 3) California's Ocean and Coast, and 4) Statewide Summary Report. It also includes nine regional reports, which have downscaled climate information to demonstrate the likely role of climate change in California's unique topographies. The *Fourth Assessment* has 51 technical reports on a wide range of topics as well as six unique tools, including mapping tools on urban heat and adaptation financing.
- [\*Planning and Investing for Resilient California\*](#), developed by the Office of Planning and Research and a Technical Advisory Group in 2016, provides guidance for state agencies to integrate climate change considerations into every aspect of government. The guidance document offers direction on scenario selection, identification of vulnerable communities, community engagement, and fostering equity in applicable local jurisdictions.
- Finally, other state agencies, such as Caltrans and the Department of Water Resources, have prepared their own plans and resource documents for addressing climate adaptation.

## STATE ADAPTATION SECTORS

Planning and implementing comprehensive resilience measures across the urban-rural divide will be critical to mitigating wildfire risk, safeguarding California's future water supplies, and preserving habitats, biodiversity, and the multitude of valuable ecosystem services that our natural and working lands provide. The 2018 *Safeguarding California* organizes its policies under 11 sectors: agriculture; biodiversity and habitat; emergency management; energy; forests; land use and community development; ocean and coast; parks, recreation, and California culture; public health; transportation; and water. Five of the *Safeguarding* sectors, emergency management, energy, land use and community development, public health, and transportation, address vulnerabilities in social systems and the built environment. Five other *Safeguarding* sectors, agriculture, biodiversity and habitat, forests, ocean and coast, and water, address vulnerabilities in natural and managed resource systems. The eleventh sector, "Parks, Recreation, and California Culture," spans these three areas.

The Adaptation Clearinghouse website organizes its resources under these topics with some changes, including revising Parks, Recreation, and Culture to Parks and Recreation and adding additional sectors of equity and environmental justice, investing in adaptation, and plan alignment.

For consistency, the discussions of potential vulnerabilities and example adaptation strategies in the APG use these 11 key sectors as an organizing framework, with Parks, Recreation, and California Culture (refer to Figure 4 for a list of the sectors). Appendix A provides summaries of each sector and its vulnerabilities. In the APG, the issue of equity and environmental justice is not a sector in itself, but an overarching topic that is integrated into all 11 sectors as applicable.

Individual communities may choose to follow this framework, or they may organize their adaptation efforts differently. All topics may not be relevant to all communities. Regardless of the preferred organizing structure, this APG recommends an approach that integrates climate adaptation and resilience across sectors.



Figure 4. State Adaptation Sectors



## How Is Equity Integrated into Climate Change Adaptation Planning?

Equity means that all people are justly and fairly included in society and that everyone is able to participate, prosper, and achieve their full potential.<sup>24</sup> It recognizes that everyone enjoys different advantages and faces different challenges, and that everyone should be treated justly and fairly according to their circumstances. Equity should be treated as a critical component of all planning, including climate adaptation planning. Equitable climate adaptation planning involves identifying persons who may be most vulnerable to climate change and ensuring that planning processes, distribution of resources, and efforts to address systemic wrongs are all conducted in an equitable manner.

First, adaptation planning should look at climate vulnerability through the lens of the adopted definition by the Integrated Climate Adaptation and Resiliency Program's (ICARP's) Technical Advisory Council. ICARP's Technical Advisory Council developed [\*Defining Vulnerable Communities in the Context of Climate Adaptation\*](#) to provide a clear understanding of the many elements that characterize vulnerable populations in the adaptation context. This guide provides the climate vulnerability assessment tools to evaluate climate risk and adaptive capacity, specific indicators to include in vulnerability assessment, and the following definition of vulnerable communities:

Climate vulnerability describes the degree to which natural, built, and human systems are at risk of exposure to climate change impacts. Vulnerable communities experience heightened risk and increased sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts. These disproportionate effects are caused by physical (built and environmental), social, political, and/or economic factor(s), which are exacerbated by climate impacts. These factors include, but are not limited to, race, class, sexual orientation and identification, national origin, and income inequality.<sup>25</sup>

The *Fourth Climate Change Assessment* and related research also affirm that several communities already feel the cumulative burden of climate change, environmental pollution, and historical socioeconomic disparities.<sup>26</sup> It is important to identify and acknowledge these communities because there is an opportunity in climate adaptation planning to address issues holistically. Communities that have long experiences with systemic exclusion and resource deprivation have developed assets, coping skills, and knowledge that can benefit overall climate resilience planning. Robust community engagement in plan development, as recommended throughout the APG, can bring these communities' wisdom into local resilience efforts.

Second, through all phases of adaptation planning, it is helpful to think of equity as multidimensional and having three objectives: 1) procedural, 2) distributional, and 3) structural (see Table 3).<sup>27</sup> State agencies and tribal governments have additional resources for equity and inclusion in adaptation planning, including the California Department of Public Health’s Climate Change and Health Equity Program, the California Environmental Protection Agency’s Office of Environmental Justice, the California Office of Emergency Services’ Access and Functional Needs Section, and the Pala Band of Mission Indian Tribe Environmental Department’s climate adaptation resources and templates.

**TABLE 3. TYPES OF EQUITY IN ADAPTATION PLANNING**

<p>Procedural Equity</p>	<ul style="list-style-type: none"> <li>• Create processes that are transparent, fair, and inclusive in developing and implementing any program, plan, or policy.</li> <li>• Ensure that all people are treated openly and fairly.</li> <li>• Increase the civic engagement opportunities of communities that are disproportionately impacted by climate change.</li> </ul>
<p>Distributional Equity</p>	<ul style="list-style-type: none"> <li>• Fairly distribute resources, benefits, and burdens.</li> <li>• Prioritize resources for communities that experience the greatest inequities and most disproportionate impacts and have the greatest unmet needs.</li> </ul>
<p>Structural Equity</p>	<ul style="list-style-type: none"> <li>• Make a commitment to correct past harms and prevent future unintended consequences.</li> <li>• Address the underlying structural and institutional systems that are the root causes of social and racial inequities.</li> <li>• Include adaptation strategies to eliminate poverty, create workforce development, address racism, increase civic participation, protect housing availability, increase education, and provide healthcare.</li> </ul>

Source: Tina Yuen, Eric Yurkovich, Lauren Grabowski, and Beth Altshuler, “Guide to Equitable Community-Driven Climate Preparedness Planning,” prepared for Urban Sustainability Directors Network, May 2017, [https://www.usdn.org/uploads/cms/documents/usdn\\_guide\\_to\\_equitable\\_community-driven\\_climate\\_preparedness-high\\_res.pdf](https://www.usdn.org/uploads/cms/documents/usdn_guide_to_equitable_community-driven_climate_preparedness-high_res.pdf).

## How Is Uncertainty Addressed in Climate Adaptation Planning?

The uncertainty of the future poses significant challenges to evaluating climate impacts and developing policy. First, because climate change is driven by how much GHG is emitted into the atmosphere, climate outcomes are subject to the adoption and effectiveness of GHG reduction. The more the world acts to reduce GHG emissions, the less adaptation should be necessary. Second, for any given level of atmospheric GHGs and associated global warming, there will be impacts to natural and human systems. Despite extensive efforts to model these potential impacts, they are ultimately uncertain. Finally, the future state of technology, socioeconomic conditions, and other human systems is unknown. This is not, however, a reason for inaction. The APG has numerous techniques for addressing uncertainty through the recommended four phases of the adaptation planning process.

In addition, Appendix B provides additional information about adaptation pathways as an approach to addressing uncertainty in strategy development and implementation. Adaptation pathways are an emerging approach for communities, but best practices are still being developed. [\*Paying It Forward: The Path Toward Climate-Safe Infrastructure in California\*](#) recommends use of an adaptation pathways approach for State agency infrastructure planning; however, its application and use by local communities in California is limited and not established as a best practice. Some communities, many of them coastal communities, are considering adaptation pathways as an approach to addressing sea level rise and coastal flooding, among other issues. Appendix B provides more information about adaptation pathways as an alternative or supplement to Phases 1 to 4.

## Who Should Be Involved?

In addition to assembling the right resources, it is important that organizations and people actively participate in adaptation planning. In general, it can be helpful to think of four different groups of potential participants:

- **Community stakeholders.** Local people and organizations are key for gathering and analyzing local information, developing robust climate adaptation strategies, building political support, and creating a more informed and active community. This includes building support from community elected officials, civic leaders, and community-based organizations.
- **Local agency stakeholders.** Since climate adaptation affects all aspects of a community, adaptation strategies should be developed by an “adaptation team” assembled from local agency staff who can provide data, insight, and ideas. The most common government agencies and departments include planning

(land use and environmental), community development, building, engineering, public works, emergency management, police, fire, finance, public health, and environment. The level of commitment needed from the team varies depending on the level of intricacy of the plan.

- **National, state, and regional stakeholders.** National, state, and regional government agencies, including tribal governments and communities; academic and research institutions; and nonprofit organizations, preferably those located in or near the community, can provide data, guidance, and sometimes funding in support of climate adaptation planning. In addition, it is important to approach neighboring communities, including tribal communities, about collaborating on adaptation planning.
- **Partner organizations.** Regional, state, and federal networks of government agencies; academic and research institutions; and nonprofits can help support implementation efforts. These networks may be able to provide funding, case studies and best practices to help ensure success—and in some cases, temporary staff or volunteer assistance.

Engaging stakeholders is essential to adopting equitable adaptation policies and strategies and ensuring that they can be implemented efficiently. Stakeholder engagement offers the opportunity to educate and build commitment and consensus among local decision-makers and community members. Each phase of the adaptation planning process should include community and stakeholder outreach and engagement.

Communicating climate change can be challenging. Hazards created or worsened by climate change as well as other climate change–related effects affect all communities across California, but communities deal with many other issues. Sometimes other issues take precedence over climate change, like housing, transportation, immigration, and public safety. However, climate change is inextricably linked with many social issues, and taking action to adapt will also provide many other benefits.

## Wrap-Up

Although climate change has the potential to significantly harm communities throughout California, local jurisdictions have many options and resources to adapt to these new conditions. The APG assists communities with this work, ensuring that adaptation planning reflects the latest best practices and information, and uses the best available science. It guides communities through a four-step process that takes a holistic approach to adaptation work, including engaging the community at large and addressing issues of equity and environmental justice. The following sections of the APG walk through each of the four steps in detail, beginning with the first phase (Define, Explore, and Initiate) discussed in the next chapter.