Regional Resilience Toolkit

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MOBILITY + COMMUNITIES + ENVIRONMENT + ECONOMY

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CONTENTS

EXECUTIVE SUMMARY

Southern California has long faced a range of natural shocks, such as wildfires, earthquakes, extreme storms, and flooding. However, climate change is intensifying many of these events, making them more frequent, severe, and unpredictable, while introducing new threats such as tropical storms. At the same time, the region must prepare for other disruptions, including pandemics, cyber-attacks, and economic instability. These acute **shocks**, whether natural, technological, or economic in nature, can exacerbate underlying chronic conditions, or stressors. **Stressors**, such as housing insecurity, low broadband access, or public health disparities, amplify and worsen the impact of shocks on communities, both increasing vulnerabilities and eroding ability to bounce back quickly. The January 2025 Los Angeles wildfires, unprecedented in their damage to diverse neighborhoods, geographies, and income classes, profoundly underscore the urgent need to build resilience and embed it throughout planning and recovery processes.

This toolkit supports communities, cities, and counties in **resilience planning** to prepare for, reduce, and respond to shocks and stressors. This process involves identifying potential challenges, defining resilience, setting goals, engaging communities, and establishing plans, policies, and projects to reduce impacts and support the continued operation of critical systems. The toolkit is intentionally high-level, intended for any jurisdiction in the Southern California region, regardless of size or familiarity with resilience.

EVERY DOLLAR INVESTED IN RESILIENCE SAVES $13 IN DAMAGES AND INDIRECT CONSEQUENCES

WHAT IS RESILIENCE?

The ability of systems to cope with and respond quickly to shocks and stressors is known as resilience. SCAG defines resilience as the capacity of the region's built, social, economic, and natural systems to anticipate and effectively respond to changing conditions, acute shocks, and chronic stressors by creating multiple opportunities for a sustainable, thriving, and equitable future.

WHY PLAN FOR RESILIENCE?

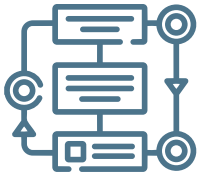
Resilience planning pays for itself. According to the U.S. Chamber of Commerce, every dollar invested in disaster preparedness saves $13 in direct damages, clean-up costs, and indirect consequences such as lost jobs and migration.[1] This return is realized from actual implementation of on-the-ground programs, projects, and capital investments, and not planning alone. Nonetheless, resilience planning is the first step on the pathway to implementation by conducting the necessary analysis to identify potential investments, strategies, and capital projects. This toolkit guides jurisdictions through the process of resilience planning, with the aim of protecting communities from the immediate impacts of disasters, other extreme events, and their associated cascading economic and social challenges. Communities and households that are more resilient in the face of shocks can reduce short-term damages and, in the long run, have more resources for education, health, and other needs. Planning for resilience can accelerate recovery, reduce ongoing vulnerabilities, and increase the economic and fiscal resilience of local and regional jurisdictions.

California Conservation Corps members install watershed protection materials in the Palisades Fire burn scar area in Los Angeles County, California.

GOALS OF THE TOOLKIT

The toolkit supports jurisdictions to:

Understand the benefits of local and regional resilience planning.



Plan for resilience at a range of scales, from integrating resilience into existing plans and programs to developing a standalone plan.

Clearly outline key steps to resilience planning, including:

- **Identify key shocks and stressors.**
- **Define parameters of resilience planning and identify key goals.**
- **Engage communities to educate and inform resilience planning and implementation efforts.**
- **Identify funding and financing opportunities to implement strategies.**
- **Develop and implement resilience strategies to prepare for and respond to shocks and stressors, and monitor and evaluate implementation effectiveness.**
- **Plan and prepare for the post-disaster recovery process to recover and build back more resiliently.**

[1] U.S. Chamber of Commerce. June 25, 2024. The Preparedness Payoff: The Economic Benefits of Investing in Climate Resilience.

THE ROLE OF SCAG

As a regional agency, the **Southern California Association of Governments (SCAG)** supports its member agencies with guidance, recommendations, advocacy, and technical assistance to strengthen resilience planning and facilitate regional collaboration and dialogues. With a governing body and membership from across six Southern California counties, SCAG supports coordination and information sharing across jurisdictions, enabling enhanced understanding of key priorities across the region. SCAG has already taken significant action to support its member agencies in addressing climate change and preparing for shocks and stressors. The concepts introduced in the toolkit build on SCAG's extensive past resources, including the Regional Climate Adaptation Framework, to provide comprehensive and actionable guidance to support regional resilience building.

Shocks and stressors frequently result in cascading effects—interrelated consequences triggered by the initial shock, amplified for communities and infrastructure across jurisdictional boundaries. Yet these impacts are often addressed in isolation, potentially leading to uncoordinated and uneven resilience planning, implementation, and post-event recovery efforts. With many shocks and stressors occurring at the landscape, watershed, or air basin scale, jurisdictions need to address resilience individually and in coordination. Regional efforts can more effectively reduce risks by taking a system-wide perspective to identify goals and priorities, manage shared resources, build partnerships, and address cascading impacts and consequences. Regional support can also build capacity for and support participation from smaller jurisdictions, ensuring they are not left behind.

AN OVERVIEW OF THE TOOLKIT

The toolkit walks users through the key steps of resilience planning, from initiating planning to developing, funding, implementing, and monitoring strategies. Because disasters are inevitable and even the most comprehensive planning efforts cannot fully eliminate the impacts of shocks, the toolkit also guides jurisdictions through planning for post-disaster recovery, with a focus on wildfires. Proactive recovery planning can support a more coordinated, effective, and thoughtful process that facilitates rebuilding and supports the local economy and vulnerable communities.

The following outlines the toolkit chapters:

CHAPTER 2
Understand Shocks and Stressors
Understanding local and regional shocks and stressors is a critical first step to effective resilience planning. This chapter describes how jurisdictions can identify, characterize, analyze, and prioritize shocks and stressors that most impact their communities.

CHAPTER 3
Define Parameters of Resilience Planning
Resilience planning should be integrated into all planning efforts and tailored to local and regional goals and priorities. This chapter helps users define resilience, establish the scope and goals of their resilience planning efforts, and identify the plans and programs into which resilience should be integrated.

CHAPTER 4
Community and Stakeholder Engagement
Community engagement should be woven throughout resilience planning. This chapter focuses on how engagement can be tailored to support resilience planning, including identifying vulnerable and impacted communities.

CHAPTER 5
Develop Resilience Strategies
Resilience strategies should identify policies, programs, and actions to directly address key shocks and stressors in each community. This chapter describes how to develop, evaluate, and prioritize resilience strategies, recognizing that strategies should be tailored to each community.

CHAPTER 6

Implementation and Monitoring

Resilience planning matters most when it's translated into action. This chapter provides guidance on effective implementation, including how to overcome common barriers, establish key performance indicators, and monitor and adjust strategies over time to ensure continued effectiveness.

CHAPTER 7

Wildfire Recovery

Post-disaster recovery can be challenging and traumatic, but it also offers opportunities to build long-term resilience. This chapter outlines the key steps and considerations of planning for recovery efforts before disasters occur, with a focus on housing, infrastructure, the local economy, and community well-being. While this chapter is centered on wildfire recovery, the guidance is broadly applicable to other natural or climate-related hazards.

CHAPTER 8

Funding and Financing Resilience and Recovery

Successful planning for and implementation of resilience efforts require comprehensive funding and financing strategies. This chapter outlines key considerations for securing funding and financing, explores the current grant landscape, and presents tools and strategies to support jurisdictions in financing both planning and implementation efforts.

CHAPTER 9

Resources

To support users throughout the resilience planning process, this chapter contains resources and tools. It includes guidance and tools on analyzing shocks and stressors, example strategies, and state and federal funding resources to support planning, implementation, and disaster recovery.

Figure 1 Resilience Toolkit Roadmap

The interactive diagram below illustrates the structure of this toolkit. It appears throughout the document as a recurring graphic, showing how each chapter is interconnected and creates a process of continuous improvement for regional resilience.

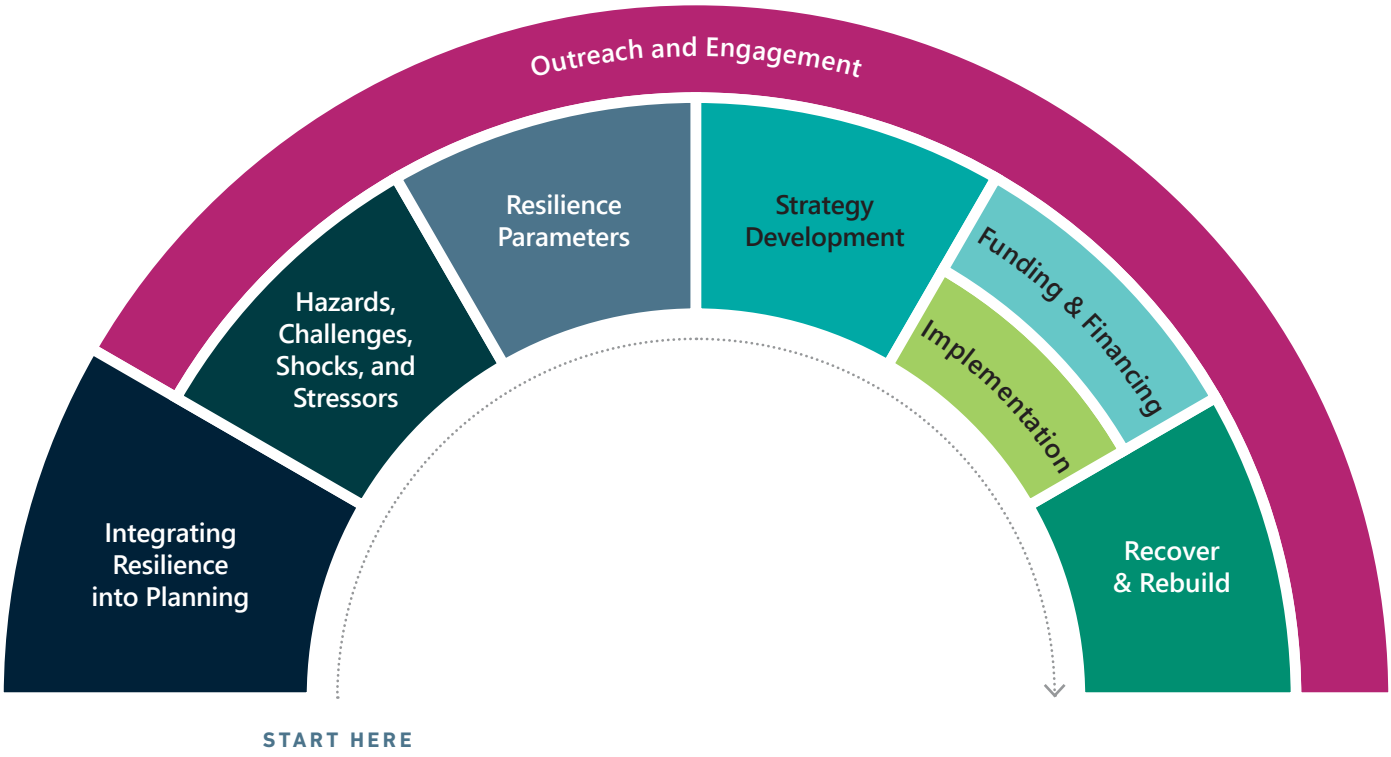


Photo credit: Midori Mizuhara

01 INTRODUCTION

OVERVIEW

Southern California has long faced a range of shocks, such as wildfires, earthquakes, extreme storms, and flooding. However, climate change is intensifying many of these events, making them more frequent, severe, and unpredictable, while introducing new threats such as tropical storms. At the same time, the region must prepare for other disruptions, including pandemics, cyber-attacks, and economic instability. These acute shocks, whether natural or technological or economic in nature, can exacerbate underlying chronic conditions, or stressors, such as housing insecurity and public health disparities. In turn, these stressors amplify and worsen the impact of shocks on communities, increasing their vulnerabilities and eroding their ability to bounce back quickly. The January 2025 Los Angeles wildfires, unprecedented in their timing, ferocity, and damage to diverse neighborhoods and communities, profoundly underscored the urgent need to build resilience and embed it throughout planning and recovery processes. Other recent events, such as Tropical Storm Hilary and its resulting flash flooding, landslides, and long-term air quality impacts, further illustrate the growing complexity and compounding nature of shocks and stressors across the region.

Resilience is the ability of systems to cope with and respond quickly to shocks and stressors. This toolkit supports jurisdictions in resilience planning to prepare for, minimize, and respond to shocks and stressors. This process involves identifying potential challenges, engaging communities, and establishing plans, policies, programs, and projects to reduce impacts and support continued operation of critical systems.

While the costs of resilience planning and implementation can appear daunting, the benefits are clear: Every dollar invested in resilience generates an additional $13 in savings.[2] Although this return is tied to implementation, planning lays the essential groundwork for infrastructure investments by identifying priorities, building partnerships, and aligning resources. This toolkit is designed to help jurisdictions navigate that process, offering strategies and pathways to move from planning to implementation and ultimately unlock the full value of resilience. Through resilience planning, jurisdictions can shift from a reactive approach to proactively anticipating challenges and threats and implementing strategies and partnerships to reduce damage, protect people, and accelerate recovery.

Building system resilience for Southern California's interconnected communities requires sustained local action at the jurisdictional scale and coordination at the regional level, as local shocks often reverberate regionally and have lingering effects. For example, up to 40 percent of small businesses never reopen after disasters, with another 25 percent eventually closing within a year, affecting economies, jobs, and tax bases regionally.[3] Severe disasters can affect a jurisdiction's fiscal health and potentially its credit ratings, impacting future ability to borrow money. This can make it more difficult for vulnerable and historically marginalized communities to recover.

[2] U.S. Chamber of Commerce. June 25, 2024. The Preparedness Payoff: The Economic Benefits of Investing in Climate Resilience.

[3] https://www.congress.gov/crs-product/R47631

The Southern California Association of Governments (SCAG) plays a critical role to enhance resilience by supporting local jurisdictions to understand, prepare for, respond to, and recover from a wide range of current and future challenges. SCAG developed this toolkit as a resource to guide jurisdictions and stakeholders in the region to plan for resilience, whether through a focused resilience plan or integrated into other initiatives, such as general plans, capital improvement plans, and sustainability plans. The toolkit also supports jurisdictions to implement plans through a guide to funding and financing opportunities.

WHAT IS AT RISK?

Shocks and stressors can directly and indirectly affect all components of the built environment and social, economic, and natural systems. **Table 1** provides example impacts that could affect each system and corresponding opportunities to enhance resilience.

Recent Shocks in the SCAG Region
2022–25

COVID-19 wiped out thousands of jobs and led to a sudden and drastic decline in economic activity.
The region is recovering, but supply chain disruptions and inflation continue to impact the economy.

More frequent, fast-moving, and destructive wildfires
in Los Angeles, Riverside, San Bernardino, and Ventura counties, affecting ecosystems, health, infrastructure, and the cost of insurance.

Extended drought
Domestic and commercial water restrictions because of extended drought from 2020-22.

Tropical Storm Hilary
brought record-breaking rainfall, flooding, mudslides, and storm-related damage to all SCAG counties in August 2023.

Table 1 Systemwide Impacts and Opportunities for Resilience

BUILT ENVIRONMENT		
System Components	Utility infrastructure (energy, stormwater, water supply and treatment, wastewater, and communication and broadband networks) Transportation systems Housing Other public and private buildings Green infrastructure	
Example Impacts		**Example Resilience Opportunities**
Wildfires can destroy property, knock out power, and damage critical infrastructure.		**Retrofit** infrastructure and utility systems with fire- and heat-resistant materials to reduce damage and maintain service.
Extreme Heat can strain energy systems.		**Install** backup generators at critical facilities to ensure uninterrupted power during outages.
ECONOMIC SYSTEMS		
System Components	Jobs Businesses	Economic sectors Regional and local economies
Example Impacts		**Example Resilience Opportunities**
Economic recessions can lead to widespread job losses and reduced local revenues.		**Boost** workforce opportunities and establish local economic resilience funds.
Drought can impact agriculture and water-dependent industries.		**Invest** in water-efficient technologies and infrastructure to industry adaptation.

SOCIAL SYSTEMS	
System Components	Communities, including vulnerable and historically marginalized communities Medical facilities Educational institutions Social networks

Example Impacts	Example Resilience Opportunities
Disasters can displace families and disrupt education and healthcare access.	**Expand** telehealth and remote learning infrastructure to ensure continued access to services during emergencies.
Wildfire smoke can be hazardous for health and exacerbate existing conditions, particularly among vulnerable populations such as young children, older adults, and people with pre-existing health conditions.	**Establish** community resilience hubs that provide shelter, clean air, health services, and remote learning access during emergencies.

NATURAL SYSTEMS			
System Components	Air	Land	Wildlife
	Water	Ecosystems	

Example Impacts	Example Resilience Opportunities
Wildfires and flooding can contaminate water systems with toxic debris. The combination of wildfires and flooding can cause soil erosion, which can lead to increased sedimentation of river and lakes, affecting water quality and ecosystems.	**Restore** natural and working lands to support ecosystem services such as flood prevention and groundwater recharge.
Infrastructure failures can lead to pollution events that degrade ecosystems and water quality.	**Develop** green infrastructure and emergency response protocols to contain and remediate environmental contamination.

1.1

ABOUT THE SCAG REGION

Founded in 1965, SCAG is a Joint Powers Authority and metropolitan planning organization (MPO) for six Southern California counties: Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura (**Figure 2**). The SCAG jurisdiction covers 38,000 square miles, 191 cities, and approximately 19 million people. SCAG is governed by an elected Regional Council of 86 members who oversee policy on transportation, community and economic development, energy, and the environment. SCAG's mission is to foster solutions that improve the lives of Southern Californians through inclusive collaboration, visionary planning, regional advocacy, information sharing, and promoting best practices.

The SCAG region is one of the most diverse and dynamic in the country, encompassing vibrant urban centers, rural towns, coastal, mountain, and desert landscapes, and communities from across the world. People of color and foreign-born residents make up about 70 percent and 30 percent of the region's population, respectively.[4] However, the region also experiences disparities in wealth and income, as about 30 percent of residents live below 200 percent of the poverty line.[5] Gaps in broadband access, homeownership, and healthcare access further exacerbate health and economic disparities between communities. In recent years, the region has faced a range of shocks and hazards, including earthquakes, heat waves, sea level rise, drought, flooding, and increasingly frequent and damaging wildfires. The size and diversity of the SCAG region means that resilience challenges, opportunities, capacities, and resources vary widely across jurisdictions, highlighting the importance of coordinated local and regional efforts to address the unique risks faced by communities.

[4] SCAG. November 2022. Racial Equity Baseline Conditions Report

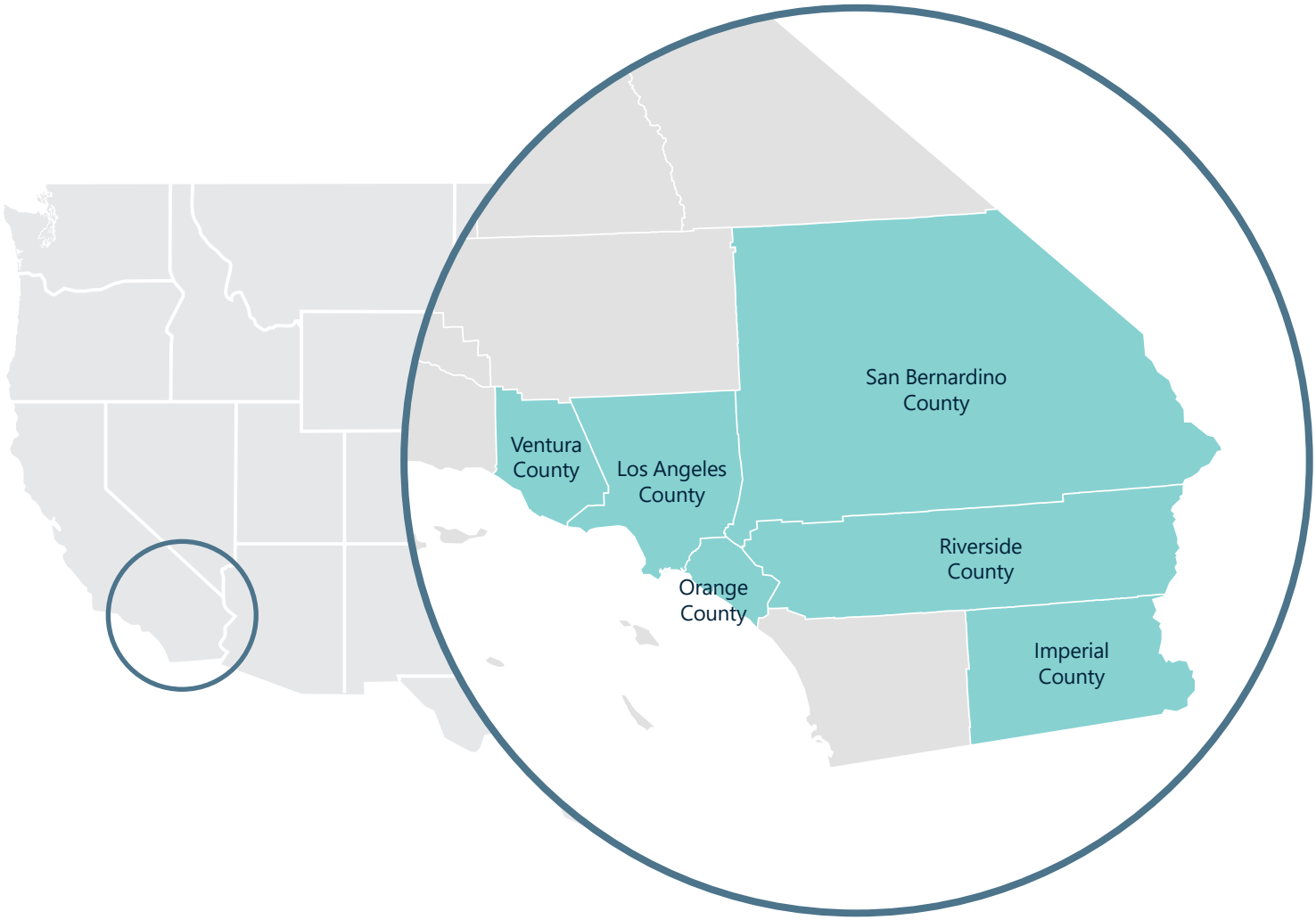
[5] Ibid

Figure 2 The SCAG Region

6 COUNTIES

191 CITIES

18.7M RESIDENTS



Imperial County	Los Angeles County	Orange County	Riverside County	San Bernardino County	Ventura County
7 CITIES	**88** CITIES	**34** CITIES	**28** CITIES	**24** CITIES	**10** CITIES
179K RESIDENTS	**9.6M** RESIDENTS	**3.1M** RESIDENTS	**2.5M** RESIDENTS	**2.2M** RESIDENTS	**829K** RESIDENTS

1.2

TOOLKIT GOALS AND AUDIENCE

This toolkit provides cities, counties, public agencies, and other partners the necessary resources to incorporate resilience into planning processes at all levels. It is intentionally high-level, intended for any jurisdiction in the SCAG region, regardless of size or familiarity with resilience. The concepts introduced in the toolkit build on SCAG's extensive climate adaptation work to provide succinct, comprehensive, and actionable guidance.

The toolkit supports local jurisdictions to:

Understand the benefits of local and regional resilience planning.

Plan for resilience at a range of scales, from integrating resilience into existing plans and programs to developing a standalone plan.

Clearly outline key steps to resilience planning, including:

- Identify key shocks and stressors.
- Define parameters of resilience planning and identify key goals.
- Engage communities to educate and inform resilience planning and implementation efforts.
- Identify funding and financing opportunities to implement strategies.
- Develop and implement resilience strategies to prepare for and respond to shocks and stressors, and monitor and evaluate implementation effectiveness.
- Plan and prepare for the post-disaster recovery process to recover and build back more resiliently.

The toolkit includes the main components of resilience planning, beginning with identifying risks and ending with post-disaster recovery. The toolkit complements SCAG's "Southern California Climate Adaptation Planning Guide" by including a wider range of shocks (not just those caused by climate change) and chronic economic, environmental, built environment, and social stressors. Recognizing that capacity may be a limiting factor for many jurisdictions, the toolkit addresses how resilience planning can integrate into existing efforts (e.g., general plans) and standalone resilience plans.

1.3

WHAT IS RESILIENCE

SCAG defines resilience as the capacity of the SCAG region's built, social, economic, and natural systems to anticipate and effectively respond to changing conditions, acute shocks, and chronic stressors by creating multiple opportunities for a sustainable, thriving, and equitable future. Resilient systems are designed and built with an understanding of likely current and future disruptive events and stressors. Rather than waiting for an event to occur and responding in the aftermath, resilience anticipates disasters and builds readiness to reduce damage and losses. The concept of resilience emphasizes building back better so communities can emerge from shocks and stressors more prepared for the next challenge.

The process of becoming more resilient is adaptation, defined as adjustments in natural or human systems to new or changing environments. The aim is to help jurisdictions understand and plan for a range of potential shocks and stressors, all of which interact with each other to impact the region's economy, communities, natural systems, and built environment.

Strengthening resilience is a comprehensive approach to increase a system's capacity to reduce vulnerabilities to shocks and stressors. These systems provide a framework for resilience planning emphasized throughout this toolkit. Building resilience also involves collaborating across individuals, communities, organizations, and governments to address the wide-reaching effects of shocks and stressors.

Before engaging in resilience planning, it is helpful to understand key terms, which are defined in **Table 2** and described in greater detail in the toolkit.

Table 2 Core Terms for Resilience Planning

Term	Definition
Resilience	The capacity of the SCAG region's built, social, economic, and natural systems to anticipate and effectively respond to changing conditions, acute shocks, and chronic stressors by creating multiple opportunities for a sustainable, thriving, and equitable future.
Shock	Sudden or acute events that threaten immediate safety and well-being.
Stressor	Chronic challenges that weaken natural, built, economic, or human resources.
Vulnerability	The degree to which systems are susceptible to impacts from shocks and stressors.
Adaptation	Actions to adjust systems to a new or changing environment.
Mitigation	Actions taken to prevent or reduce the likelihood or magnitude of shocks and stressors.

EVERY DOLLAR INVESTED IN RESILIENCE SAVES $13 IN DAMAGES AND INDIRECT CONSEQUENCES

1.3.1

WHY PLAN FOR RESILIENCE?

Resilience planning pays for itself. According to the U.S. Chamber of Commerce, every dollar invested in resilience saves $13 in direct damages and clean-up costs as well as indirect consequences such as lost jobs and migration.[6] Households may face income loss, health impacts, inability to work, home repair costs, higher insurance premiums, and medical bills from unexpected disruptions. Small businesses, which make up the backbone of local economies and tax revenues, may struggle to cover damages from floods or wildfires and the loss of income from extended closures. A thriving local economy is foundational to resilience, as it provides income for households and businesses and a strong tax base that can enable jurisdictions to invest in resilient infrastructure. Examples investments include updated stormwater management systems, undergrounded utility distribution lines, or green infrastructure, which further protects households and businesses from shocks and stressors.

Resilience planning can also significantly enhance recovery efforts and prioritize allocating resources where they are most needed. For example, households that can avoid paying for costly damages will have more resources for education, health, and other needs. This can enhance overall community capacity to recover more quickly and lead to long-term savings for jurisdictions.

Although the benefits of resilience planning are often evaluated through the lens of sudden shocks and disasters, resilience planning can also protect residents and businesses from the long-term consequences of ongoing environmental and socioeconomic stressors. For example, chronic exposure to poor air quality worsens asthma, increases medical bills, and can lead to missed school or work. Low homeownership rates keep families from building wealth and increases their vulnerability to economic recessions and sudden shocks. Addressing these chronic challenges can enable communities to live healthier lives, access more opportunities, and achieve their full potential.

[6] U.S. Chamber of Commerce. June 25, 2024. The Preparedness Payoff: The Economic Benefits of Investing in Climate Resilience.

WHAT DOES ENHANCED RESILIENCE ACROSS DIFFERENT SECTORS/SYSTEMS LOOK LIKE?

BUILT ENVIRONMENT

Transportation systems, utility infrastructure, critical facilities, and other infrastructure systems can withstand and recover quickly from both natural and manmade shocks, and are able to maintain service and minimize downtimes through chronic stressors or changing conditions (e.g., sea level rise and increases in extreme heat).

SOCIAL SYSTEMS

Communities and individuals respond to, recover from, and thrive in the face of shocks and stressors, accessing essential services and forming strong social networks while guided by effective, inclusive governance.

ECONOMIC SYSTEMS

The economy can attract and retain diverse workforces and business ecosystems, including businesses of all sizes and emerging industries, enabling it to recover quickly from recessions or major industry changes.

NATURAL SYSTEMS

Natural resources are managed and protected to support thriving ecosystems, nurture biodiversity and native species, and provide ecosystem services necessary for human health and well-being and buffer natural disasters.

1.3.2

RESILIENCE BY GEOGRAPHY AND JURISDICTION

Shocks and stressors often result in cascading effects across regions, but impacts are addressed at the local level, jurisdiction by jurisdiction. This can lead to uncoordinated and uneven planning, implementation, and response efforts. With many shocks and stressors occurring at the scale of landscapes, watersheds, and air basins, local action should be complemented by regional coordination to identify partnerships and opportunities for collaborative planning and implementation. For example, agencies with rights to the same groundwater basin can coordinate on water management policies for long-term sustainability.

Ideally, resilience efforts should align at both local and regional levels. **Table 3** describes the roles of local and regional agencies in planning for resilience. Regional efforts can take a system-wide perspective to identify goals and priorities, secure and manage shared resources, build partnerships, and address cascading impacts and consequences. It can also support fairness so that smaller jurisdictions are not left behind. Local efforts can more effectively address the needs, priorities, and challenges of specific communities and develop place-based initiatives. Critically, local jurisdictions also have authority over land use and development, shaping how and where communities grow.

Planning for resilience should be supported by consistent and thoughtful community feedback and input. The pink call out boxes in this toolkit show which stakeholder engagement efforts are recommended.

Notably, in response to complex challenges like climate change, agencies are increasingly forming regional collaborations to plan at a systemwide scale. For example, the Headwaters Resilience Partnership brings together local, state, and federal agencies to fund and implement forest resilience projects in the Upper Santa Ana River Watershed, which encompasses parts of Riverside and San Bernardino counties.

Table 3 Local and Regional Roles in Building Resilience

LOCAL
Plan and permit future growth.
Plan for resilience through focused, standalone efforts or integrated into other plans.
Authority to plan, prioritize, fund, and implement strategies.
Conduct outreach and engagement.
Understand community needs and priorities.
REGIONAL
Identify and coordinate on landscape-scale or regionwide challenges and impacts.
Collaborate on regional projects, strategies, and programs, leveraging resources and avoiding duplication.
Advocate for and secure funding.
Build networks, partnerships, and collaborations.
Align on regional needs and share information, best practices, and research.

Legislative Drivers for Resilience Planning

AB2140
2006

Allows jurisdictions to be considered for additional state funding for local cost-share on eligible public assistance projects by adopting their current, Federal Emergency Management Agency-approved local hazard mitigation plan (LHMP) into the safety element of their general plan.

AB162
2007

Requires the general plan safety element to address flood risks within jurisdictions.

SB1241
2012

Requires the safety element to address fire risk in state responsibility areas and very high fire hazard severity zones within jurisdictions.

SB379
2015

Requires jurisdictions to address climate adaptation in the safety element of the general plan, or a separate hazard mitigation plan or climate adaptation and resiliency strategies incorporated by reference.

SB1035
2018

Requires review and revision of the safety element upon each revision of the housing element or LHMP, at least once every eight years.

SB747
2019

Requires jurisdictions to identify evacuation routes and evaluate route capacity, safety, and viability under a range of emergency scenarios in the safety element.

SB99
2020

Requires jurisdictions to identify residential developments in hazard areas that do not have at least two emergency evacuation routes in a safety element update.

AB1445
2022

Requires councils of governments to consider evacuation route capacity, wildfire risk, sea level rise, and other climate impacts in distributing existing and projected housing needs.

SB272
2023

Requires jurisdictions within the coastal zone to develop a sea level rise plan by 2034.

AB2684
2024

Requires jurisdictions to address extreme heat in safety elements in the next general plan update after 2028.

- Assembly Bill
- Senate Bill

1.4

ROLE OF SCAG IN REGIONAL RESILIENCE

As an MPO, SCAG's core role is to develop long-range transportation plans and sustainable community strategies, oversee transportation improvement programs, plan for future housing development needs, and provide research and data. With a governing body and membership from across the six counties, SCAG has resources and an organizational infrastructure that can be utilized to coordinate local jurisdictions and scale resilience efforts across the region. SCAG has already taken significant action to support its member agencies in addressing climate change and preparing for shocks and stressors:

- Conducting studies and sharing research and information that jurisdictions can use to inform and support their own resilience initiatives.
- Developing and disseminating recommended policies to local jurisdictions to enhance resilience.
- Providing resources to support resilience efforts including funding, technical assistance and guidance, best practices, and research.
- Convening local jurisdictions, subregions, transportation agencies, and other stakeholders to share information and advance regional resilience goals.

EXISTING SCAG RESILIENCE PLANNING EFFORTS & RESOURCES

The need for sustainable infrastructure, housing, and transportation to support the needs of Southern California's diverse population is growing, with planning required for a future that is increasingly difficult to predict. SCAG is a leader in regional resilience and has produced many resources and tools, including this toolkit, to help jurisdictions tackle shocks and stressors. Ways in which SCAG is already advancing or supporting resilience are described on the right.

This toolkit builds on those initiatives to support jurisdictions of all sizes and capacities in navigating these challenges, recognizing that tailored, place-based strategies are key to building long-term resilience across the region.

Connect SoCal

The Connect SoCal Regional Transportation Plan/ Sustainable Communities Strategy outlines a vision for a more resilient and equitable future. The plan outlines investments, policies, and strategies for achieving the region's goals through 2050. Regional resilience considerations are integrated throughout, in addition to a section dedicated to climate resilience.

SCAG addresses natural and agricultural conservation through various initiatives:

- The Regional Advanced Mitigation Planning (RAMP) initiative supports public agencies to establish RAMP programs for regionally significant infrastructure projects—enabling early evaluation of environmental impacts and mitigation needs during the planning process
- The forthcoming SoCal Greenprint is a conservation-focused web-mapping tool that will support data-driven land use, transportation, and infrastructure decisions, including RAMP programs.
- Initiatives that focus on preserving, enhancing, and restoring natural and agricultural lands that play an important role in regional resilience, such as the "Natural and Agricultural Lands Economic and Resilience Benefits Study."

Resolution on Climate Action

SCAG's 2021 Resolution on Climate Action declared a climate emergency in the SCAG region and called on local and regional partners to work together to improve resilience.[7]

Southern California Climate Adaptation Planning Guide

In 2023, SCAG developed the Southern California Climate Adaptation Planning Guide, which provides a detailed guide for how local jurisdictions and the region can work together to plan and prepare for climate impacts, including sea level rise, extreme heat, and wildfires. The guide provides an overview of climate hazards in the SCAG region and explains how to develop an adaptation plan.

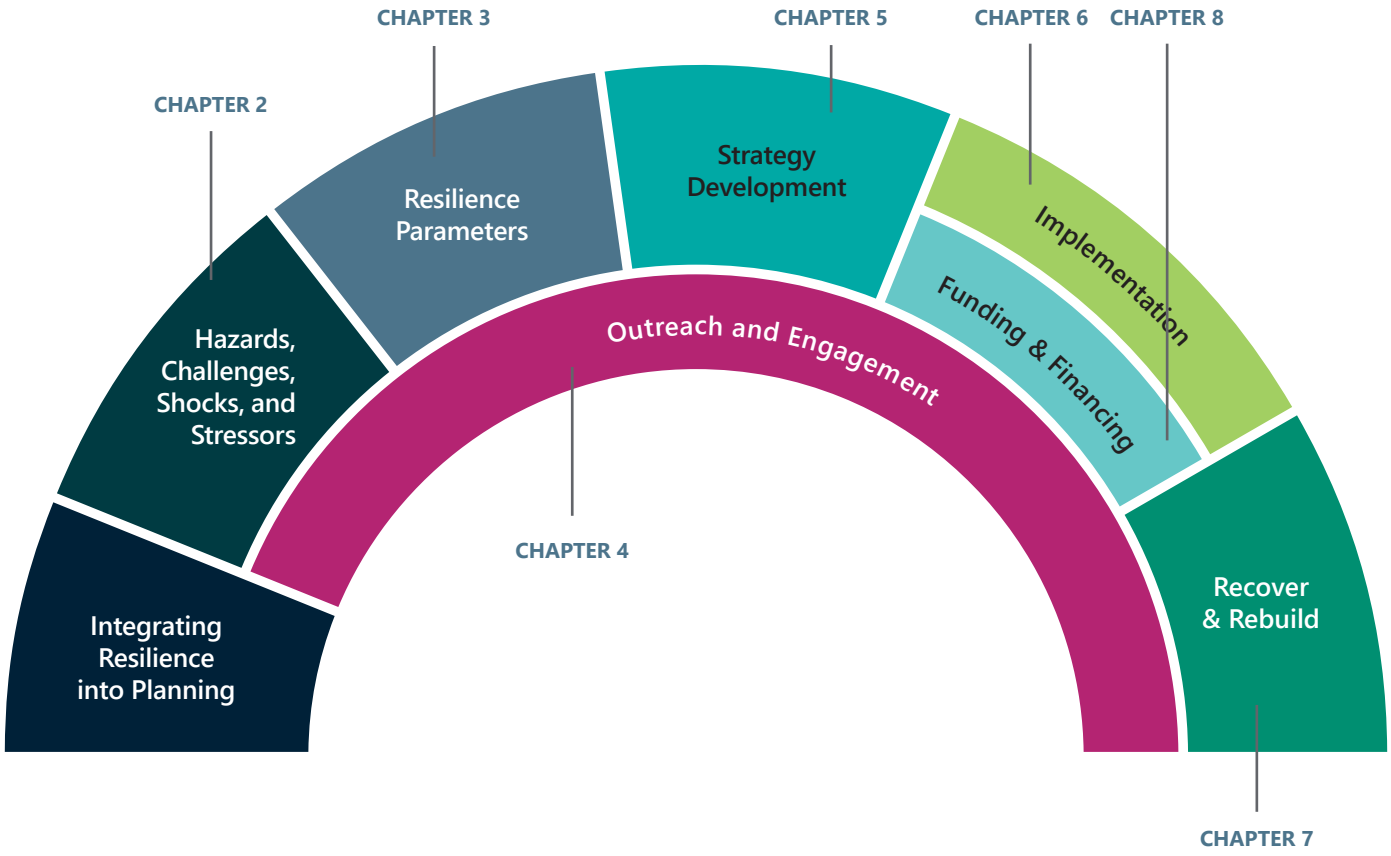
2025 Resolution on Regional Resilience

SCAG's 2025 Resolution on Regional Resilience highlighted opportunities to leverage the agency's capacity to support equitable and resilient recovery following the 2025 Eaton and Pacific Palisades Wildfires.

[7] SCAG Adopts Resolution on Climate Change Action - Southern California Association of Governments

1.5

HOW TO USE THIS TOOLKIT



Resilience planning is a flexible process and framework with several key components. The toolkit is intended to support an ongoing, iterative approach to planning, allowing jurisdictions to revisit and refine strategies over time as conditions, priorities, and capacities evolve. Users are encouraged to follow the steps in the toolkit at the level of detail they deem necessary, either referenced as a step-by-step guide or focused on individual chapters. Where applicable, the toolkit provides external resources that can provide additional information.

As shown in the figure above, the process begins by identifying relevant shocks and stressors and characterizing their impacts (Chapter 2). Next, the toolkit describes defining the goals and scope of resilience planning and establishing the plans, programs, and processes in which resilience can be integrated or enhanced (Chapter 3). Chapter 4 details the importance of conducting outreach and engagement to enable community input to inform resilience planning.

Next, Chapter 5 describes the process of developing resilience strategies and implementation timing to address both immediate and long-term resilience. Chapter 6 explains how to implement, monitor, evaluate, and refine strategies to ensure resilience efforts are successful over time. While the main focus of the toolkit is on building resilience, no shocks and stressors can be completely prevented, and Chapter 7 outlines how jurisdictions can recover from disasters, specifically wildfires, both through advance planning and during the recovery process. To support implementation, Chapter 8 provides available funding opportunities—including ones focused on resilience—and guidance on creating a financing plan. Finally, Chapter 9 concludes the toolkit with compilation of resources, guidance, tools, and example strategies.

Ventura Pier,
Ventura, CA
PatriciaPix, Adobe Stock

UNDERSTANDING SHOCKS & STRESSORS

02

OVERVIEW

Each jurisdiction faces unique shocks and stressors. Understanding specific challenges is a critical first step to resilience planning, which is most successful when grounded in local context. The following chapter introduces key concepts and methods for assessing shocks and stressors, laying the foundation for targeted and effective resilience strategies.

Shocks are sudden, short-term events like natural disasters, recessions, or pandemics that disrupt normal life, while stressors are long-term conditions, such as poverty or ongoing droughts, that weaken a community over time and worsen the impacts of shocks. For instance, a community on the coast might experience shocks from storm surge and flooding, while communities in the Inland Empire face heat waves. Stressors such as lack of access to open space or limited tree canopy can vary by community, while others like housing affordability are generally experienced regionwide.

Chronic stressors can increase vulnerabilities and potential damage for communities and systems, exacerbating a shock's scale of impact and weaken potential responses. In turn, shocks can worsen existing stressors. To fully understand the relationship between shocks and stressors in a unique planning context, a jurisdiction should evaluate how stressors could affect the resilience of key systems and communities in the face of likely shocks, and vice versa. For example, the high cost of housing and lack of affordable housing can leave more residents living in aging homes in areas with high flood risk and poor drainage. In turn, a flood event due to tropical storms or severe precipitation might damage homes, further eroding the quality and quantity of available housing and reduce savings for residents, potentially pushing them further away from eventual homeownership.

WHY IS THIS IMPORTANT?

Identifying and understanding shocks and stressors specific to a jurisdiction, their relationship, and their associated cascading impacts to the built, social, economic, and natural systems can lead to more comprehensive and effective resilience planning and strategy development. This chapter guides jurisdictions through the process of identifying and evaluating acute shocks and chronic stressors to understand their potential impacts. It introduces tools, resources, and guidance to inform resilience planning priorities.

NAVIGATING THE PROCESS

2.1 IDENTIFY SHOCKS AND STRESSORS

Identifying current and future shocks and stressors is the first step in resilience planning. This is a multi-step process that involves reviewing foundational data, conducting technical analysis, and engaging communities. This integrated approach helps jurisdictions recognize the presence of shocks and stressors and understand their scale, interactions, and impacts.

- Begin by developing a list of shocks and stressors likely to affect the planning area based on stakeholder input, document review, and research. Consider the following questions in reviewing these resources:
- What stressors currently affect the planning area? How do they affect the capacity of communities and systems to respond to shocks? What shocks could these stressors lead to or exacerbate?
- Where, and how often, have shocks occurred? How might these shocks worsen current stressors in the community?
- Which communities and systems were adversely affected by past shocks or stressors?
- Does the planning process focus on a specific type of shock or stressor (e.g., natural hazards, climate change, economic disruptions, social disturbances, etc.)?
- Are there any shocks or stressors that current plans overlook but could pose a greater risk in the future?
- Are there any upcoming changes (e.g., changes in leadership or policies) that could affect the jurisdiction's ability to address shocks and stressors?

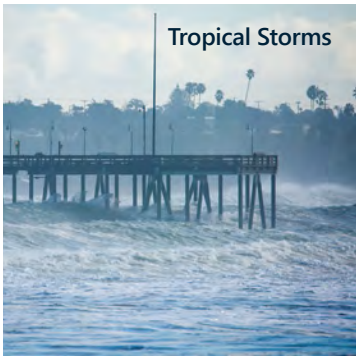
To support this process, the Shocks and Stressors Matrix in Appendix A can be used as a starting point to develop an initial list of shocks and stressors. It includes primary shocks and stressors likely to be relevant for Southern California jurisdictions, with associated indicators and links to datasets for further research, as summarized in **Figure 3**. It also includes guidance on how to interpret these metrics, with some tools offering numerical data (like census data or index scores) and others providing visual or spatial information, such as maps of wildfire-prone zones. Developed specifically for the Southern California region, the matrix reflects the input of community-based organizations on key challenges faced by their communities and serves as one component of a broader process for identifying and understanding shocks and stressors.

By reviewing the matrix and accompanying datasets, jurisdictions can identify their exposure to shocks and stressors and use the provided indicators to assess their resilience to each shock or stressor. The shocks and stressors are grouped into four categories that can be aligned with different planning processes: the built environment and economic, natural, and social systems. Generally, plans will focus on one to two of these categories but may have implications for others as well. For example, local hazard mitigation plans address natural disasters (including climate change impacts), general plans consider the built environment and social stressors, and economic development strategies address economic conditions. An active transportation plan will primarily focus on transportation infrastructure but will also impact social systems, economic systems, and the built environment.

After developing an initial list of shocks and stressors, talk with community members. Their real-life experiences can help highlight which issues matter most locally and point out any important ones you could have missed.

Example Shocks and Stressors
that have affected the SCAG region in the recent years

SHOCKS



STRESSORS

Heat-related stress and illness, particularly among vulnerable populations such as the elderly and low-income households

Drought, which strains water resources and increases water agency costs and competition for water supplies

Long-term displacement from shocks such as wildfires and impacts to regional housing supply

Housing affordability, a barrier to economic stability and growth

Inflation impacting consumer spending and affecting economic uncertainty

Population decline due to remote work and the high cost of living

Aging infrastructure, affecting mobility, electricity, water, wastewater, and other sectors

Figure 3 Shocks and Stressors in the SCAG Region

Category	Shocks		Stressors	
Built Environment	Power outages Infrastructure failure Hazardous materials release Poor water quality		Lack of broadband access Deteriorating infrastructure Maladaptive infrastructure Lack of public and active transportation options Non-resilient infrastructure	
Economic Systems	Economic recession Supply chain disruptions		Food insecurity Downturns in industries critical to the local economy Downturns in the national or international economy that lower consumer spending and demand for local goods Low rates of home ownership Limited mobility	Lack of smartphones or other technology Lack of access to employment Income inequality Increasing rent-burdened low-income populations Homelessness Household crowding
Natural Systems	Avalanches Earthquakes Landslides Hurricanes Strong winds Pandemics Tsunamis	Wildfires Flooding (coastal and inland) Extreme heat Extreme cold Severe weather Coastal erosion Drought	Chronic flooding Limited tree canopy Environmental contamination Air pollution	
Social Systems	Terrorism Cyber-attacks		Declining literacy rate Declining educational attainment Lack of access to open space Increasing aging population Increasing asthma-related hospital visits Lack of civic and social organizations	Declining active voters Increasing population of outdoor workers Lack of healthcare access Lack of insurance access Increasing number of households with a single head Increasing population with a disability

Although the matrix in Appendix A serves as a useful entry point for assessing shocks and stressors, it is not exhaustive. Jurisdictions might find that locally sourced data or alternative indicators are more relevant or accurate for their context. Engaging with local departments, stakeholders, and planning teams can help determine whether customized metrics should be used instead. As a next step, jurisdictions should conduct additional data collection, technical analysis, and community engagement to localize and refine understanding of shocks and stressors, their scale and severity, and interrelated impacts within their community. For example, statewide and national datasets can identify high costs of housing and homelessness rates, but further analysis and community engagement can uncover local trends, interactions, and cascading impacts between shocks and stressors, such as how housing costs can affect environmental burdens, education access, and wildfire recovery.

2.2

EVALUATE SHOCKS AND STRESSORS

After shocks and stressors have been identified, it is important to understand their current impacts on systems and communities, trends and likely changes over time, and emerging or new shocks and stressors. This stage uses data and stakeholder input to understand the rate and direction of change for shocks and stressors and applies this information to understand potential impacts.

For instance, are heat waves expected to increase or decrease, and to what extent? Is the population projected to grow or shrink, and to what degree? Understanding the degree of change expected for each shock or stressor will help prioritize those that should be addressed immediately from those that are less urgent. For example, if a community is likely to experience more frequent extreme heat days over the next 30 years, priority resilience measures might focus on planting and maintaining urban trees to reduce urban heat and updating building codes, incentivizing home retrofits, and developing community resilience hubs to protect vulnerable populations. Climate vulnerability assessments offer one way to assess future shocks for communities, but shocks and stressors can also be evaluated as part of other planning frameworks, for example through community engagement and technical analyses efforts as part of a general plan update.

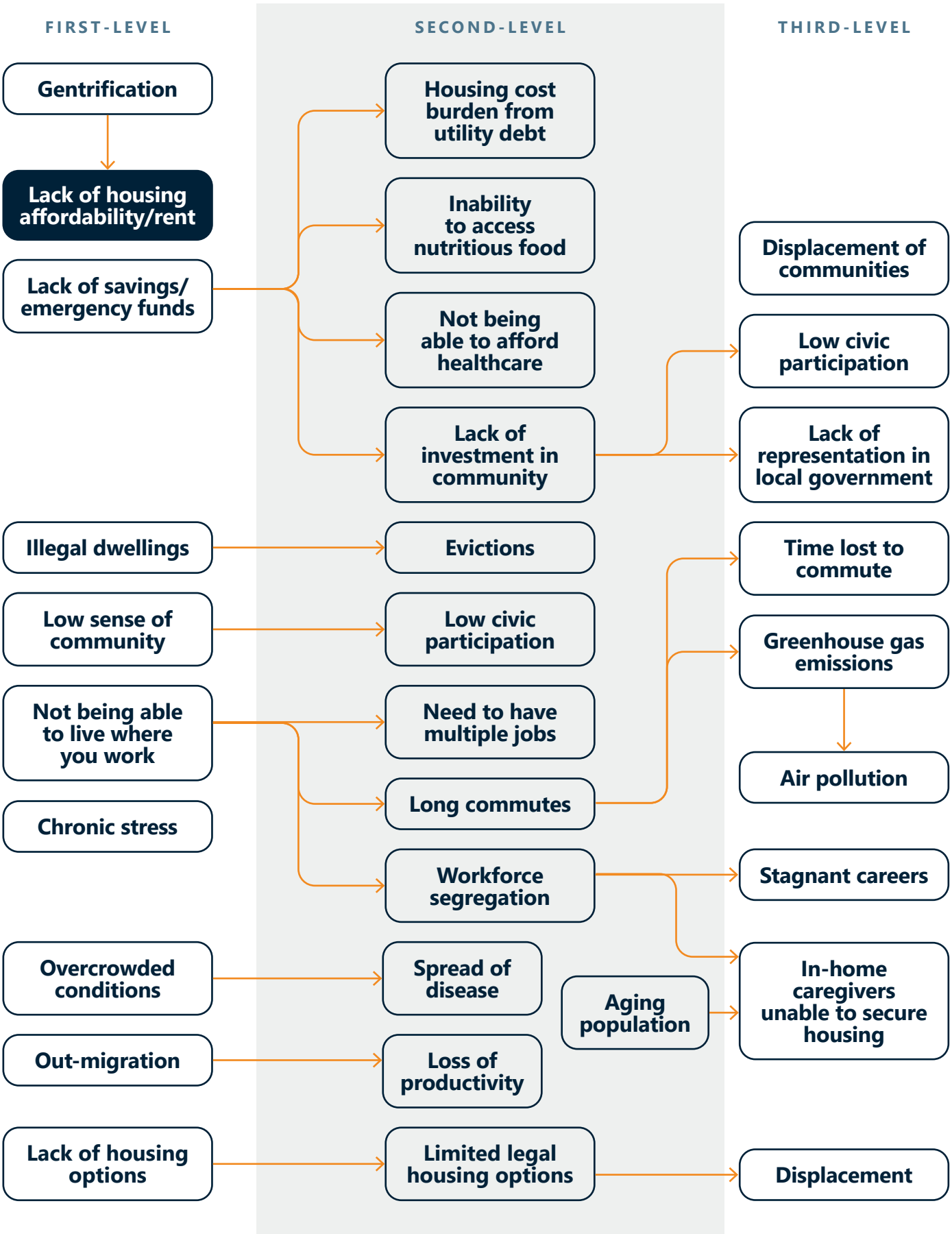
Impacts describe the degree to which each shock or stressor is likely to affect systems or communities, including cascading, indirect effects. Evaluating impacts involves understanding the potential for damage, disruption, and losses based on the interaction between shocks and stressors and various systems. Impacts from stressors are often overlooked because they have ongoing background impacts, delayed onset, or indirect linkages. For instance, lack of healthcare access can prevent outdoor workers from seeking care when affected by extreme heat or wildfire smoke, which could lead to chronic health impacts, absences from work, and decreased mental health, all of which could further exacerbate income inequality, rent burden, and lack of mobility. Thus, strengthening resilience requires thinking comprehensively through cascading impacts of shocks and stressors.

Common Impacts from Shocks and Stressors

- **Deteriorating infrastructure**
- **Health impacts**
- **Poverty**
- **Endemic crime**
- **Physical and economic displacement**
- **Constrained housing supply**
- **Lack of affordable housing**
- **Environmental degradation**
- **Job insecurity**
- **Heightened stress**

First-level impacts are direct, immediate effects, such as disruptions to infrastructure, environment, or specific populations. **Second- and third-level impacts** are indirect, result from first-level impacts, and potentially compound over time, such as supply chain interruptions, cumulative health impacts, and population change. Examples of first- and second-level impacts are shown in **Figure 4**. The connection of second- and third-level impacts to the initial shock can be underestimated or overlooked; literature review can confirm these associations, such as extreme heat impacts on mental health, crime rates, educational performance, and low-birth weights. Characterizing cascading impacts across all levels is key to identifying the full spectrum of social, environmental, and economic needs and developing corresponding response strategies. This can require research, creative thinking, and scenario planning. Additionally, the impacts of concern may differ based on the type of plan under development. Impacts should tie back to the goals, scope, and timeframe of the plan.

Figure 4 Example of First- and Second-Level Impacts from Housing Affordability



2.2.1

GUIDE TO CHARACTERIZING SHOCKS AND STRESSORS

Characterizing shocks and stressors can be done in several ways. A common practice is to identify a metric or indicator that can assess future change for a shock or stressor.

The Shocks and Stressors Matrix in Appendix A includes over 20 types of shocks and over 30 resilience indicators for communities. The User Guide and Example tabs of the matrix describe how to use the metrics to characterize each shock and stressor. Some tools provide quantitative metrics (such as specific census data or an index value) while others provide qualitative information, such as a map of high-risk wildfire areas. As noted above, the matrix is not intended to be comprehensive, and the metrics identified might not be the most accurate or relevant for every jurisdiction, shock, or stressor. Jurisdictions may have locally specific data sources and metrics, and consultations with the planning team, stakeholders, and city/county departments can determine if alternative metrics would be more suitable.

In addition, a variety of tools can characterize climate, social, and economic shocks and stressors. An overview of these tools are listed in **Table 4**, and a full list is provided in Section 9.1, Section 9.3, and Section 9.3.1.

Key considerations for characterizing impacts from shocks and stressors include:

Different levels of detail and data may be required for different plans.
For example, a sea level rise vulnerability assessment should collect detailed projections on the extent of future coastal hazards. A safety element for a general plan may require only qualitative description of hazards.

Consider both current and future risks.
Historical data is available describing the past and current state of shocks and stressors. Consider future conditions and trends if data is available for projected changes in land use, climate, population, and transportation.

Assess unpredictable shocks and stressors based on risk level.
Some shocks, such as cyber-attacks, pandemics, economic downturns, and hazardous materials release, are inherently unpredictable. When no data is available, shocks and stressors should be assessed based on the level of risk to the jurisdiction.

Consider underlying infrastructure, resources, and assets.
The resilience of existing infrastructure is foundational to a community's overall resilience across all dimensions. Evaluate the robustness and redundancy of existing and planned infrastructure such as transportation, utilities, flood protection, and critical facilities (e.g., hospitals). Communities with gaps or fewer resources will likely face greater impacts.

Consider disproportionate impacts on communities.
People in low-income, vulnerable, and historically marginalized communities, and people living in rural areas or on tribal lands often have less access to resources, limiting their capacity to prepare for, respond to, and recover from disruptions.

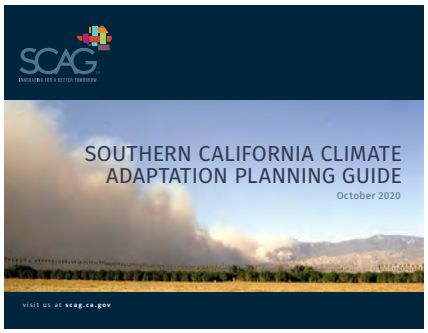
To identify cascading impacts, consider how shocks and stressors will interact with system components in the planning area. Understanding how shocks and stressors interact can also help identify where stressors could exacerbate shocks and vice versa.

CONDUCTING A CLIMATE VULNERABILITY ASSESSMENT

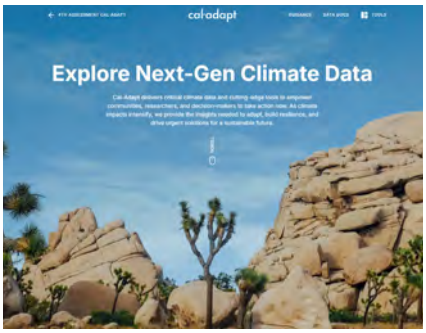
A climate vulnerability assessment is one approach to analyzing future shocks and stressors, helping jurisdictions and organizations determine which assets are most vulnerable to climate hazards. This technical analysis uses a combination of quantitative and qualitative information (detailed asset data and climate projections, and often data on socioeconomic and population characteristics) to estimate the vulnerability of assets and communities to future climate impacts. A vulnerability assessment provides a more detailed approach for characterizing future climate shock and stressor impacts than a qualitative approach, leading to highly impactful resilience measures. The SCAG Adaptation Planning Guide provides a detailed overview on conducting a Climate Vulnerability Assessment.

Table 4 Resilience Planning Tools and Resources

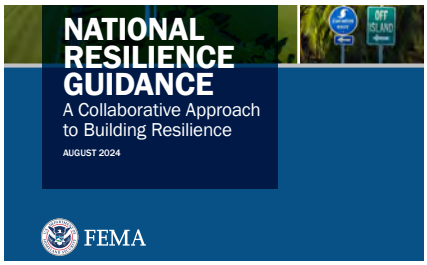
Connect SoCal 2024
Long-range plan for the SCAG region outlining strategies and metrics for mobility, communities, environment, and economy through 2050.



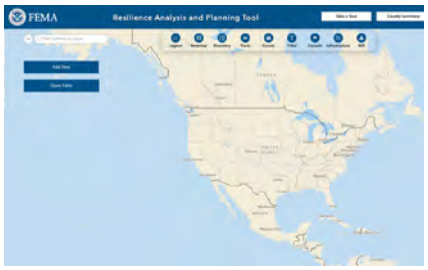
SCAG Adaptation Planning Guide and Appendices, 2020
Step-by-step guidance and tools for local climate adaptation planning.



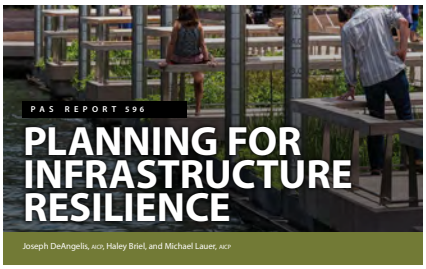
Cal-Adapt
Provides downscaled climate projections for California to assess future climate hazards. The Local Snapshot feature enables a quick overview of climate projections for census tracts, cities, counties, or other areas.



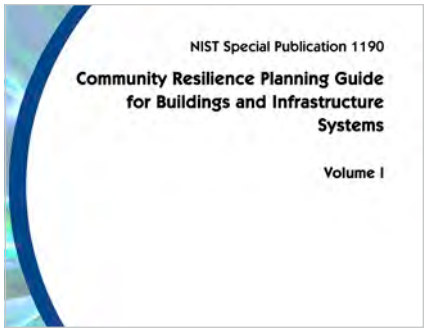
Federal Emergency Management Agency (FEMA) National Resilience Guidance, 2024
Describes steps to strengthen resilience to prepare communities, systems, and infrastructure against natural disasters.



National Risk Index
Identifies communities at risk from natural hazards by considering underlying socio-economic conditions and exposure to hazards.



American Planning Association Planning for Infrastructure Resilience, 2019
Guidance focused on climate-resilient infrastructure planning across systems.



National Institute of Standards and Technology Community Resilience Planning Guide, 2016
Aid for communities setting building and infrastructure goals based on social needs.

FEMA Community Resilience Indicator Analysis, 2022
Provides FEMA's common indicators used to measure community resilience.

U.S. Environmental Protection Agency (U.S. EPA) Regional Resilience Toolkit, 2019
Five-step process for building and evaluating resilience.

METRO CLIMATE ACTION PLAN AND ADAPTATION PLAN

FUNDING	**2019 CAAP**	**~$700K**
	2025 Update	**~$100K**
PARTNERS	**Metro**	
SHOCKS/ STRESSORS ADDRESSED	**Extreme Heat**	
	Wildfire	
	Flooding	
	Landslides	

OVERVIEW

The Los Angeles County Metropolitan Transportation Authority's (Metro) 2019 Climate Action and Adaptation Plan (CAAP) and 2025 update assess how climate change is projected to impact Metro's system and operations. The 2019 CAAP identifies steps for Metro to reduce operational greenhouse gas emissions and enhance resilience to long-term climate change and extreme weather events, with a focus on improving the resilience of transportation services and infrastructure in Equity-Focused Communities (EFCs). The 2025 CAAP focuses on building external and internal partnerships to facilitate operational emissions reductions through efforts such as zero-emissions bus deployment and resilience actions such as upgrading vulnerable assets.

Both CAAPs demonstrate Metro's commitment to integrate resilience as an organizational priority within planning processes and daily operations. The 2019 CAAP outlines a flexible adaptation approach to achieve resilience by implementing strategies that are evaluated and improved upon over time. An interactive dashboard and map allows users to identify highly vulnerable assets and conduct a risk assessment. In 2022, Metro used the results of the vulnerability assessment to evaluate short- and long-term climate risks likely to impact the system. This helped Metro identify locations, facilities, infrastructure, and equipment for resilience investments to ensure systems can resume service quickly after extreme weather events and protect the safety of transit riders. The 2025 CAAP Update builds on the analysis and actions set out in the 2019 CAAP to demonstrate the progress Metro has made in delivering operational emissions reductions and implementing resiliency measures across the system while also expanding the CAAP to include Metro's influential role in reducing regional vehicle miles traveled.

LESSONS LEARNED

Create a central repository for geospatial data. Standardizing spatial data makes it easier to evaluate and monitor the impact of resilience strategies on Metro's assets and infrastructure and supports future assessments and integration with regional datasets. Turning the data into an interactive map allows planners and members of the public to visualize the results of the vulnerability assessment and identify high risk assets. To maintain the effectiveness of such a tool, a clear data management and update procedure is essential to enable the map or other similar tools stay relevant for the agency.

Incorporate flexible adaptation pathways.
The 2019 CAAP introduced a pathways approach that allows adaptation strategies to be scaled over time based on the future evolution of factors uncertain today. This approach allows Metro to incorporate advances in science and technology into adaptation actions, encourages rigorous monitoring, and reduces the costly risk of being either over- or under-prepared.

Align adaptation strategies with the asset management lifecycle.
Building on the approach above, Metro identified and aligned adaptation actions with planned infrastructure planning and replacement cycles. This provides a model to conceptualize scaled adaptation in alignment with infrastructure projects and reduces the costly risk of intervening at a site multiple times.

Center equity throughout the planning process.
The agency invested in capacity-building efforts through a strategic revamp of its Growing a Greener Workforce program, which offers trainings to Metro staff and the general public on a range of climate subjects, including extreme heat training for contractors and landscapers. In addition, Metro's Bus Stop Improvement Plan prioritizes high-need areas to invest in bus stop shading, creating cooler and safer environments for Metro riders.

NEXT STEPS AND IMPLEMENTATION

Since the 2019 CAAP, Metro has begun to implement many of the resilience actions in the plan. As a result, Metro's system is better prepared for natural disasters and longer-term stressors. Several of Metro's actions to-date to enhance resilience include:

- **The 2025 CAAP Update**, approved by the Board of Directors in October 2025, provides a clear picture of Metro's progress on its goals and projects and outlines Metro's priorities for the coming years, including a greater focus on addressing extreme heat and positioning for grants and interagency partnerships.

- Metro has **integrated the CAAP into several other agency plans and even state plans**, including the All-Hazard Mitigation Plan. Integration of several Metro projects into Caltrans's State Climate Resilience Improvement Plan for Transportation (SCRIPT) positioned Metro to receive funding through the federal Local Transportation Climate Adaptation Program (LTCAP) Program. One awarded LTCAP grant focuses on upgrading catenary systems on the A Line at risk of overheating. Other resilience projects in the SCRIPT include infrastructure upgrades to build heat resilience and hillside stabilization to prevent landslides.

- Metro **adopted a tree policy** to provide additional shade, reduce the urban heat island effect, and improve water and air quality. The policy requires Metro to protect trees during construction, replace each tree removed with at least two drought-tolerant trees, train staff on implementation, and conduct community outreach.

- To address urban heat and extreme temperatures, Metro developed a **Bus Stop Improvement Program** to improve shade, lighting, and accessibility at bus stops, focusing on improvements at stops with high ridership in equity-focused communities (EFCs) first. Over 150 high-need bus stops were identified based on factors such as location in EFCs or communities identified as vulnerable by the California Heat Assessment Tool and tree canopy coverage.

- Metro is **integrating resilient design features into new capital projects**, beginning with an evaluation of resilience during the scoping and design phase to identify risks that threaten infrastructure. For example, new stations constructed as part of the D Line Extension Project were designed to depths that would anchor the station in dense soil that can withstand seismic risks.

ADDITIONAL INFORMATION

LA Metro Resilience and Climate Adaptation

2019 Climate Action and Adaptation Plan

Metro Climate Change Resilience Map

Sustainability Strategic Plan
(see section 3.9 on Resilience and Climate Adaptation)

2.2.2

ANALYZE AND PRIORITIZE IMPACTS

After identifying impacts from shocks and stressors through screening, research, and community or stakeholder engagement, they should be reviewed and analyzed to support prioritization. Prioritization can help communities determine which shocks and stressors should be addressed immediately, versus in the mid-or long-term, and how to accordingly allocate resources and capacity.

The following questions provide guidance for the review and analysis of shock and stressor impacts.

Consequences.
Which shocks and stressors lead to the worst impacts or highest consequences (most expensive or most damaging to physical infrastructure, threats to public safety and life, disruptions to transportation networks and supply chains)?

Repeating or ongoing impacts.
Which impacts occur the most frequently or are ongoing, resulting from multiple shocks and stressors?

Varied impacts.
Which impacts vary by geography? While shocks and stressors may affect an entire jurisdiction, some neighborhoods or communities may experience greater impacts. For example, during a regional heat wave, inland communities and neighborhoods with low tree canopy, higher percentages of pavements, and less air conditioning will face more significant impacts.

Validated impacts.
How do community engagement outcomes support the identified patterns of impacts?

Impacts on historically marginalized and vulnerable communities.
Which shocks and stressors have particularly severe impacts on historically marginalized and vulnerable populations?

Cascading impacts.
Which shocks and stressors result in more second- and third-level impacts?

Identify other impacts.
Are there other impacts that should be considered that have not been identified?

Qualities of a Good Resilience Metric/Indicator

- **Relevant to the shock or stressor it represents**
- **Sensitive enough to detect changes in the shock or stressor**
- **Provides timely and accurate information**
- **Is easy to understand and interpret**
- **Considers impacts on diverse groups**
- **Is cost-effective**

Best practices for prioritizing impacts include:

Engage the community.
Local perspectives can identify additional, indirect impacts from lived experience. Shocks and stressors that disproportionately impact historically marginalized and vulnerable communities should be prioritized.

Develop impact statements.
These describe the probability and severity of each shock or stressor in relation to the timeframe of the assessment, considering near- and mid-term impacts as well as longer-range timeframes. For example, "The wastewater treatment plant at the coast is projected to be sporadically impacted by king tides and storm surge in the present, with partial inundation by sea level rise in 2050 and full inundation by 2080. Short-term impacts could include temporary flooding, interruptions to treatment processes, discharge of untreated sewage, power loss, water contamination, and disruptions to beach access. In the long-term, the treatment plant might need to be relocated, which will require significant funding."

Define prioritization criteria.
Identifying criteria that align with community values or goals can guide the prioritization process. Shocks and stressors can be rated for their impacts on each criteria, and those with the highest ratings can be considered priorities. Engagement can help to identify the priorities and values important to a community. For example, a community with public health and safety as a planning goal could choose to prioritize shocks and stressors that have greater impacts on health.

Different Types of Plans Address Impacts to Different Sectors

Impacts assessed will likely differ based on the type of plan in development. Impacts should tie back to the goals, scope, and timeframe of the plan.

A **long-range transportation plan** can consider shock and stressor impacts on transportation infrastructure such as roads, bridges, and public and active transportation systems. It can also explore how stressors, such as economic recession or increasing gas prices, can impact mobility trends (e.g., mode share for public transportation).

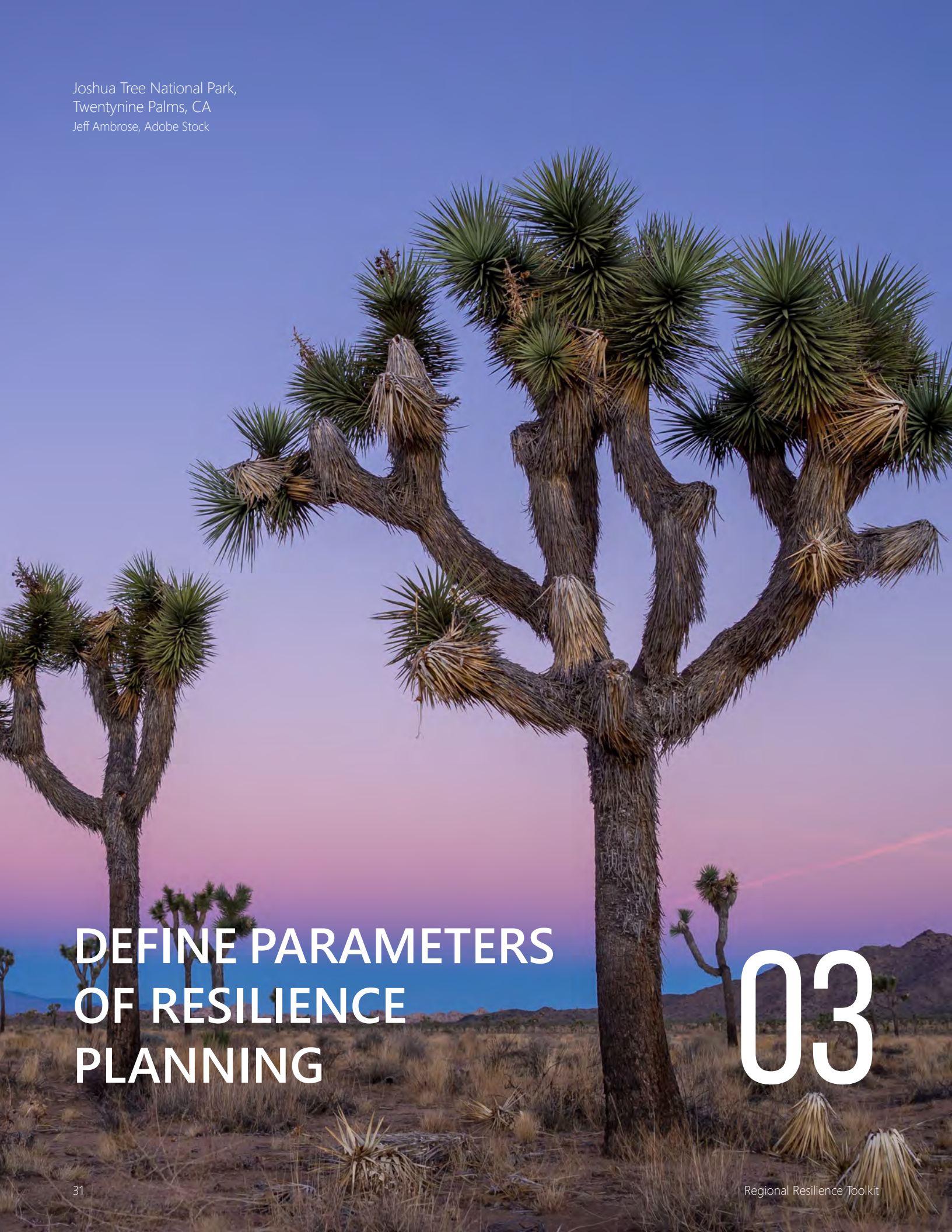
The **housing element of a general plan** should consider potential physical impacts on future housing opportunities, available stock, and supporting infrastructure, as well as economic and social impacts on the housing market and housing affordability.

An **economic resilience plan** should consider costs associated with climate shocks and stressors, such as physical damage, supply chain and service disruptions, repair costs, impacts on jobs and workforce, and costs for the surrounding community. It should also consider persistent local and regional economic challenges, demographic shifts, future workforce training needs and gaps, over-reliance on a single industry, and other economic factors.

A **hazard mitigation plan** considers the immediate impacts of shocks on physical infrastructure and vulnerable communities. What short- and long-term projects can help to reduce the severity of these impacts?

Local perspectives can identify additional, indirect impacts from lived experience. Shocks and stressors that disproportionately impact historically marginalized and vulnerable communities should be prioritized.

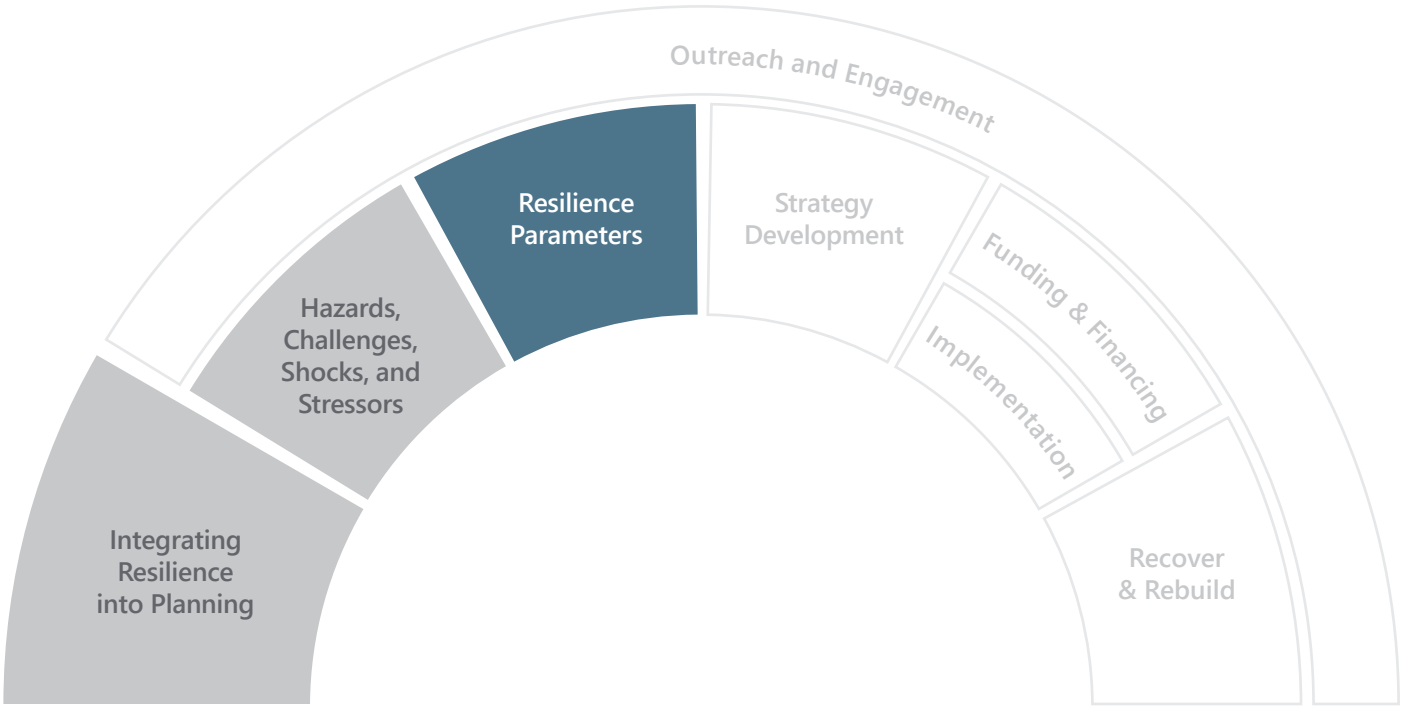
Ventura County



Joshua Tree National Park,
Twentynine Palms, CA
Jeff Ambrose, Adobe Stock

DEFINE PARAMETERS OF RESILIENCE PLANNING

03



OVERVIEW

Shocks, stressors, and their related impacts fall into broad categories that can be aligned with different planning processes. For example, local hazard mitigation plans address natural disasters, general plans consider the built environment and social stressors, and economic development strategies address economic conditions. After shocks and stressors are identified, they can inform the development of key resilience planning parameters, including the type of resilience planning effort needed. Defining clear parameters through an iterative process can focus efforts and guide jurisdictions to identify where and how to incorporate resilience to maximize benefits and minimize costs. Parameters can include timeframes, goals, community priorities, and other considerations.

WHY IS THIS IMPORTANT?

Defining goals, scopes, and timeframes can identify the plans and programs into which resilience can be integrated, helping communities to align efforts, reduce costs, and improve outcomes across sectors. This chapter equips users with steps to outline key planning parameters, from defining resilience to selecting a planning framework. Local shocks and stressors should inform the establishment of clear planning parameters, which can then lay the groundwork for effective, long-term resilience.

Getting input from the community helps make sure the resilience definition fits local needs and values. Working together with community members makes the definition more meaningful for them, helps them feel included, and encourages everyone to support resilience.

NAVIGATING THE PROCESS

3.1

DEFINE RESILIENCE

Resilience has different meanings across geographic areas, communities, and sectors. Jurisdictions should develop their own definitions of resilience based on present and future risks and goals. SCAG's definition (in Section 1.3) can be used as a starting point. Consider the key priorities, values, and unique characteristics of a jurisdiction to develop initial definitions for stakeholder and community feedback, which can be further refined in an iterative process.

3.2

IDENTIFY PLANNING TEAM AND LEADERS

A jurisdiction (or organization, agency, community, etc.) should establish formal groups or a point person to lead resilience efforts. The people or team in charge of resilience will vary based on the type of plan and by jurisdiction. For instance, the duties of a sustainability office, sustainability officer, or emergency manager can be expanded to include resilience planning. Responsibilities and tasks can also be incorporated within multiple departments. A sustainability manager might be tasked with implementing recommendations from the findings of a climate resilience assessment, while public health and emergency management departments might work together to improve access to healthcare during emergencies. Planning efforts are often led by a small, core team of staff and supported by a larger working group composed of representatives from other departments. Establishing this working group is often part of an engagement plan (see Section 4.2) and should consider how vulnerable or impacted communities are represented in the decision-making process.

3.3

SELECT A PLANNING FRAMEWORK

Increasingly, California jurisdictions are developing standalone resilience plans, such as a climate adaptation plan or wildfire resilience plan, to cast a spotlight on core emerging challenges. At the same time, many jurisdictions also choose to incorporate resilience into existing plans, programs, and regulations, motivated both by legislation (e.g., SB 379), and the benefits of an integrated approach to resilience. Integration can reduce silos, align multiple planning efforts, and facilitate implementation through existing funding structures to enhance resilience across planning, policymaking, and implementation. The choice between a standalone plan or an integrated approach will depend on the specific focus areas, and the jurisdiction's immediate and long-term priorities, needs, and resources (e.g., grants available to update a particular plan). **Table 5** details some of the factors to consider when making this determination. See Section 9.2 for examples of standalone plans and integrated plans and their opportunities to incorporate resilience.

Notably, this is not a binary choice, and jurisdictions may take both approaches, depending on their capacity and prior planning efforts. It is increasingly recognized both as best practice and in some cases as a statutory requirement that resilience must be integrated into other planning processes, such as general plans, housing elements, and capital improvement programs. For example, after conducting a wildfire plan, jurisdictions can then integrate its policies and strategies throughout relevant plans and programs (e.g., safety element, housing element, and evacuation plans).

Hazard Mitigation Plans and FEMA Funding

Adopted and approved hazard mitigation plans are required for eligibility for certain non-emergency FEMA funding sources, including the Hazard Mitigation Grant Program or other Hazard Mitigation Assistance Programs.

Table 5 Resilience Planning Tools and Resources

Considerations	Standalone Resilience-Focused Plan	Integration into Existing Plans
Example	Resilience strategy, climate adaptation plan	General plan, capital improvement plan, long-range transportation plan
Key characteristics	A standalone plan focused on resilience either across multiple topics or sectors, or within a single hazard or sector.	Embeds resilience goals and actions in plans where there is most overlap with resilience issues.
	Brings together resilience-focused goals, priorities, and actions into one plan.	Highlights how existing policies and planning efforts can be strengthened to address resilience.
What resources are available?	Developing a new, standalone plan may require additional budget or staff capacity, including for future updates.	Existing funding and resources may already be allocated for updating existing plans. Embedding resilience may require only a smaller, additional cost.
		Can leverage existing team and relationships to jump-start the process.
What is the level of focus on resilience?	Shocks that are a high priority or topics important to the public may require their own plan to spotlight key initiatives and make sure they receive sufficient attention and resources.	Resilience might not be key focus of plan, but one of multiple goals and priorities.
	Climate adaptation, sea level rise, and wildfires are some examples of topics growing in importance for Californians.	Resilience can be effectively incorporated across a range of topics that are the focus of local planning, such as active transportation, capital improvements, vegetation management, and road maintenance.
What support is there for implementation?	New plans might require additional staffing or resources to support implementation and track progress. However, strategies from standalone plans often address existing policies and actions and can be incorporated into existing plans.	Embedding resilience within existing plans can allow jurisdictions to take advantage of existing planning processes and funding and implementation mechanisms.
Other considerations	A standalone resilience plan often includes a visioning or goal-setting process, allowing community members to share their key resilience concerns.	Training might be needed so that planning teams are familiar with key emerging resilience concerns for their planning areas.
	Plan alignment can be a key recommendation and allows for integration into ongoing efforts.	Make sure that resilience is not dropped from future updates as jurisdiction priorities shift.

SOUTH ORANGE COUNTY REGIONAL COASTAL RESILIENCE STRATEGIC PLAN

Orange County

FUNDING **$214,500**

Proposition 68 grant award from the Ocean Protection Council; federal sources such as the Infrastructure Investment and Jobs Act and the National Coastal Resilience Fund; and local revenue streams like the Transient Occupancy Tax and cost-sharing agreements among municipalities.

PARTNERS

Orange County Parks with key partners such as the California Coastal Commission, the U.S. Army Corps of Engineers, San Diego Association of Governments, State Parks, the city of San Clemente, and local stakeholders, including Tribes and advocacy organizations.

SHOCKS/ STRESSORS ADDRESSED

Coastal Erosion

Sea Level Rise

OVERVIEW

Completed in June 2024, the South Orange County Regional Coastal Resilience Strategic Plan serves as a framework to develop a regional multi-agency, multi-sector collaborative that can implement programs to enhance coastal resilience along an eight-mile stretch of shoreline in South Orange County.[†]

The plan's primary innovation lies in exploring creative governance structures for regional collaboration that enable agencies to coordinate planning, pool resources, align priorities, and implement unified actions. The plan evaluates various governance models, such as joint powers authorities (JPAs), which allow multiple agencies to form a new agency that can receive funding, plan projects, and acquire permits and environmental approvals. JPAs can facilitate large-scale projects like regional sand retention programs and hybrid green-gray solutions.[††] This approach ensures that resilience initiatives are not only comprehensive but also adaptive to emerging challenges like shifting coastal dynamics and funding opportunities. The plan also evaluates the utility of more informal structures established through memoranda of agreement (MOAs) or memoranda of understanding (MOUs), which define roles and responsibilities among agencies, promoting efficient collaboration without creating new entities.

By focusing on governance, the plan ensures that resilience initiatives are integrated across jurisdictions, leveraging collective expertise and funding opportunities. This approach facilitates coordinated implementation and engagement with underserved communities—maximizing the impact of resilience measures across regional coastal landscapes.

In addition, the plan creates a replicable framework for stakeholders to prioritize projects based on integration of ecological, economic, and engineering objectives. The framework was utilized throughout an iterative external engagement process, which targeted underserved communities. This framework can offer insights for addressing similar challenges in coastal urban regions.

LESSONS LEARNED

Align and coordinate on regional priorities. The plan demonstrates how governance models such as JPAs, MOAs, and MOUs can align regional priorities and support coordination to build resilience across shared coastal landscapes. A collaborative, multi-agency structure can facilitate efficient implementation by strengthening funding applications, supporting data exchange, enabling cost sharing, enhancing engagement opportunities, streamlining permitting processes, and coordinating implementation actions.

Stack funding streams to maximize project budgets. To develop the plan, agencies leveraged multiple funding sources, including Proposition 68-funded grant from the Ocean Protection Council, federal funds from the Infrastructure Investment and Jobs Act and the National Coastal Resilience Fund, local revenue streams like the Transient Occupancy Tax, and cost-sharing agreements among municipalities. Assembling diverse funding sources is critical to support larger projects, whether within a single or multiple jurisdictions; challenges could include aligning multiple grant timelines and requirements. Ongoing financing mechanisms like taxes can provide leverage or local match for one-time funding sources, especially if the jurisdiction can connect resilience initiatives with long-term economic health (in this case, coastal resilience drives tourism and visitors, justifying the use of the transient occupancy tax).

Design resilience plans to address multiple benefits. Resilience plans can and should address multiple benefits—not just climate change, but also recreation, economics, public access, infrastructure, etc. Engagement across a broad range of stakeholders can help identify priority co-benefits in the planning area. For example, Orange County stakeholders strongly preferred nature-based sea level rise strategies, such as beach nourishment, over engineered solutions that could reduce recreation and public access.

NEXT STEPS AND IMPLEMENTATION

The plan spans 10–50 years, with near-term pilot projects underway. Continued collaboration and successful funding acquisition will be critical to moving the plan from concept to implementation. Near-term pilot projects, such as the San Clemente Beach Nourishment Program, will deliver substantial benefits while establishing a foundation for regional expansion. These pilot projects not only address acute erosion issues, but also test feasibility, demonstrate solutions, and generate momentum for the overall strategy, building public and stakeholder confidence. Implementation is guided by robust regional partnerships facilitated through MOAs and MOUs, defining roles and streamlining coordination across jurisdictions while pooling resources to support large-scale projects. While no formal governance models have been adopted for the South Orange County shoreline yet, pilots and relationship-building have enabled progress on regional challenges such as sedimentation management and beach nourishment between partners such as OC Parks, California State Parks, San Diego Association of Governments, the city of San Clemente, and the city of Dana Point. At the same time, individual jurisdictions continue to pursue initiatives on their own, such as the city of San Clemente's Nature-Based Adaptation Project Feasibility Study.

ADDITIONAL INFORMATION

Project Resources

South Orange County Regional Coastal Resilience Strategic Plan

† OC Parks. (2024). South Orange County Regional Coastal Resilience Strategic Plan. https://www.ocparks.com/sites/ocparks/files/2024-06/South%20Orange%20County%20Regional%20Coastal%20Resilience%20Strategic%20Plan_FINAL.pdf

†† Green-gray solutions combine nature-based solutions ("green"), such as rain gardens or green roofs, and engineered systems ("gray"), such as seawalls or pipes, for more effective and cost-efficient outcomes in climate resilience projects.

Best practices for plan integration and alignment include:

Coordination
Coordination during the planning process is critical to avoid silos and develop actionable plans and strategies that support one another. Consider which planning efforts and departments could be affected by each resilience planning effort and invite relevant stakeholders to participate at key points in the planning process, such as scoping and review.

Scope of Work
Effective integration of resilience into the plan's scope of work, including engagement and technical analysis, is essential to ensure that resilience is not treated as a separate initiative or an afterthought but a core component. Examples include tailoring community engagement activities to surface local resilience-related challenges and priorities, developing or updating a climate action and adaptation plan as part of a general plan update process, and incorporating resilience goals into visioning, policy development, and implementation frameworks. This integrated approach enables resilience to be budgeted for and addressed throughout the planning process, including plan review and evaluation.

Plan Alignment
Based on the outcomes of standalone resilience plans, update or align other plans to ensure consistency and effectiveness. For instance, a general plan may identify a waterfront district for economic development, while a climate vulnerability assessment may call for evaluation of sea level rise impacts on new development. In this case, the climate vulnerability assessment's recommendations should be included in subsequent specific plans and economic development plans, so that new developments will account for higher sea levels in infrastructure design and deploy nature-based solutions to reduce impacts.

A CLOSER LOOK AT STANDALONE RESILIENCE PLANS

Many jurisdictions opt to develop standalone resilience plans as comprehensive guides to proactively address and manage shocks and stressors and build resilience. These include Local or Multi-Jurisdictional Hazard Mitigation Plans (HMPs), Wildfire Mitigation Plans, and Disaster Recovery Plans. Climate Adaptation Plans are also increasingly developed to address resilience, often combined with Climate Action Plans. Together, they provide a structured approach to mitigating stressors and hazards, preparing for impacts, identifying resilience strategies, and supporting effective recovery. These plans are most effective when they are tailored to local risks and integrated with long-term resilience goals. Jurisdictions can use one or a combination of these plans for the most appropriate planning method for their communities.

LOCAL OR MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

A hazard mitigation plan aims to reduce loss of life and property by minimizing the impact of disasters. A Local Hazard Mitigation Plans (LHMP) focuses on specific hazards, vulnerabilities, and mitigation strategies within the boundaries of a single city, county, or local agency. A multi-jurisdictional HMP addresses hazards that affect multiple jurisdictions, requiring collaboration and coordination among participating agencies. Hazard mitigation plans must be updated every five years to remain eligible for FEMA mitigation funding. Whether agencies develop a local or multi-jurisdictional plan will depend on their resources and goals; **Table 6** describes some of the potential considerations for each. For those participating in an HMP, completing a jurisdiction-specific risk assessment will still be important to tailor mitigation and planning strategies. FEMA provides detailed guidance and resources on the hazard mitigation process, including instructions and templates.

Table 6 Considerations for a Local or Multi-Jurisdictional Hazard Mitigation Plan

Advantages	Considerations
Local	
Allows for a focused approach to address unique local hazards and vulnerabilities in detail with full community control of the planning process. It involves fewer stakeholders and can make coordination and decision-making more straightforward.	A smaller jurisdiction may have fewer resources and expertise to develop, implement, and maintain the mitigation plan. There can also be potential duplication of efforts with neighboring jurisdictions.
Multi-Jurisdictional	
Allows for pooling of resources, expertise, and funding to enhance the effectiveness of wide-ranging mitigation strategies for hazards that affect multiple jurisdictions, and promotes cross-communication, collaboration, and cooperation among different jurisdictions and governing bodies.	Requires complex coordination and extensive documentation for multiple jurisdictions, which may have differing priorities, capabilities, and hazard history.

WILDFIRE MITIGATION PLANNING

Wildfire mitigation planning encompasses a number of plans and approaches to support communities to reduce wildfire risk, build preparedness, and enhance community resilience. While LHMPs and HMPs evaluate wildfire risk, they do not replace the need for focused wildfire planning efforts, particularly in high-risk areas. The following components have become increasingly common tools to reduce wildfire risk in California:

Community Wildfire Protection Plans (CWWPs)
CWPPs are a core component of a wildfire mitigation plan that addresses unique conditions, values, and priorities for wildfire risk reduction. They often serve as the foundation for other wildfire-related strategies. Because CWPPs are highly localized, communities can prioritize actions based on specific vulnerabilities and values. They can also help secure funding and support from state and federal agencies. However, CWPPs can vary widely in quality and scope depending on local capacity and resources and can lack enforcement mechanisms if not integrated into broader planning frameworks.

For example, the city of Santa Barbara's Wildfire Protection Plan (2021) provides a clear framework to reduce wildland fire impacts. Funded by a California Department of Forestry and Fire Protection Fire Prevention Grant, it updates the city's 2004 Wildland Protection Plan. MySafe:LA—a public-private partnership with the city of Los Angeles Fire Department—is currently developing a FEMA-funded, community-driven CWPP for the city of Los Angeles to improve fuel management and evacuation strategies and promote community awareness.

Hollywood Beach, Oxnard, CA
Mike Kitchen, Unsplash

Fire Safe Councils and Firewise Communities

- Vegetation management plans (VMPs) are often developed as standalone plans or integrated within a wildfire mitigation plan. VMPs outline strategies for managing vegetation to reduce wildfire intensity and spread, including mechanical thinning, prescribed burns, defensible space creation, and ecological restoration. VMPs commonly address fuel load, one of the most controllable aspects of wildfire risk, and can be tailored to local ecosystems and land use patterns. However, plan implementation can be costly (e.g., for environmental review) and labor-intensive and can sometimes face regulatory blocks or community opposition, especially in areas with sensitive habitats.

- Emergency preparedness plans (EPPs) may be developed as standalone documents or within a wildfire mitigation plan. EPPs focus on readiness and response, agency coordination, community drills, and communication systems to ensure timely, effective evacuation and emergency response. They also consider evacuation routes, emergency notifications, and public education strategies. EPPs can improve response during wildfire events but their effectiveness depends on regular updates, interagency communication, and public participation, which can all be challenging to maintain over time.

DISASTER RECOVERY PLAN

Risk Assessment
Risk assessment to identify critical governmental services and functions that are essential and would require quick restoration, specifically operations, information technology (IT) systems, physical infrastructure, and staff.

Emergency Response Procedures
Emergency response procedures for different types of disasters, prioritizing public and agency staff safety. Response procedures and plans aim to maintain communication across chains of command and relevant stakeholders during an active event.

Technology Security and Recovery Strategies
Technology security and recovery strategies to support regular data backup and swift restoration of IT systems and applications following a disaster event.

Roles and Responsibilities
Roles and responsibilities for disaster recovery staff should be clearly identified in advance to manage the recovery process. Regular training and desktop drills are essential to maintain preparedness.

CLIMATE ADAPTATION AND ACTION PLAN

Climate adaptation and action plans are increasingly critical tools for building long-term community resilience to climate change. These plans may be developed as standalone documents or integrated into broader climate action plans. A combined Climate Action and Adaptation Plan can offer a holistic approach to climate resilience. Key components typically include:

Climate Vulnerability Assessment
Identifies populations, infrastructure, and systems at greatest risk to climate-related hazards such as extreme heat, flooding, sea level rise, wildfire, and drought.

Adaptation Strategies and Prioritization
Outlines specific actions to reduce climate risks, such as green infrastructure, cooling centers, floodproofing, and land use changes. These strategies are often prioritized based on feasibility, cost effectiveness, and equity impacts.

Greenhouse Gas Mitigation Measures
Increasingly, jurisdictions are focusing their climate planning efforts on both mitigation, i.e., reducing greenhouse gas emissions, and adaptation. When integrated, a combined adaptation and mitigation approach can result in synergies that increase resilience and reduce emissions. For example, electrifying buildings, adopting renewable energy, and expanding mobility options can increase resilience through improved air quality and energy and transportation affordability.

Monitoring and Implementation Framework
Establishes metrics, timelines, and responsible parties for tracking progress and updating the plan. Some jurisdictions also include indicators and dashboards to communicate progress transparently.

Examples of climate action plans in the SCAG region with resilience strategies include the Long Beach Climate Action Plan, LA County Climate Action Plan, city of Riverside Climate Action and Adaptation Plan (in progress), and Santa Monica Climate Action and Adaptation Plan.

3.4

ESTABLISH SCOPE

A project's scope defines the purpose and need for the assessment. Considering the following can help toolkit users determine the scope of their plan or project.

Who or what triggered the planning process. Resilience work is often driven by triggers. These can be chronic stressors, immediate and ongoing challenges, recent disasters, new regulations, local or national trends, or business and investments. The instigator may be an agency, a regulation, pressure from the community, the desire to prevent new disasters, or neighboring jurisdictions. Identifying the trigger can ensure the plan or project is designed specifically to meet the needs of the jurisdiction or community.

The lens through which the plan is being developed. Is the plan rooted in climate change resilience, sustainability, housing, or transportation planning, infrastructure design and investment, economic development, or another related issue? Is the focus on resilience broadly, or resilience as it relates to a specific topic, community, or sector?

The community's vision for the future. What are the goals and objectives of the community today, in the next five years, or 20 years from now? This may be informed by the timeframe of the plan, discussed in Section 3.6.

If shocks and stressors have been integrated into other plans. What is the current understanding of existing and future conditions, shocks, and stressors based on existing plans?

Resources available for resilience planning. What tools or datasets can inform the planning process and measure outcomes?

The timing of other plan and policy updates. What is the timing of other policies and plans that will be developed or updated, including those at other levels of government? For example, the update of a safety element or local hazard mitigation plan will generate recommendations that other plans should align with.

Who has been engaged in previous planning processes. What communities or experts participated in previous planning efforts?

3.5

SET RESILIENCE GOALS

Goals provide overarching guidance for the project team, decision makers, and stakeholders. Setting goals builds transparency into the planning process, lays the groundwork for future planning decisions, connects to metrics, and aids in monitoring the effectiveness of implementation. During the goal-setting process, existing goals from other plans can be adapted if they relate to resilience. Engagement with stakeholders such as residents, businesses, leaders from key departments, and community-based organizations (CBOs) can help ensure the goals reflect community needs and priorities.

Working with stakeholders like residents, businesses, department leaders, and community-based organizations helps ensure the goals align with the community's needs and values.

3.6

TIMEFRAME

A planning timeframe is the future time horizon over which planning is conducted. Establishing a clear planning timeframe (e.g., 2030 or 2045) can support goal-setting, guide projections or assumptions around future conditions, and prioritize and phase strategies.

Identifying a planning timeframe allows assumptions about future conditions using data-informed projections that account for uncertainties such as population growth, technological advancements, climate conditions, and natural hazards. Many long-range plans, such as general plans and regional transportation plans like Connect SoCal, are built around future timeframes and associated projections for population, housing, land use, and transportation. These plans often outline specific strategies, policies, and investments designed to meet long-term goals.

On the other hand, some planning efforts use a present-day planning horizon to achieve short-term resilience. For example, the 2021 Santa Barbara CWPP establishes policies and actions across topics such as codes, standards, and public education to minimize wildfire impacts in the near term. Although the plan discusses the implications of climate change on wildfire risks, the primary focus is on existing risks.[8]

Thus, planning horizons can provide a structured timeframe for developing and implementing strategies that address both current and future conditions. The type of planning process and its intended outcomes will determine the choice of timeframe.

[8] City of Santa Barbara, California Community Wildfire Protection Plan

Historic Center of Mexicali, Calexico, CA
Victor, Adobe Stock

RESILIENT INLAND EMPIRE

Counties of Riverside and San Bernardino

FUNDING **Adaptation Planning Grant from Caltrans**

Phase I	Climate Vulnerability Assessments and Adaptation Plans, Guidebook, & Toolkit	**$430,000**
Phase II	Analyses for Smart Climate Resilient Transportation Planning and Investments	**$650,000**
Phase III	Emergency Evacuation	**$1.5M**

PARTNERS **Western Riverside Council of Governments and San Bernardino County Transportation Authority**

SHOCKS/ STRESSORS ADDRESSED

- **Extreme Heat**
- **Wildfire**
- **Flooding**
- **Landslides**

OVERVIEW

Resilient Inland Empire (IE) is a regional partnership between the Western Riverside Council of Governments (WRCOG) and the San Bernardino County Transportation Authority (SBCTA) to support efforts to address climate risks to transportation infrastructure. WRCOG and SBCTA were awarded multiple rounds of funding, including from Caltrans, to initiate and build on the project.

Resilient IE provides a collection of resources, including data on climate-related hazards and tools for developing and implementing climate adaptation and resilience strategies to reduce climate risks. The overarching goal of Resilient IE is to make it easier for local jurisdictions to embed resilience in their planning documents and infrastructure improvements.

In the first phase, the project developed subregional climate vulnerability assessments and adaptation plans, a regional climate resilient transportation infrastructure guidebook, and a comprehensive toolkit with resources on how to implement climate adaptation and resilience strategies. As part of this initial phase, Resilient IE established the Southern California Climate Collaborative (ISC3) to facilitate community engagement efforts. ISC3 brought together agencies, organizations, and companies, coordinated by CivicWell and Climate Resolve. The network facilitated workshops, leadership summits, and working groups for elected officials, planners, and community leaders to effectively build a shared understanding of the region's climate risks and opportunities. In 2023, University of California, Riverside, assumed responsibility for coordinating ISC3.

The second phase of the project, from 2020 to 2022, conducted more in-depth analyses on highly vulnerable transportation assets. This phase continued engagement and collaboration through ISC3 and expanded upon the pilot projects in Phase I to estimate costs of climate risks and different adaptation options. The Phase III of the project prepares adaptation frameworks based on findings from Phase I and II, which involves engaging with the community and identifying policies and implementable strategies for adapting to climate change.

LESSONS LEARNED

Identify ongoing resources to maintain long-term multi-jurisdictional partnerships.
The formation of multi-jurisdictional collaborative bodies such as the ISC3 provides a forum for addressing diverse hazards and pooling limited resources. However, keeping these partnerships going takes effort—it requires time, staffing, and funding to manage projects, facilitate meetings, and coordinate shared initiatives. It also requires a sponsoring organization to act as a fiscal agent.

Ensure evacuation routes account for climate-related hazards such as floods, wildfires, and landslides.
For Resilient IE, this process involves analyzing extensive data on proposed routes and identifying intersections with hazard-prone areas and at-risk communities. By engaging local governments, emergency planners, and vulnerable communities through workshops and feedback loops, Resilient IE developed tailored maps to address specific climate risks.

Build time for data collection into project schedules.
From past experience with greenhouse gas inventories, Resilient IE recognized that gathering data often takes longer than expected. They anticipated this challenge in the vulnerability assessment process and allocated sufficient time for data collection in addition to proactively identifying data sources during the process of applying for project funding.

Align with local priorities.
Development is the primary focus of many fast-growing jurisdictions in the Inland Empire, and climate resilience initiatives that are not legally required can receive limited attention. True engagement comes from relationships and one-on-one engagement with staff interested to build resilience expertise and awareness. Even with strong relationships, jurisdictions could face difficulties translating technical guidance into fully funded, actionable steps. To move from planning to action, Resilient IE offered hands-on assistance when possible.

NEXT STEPS AND IMPLEMENTATION

Resilient IE will continue to identify transportation-related priorities, provide guidance, and facilitate collaboration and engagement with jurisdictions to advance adaptation efforts identified in adaptation plans for Riverside and San Bernardino counties.[†] The partnership is currently finalizing jurisdiction-level evacuation assessments to help comply with California Assembly Bill 747, which requires cities and counties to identify evacuation routes and evaluate the route capacity, safety, and viability under various emergency scenarios. This phase will expand the evaluation route analysis from a local to a regional scale to identify system-wide vulnerabilities and investments that address broad, regional issues. Longer-term, Resilient IE hopes to update the information in the toolkit to reflect the best available data, climate projections, and adaptation strategies.

ADDITIONAL INFORMATION

Resilient IE Project Resources

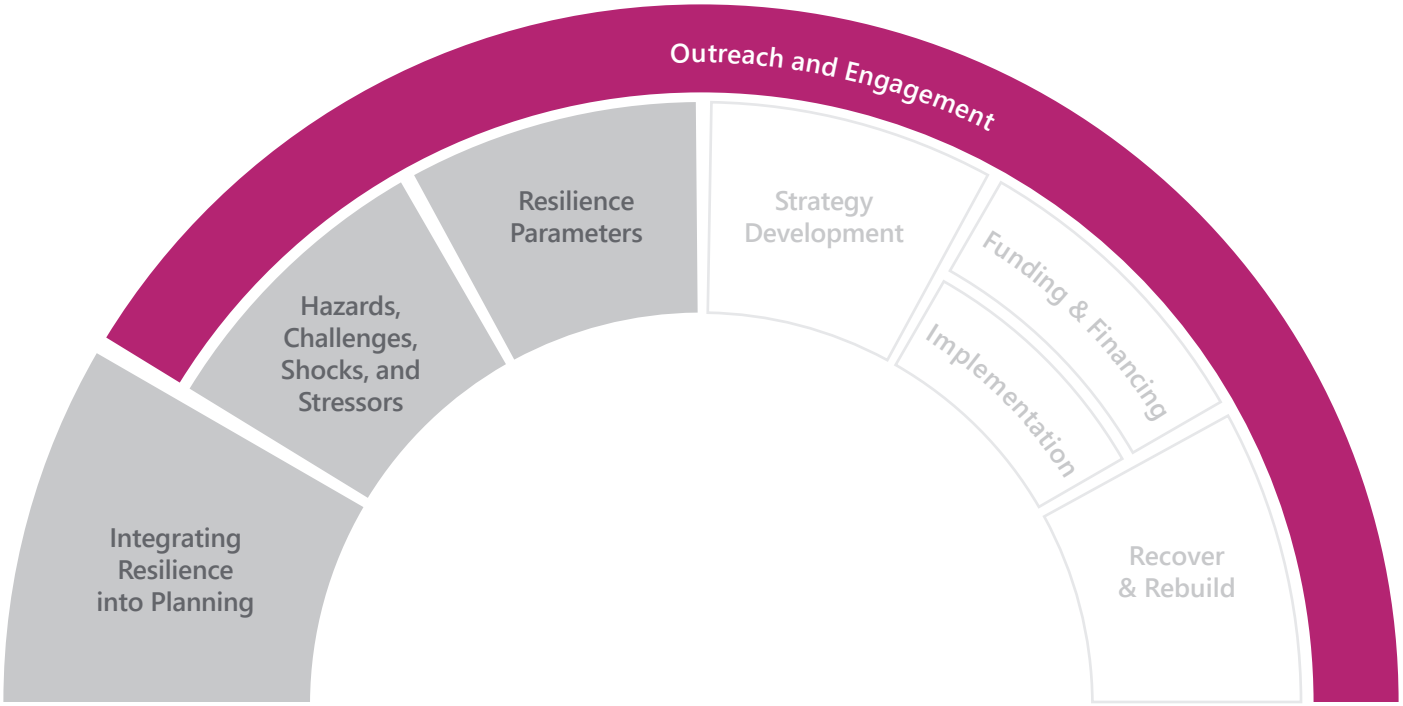
Climate Resilient Transportation Infrastructure Handbook

† Western Riverside Council of Governments. (n.d.). Western Riverside Adaptation and Resiliency Strategy: Part 2, Adaptation Strategies. https://www.wrcog.us/DocumentCenter/View/12345/Adaptation-and-Resiliency-Strategy-Part-2

Members of the watershed protection team for the Palisades Fire burn scar area, including Cal Fire and Cal OES personnel, as well as Watershed Protection Specialists from the California Department of Water Resources (DWR), the Central Valley Flood Protection Board (CVFPB), and the California Department of Transportation (Caltrans) on Zuma Beach in Los Angeles County, California.
Ken James/DWR

COMMUNITY AND STAKEHOLDER ENGAGEMENT

04



OVERVIEW

Community input and subject matter experts can provide critical input to inform all stages of resilience planning, from shock and stressor identification to strategy development and implementation. Failing to incorporate community needs and challenges or stakeholder expertise may result in planning that does not fully account for all shocks and stressors. Throughout the toolkit, **pink call out boxes** identify points at which engagement would be beneficial.

Engagement has many benefits for resilience planning. Engaging with stakeholders can:

- **Ground truth data and community needs and priorities.** Community members provide specific local knowledge that can be used to verify shocks and stressors, their interactions, and cascading impacts.
- **Identify potential solutions and opportunities.** Diverse experiences and perspectives can lead to innovative, culturally appropriate solutions.
- **Identify potential barriers such as regulatory issues,** implementation considerations, funding challenges, or community opposition before the plan is finalized.
- **Identify trusted communication channels and partners.** Understand the best ways to reach each community, as providing clear education and information can increase community resilience.
- **Refine and improve resilience strategies.** Once strategies have been developed, stakeholders can help make them more actionable for a specific jurisdiction or community and avoid unintended consequences.
- **Enhance trust and transparency.** Engagement with the public improves trust between jurisdictions and communities, paving the way for deeper engagement in the future.

Effective engagement requires thorough planning that should be initiated as early as possible. Continuous feedback at every stage of the planning process can strengthen the plan, making it more robust and comprehensive.

WHY IS THIS IMPORTANT?

Similar to resilience, engagement should be integrated into all plans and processes. Engagement enables the planning process to reflect both insights from stakeholders and community perspectives, needs, and priorities. For example, the lived experiences of residents in a community impacted by sudden or chronic flooding can identify gaps in emergency response or ongoing services, resource needs, and issues such as aging or maladaptive infrastructure. This chapter provides guidance on how jurisdictions can meaningfully engage vulnerable and impacted communities throughout the resilience planning process and emphasizes the importance of inclusive outreach.

NAVIGATING THE PROCESS

4.1

ENGAGE VULNERABLE AND IMPACTED COMMUNITIES

Effective engagement should seek input from the entire community and include a conscious effort to incorporate members of historically marginalized, vulnerable, and impacted communities, who are often the most affected by acute events and the least prepared to respond and recover. For example, vulnerable communities are more likely to lack access to (or afford) air-conditioning, to work outside, or to rely on walking and biking—all of which leaves them more exposed to shocks such as heat waves and wildfire smoke events. Planning processes that overlook the specific challenges and needs of marginalized communities risk leaving them behind, increasing their vulnerabilities. To build resilience, engagement should identify vulnerable and impacted communities and seek their input on shocks and stressors experienced, cascading impacts, desired strategies, and implementation opportunities.

When visualized, centering communities in resilience planning means inducing a shift from exclusion to belonging. Belonging is a state where everyone is recognized as a unique individual, differences are celebrated, and multiple communities can exist independently (**Figure 5**). When applied to resilience, this translates to grounding planning approaches to a "sense of belonging" among community members. More details on each element in Figure 5 can be found in Centering Equity in Climate Resilience Planning and Action: A Practitioner's Guide. Additional resources for engaging with vulnerable and impacted communities can be found on the SCAG website and Section 9.4.

4.1.1

IDENTIFY VULNERABLE AND IMPACTED COMMUNITIES

Identifying vulnerable communities is a critical first step in engagement. These communities should be engaged from the outset to ensure their voices are part of every stage of the planning process. Identifying communities enables planners to build trust, foster meaningful participation, and ensure that strategies reflect the lived experiences and priorities of those most at risk.

Federal, state, and local agencies have developed various tools and indicators to identify priority communities to target outreach efforts, investments, and policy benefits. Many agencies, including SCAG, have developed their own definitions to serve a distinct purpose. Jurisdictions should choose the definitions that best reflect their communities, using localized data or ground truthing where possible.

- SCAG Priority Equity Communities use nine indicators to identify census tracts that have a greater concentration of historically marginalized communities and are susceptible to inequitable outcomes. Each criterion is compared to the average in each county, as opposed to statewide averages.

- CalEnviroScreen uses 21 indicators to measure environmental, health, and socioeconomic conditions and identify communities disproportionately impacted by pollution and environmental hazards.

Equity describes the actions, policies, and practices that eliminate biases and barriers that have historically and systemically marginalized communities to ensure all people can be healthy, prosperous, and participate fully in civic life.

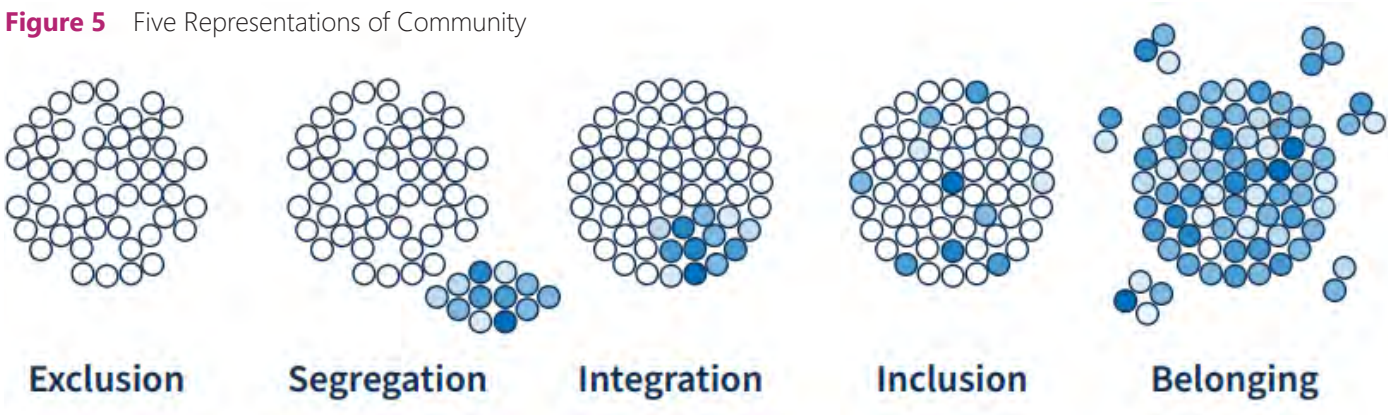
- Connect SoCal 2024

- The Healthy Places Index was developed by the Public Health Alliance of Southern California and measures social determinants of health, including education, employment, housing, and environmental factors. It helps identify communities with lower access to resources and higher vulnerability to economic, social, and climate stressors. The tool can highlight areas at greater risk of poor health outcomes, displacement, and economic disparities, and heat exposure.

- The Vulnerable Communities Platform (VCP) is a tool designed by the California Governor's Office of Land Use and Climate Innovation (formerly Governor's Office of Planning and Research) that aggregates maps of climate hazards and vulnerable communities. The tool provides a comparison of other social vulnerability tools (including CalEnviroScreen and the Healthy Places Index), helping users understand the strengths of each and how to use them together. Jurisdictions can use the VCP to identify communities that are most vulnerable to the impacts of climate change and other shocks.

- FEMA's National Risk Index (NRI) is a nationwide dataset and mapping tool that identifies communities most at risk from natural hazards. The NRI combines data on expected annual losses from 18 natural hazards with social vulnerability and community resilience indicators to highlight areas where hazard exposure overlaps with limited capacity to respond and recover.

Figure 5 Five Representations of Community



Adapted from "Centering Equity in Climate Resilience Planning and Action: A Practitioner's Guide," by the National Oceanic and Atmospheric Administration.

GREEN TOGETHER COLLABO-RATIVE

San Fernando Valley

FUNDING

Adaptation Planning Grant from Caltrans

TCC Program	**$23.0M**
Additional as leverage	**$38.7M**

PARTNERS

Pacoima Beautiful, in collaboration with partners such as GRID Alternatives, the city of Los Angeles, the Los Angeles Conservation Corps, Community Partners, Los Angeles Business Council, The Trust for Public Land, city of Los Angeles Department of Transportation

SHOCKS/ STRESSORS ADDRESSED

Air Pollution

Extreme Heat

Gentrification

OVERVIEW

The Green Together Collaborative is a partnership between organizations and government agencies focused on enhancing equity and resilience in Los Angeles' Sun Valley and Pacoima neighborhoods. These low-income, predominantly Latino communities face disproportionate exposure to pollution and lack access to environmental benefits. To date, the collaborative has advanced a solar panel installation program, tree planting, pedestrian improvements along major roads, mobility hubs, and battery-electric buses. Funded by the California Strategic Growth Council's Transformative Climate Communities (TCC) Program implementation grant, the project leverages more than $38 million in outside funding, from sources such as public funding (e.g., through projects by partner agencies) and foundation grants.

The collaborative uses a community-led approach to address challenges related to air quality, transportation, and heat. The project team engaged over 4,400 residents and local stakeholders to develop resilience goals, strategies, and projects aligned with their own community vision and priorities. The collaborative's multi-tiered governance structure—including a Steering Committee, an elected Leadership Council, and a Displacement Avoidance Plan Committee—ensures transparency, accountability, and ongoing community input. The collaborative's holistic community-centered approach is a valuable model for other jurisdictions.

The collaborative's success is rooted in its comprehensive, inclusive engagement strategy, led by grassroots environmental justice organization Pacoima Beautiful, which has decades of trust-building with residents and businesses. An elected Leadership Council composed of residents, business leaders, local elected officials, and community leaders provides input throughout the grant implementation process, resulting in the implementation of impactful capital projects, long-term capacity building, training, and leadership development.

The city of Los Angeles has played a pivotal role in supporting implementation efforts. The Los Angeles Department of Transportation introduced a new battery-powered bus route with 14 electric buses through the Pacoima community, enhancing sustainable active transportation. The Sanitation and Environment Department was instrumental in establishing the Bradley Plaza and Green Alley project, which replaced aging asphalt and added infiltration planters to improve stormwater management. The alley is the first shared street in Los Angeles, designed to slow down traffic and create a space for residents to gather.[†]

LESSONS LEARNED

Make events accessible to the community.
The collaborative's community-led planning process reduces barriers to participation and actively involves residents in decision-making. Best practices from public engagement include hosting meetings at convenient times, providing translations and childcare, prioritizing interactive events, and attending existing events. The collaborative also took care to culturally and linguistically tailor outreach efforts, including door-to-door canvassing, focus groups, home "charlas" (talks), social media updates, and traditional public meetings.

Recruit a diverse set of community leaders.
A crucial part of the collaborative's outreach approach is an elected Leadership Council composed of a diverse set of stakeholders: two residents, two local business owners, two community leaders, and a local elected official. These community leaders can leverage their existing networks to encourage resident engagement and participation.

Cultivate relationships with the City/County.
Partnerships with departments in the city of Los Angeles enabled multi-benefit projects to come to fruition, working alongside community organizations. City officials participate in the Leadership Council, ensuring alignment between city policies and community priorities.

Use a multifaceted approach.
The collaborative combines projects like tree planting, energy-efficient retrofits, cool roofs, and electric vehicle infrastructure with strategies to avoid displacement, recognizing that resilience should be addressed across environmental, economic, social, and public health systems.

Integrate workforce development and local business engagement into project development.
Resilience efforts can yield broader socio-economic benefits and bring awareness of climate hazards and risks to new audiences. The project's workforce development plan aims to create high-quality jobs and support inclusive economic development through business retention. Ongoing and planned activities include paid employment training opportunities in solar and conservation jobs, job search support for training graduates, and an employment resource center.

NEXT STEPS AND IMPLEMENTATION

The collaborative identified projects to enhance regional resilience through transportation (active transportation improvements, transit, mobility hubs), energy (rooftop solar), and heat mitigation (cool roofs, urban forestry, green infrastructure). These projects will reduce carbon emissions, improve mobility choices, create cooler urban environments, reduce air pollution, improve stormwater management, and develop an energy-resilient community hub. To build social and economic resilience, project implementation will be integrated with initiatives for green job training and employment. The collaborative designed a Displacement Avoidance Plan to help residents and small businesses stay in the community as improvements are made, which educated renters about available legal protections and conducted door-to-door outreach to ensure information reached all residents. The collaborative's next steps involve mobilizing resources, finalizing designs, and continuing to ensure community involvement at every stage to meet environmental and socio-economic goals.

ADDITIONAL INFORMATION

Green Together Collaborative

Pacoima Beautiful

Project Updates and Resources: UCLA Luskin Center for Innovation's Annual Reports – Tracking Groundbreaking Climate Action

† The Trust for Public Land, 2020." Bradley Plaza and Green Alley Project Completed." https://www.tpl.org/media-room/bradley-plaza-and-green-alley-project-completed

4.2

CONDUCT AN ENGAGEMENT PROCESS

Engagement should be considered, budgeted for, and conducted throughout the entirety of the resilience planning process. Where possible, leverage and build upon engagement activities for other planning processes. For example, identify opportunities to ask about resilience during engagement activities for a general plan or economic development plan, or develop joint activities. Review community input from earlier efforts and reflect that back to the community, so they know that past feedback has been heard and documented.

Prior or in parallel to the beginning of the project, develop an engagement plan. This plan should identify audiences, including vulnerable and impacted communities (Section 4.1), set goals and desired outcomes, align activity timing with planning and technical phases, outline strategies, and describe activities. For example, SCAG developed an Outreach Strategy as part of the Southern California Climate Adaptation Planning Guide that summarizes the approach for engagement activities throughout the project. Section 1.1 of the Outreach Strategy includes best practices for developing an engagement plan.

Figure 6 summarizes the type of feedback that should be sought from communities and experts at each stage in the resilience planning process.

1. **Understand Shocks and Stressors.**
   Engagement with both the general public and vulnerable and impacted communities can validate shocks and stressors and identify key needs, concerns, and priorities. Experts can provide technical assistance on data, modeling, scenario analysis, and insights on interdependencies among shocks and stressors.

   Example questions for community engagement include:

   - What disruptive events have affected your community—such as an economic downturn?
   - How would you identify communities that are at higher risk or more vulnerable to shocks and disruptions (for example, hazards, natural disasters, or recessions, etc.)?
   - Thinking of the future, what are your biggest concerns when it comes to issues that could seriously impact the health and well-being of your community on a regular basis?

2. **Define Parameters.**
   The public can provide input on local priorities, goals, and values and what resilience means to them. Experts can provide input on the project goals and framework, identify key systems and sectors that should be included, review scopes of work, and identify ways to align with regulatory and policy requirements.

   Example questions for community engagement include:

   - What do you value most about our community? What places do you particularly cherish?
   - Imagine this community thriving in 30 years. What does it look like?

3. **Develop Strategies.**
   The public can shape strategy development by articulating their needs and priorities. They can also express support or resistance to specific strategies, including providing suggestions to improve strategy implementation or identifying potential negative consequences (e.g., gentrification or displacement). Experts can provide input on strategy feasibility, phasing, effectiveness, engineering and design, and ability to integrate with existing plans.

   Example questions for community engagement include:

   - In what ways, if any, are community members currently prepared for shocks such as extreme heat, wildfires, earthquakes, extreme drought, pandemics, etc.? How can preparedness be improved?
   - How did community members cope with this shock or stressor? What services, resources, and programs did they seem to access the most? What services, resources, or programs would have been helpful?

4. **Fund and Finance.**
   Financing mechanisms that require voter approval will need extensive community outreach and engagement. Public input can also inform the development of new funding mechanisms such as climate resilience districts to make sure they are inclusive, incorporate public participation processes, and align with community needs. Expert input can help identify funding sources, build partnerships and new funding models, and provide input on long-term investments.

5. **Implement and Monitor.**
   The public can participate in monitoring and evaluation and share observations on strategy effectiveness, guiding adjustments in strategy design or new strategies. Experts can provide recommendations on adaptive management, evaluate outcomes, and develop lessons learned.

6. **Recovery.**
Public input during the recovery phase is critical to ensure that agencies can swiftly identify and address community needs. Engagement can also help to identify gaps and shortcomings in pre-disaster planning, which can be fixed before the next disaster. Expert input can help prioritize critical infrastructure needs, share lessons learned from prior disasters, leverage neighboring or parallel efforts, and develop solutions to enable "building back better," accelerating both current and future recovery efforts.

Figure 6 Opportunities for Stakeholder Engagement Along the Resilience Planning Process.

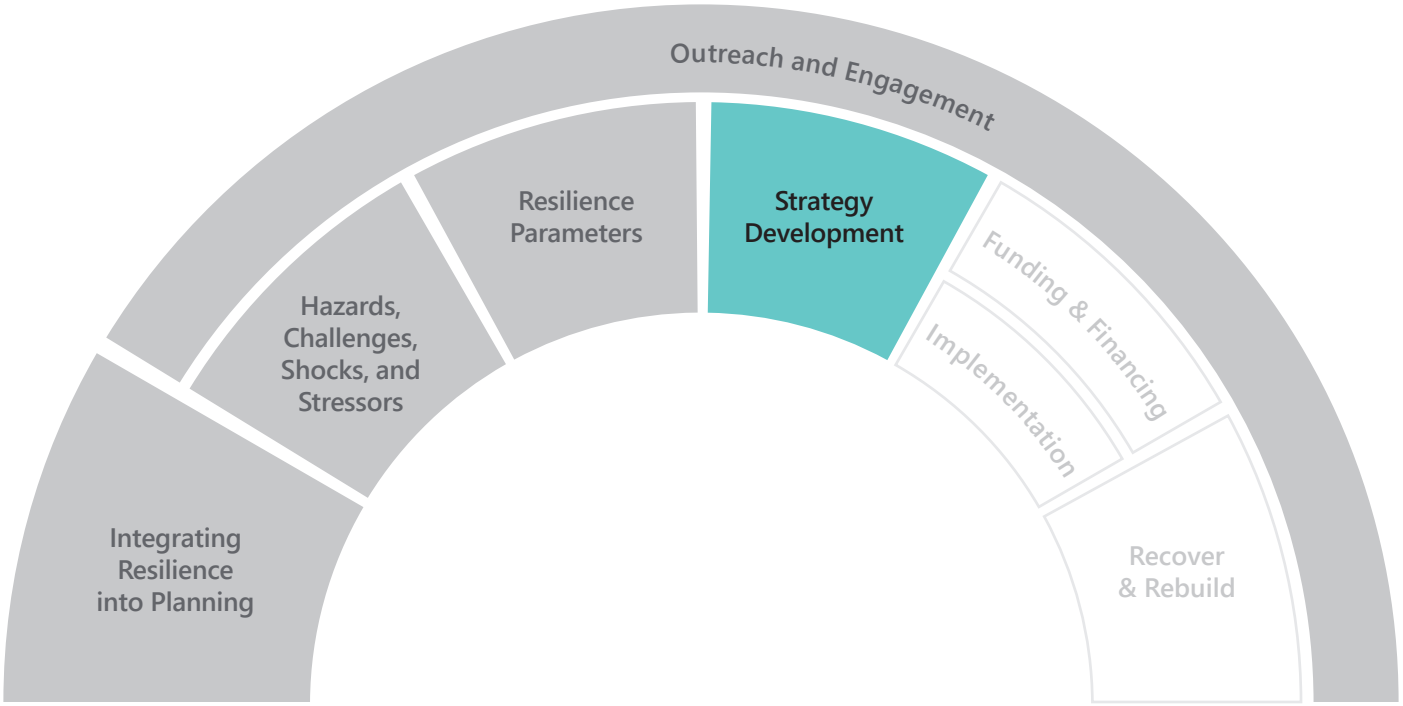
PROJECT STEPS		STAKEHOLDER ENGAGEMENT
Understand Shocks and Stressors Identify relevant shocks and stressors Analyze and prioritize impacts	1	**Experts** Identify compounding and cascading risks Recommend data sources and methodologies **Public** Provide initial reactions to results from shocks and stressors impact analysis
Define Parameters Define resilience Identify team and leaders Establish scope Set goals	2	Develop a stakeholder engagement plan that identifies engagement groups, a schedule, engagement activities, and outreach methods
Develop Strategies Understand different types of resilience strategies Evaluate and prioritize strategies	3	**Experts** Identify key shocks and stressors Input on feasibility of goals Suggestions for aligning with existing plans and regulations **Public** Feedback on parameters, vision and goals Community values and priorities Identify shocks and stressors that affect the community
Fund and Finance Understand available funding mechanisms (grants and tools) Develop funding and financing strategy	4	**Experts** Provide feedback on strategy effectiveness, legal and engineering considerations, and ability to integrate with other planning efforts **Public** Share concerns about trade-offs and preferences for types of strategies
Implement and Monitor Create an implementation program to move strategies from concept to reality Develop key performance indicators to track progress	5	**Experts** Provide feedback on funding and financing strategy Identify implementation barriers
Recovery Engage the public to identify gaps in pre-disaster planning Use expert input to prioritize infrastructure needs, share lessons learned, and coordinate solutions	6	**Experts** Analyze performance metrics Share recommendations for adaptive management **Public** Share observations on if changes are effective Suggest improvements

Source: Regional Resilience Toolkit

Omnitrans shaded bus shelter.

DEVELOP RESILIENCE STRATEGIES

05



OVERVIEW

Once shocks and stressors have been assessed and confirmed by stakeholders, the work moves to the heart of resilience planning: developing strategies and policies to respond. These resilience measures transform findings into practical, coordinated actions that address priority impacts and align with jurisdictional goals while integrating into current plans and processes.

WHY IS THIS IMPORTANT?

Transforming resilience assessments into actionable policies and strategies is essential to address priority shocks and stressors. By applying best practices, such as clarifying goals, evaluating trade-offs, and prioritizing impacts, jurisdictions can develop targeted, flexible strategies that avoid maladaptation, maximize co-benefits, align with community goals, and build long-term resilience. This chapter provides guidance on developing policies and strategies that address priority impacts, meet the goals or objectives of a given plan, and can be integrated into existing plans and processes. The chapter walks through the distinction between resilience strategies and policies, then describes best practices for strategy development and prioritization.

Embedding Resilience into a Capital Improvement Plan

The Capital Improvement Plan (CIP) can play a key role in mainstreaming resilience into projects and plans. The CIP process determines near- and long-term infrastructure needs, which should incorporate and address resilience considerations and challenges to maximize cost-effectiveness for public investments. Resilient infrastructure also boosts overall resilience for the jurisdiction. Thus, a CIP must focus on long-term goals, identify existing and future vulnerabilities, and prioritize specific projects for funding.

NAVIGATING THE PROCESS

5.1

UNDERSTAND TYPES OF RESILIENCE POLICIES AND STRATEGIES

Resilience policies set the guiding principles and direction for integrating resilience into plans, frameworks, and programs within a jurisdiction, while resilience strategies serve to implement policies through specific actions to improve resilience. Because resilience can be integrated across various planning processes, sectors, and scales, there are correspondingly many different policy and strategy types. **Policies** can be established in plans (e.g., general plans) or departments or adopted through ordinances and regulations. **Strategies** can be broadly grouped into four categories: programs, projects, research and tools, and coordination.

Addressing resilience challenges often requires layering multiple coordinated policies and strategies. For example, wildfire smoke—which is becoming a chronic challenge in Southern California, especially during wildfire season from fires both near and far—requires multiple strategies that must be implemented throughout the year to build readiness, such as engagement to educate communities, employers, and workers (program); funding and incentives for air filtration upgrades at homes, schools, and other sites (program); developing guidance for schools and athletic events (policy); and upgrading heating, ventilation, and air conditioning (HVAC) systems in trusted community spaces to establish a network of community-run cooling centers (coordination and project).

Establishing resilience policies can be foundational to strategy development. Policies can take a variety of formats, including planning policies, formal regulations and ordinances, city or county policies, resolutions, guidance, and procedures (**Figure 7**).[9] Examples may include updates to standards and codes for buildings or other infrastructure to embed resilience considerations and account for dependencies between systems (e.g., building codes consider not only energy efficiency but also maintaining safe temperatures during power outages). Policies may require updates to existing policies and additional planning, e.g., updating a hazard mitigation plan or developing a sea level rise plan, as required by SB 272 (2023).

Figure 7 Examples of Resilience-Related Policies.

LAWS	REGULATIONS
Create resilience-focused positions or establish resilience responsibilities Authorize creation of climate resilience districts Require sea level rise planning for coastal jurisdictions	Building codes related to shocks such as floods, wildfires, and earthquakes Requirements to protect workers from heat illness
RESOLUTIONS	**PROCEDURES**
Require adoption of resilience plans Establish 'awareness' days or months	Incorporate resilience criteria into budget processes Enforce resilience-related codes and standards

Source: FEMA, "National Resilience Guidance," 2024

Resilience strategies translate policy into actions that enhance a community's ability to prepare for, respond to, and recover from climate-related hazards. As shown in **Figure 8**, these strategies can take many forms and are typically grouped into four key categories, where each category reflects a different implementation method. Because resilience challenges often span systems and jurisdictions, strategies are most effective when layered and coordinated to address both immediate risks and long-term vulnerabilities.

[9] FEMA. National Resilience Guidance, pg. 23

VENTURA'S SURFERS POINT MANAGED RETREAT PROJECT

The city of Ventura's Surfers Point Managed Retreat Project is an example of a sea level rise resilience project that moved an oceanfront parking lot, pedestrian path, and bike path—which had all been experiencing erosion damage—inland. In 2023, the city of Ventura secured $16 million in grant funding for Phase II, which will continue the retreat process, restore the coast with dunes and native plantings, and build a new parking lot and multi-use path that will be protected by the dunes.

Surfers Point at Seaside Park, Ventura, CA
Adam, Adobe Stock

5.1.1

BEST PRACTICES FOR STRATEGY DEVELOPMENT

Strategy design depends on the type of plan under development, resilience goals, the stakeholders involved, and other planning parameters. Strategies will also depend on a jurisdiction's priority shocks and stressors, their impacts and consequences across immediate and mid- or long-term timeframes, additional community values and priorities, impacted communities, and stakeholder capacity, among other considerations. See Section 9.5 for example resilience strategies.

To begin, consider the following questions to guide the strategy identification and development process:

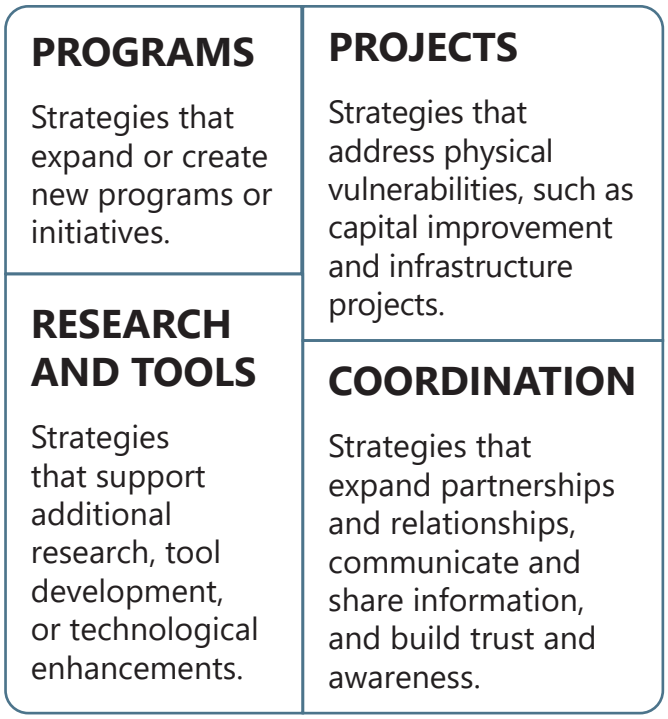
1. Clarify need and goals:

- Why is the strategy needed? What shocks and stressors does it address, and what communities are disproportionately impacted?
- What is the intended outcome of the strategy?
- How does the strategy align with current plans, programs, or policies?
- How does the strategy reduce or eliminate shocks and stressors and their impacts?

2. Think about how to implement the strategy:

- Who will be responsible for strategy implementation? Which stakeholders should be involved for successful implementation?
- What levers does the responsible agency have at its disposal? Identify whether the agency has regulatory authority, capacity, funding, or existing programs that could be leveraged.
- Whose input has informed or will inform the strategy? Ensure engagement has been conducted for all communities that will be impacted by the strategy.
- What are the potential unintended consequences or drawbacks? This can include maladaptation or harm to the environment, or vulnerable and marginalized communities.
- Can strategies be linked to desired outcomes, performance standards, or other metrics? Focusing on outcomes or performance standards can avoid tying strategies to specific technologies, which can become outdated. For example, indoor heat safety standards can be set at a desired maximum safe-temperature threshold of 82°F. Multi-faceted approaches that combine technology, community and building design, and green infrastructure could be utilized to achieve this objective.
- Consider a multi-pronged approach. Depending on the community or region, or the urgency and need for the strategy, it might be more appropriate to start with engagement and incentives, before moving into mandatory ordinances. Even when a mandatory ordinance is adopted, such as green infrastructure requirements for new developments, incentives can help support adoption, increase support, and facilitate participation within less-resourced communities.
- How can the strategy be adaptive or flexible? Adaptive management is a flexible approach that phases implementation based on key indicators and metrics. Indicators can assess the severity of shocks and stressors (e.g., a certain amount of sea level rise or the percentage of income spent on housing), while metrics can track the performance of the strategies. An adaptive management approach can help users navigate decision-making around uncertainty over the timing and severity of future impacts when determining the scale of strategy implementation, which can be phased based on measurable indicators or observable outcomes rather than preestablished timeframes.

Figure 8 Examples of Examples of Resilience-Related Strategies



Considerations for embedding resilience strategies into both new and existing plans that do not focus explicitly on resilience include:

- **What key topics does this plan address, and what shocks and stressors might be relevant over the planning horizon?** Refer to Chapter 2 to identify the shocks and stressors likely to impact the planning topic. For example, an active transportation plan may want to consider how extreme heat, flood risk, and sea level rise may affect planned bike routes.

- **How could these shocks and stressors change over the long-term?** In developing strategies, planners should consider the current state, future conditions, and cascading impacts for how they may affect the planning topic. For example, communities dependent on a single industry (e.g., winter recreation) might want to explore the impacts of future trends on that industry and strategies to diversify their economy.

- **How will plans and strategies interact with other topics, shocks, and stressors, both in the short- and long-term?** Every plan has the opportunity to contribute toward building resilience, and to be affected by unexpected shocks in turn. At the planning stage, it is important to consider how these interactions could affect resilience. A new master plan, for example, could propose greenfield development and should address a range of key questions such as:

  - What are the area's current and likely future vulnerabilities?

  - What is the range of potential hazard risks to the master plan area and what role does the area play in broader community resilience?

  - What points of ingress and egress would be needed to support emergency first-responder access and evacuations?

  - Are there specific building codes and design policies that should be integrated into the plan to reduce identified vulnerabilities?

  - Are there potential impacts on key ecosystem services currently provided by the area, and what role do these services play in local resilience? What policies and strategies should be established and deployed to preserve these ecosystem services?

  - How can the plan support a wide range of housing types, housing affordability and mobility options to enable a diversity of household types and income levels to build economic and social resilience?

  - What infrastructure investments are needed to increase resilience of the area and the broader community such as utilities (e.g., electric, water, stormwater, green infrastructure, etc.)?

  - What funding and financing approaches are available and most appropriate to develop and maintain the area with long-term resilience as a key priority?

- **What conversations and collaborations can define challenges and craft strategies?** To answer the example questions above, discussions with a wide range of stakeholders or charettes and workshops can improve understanding of cascading impacts. Consult with technical experts and CBOs early in the planning process to understand potential resilience implications for the planning topic. Use the planning process to build ongoing collaborations with internal and external stakeholders that can inform strategy development, and in later stages, apply for funding and support implementation. Integrate their feedback into broader agency activities, initiatives, and policies—not just the plan under development. The Headwaters Resiliency Partnership and the Ventura Wildfire Collaborative are two examples of collaborations in the SCAG region that support strategy and project identification, funding, coordination, and implementation.

- **Evaluate existing strategies.** Existing strategies in a plan already have the benefit of being vetted by agency leadership and approved through a public process. As agencies move from planning to implementation, review and refine these strategies in the context of priority shocks and stressors to strengthen their ability to build resilience. This could include, for example, incorporating future climate conditions in urban forestry policies. At the next plan update, incorporate these resilience refinements and considerations.

- **Review strategies with community members, stakeholders, and subject matter experts.** Community engagement can help jurisdictions to understand whether proposed strategies will address priority challenges, avoid maladaptation and negative consequences, and support more equitable outcomes. Engagement with stakeholders and agency partners can expand support for resilience strategies on a subregional or regional scale.

HEADWATERS RESILIENCY PARTNERSHIP

FUNDING

$1 Million

PARTNERS

San Bernardino Valley Municipal Water District, USDA Forest Service, CAL FIRE, Inland Empire Resource Conservation District, Southern California Mountains Foundation, National Forest Foundation, and California State University San Bernardino

SHOCKS/ STRESSORS ADDRESSED

Wildfire

Drought

Habitat Loss

OVERVIEW

In 2021, the San Bernardino Valley Municipal Water District (SBVMWD) launched the Headwaters Resiliency Partnership (HRP) to enhance collaboration on projects to sustain the watershed, natural resources, ecosystems, and communities in the Inland Empire mountains and foothills. Over two-thirds of the water supply in SBVMWD's service area originate in the headwaters of the Santa Ana River in the San Bernardino National Forest. An estimated one million residents and businesses rely on SBVMWD's services and stewardship of these water resources. Wildfires lead to increased runoff, reduction of groundwater recharge capabilities, water quality impacts from debris flows, facilities damage, and habitat destruction. The HRP aims to bring local and regional stakeholders together to build relationships and leverage their collective expertise to reduce wildfire impacts, protect key species, and restore habitats. The partnership aims to create solutions that are sustainable, resilient, restorative, evidence-based, integrated with local priorities, and scaled to meet needs.

The HRP aims to meet these objectives through activities like fuels reduction, community capacity building, native species habitat protection and restoration, education, and responsible recreation. The HRP will help implement actions outlined in other plans and programs, including the Upper Santa Ana River Habitat Conservation Plan (which aims to protect natural resources and species in the headwaters), the Forecast-Informed Reservoir Operation program (which increases flexibility in reservoir operations), and the SBVMWD Climate Adaptation and Resilience Plan (which aims to ensure investments are resilient to changing climate and hydrology conditions). The partnership includes various focus groups, including teams focused on projects related to environmental documentation and permitting, outreach and education, monitoring, and financing and funding.

LESSONS LEARNED

The unique design of the HRP can serve as a roadmap for other jurisdictions considering a similar endeavor.

Establish clear goals, roles and expectations.
Members participate in the HRP in addition to their primary job responsibilities, which can make it challenging to prioritize HRP-related tasks. Although the HRP aims to integrate projects with broader organizational priorities, assignments can often take a backseat to core duties. To address this, the HRP is developing a strategic plan that clearly defines expectations and establishes roles for all members, ensuring smoother alignment and accountability.

Collaborate to consolidate funding and streamline efforts.
The partnership fostered relationships and conversations that led SBVMWD and the Inland Empire Resource Conservation District to conduct Light Detection and Ranging (LiDAR) mapping across the region. Rather than conducting LiDAR mapping individually, partnering allowed the two agencies to pool resources and expand the scale and detail of the mapping project, producing detailed digital elevation data that both agencies use to inform forestry decisions, watershed management, and floodplain mapping. Similar partnerships can enhance research and implementation efforts throughout the region.

Be inclusive.
The HRP takes a "big tent" approach, welcoming staff from partner agencies and members of the public with a passion for improving the ecological health of the headwaters. Partnering brings together resources, expertise, and ideas and encourages collaboration. Investing in building this relationship now can pay dividends down the road.

Conduct engagement at a local level.
Understanding what is happening on the community level builds trust and can lead to the discovery of novel and unique approaches.

NEXT STEPS AND IMPLEMENTATION

In February 2025, SBVMWD, Western Municipal Water District, Riverside Public Utilities, and the San Bernardino Valley Water Conservation District successfully completed the Santa Ana River Enhanced Recharge Phase 1B project. This milestone project enables the capture and storage of up to 80,000 acre-feet of stormwater annually in the local aquifer, creating a vital groundwater reserve for future drought conditions and demonstrating the power of partnership. Over the next few years, the HRP will be further solidified and expanded as the partnership expands and projects are implemented. Next steps for the HRP include:

- Finalize a charter laying out clear expectations for partner agencies, members, and roles.
- Develop partnership-wide projects that address HRP goals and a monitoring and evaluation approach.
- Identify opportunities to enhance wildfire resilience in the headwaters.
- Finalize a communications and engagement plan to increase awareness of the partnership. The plan will include a timeline and intended audience for project-specific and more general "get-to-know-us" advertisements, engagement events, and community workshops.
- Engage Tribes and rural communities.

ADDITIONAL INFORMATION

Headwaters Resiliency Partnership Storymap

Press Release: Valley District to Lead Local Headwaters Resiliency Partnership

San Bernardino Valley Climate Adaptation and Resilience Plan

Upper Santa Ana River Wash Habitat Conservation Plan

5.1.2

EVALUATE & PRIORITIZE STRATEGIES

Implementing a long list of strategies might not be feasible due to limited funding and capacity. Prioritization enables agencies to focus on the actions that can deliver the most meaningful benefits to their community today, while planning ahead for strategies designed to address mid- to long-term shocks and stressors. Prioritization processes often evaluate strategies against a set of evaluation criteria to standardize comparisons and identify trade-offs.

Evaluation criteria should be tailored to each community and planning process to capture key elements of each strategy and reflect plan goals and community values. Criteria often include effectiveness implementation feasibility, capacity, costs, co-benefits and disbenefits, timeframe, and other considerations. Robust evaluation criteria can also help identify maladaptation—decisions that worsen outcomes or transfer challenges from one sector to another. The following list provides evaluation criteria commonly used to evaluate resilience strategies:

San Bernardino County

Effectiveness
Does the strategy directly address the shock or stressor? To what level does the strategy enhance resilience?

Implementation Control and Authority
Does the agency have direct control over implementation, or would it need to rely on partner agencies? Does the agency already have well-defined authority or levers to implement the strategy? Is a new ordinance or regulation required? How long would it take—or how likely is it—that the agency could get direct control or authority?

Organizational Capacity
Does the agency have the necessary expertise, funding, capacity, and staffing to oversee strategy implementation?

Costs and Funding
How much will the strategy cost to implement? What funding and financing tools are available, feasible, and appropriate, and can they collectively be used to fund the strategies?

Co-Benefits
Does the strategy have social, economic, or environmental benefits? Co-benefits should reflect community goals and priorities, which community engagement processes can help identify.

Dis-Benefits
Does the strategy have the potential to create negative impacts for communities, the environment, or the economy? Can these negative impacts be prevented, especially for low-income and disproportionately impacted communities?

Consistency
Does the strategy support the goals and objectives of the plan? Does the strategy align with other plans or policies?

Community Engagement and Support
Has community engagement informed the development of the strategy, and is there sufficient support for the strategy?

Timing
When will implementation start and how long will it take? How long will it take to realize benefits?

Monitoring, Evaluation, and Adjustment
Can the strategy be monitored for effectiveness? How will it be measured and evaluated? Is there a process for making needed adjustments?

A matrix can facilitate the prioritization process by rating each strategy (in rows) against the evaluation criteria (in columns). Ratings should be qualitative but translatable to scores (e.g., 1 for yes and 0 for no, or 0, 1, and 2 for a greater gradation), which can then be summed up for each strategy. Strategies with the highest evaluation scores can be considered priorities. Some criteria can be employed as screening criteria, such as implementation control and authority, to filter out wholly infeasible strategies. If these strategies nonetheless have high evaluation scores, they can be tabled for further study (e.g., should the jurisdiction aim to acquire implementation authority, build a coalition to gain support, or collaborate with another stakeholder better suited for implementation?).

Multiple strategies can be strung together into pathways or roadmaps, with immediate or short-term strategies implemented first and others phased in later depending on timing, impacts, funding, or other factors. A set of strategies with a specific order and identified catalysts for implementation is often called an adaptation pathway or implementation roadmap.

Stakeholder input can help to narrow the list of strategies. Stakeholders, particularly representatives from partner agencies or subject matter experts, can provide input on many of the evaluation criteria, such as effectiveness, administrative capabilities, and co-benefits.

Once a final suite of strategies has been selected, more research on the resources, time, specific steps, and cost to implement strategies can be summarized into a strategy profile and integrated into a plan. **Table 7** provides an example strategy profile.

Community engagement can help jurisdictions to understand whether proposed strategies will address priority challenges, avoid maladaptation and negative consequences, and support more equitable outcomes.

Developing Strategies for a Resilience Plan vs. Integration into Other Plans

Strategies within a stand-alone resilience plan are developed in tandem for a comprehensive approach to resilience. These strategies will ideally be coordinated across multiple departments and sectors for a jurisdiction-wide response. Coordination offers the opportunity to consider holistically how resilience can be embedded into the agency's departments, programs, processes, and plans.

When developing resilience strategies within another planning process, opportunities to embed resilience are often limited to a single planning topic or focus area—e.g., integrating resilience into a hazard mitigation plan will not affect zoning in general plans, design criteria in specific plans, or investment priorities in a CIP. Thus, strategy development will focus on programs and policies within a specific planning structure. Jurisdictions will also need to make sure future plans are in alignment.

General plans offer the most comprehensive vehicle to embed resilience strategies across a range of topics. However, key elements are updated in isolation, not all elements are updated regularly, and opportunities could be missed due to lack of capacity, expertise, and resources, and existing state requirements and processes. To guide and formalize this process, jurisdictions can adopt overarching policies or resolutions on resilience integration into its plans and processes. The goal can be to provide general structure or direction, or focus on specific or priority plans (e.g., CIPs or general plans).

URBAN HEAT ISLAND REDUCTION STRATEGIES

Long Beach and Pasadena

FUNDING

SCAG Sustainable Communities Program, with additional funding from state grants and private donations

PARTNERS

Each effort was led by the respective city, with significant contributions from Alta Planning+Design, community organizations, and universities, environmental groups, and public health agencies.

SHOCKS/ STRESSORS ADDRESSED

Extreme Heat

OVERVIEW

The cities of Long Beach and Pasadena evaluated urban cooling strategies that could be integrated into streets, sidewalks, and alleys. The project was funded through SCAG's Sustainable Communities Program, which supports local jurisdictions in addressing climate change and reducing greenhouse gas emissions.

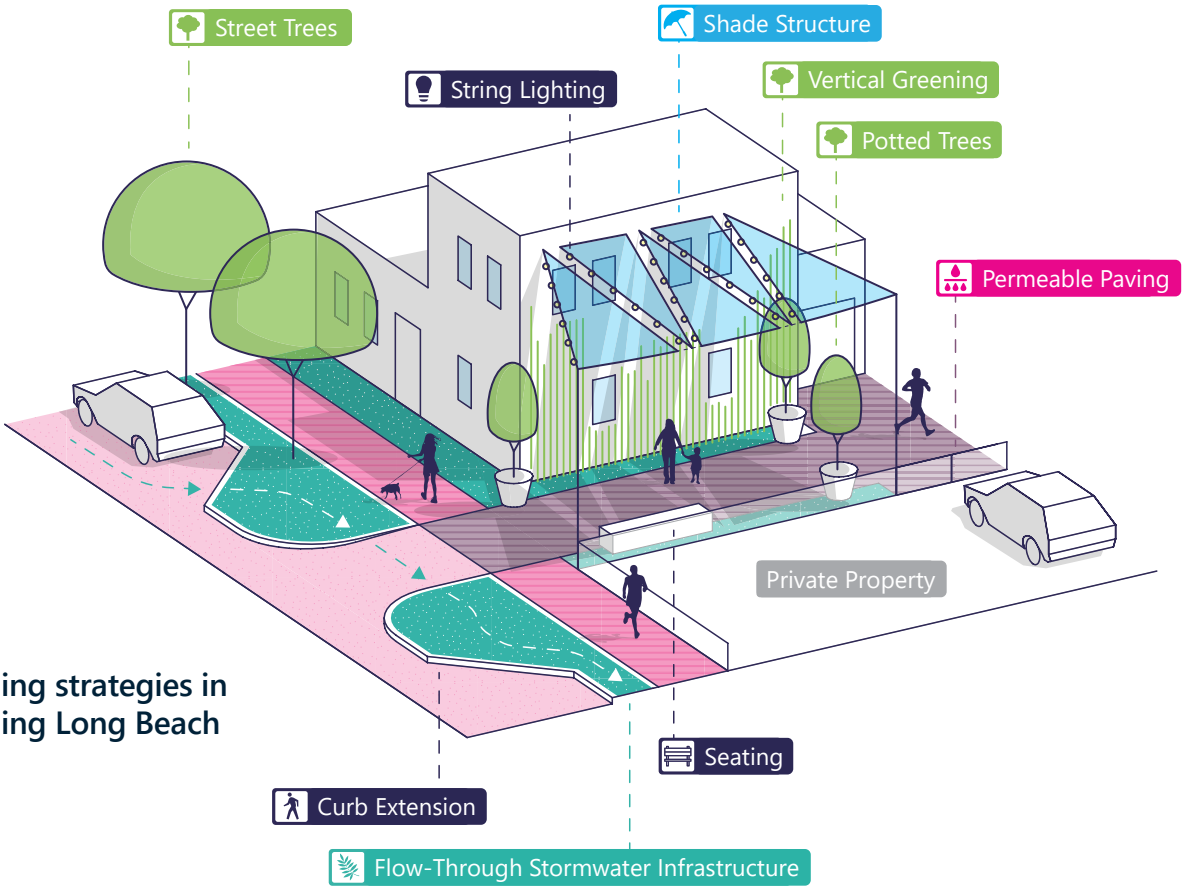
Working with Alta Planning + Design, the cities evaluated the suitability of shade and green infrastructure, recorded heat measurements, and engaged communities in three neighborhoods to understand how extreme heat affects residents and gather local ideas for improvements.[†] The project took place from 2020 to 2021 and consisted of three phases: exploration, idea generation, and refinement.

The exploration phase included site visits for temperature readings, review of city documents, and an assessment of existing conditions, focusing on context, shade, heat vulnerability, and mobility. In the idea generation phase, the existing conditions assessment and public feedback informed the development of initial cooling strategies. The refinement phase turned these into five specific cooling strategies and created a toolkit for each study area—specifically the Lincoln and Holly/Ramona neighborhoods in Pasadena and the Washington neighborhood in Long Beach.

Community engagement included social media posts, event flyers, community navigators, a community event caravan, an online survey, a standalone project website, and two virtual open houses. These efforts reached 120 attendees and 127 survey respondents in Long Beach, and 160 attendees and 76 respondents in Pasadena. The input from engagement efforts directly shaped the toolkit and strategies.

LESSONS LEARNED

Build resident capacity and interest.
SCAG launched a Community Navigators pilot program in Long Beach as a part of project engagement efforts. The program provided outreach training and skills building to six residents, enhancing their capacity and networks. Through technology training and support, the residents successfully conducted outreach, engaged 480 people, and facilitated relationship building within the community. This approach demonstrated the effectiveness of empowering local residents to lead outreach efforts, resulting in higher engagement and stronger community ties.



Cooling strategies in Cooling Long Beach

Enhance virtual outreach with innovative methods. To help the public visualize heat reduction strategies deployed in their neighborhood, the second virtual community event featured an innovative live sketching segment. During this activity, community feedback was sketched live onto images of specific locations in the community. In total, live sketching helped community members visualize their preferred cooling strategies in three locations.

Combine site observations and data with community input to ensure data accuracy. To develop community-informed cooling strategies, the planning team combined temperature readings from site visits, city plans, and assessments of context, shade, heat vulnerability, and mobility with community feedback to develop initial strategies. The final phase developed five specific strategies, creating a comprehensive toolkit for each study area. While the toolkit can be deployed by other jurisdictions for heat reduction, they can also adapt this approach to ensure data accuracy for a range of planning processes.

† Alta Planning + Design. (n.d.). SCAG Urban Heat Island Reduction Strategies. Alta Planning + Design. https://altago.com/projects/scag-urban-heat-island-reduction-strategies/

NEXT STEPS AND IMPLEMENTATION

Both toolkits help identify and prioritize areas where cooling is needed most, and which strategies (e.g., shade trees and cool pavements) might be most effective in these areas. In Pasadena, the toolkit recommends launching targeted rebate programs and continuing community outreach to ensure widespread adoption of sustainable practices. In Long Beach, next steps include securing funding and launching pilot projects in high-priority areas. The plan recommends balancing funds for capital improvements projects with external grant funds to cover project costs. Ongoing evaluation and feedback are crucial to refining and improving the toolkits.

ADDITIONAL INFORMATION

Cooling Pasadena project website

Cooling Long Beach report

Alta project page

Table 7 Example Strategy Profile

STRATEGY NAME

Description	Brief overview of the strategy.
Actions	Describe specific actions, steps, or tactics required to implement the strategy.
Shocks and Stressors Addressed	What shocks or stressors does the strategy address?
Timeframe	Short-Term (0-5 years), Medium-Term (5-10 years), or Long-Term (10+ years). Exact dates can also be provided.
Lead Agency/ Department	Who will oversee the effort?
Partners	Which agencies and/or departments or groups (both internal and external) will help implement the strategy?
Metric of Evaluation	How can the strategy be monitored or measured over time?
Estimated Cost	How much will implementation cost? Often provided qualitatively (e.g., $, $$, $$$, or $$$$; bin sizes will be relative to strategy types, for example $0-$50,0000, $50,000-$200,000, $200,000-$500,000 etc.).
Co-Benefits	What (if any) environmental, economic, and social benefits would the strategy provide?
Benefits (or Disbenefits) to Vulnerable or Disadvantaged Communities	How can the strategy improve chronic stressors or reduce impacts of shocks for vulnerable communities? What are some potential disbenefits or negative consequences and how can they be reduced?

Adaptation Pathways

Commonly used in sea level rise planning, adaptation pathways allow for strategies to be phased in over longer timeframes while accounting for uncertainty. An adaptation pathway consists of a series of strategies, gradually increasing in their level of intervention, linked by identified thresholds that serve as trigger points to advance to the next higher level of planning and strategy implementation. For instance, an immediate strategy to address sea level rise might be to conduct beach nourishment, but if a community experiences significant flooding twice within a certain timeframe (the trigger), the next phase might include wetland restoration and living shoreline projects, with subsequent phases including strategies such as relocating critical infrastructure further inland. Throughout this process, jurisdictions should monitor action triggers (e.g., amount of sea level rise and number of flood events), and plan ahead for the next phase, including identifying funding and financing and engaging community and agency partners. This flexible and dynamic approach ties strategies to measurable indicators and allows jurisdictions to plan for the future while accounting for uncertainty in the scale or timing of impacts.

Adaptive Management

Adaptive management is a flexible and dynamic approach to monitor and respond to changing conditions and plan or project performance. This approach involves on-going monitoring of strategy metrics, which then inform adjustments to planning and implementation. It can also include stakeholder engagement to support collaborative decision-making around proposed adjustments.

Adaptive management is often preferred because it accounts for the unpredictable nature of future conditions. Unlike static plans, adaptive management allows communities to plan for the long-term while recognizing that strategies should be responsive to changing outcomes and not all actions need to be implemented immediately. An adaptive management approach can be more cost effective by implementing actions on an incremental, as-needed basis, rather than focusing on a high-risk, low likelihood scenarios (such as a tsunami or 1,000-year storm). Adaptive management can also diagnose why strategies might not be performing as expected and make corrections, rather than discarding them immediately, wasting planning resources and implementation costs. Monitoring efforts should allow for enough time for strategies to generate measurable benefits; e.g., a new program can slowly attract participants through word-of-mouth.

Ventura Beach, CA
Mykola, Adobe Stock

LOS ANGELES RIVER MASTER PLAN

FUNDING

$19B – $24B to implement all projects included in the plan

PARTNERS

Los Angeles County, city of Los Angeles, Los Angeles County Flood Control District, U.S. Army Corps of Engineers – L.A. District, California State Parks, Mountains and Recreation and Conservation Authority, Friends of the LA River

SHOCKS/ STRESSORS ADDRESSED

Flooding

Reduced Water Quality

Habitat Fragmentation

OVERVIEW

The county-wide Los Angeles River Master Plan is an ambitious project to revitalize the Los Angeles River and surrounding area. The river, which runs from the San Fernando Valley to the Pacific Ocean, was once free-flowing but was confined to a concrete channel after devastating floods in the 1930s. The plan outlines projects that will transform 51 miles along the river into a connected open space with reduced flood risk, preserved habitat, affordable housing, recreation activities, a clean and continuous water supply, and opportunities for education and the arts. Developed over six years, the plan draws from hundreds of planning documents and datasets, hundreds of hours of community outreach, and ecological, demographic, and hydrologic studies for the entire 834-square-mile watershed.

The plan is oriented around nine goals, each supported by actions and methods. These goals include reducing flood risk, increasing access to green space, supporting healthy ecosystems; addressing adverse housing affordability impacts; enhancing opportunities for arts, culture, community development, and education; and improving local water supply reliability and water quality. The plan outlines 56 potential projects but does not specify individual ones. Instead, the plan utilizes a "kit of parts" approach, detailing design elements that can be combined in different formations to improve the channel. These elements include river trails, channel modifications, and floodplain reclamation.

LESSONS LEARNED

This is a complex plan covering a large geographic area. As such, there are numerous best practices and lessons learned.

Find creative ways to illustrate data.
The LA River is a complex system with many layers of information and data. To better understand conditions along the river, the plan used over 200 "river rulers" to organize and illustrate data. The rulers represent the river as a straight line, allowing readers to easily understand how conditions along the river change from one mile to the next.

Resolve conflicting interests through innovative problem solving and compromise.
One major concern was green gentrification; residents were concerned that revitalization projects along the river would improve a community so much that rising housing costs would push out low-income and disadvantaged residents. To address this, plan elements aim to mitigate housing shortages and address affordable housing concerns along the river's course. Another key issue was supporting ecosystem health while investing in infrastructure for housing, economic development, and recreation access.

Invest in collaborative partnerships.
Bringing together government agencies, nonprofit organizations, members of the public, and academic institutions led to project concepts that are informed by resident needs. Community-based organizations, such as Friends of the LA River, were brought onto the project to engage the local community through educational programs, community events, and advocacy.

NEXT STEPS AND IMPLEMENTATION

The Los Angeles River Master Plan consists of multiple projects that will require funding from local, state, and federal sources, as well as coordinated efforts among public, private, nonprofit entities. Each project must have a three-year maintenance plan in place, as well as a named entity for ongoing maintenance. One project currently underway is the Paseo del Rio Project at Taylor Yard, which will transform an old railyard into a 42-acre park. This project covers one mile of the river and will include a greenway, entry plaza, and water quality improvement wetland. The city of Los Angeles' Bureau of Engineering has been leading the project since 2021.

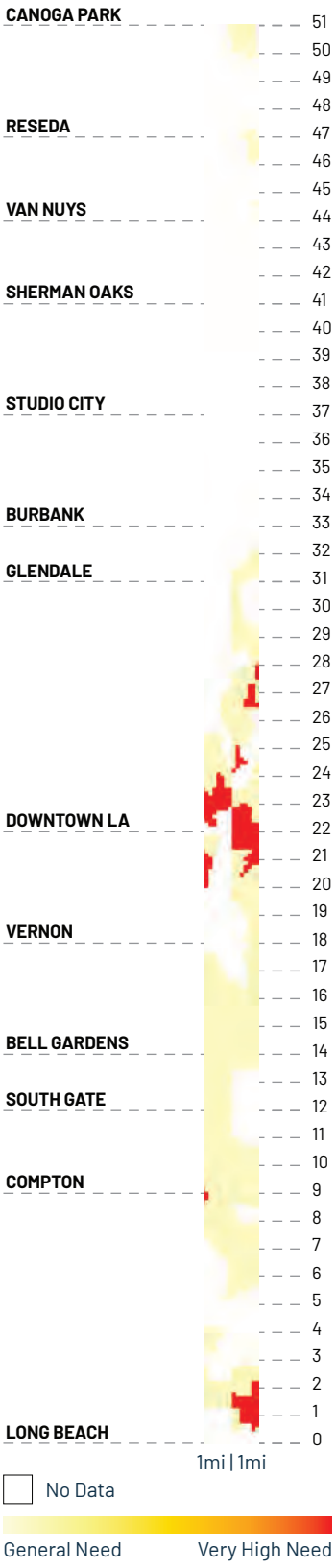
ADDITIONAL INFORMATION

Los Angeles River Master Plan

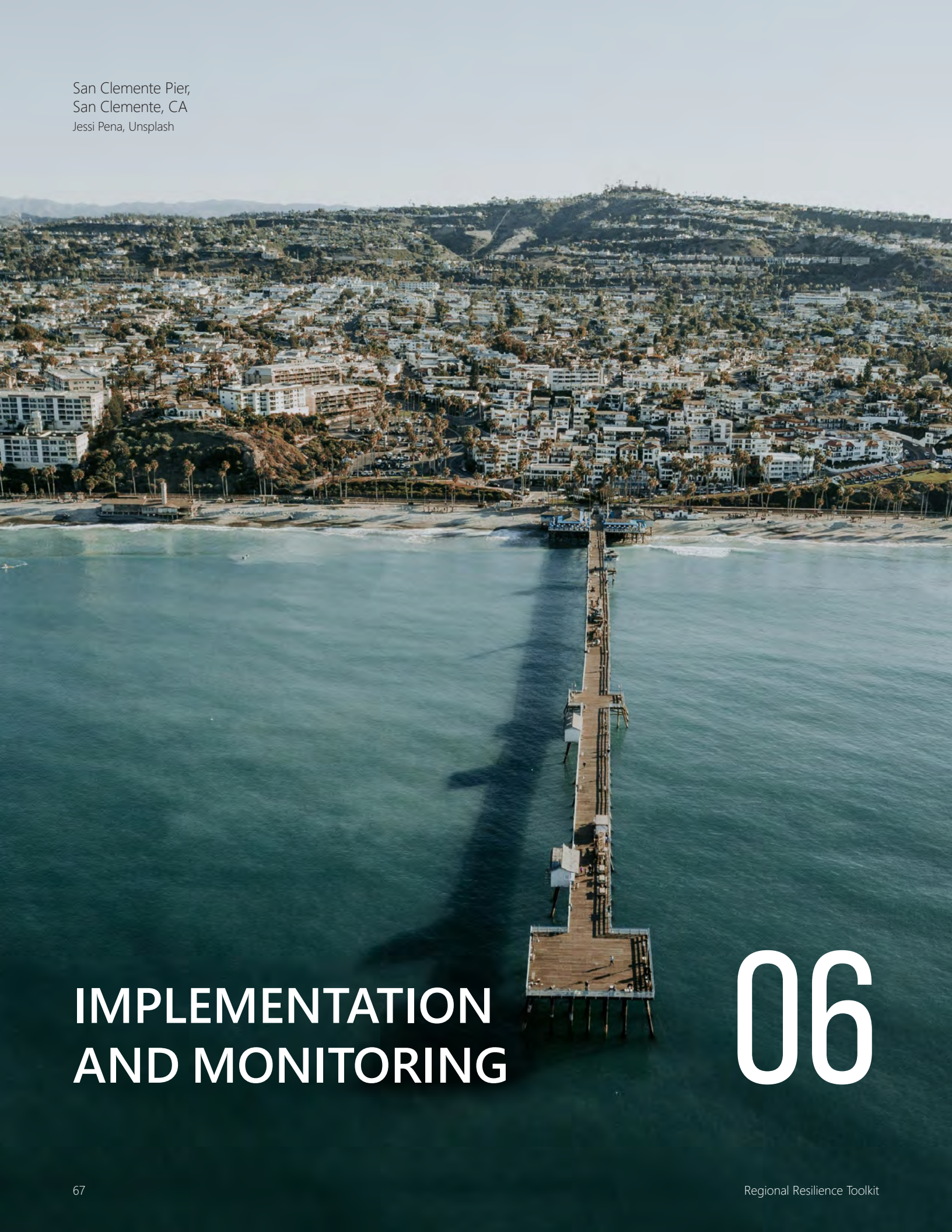
Los Angeles River Revitalization

Friends of the LA River

LA County Housing and Affordability Need Ruler

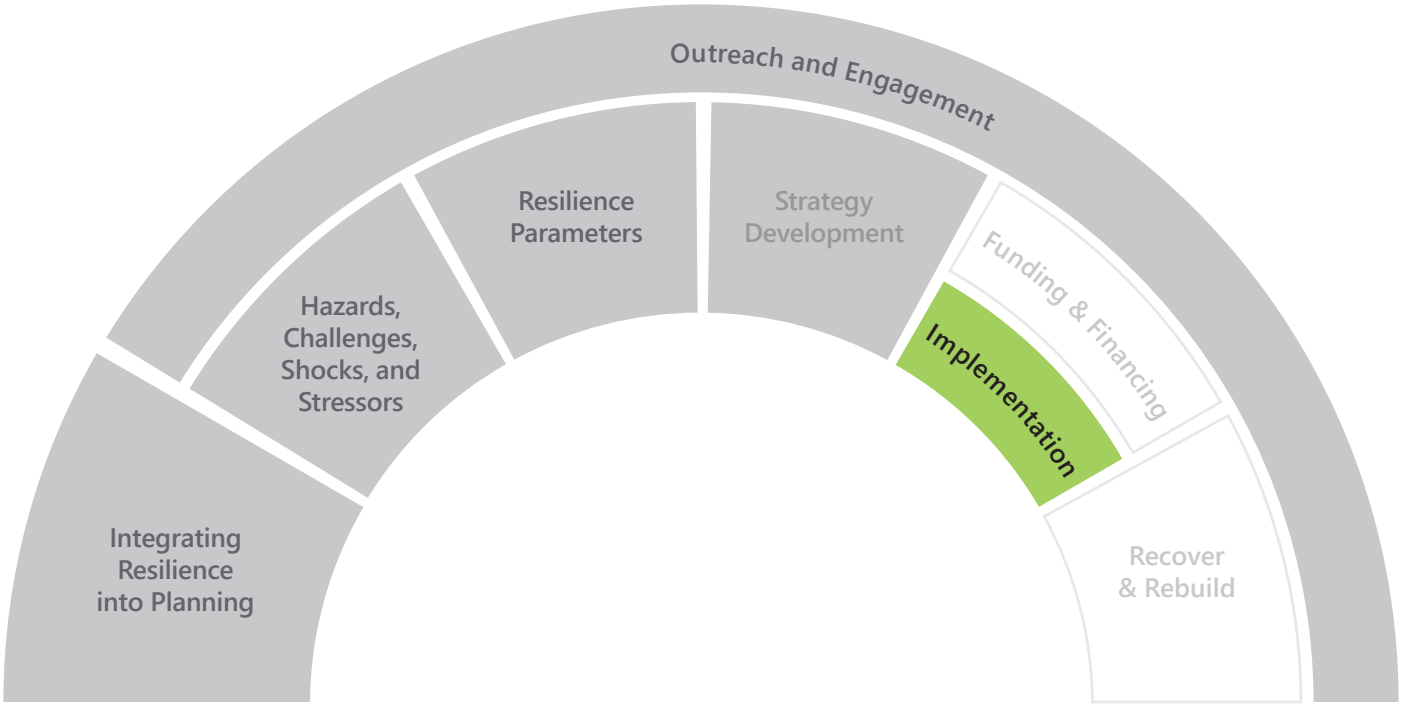


San Clemente Pier,
San Clemente, CA
Jessi Pena, Unsplash



IMPLEMENTATION AND MONITORING

06



OVERVIEW

Planning for resilience is only the first step—the outcome of all planning processes is translating strategies into action. Some strategies can be undertaken relatively easily through adjustments to existing programs or projects, while others can require coordination across departments, capacity building, and additional resources. Whether resilience strategies are embedded in a dedicated plan or integrated into existing frameworks, a clear prioritization process and implementation roadmap can help local agencies identify early opportunities and move from concept to reality.

These roadmaps help jurisdictions define actionable steps, assign responsibilities, and identify prerequisites and opportunities for progress. While implementation roadmaps are typically developed for high-priority strategies, medium- and lower-priority actions should also be revisited over time to determine if they should be elevated.

Once implementation begins, monitoring and evaluation become essential. Tracking key performance indicators (KPIs) allows jurisdictions to assess progress, measure effectiveness, and refine and adjust strategies based on real-world outcomes.

WHY IS THIS IMPORTANT?

Implementation is where resilience planning becomes tangible. Without it, even the most well-crafted strategies remain theoretical. By establishing clear roadmaps and monitoring systems, jurisdictions can ensure that resilience efforts are not only initiated but sustained, impactful, and responsive. This chapter sets out key considerations for implementing strategies and describes how metrics can be developed and monitored to track overall resilience progress and strategy performance.

Community feedback can inform which resilience metrics are the most important to track and have the greatest relevance for the community.

NAVIGATING THE PROCESS

6.1 IMPLEMENTATION

Implementation is the culmination of resilience planning, as it represents the translation of months and years of work into on-the-ground actions and investments that can deliver real change. This process can extend across multiple stages—e.g., updating zoning, adopting ordinances, embedding strategies into capital programs and budgets, designing projects, and securing construction funding—but with careful phasing, implementation can deliver opportunities and values for jurisdictions.

6.1.1 INTEGRATE STRATEGIES INTO PLANS

Jurisdictions can leverage local plans with associated regulatory or procedural frameworks to facilitate policy and strategy implementation. Standalone resilience plans often highlight policy and strategy integration within other plans, processes, and programs as a key recommendation. Examples of plans that could benefit from resilience strategy integration include:

General Plan
A general plan develops a long-term vision and goals that guide development in a jurisdiction. While resilience can be integrated into all general plan elements, SB 379 (2015) requires the safety element to include a climate vulnerability assessment, strategies, and a comprehensive hazard mitigation and emergency response strategy. The safety element informs other general plan elements (particularly housing, conservation, and open space), providing opportunity to avoid development in areas with greater hazard risk. Resilience strategies could also be integrated throughout other general plan policies, for example environmental justice to address chronic community stressors.

Hazard Mitigation Plans
Hazard mitigation plans (HMPs) assess existing hazards and vulnerabilities in a jurisdiction and lists actions to reduce risk. It is required for eligibility for federal and state funding for hazard mitigation projects. Often LHMPs include implementation roadmaps that outline specific mitigation actions, timelines, and responsible parties. By integrating resilience strategies into an LHMP, jurisdictions can more comprehensively address current and future risks, thereby unlocking funding opportunities and facilitating effective implementation of resilience strategies. Further, AB 2140 (2006) incentivizes the inclusion of LHMPs into general plan safety elements.

Transportation Plans and Capital Improvement Plans
Because these plans identify priority projects for funding over an extended timeframe, they can be an effective vehicle to support funding resilience projects. Resilience can be established as a project feature or prioritization criteria, and resilience elements incorporated as part of project planning and design.

Other plans
Resilience strategies can be integrated into many other plan types. A bicycle and pedestrian plan, for example, may benefit from incorporating strategies to increase shading, water fountains, green infrastructure, and heat-resistant materials to protect public health and support active transportation during warmer summers. Water utilities may need to consider increased storm intensities in planning for upgrading stormwater mains. An urban forestry master plan should consider how drought and heat could affect planning and maintenance to establish an urban shade canopy that can thrive under future conditions. See **Table 8** for examples.

Using the Shocks and Stressors Matrix to Identify Metrics

The Shocks and Stressors Matrix (Appendix A) identifies specific metrics that can be used to track the severity of shocks or stressors overtime. For instance, if a jurisdiction has a resilience project to increase tree canopy to provide shade and reduce heat-related health risks, they may choose to track the "percent of area not covered by tree canopy" indicator from the California Department of Public Health's Climate Change and Health Vulnerability Indicators for California as a resilience KPI.

Table 8 Example Plans and Opportunities to Increase Resilience

Plan Type	Benefits of Integrating Resilience Strategies
Sustainability Plans	Address resilience holistically throughout multiple related efforts, such as air quality, climate change, health, and food access.
Urban Forestry Management Plans	Plant tree species tolerant to future conditions; maintain and grow a robust urban forest able to protect communities from future shocks and stressors.
Bike and Pedestrian Master Plans	Protect users from future conditions and ensure continued safety and feasibility of walking and biking. Protect transportation assets and surrounding communities.
Water Management Plans	Account for increased cycles between wet and dry extremes.
Local Coastal Programs	Protect coastal developments and investments from tidal flooding or full inundation.

One shock or stressor can be addressed by multiple strategies embedded across different plans, e.g., projects outlined in a capital improvement plan, policies mandated in a local coastal program, and programs in a sustainability plan. By leveraging various efforts, jurisdictions can create a robust, cross-cutting framework for implementing strategies. This integrated approach can support effective coordination, funding, and implementation, ultimately supporting communities' overall resilience.

6.1.2

ESTABLISH IMPLEMENTATION ROADMAPS

Whether resilience strategies are part of a dedicated resilience plan or within an existing plan, defining a clear implementation roadmap is critical to move planning from concept to reality. An implementation roadmap outlines necessary steps and identifies responsible leads, key considerations, capacity, future opportunities, and prerequisite actions (e.g., conduct a preliminary study before drafting an ordinance). Implementation roadmaps or programs are typically developed only for high-priority strategies, but medium- or low-priority strategies should be revisited over time as higher-priority actions are rolled out. The U.S. EPA's Regional Resilience Toolkit outlines best practices for developing implementation programs. Key components of an implementation roadmap are outlined in **Table 9**, using a strategy to develop a community resilience hub as an example.

As implementation progresses, agencies can look for opportunities to embed strategies, goals, and metrics into annual budgets, role descriptions, program activities, design guidelines, and departmental policies and procedures. This can help ensure that resilience remains a priority and becomes a part of ongoing practice, and not merely a plan sitting on a shelf. Example opportunities to integrate resilience include:

- For agencies that distribute **funding**, incorporate resilience into grant scoring criteria or grant requirements.
- Integrate resilience recommendations as part of the **project review** process for new development proposals.
- Leverage **existing infrastructure project** opportunities to enhance resilience. For example, installing new electric vehicle charging stations can require significant pavement work, which could incorporate green infrastructure or permeable pavements.
- Establish a cross-departmental or cross-agency **resilience committee** to bring together key leads at regular intervals to share information, collaborate on opportunities, develop projects, and reduce silos.

METROLINK CLIMATE VULNERABILITY ASSESSMENT AND ADAPTATION PLAN

FUNDING **$520,000**

PARTNERS **Southern California Regional Rail Authority (Metrolink), Caltrans, cities and counties in Southern California, transportation authorities in Southern California**

SHOCKS/ STRESSORS ADDRESSED


Extreme Heat


Wildfire


Flooding


Landslides/ Mudslides


Earthquakes

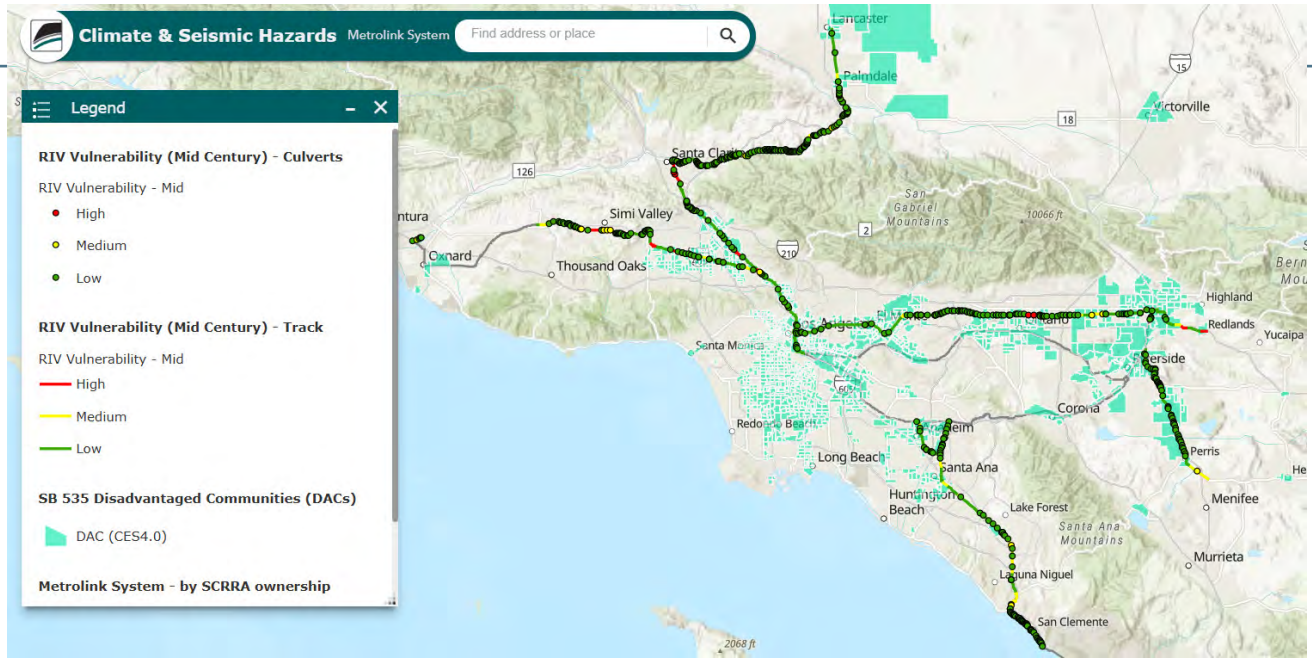
OVERVIEW

In 2022, Metrolink completed a systemwide vulnerability assessment that identified future climate risks to its infrastructure, facilities, and operations. The assessment also identified areas with high social vulnerability, as these communities are particularly sensitive to climate hazards. The results of the vulnerability assessment were used to develop an adaptation plan to guide infrastructure design and resilience investments. The plan is also a dashboard that Metrolink staff can use to understand which parts of the system are vulnerable to different climate hazards and investigate the relationship between system-wide vulnerability and disadvantaged communities.

LESSONS LEARNED

Use examples that demonstrate how to implement strategies.
Illustrating how resilience strategies can be implemented helps ensure the results and recommendations of the study will be embedded into future planning processes. The Metrolink study describes in detail how to implement four adaptation strategies and demonstrate their integration into decision making processes.

Think about implementation early.
Before beginning the project, establish how outcomes will inform future decision-making. For instance, Metrolink completed the vulnerability assessment ahead of updating the design guidelines, ensuring the guidelines require future projects to conduct a climate risk assessment based on the results of the vulnerability assessment.



Screen capture from Metrolink's Climate Vulnerability Dashboard

Develop an interactive dashboard or web map. An online dashboard allows staff to look up a specific site's projected exposure to climate hazards. The dashboard was developed iteratively with Metrolink staff input to ensure it met user needs. It provides all geospatial layers generated during the vulnerability assessment, including climate hazards, asset vulnerability, and transit-dependent communities.

Tap into available local resources. Local institutions and groups offer valuable insights and perspectives. When developing an engagement plan, it is essential to include early opportunities to engage Tribes, community-based organizations (CBOs), and research institutions, such as universities. Early engagement fosters a more comprehensive understanding of the resilience landscape, helps identify priority stakeholders, and uncovers data sources that can inform the technical aspects of projects. Including local knowledge at the beginning ensures this process informs project direction from the start of the plan.

NEXT STEPS AND IMPLEMENTATION

Metrolink released updated design criteria in 2024 requiring all projects to assess the vulnerability of the project assets and site to current and future climate hazards. If assets planned for a specific location are found to be vulnerable, adaptation strategies must be incorporated.

In addition, Metrolink is using the climate vulnerability assessment to inform siting and development of projects for the Southern California Optimized Rail Expansion (SCORE) Program, a $10 billion capital improvement program to upgrade Metrolink's system in time for the 2028 Olympics. These projects have useful lives of 20 to over 100 years, so it is essential that future climate conditions be considered in planning, design, and delivery. Five SCORE projects (out of 21) were evaluated to identify climate vulnerabilities and adaptation strategies that could still be integrated into the project scope to reduce future service disruptions. This evaluation demonstrated how to apply the dashboard and toolkit at a project level.

ADDITIONAL INFORMATION

Metrolink Climate Vulnerability Assessment and Adaptation Plan

Metrolink Climate Vulnerability Dashboard

Table 9 Example Implementation Roadmap

Consideration	Example
Action Description Provides a description of strategy and outcomes.	Develop resilience hubs that can support residents during a wide range of hazards, providing clean air, cooling, electricity, and other community benefits.
Responsible Lead Identifies the lead department or agency, any supporting departments or agencies, and their roles.	Will vary by jurisdiction but could include Office of Emergency Management, Department of Public Health, Department of Community Services, etc.
Partners Identifies external partners and stakeholders whose support, buy-in, or engagement are critical.	CBOs, local utilities, public health organizations.
Timeframe Describes when implementation is likely to start and finish. Can breakdown strategy actions into short-, medium-, and long-term phases.	Short-term (2 years): Develop a resilience hub pilot using existing agency-owned site. Medium-term (5-8 years): Identify community partners and sites. Identify and fund infrastructure upgrades (HVAC systems, microgrids, and solar).
Immediate Next Steps Outlines detailed, short-term actions to initiate implementation, including identifying resources, defining scopes of work, and incorporating actions into departmental work plans.	Identify communities with greater vulnerabilities. Select existing facilities for pilot, using criteria such as accessibility, site location, upgrades needed, etc. Apply for funding for pilot.
Permits and Regulations Identifies permitting authorities and requirements and relevant ordinances or regulations.	Significant upgrades to building infrastructure may trigger latest version of state and local building codes.
Engagement and Outreach Describes community engagement needed to support effective implementation including objectives, methods, partners, events, etc.	Engagement to understand community preferences, concerns, and priorities to ensure that resilience hubs will support their needs. Advertise resilience hub availability.
Staff Capacity Identify available staff capacity throughout implementation timeframe and any needed new hires.	0.20 full-time employees for years 1-2 2 full-time employees for years 3-8
Cost Estimate strategy costs, often at the rough order of magnitude scale. Should include planning, capital, and operational costs.	Planning costs: Feasibility studies, energy plans, site assessments, architectural and engineering plans, permitting, including California Environmental Quality Act requirements Capital costs: Construction and costs for infrastructure and equipment (e.g., battery costs). Operational costs: Cost to staff hub and offer programming.
Funding Identify funds, grants, and financing mechanisms and outline a plan to secure funding.	Community Resilience Centers grant (Strategic Growth Council), Building Resilient Infrastructure and Communities grant (FEMA)
Milestones Establishes milestones for strategy to work toward.	Resilience hub pilot is active. Establish three community-based resilience hubs.
Monitoring progress Identifies key metrics to track strategy progress.	Number of resilience hubs in 10 years Number of people using hubs during shocks
Evaluation and Adjustment Define a process to review and adjust strategies based on performance.	Review number of emergency room visits during extreme heat days in neighborhoods served by the resilience hub to adjust outreach strategy, resilience hub programming, and determine potential scaling.

6.2

MEASURE

Implementation is the culmination of resilience planning, as it represents the translation of months and years of work into on-the-ground actions and investments that can deliver real change. This process can extend across multiple stages—e.g., updating zoning, passing ordinances, embedding strategies into capital programs and budgets, designing projects, and securing construction funding—but with careful phasing, implementation can deliver opportunities and values for jurisdictions.

6.2.1

ESTABLISH KPIs

KPIs evaluate the success of individual strategies, programs, policies, or projects in achieving their intended outcomes, using quantifiable metrics, and can track broad trends related to a specific shock or stressor. For example, the number of parcels in the 200-year floodplain is a KPI that reflects the community's vulnerability to flood risk, while the miles of levees upgraded to provide 200-year flood protection tracks strategy implementation. Jurisdictions should tailor KPIs based on their plan types, values, strategies, characteristics, and needs. The previous steps described in this resilience planning process can inform KPI selection:

- **Identified Shocks and Stressors**
  Jurisdictions can select locally relevant KPIs based on their identified shocks and stressors. The Shocks and Stressors Matrix in Appendix A provides KPIs for key shocks and stressors in the SCAG region. For instance, lack of access to open space (a stressor) can be measured through the neighborhood park access indicator available via the Healthy Places Index.

- **Ongoing community engagement**
  Community feedback can inform which resilience metrics are the most important to track and have the greatest relevance for the community. Engagement can also build community buy-in for the resilience monitoring approach.

- **Identified impacts to the community**
  Chapter 2 outlines methods for understanding direct and indirect impacts of shocks and stressors. Resilience KPIs should track priority impacts for the community. For instance, if extreme heat is a priority impact, local emergency department data that monitors heat-related illness and death can be a valuable resilience KPI.

- **Integrated plans and jurisdiction-wide KPIs**
  For broader plans into which resilience has been integrated and is not the sole focus (e.g., general plans), jurisdictions might not have the resources to establish separate tracking and monitoring efforts dedicated to resilience. If these plans already track related KPIs, resilience should be incorporated into at least one or more metric. Resilience-focused metrics can also be added to the set of jurisdiction-wide KPIs already reported as part of ongoing operations. For example, permitting databases could track the number of units developed with climate-resilient features or the number of permits issued for hazard zones; parks departments could track the acreage of parks and open space developed in flood zones; and fire departments could track the number of emergency calls received during extreme heat days.

- **High-priority resilience strategies**
  Locally relevant KPIs can include metrics to monitor the progress of jurisdiction-specific resilience strategies developed in Chapter 4. For example, if a jurisdiction has a strategy on limiting floodplain development, a relevant KPI may include the number of new development permits granted within the 100-year and 500-year floodplains. See Section 6.2.3 for more information on tracking strategy performance.

The California Governor's Office of Land Use and Climate Innovation (LCI) draft "Resilience Metrics White Paper" (2020) under the Integrated Climate Adaptation and Resiliency Program synthesizes research and guidance to describe the goals and process for developing resilience metrics. It emphasizes the importance of resilience metrics across natural, built, and social systems, and recommends jurisdictions identify gaps and propose metrics to track progress in areas such as climate conditions, resilience outcomes, and resource allocation. Appendix B of the "Resilience Metrics White Paper" presents conceptual metrics for tracking changing climate conditions and resilience outcomes. It also highlights the need for adaptive management and regular reporting to ensure transparency and accountability in resilience initiatives. The white paper is an excellent resource for jurisdictions to review when establishing resilience metrics.

LOCAL AND REGIONAL SCALES

While the Shocks and Stressors Matrix in Appendix A provides regionally relevant resilience KPIs with publicly available datasets, jurisdictions should consider local data for custom resilience KPIs to more effectively measure progress. Metrics can be related to local impacts from shocks and stressors, or outcomes tied to specific policies or strategies. Local resilience KPIs should rely on data specific to the jurisdiction that can be tracked easily, without reliance on other agencies. Additionally, jurisdictions might want to track KPIs at even more local levels to understand how resilience outcomes are improving in specific communities, such as low-income or vulnerable populations. Examples are provided in **Table 10**.

Regional resilience KPIs are broader metrics that evaluate the resilience of larger areas, such as counties or multi-county regions. Regional KPIs rely on data reported at the regional level or aggregated from jurisdictions. Regional KPIs can monitor regional-level infrastructure such as transportation, energy, or utility networks. They can also compare progress on a larger scale and capture regional disparities. Examples are in **Table 11**.

Tailoring KPIs to the unique characteristics and needs of each jurisdiction is crucial for effective, transparent resilience planning. By leveraging identified shocks and stressors, ongoing community engagement, and specific impacts and strategies, jurisdictions can develop meaningful, context-specific, and actionable KPIs. Regularly reviewing and updating KPIs can inform jurisdictions on the effectiveness of their resilience efforts.

Table 10 Local Resilience KPI Examples

Shock/Stressor	Example KPI	Equity Consideration
Flooding	Number of development permits granted within floodplains	Track permits by neighborhood income level to assess disproportionate exposure to flood risk.
Urban flooding and heat	Annual change in impervious surface coverage	Track changes in impervious surface coverage in low-income and historically underserved areas to identify increased vulnerability.
Housing affordability	Number of affordable housing units constructed per year	Break down by income level, geography, and race/ethnicity to ensure equitable access to new housing.
Extreme weather events	Total annual local dollars spent on extreme weather recovery and repair	Compare spending across neighborhoods to identify disparities in recovery investment.
Extreme heat	Net change in forest canopy coverage Net change in emergency room visits during heat waves per 100,000 people	Track net change in shade canopy in heat-vulnerable, low-income, and low-canopy neighborhoods to promote equitable cooling.
Transportation access	Miles of transit service with reduced headway	Measure improvements in transit-dependent and underserved communities.

Table 11 Regional Resilience KPI Examples

Shock/Stressor	Example KPI	Equity Consideration
Extreme weather events	Annual count of significant weather-related energy disruptions	Assess frequency and duration of power disruptions in low-income and energy-insecure communities.
Flooding	Annual flood-related property loss at the county level	Track property loss data by census tract or zip code to identify communities, particularly low-income or historically marginalized areas, experiencing disproportionate impacts.
Public health system resilience	Percentage of regional healthcare facilities with emergency preparedness plans	Prioritize preparedness in facilities serving high-risk or underserved populations.
Transportation access	Number of regional transit stops providing service to vulnerable or low-income populations	Track average wait time for transit for low-income and transit-dependent communities compared to the regional average.

6.2.2

ESTABLISH IMPLEMENTATION ROADMAPS

When selecting KPIs to track progress, jurisdictions should consider practical and strategic factors to ensure metrics are meaningful, actionable, and feasible.

Availability of data
Metrics should be developed with data availability in mind. A metric is only useful if reliable data exists or can be reasonably collected to support it. Regional and local jurisdictions should assess whether the necessary data is publicly available, regularly updated, and granular enough to support analysis. In cases where data is unavailable or difficult to obtain, alternative metrics or proxy indicators might be necessary.

Outcomes
To measure meaningful change, metrics should correspond with the desired strategy outcome and indicate an increase in resilience. It is often easier to track metrics that measure action implementation itself, but these might not indicate meaningful change. For example, tracking the number of trees planted annually might not improve overall resilience if existing trees are dying due to poor management, or if the new trees are not planted in communities with the highest heat vulnerabilities; an improved metric could be net change in shade canopy, which focuses on the presence of shade itself, both jurisdiction-wide or in specific communities. Similarly, tracking the number of mailers or social media posts might be straightforward, but it might not indicate meaningful outcomes if the messaging is ineffective at reaching target audiences.

Timeframe
Metrics should correspond with the expected implementation timeframe. For example, strategies with expected short- or mid-term impacts should have metrics that can evaluate near- or medium-term progress. Some indicators might only show meaningful change over a long timeframe or may not be sensitive enough to capture the impact of specific strategies. While usefulness might not always be possible to predict, it should remain a guiding consideration during metric selection.

Number of metrics
Too few metrics might not adequately reflect progress. Tracking too many metrics can strain staff capacity and divert resources from implementation. A strategic approach to monitoring should balance comprehensiveness with practicality. Jurisdictions should focus on a core set of metrics that are most relevant to their resilience goals, shocks and stressors, and priority strategies. This ensures that monitoring efforts remain manageable and that adaptive management processes, such as evaluating performance and making adjustments, are not overwhelmed by excessive data collection.

Integration with adaptive management
Monitoring and evaluation should be embedded within a broader adaptive management framework. Metrics should inform decision-making to adjust strategies based on real-world outcomes. Monitoring should also consider timeframes and scale. Some strategies, such as those targeting health and social chronic stressors, could require a longer time period before impacts become measurable. Local job training programs might increase incomes for participants but have a more diffuse impact on broader economic indicators. When adjusting strategies, consider implementation timeframes and expected benefits. As conditions change and new data becomes available, jurisdictions should be prepared to revisit and revise their metrics to ensure continued relevance and effectiveness.

6.2.3

TRACK POLICY AND STRATEGY PERFORMANCE

Once resilience policies and strategies are in place and implementation has begun, performance tracking can determine if they are effectively addressing the intended risks and achieving desired outcomes. Ongoing evaluation and monitoring support adjustments and improvements, which can help strategies remain effective in the face of changing conditions.

Notably, adaptive management can support capacity-building as jurisdictions gain experience with monitoring and evaluation and learn which strategies and implementation approaches are most effective. However, the resources required for ongoing monitoring and evaluation could present a challenge, as limited capacity, staff turnover, and shifts in agency priority could lead to discontinuation of monitoring and evaluation. To address this, resources for adaptive management should be identified as part of the planning process and incorporated into agency budgets and policies.

Metrics to track progress as part of an adaptive management approach should be specific, well defined, and continuously measurable. The following steps provide guidance on how to establish metrics. **Figure 9** shows an example of this process for strategies to reduce heat-related illness.

1. **Identify resilience goals**
   First, consider the resilience goals of a policy or strategy. These might include reducing vulnerability to specific shocks or stressors or enhancing system redundancy.

2. **Identify key variables**
   Next, consider the key variables that are relevant to the policy or strategy. These could include number of flood events (for strategies to manage flooding), number of grocery stores in communities (for strategies to improve food deserts), or number of jobs accessible within 30 minutes by transit (for strategies to expand or to improve transit systems).

3. **Establish baseline data**
   Collect baseline data for the identified resilience goals and variables to provide a reference point against which future changes can be measured. Baseline data may be historic data (e.g., for changes in weather or climate conditions), current infrastructure conditions (e.g., for strategies to maintain or update infrastructure), or existing health statistics (for strategies to improve health outcomes or disparities).

4. **Define specific, measurable indicators**
   Specific, measurable indicators can track progress toward resilience goals. Indicators should be clear, quantifiable, and directly related to the resilience goals, variables, and the strategy or policy itself. Essentially, the strategy should result in a meaningful change in the indicator.

5. **Set targets and threshold**
   Set realistic targets and thresholds for each indicator. Targets represent the desired level of performance, and thresholds indicate critical points that trigger specific actions or interventions. For instance, "increase the number of cooling centers by 20 percent in five years" is a target and "activate additional cooling centers if the number of consecutive extreme heat days exceeds 3 days" is based on a threshold. Targets should be realistic and provide enough time for strategies to realize benefits.

6. **Develop regular monitoring and reporting systems**
   This involves setting up collection methods, assigning responsibilities, and determining the frequency of reporting and how metrics are shared.

7. **Analyze data and adjust strategies**
   Regularly analyze the collected data to assess progress towards the targets. If progress is slower than expected, assess to what degree this is due to schedule delays or other confounding factors, versus necessary adjustments in strategy design or implementation. Engagement with community members and stakeholders may be necessary to diagnose needed changes. Use this analysis to adjust strategies and actions as needed—this could range from fundamental revisions to strategy design to smaller shifts in implementation tactics, such as increased engagement. This iterative process helps resilience policies and strategies to remain effective and responsive to changing conditions.

For more information on resilience metrics, see the LCI Resilience Metrics Whitepaper, Appendix B and the SoCal Climate Adaptation Planning Guide, Phase 4.

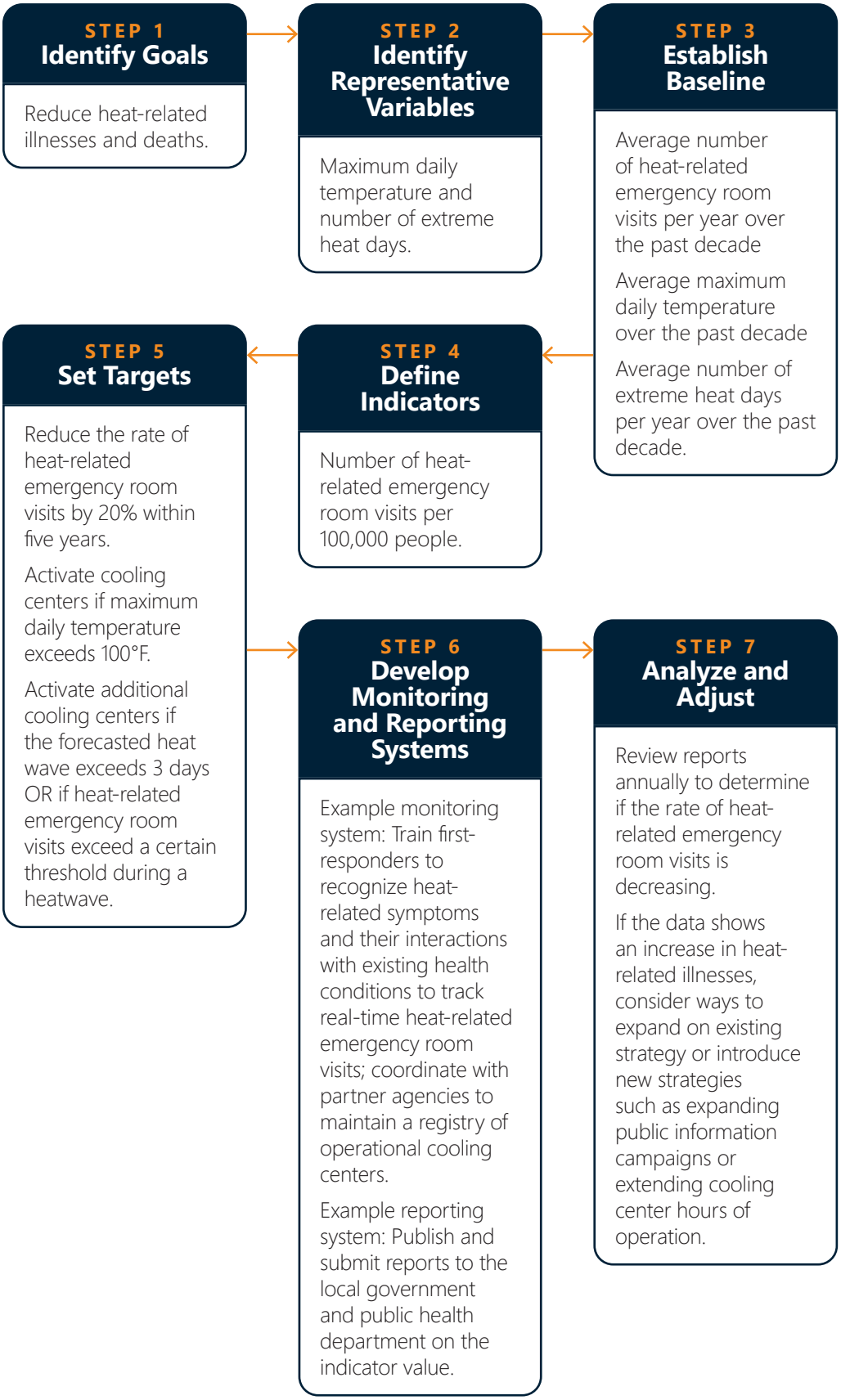
Monitoring and evaluation might not be necessary for every strategy or project. Instead, jurisdictions can identify where tracking for major efforts is most critical, such as infrastructure upgrades, pilot programs, or cross-sector initiatives. For jurisdictions that do not have the resources for a stand-alone resilience plan, monitoring resilience goals and metrics can be integrated into existing planning frameworks. Jurisdictions can also adopt formal policies or resolutions that establish resilience as a planning priority and require integration across departments and plans. For example, SCAG's Climate Action and Water Action resolutions outline specific activities and reporting requirements that help institutionalize resilience without requiring a separate plan.

Other strategies include:

- Designating a resilience lead within an existing department.
- Using executive orders or council resolutions to mandate resilience integration.
- Creating a checklist or guidance for integrating resilience into all new planning efforts.
- Leveraging regional partnerships or technical assistance programs to support monitoring.
- Using existing community engagement processes to gather input on resilience priorities.
- Tracking a small set of key indicators (e.g., heat-related illness, flood exposure, housing vulnerability) that align with local priorities.
- Incorporating resilience into capital improvement planning and budgeting.
- Aligning resilience goals with grant applications and funding criteria.
- Establishing internal reporting protocols to track progress annually or biannually.
- Participating in regional or state-level resilience initiatives that offer shared tools and resources.

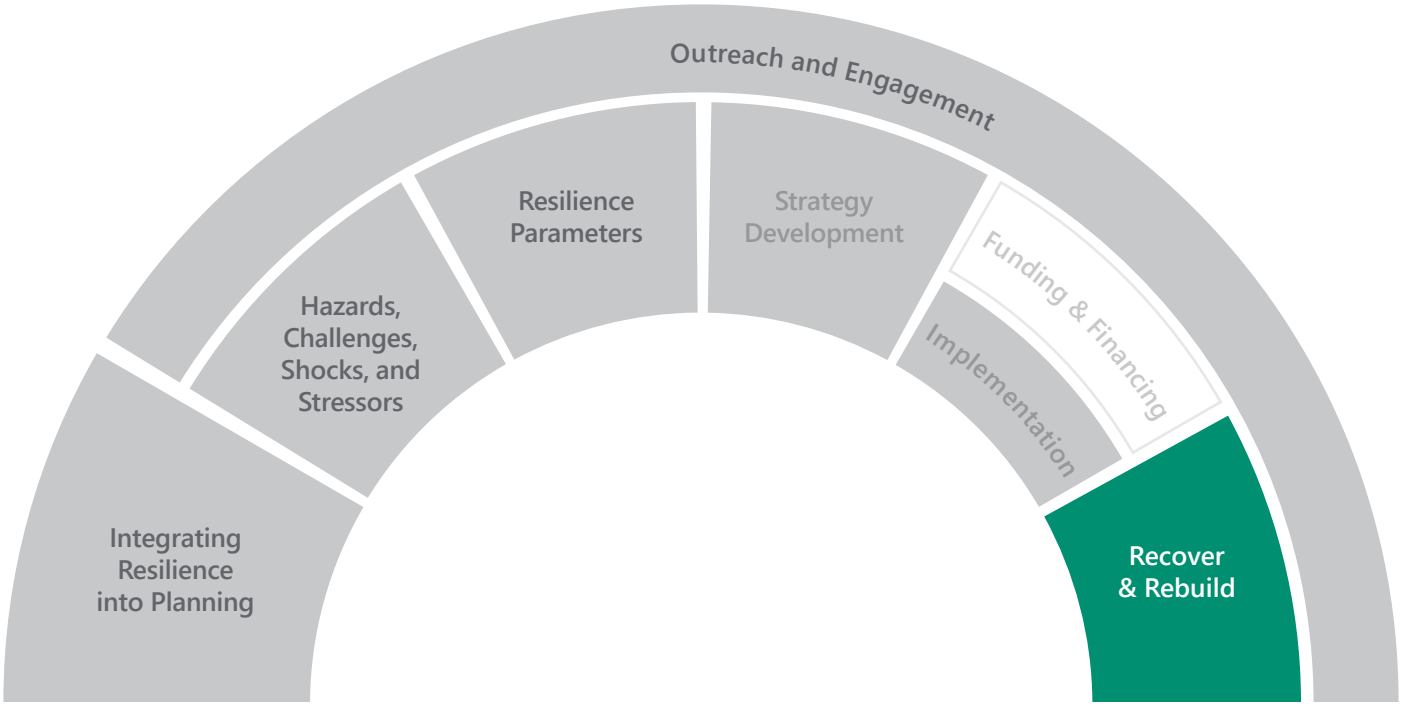
These approaches allow jurisdictions to build resilience incrementally and strategically, even in the absence of a stand-alone resilience plan.

Figure 9 Flow Diagram of Developing and Monitoring Heat-Related Resilience Strategies



Palisades Fire, 2025
Los Angeles, CA
Jessica, Adobe Stock

07 WILDFIRE RECOVERY



OVERVIEW

Southern California has a long history of wildfires, shaped by the complex interplay of human development and activities and the natural fire ecology of the region. Historically, the area's ecosystems evolved with regular intervals of wildfire, both naturally occurring (such as lighting strikes) and from human activities (such as indigenous use of fires in many areas to proactively manage natural lands), which were vital for ecological health and renewal. However, the convergence of several factors has significantly increased the risk communities face: the expansion of developments into wildland-urban interface (WUI) zones, climate change, and a switch from proactive use of fires to manage fuels to an emphasis on widespread fire suppression. These and related factors have supercharged fire cycles, leading to longer, increasingly devastating fire seasons.

The January 2025 wildfires had a catastrophic impact on Los Angeles County, impacting multiple communities, neighborhoods, and infrastructure systems. Wildfires erupted simultaneously in Pacific Palisades and Eaton Canyon fueled by Santa Ana winds, a climatological phenomenon marked by strong, dry winds that accelerate through mountain passes to coastal regions. The Eaton fire alone, propelled by intense winds, reportedly expanded 20-fold within hours, causing unprecedented destruction. Ultimately, these fires devastated approximately 16,000 structures, consumed 40,000 acres, displaced over 100,000 residents, and tragically resulted in 29 fatalities. Its impacts have highlighted a significant need for effective and community informed recovery efforts.

Watershed Protection Specialist from DWR documents the placement of watershed protection materials by members of the Conservation Corps to protect the watershed in the Palisades Fire burn scar area in Los Angeles County, California.
Ken James/DWR

WHY IS THIS IMPORTANT?

The ongoing recovery efforts for the 2025 wildfires offer an opportunity to strengthen broader climate resilience for the future and build back better. Inevitably, wildfires and other hazards will continue to occur, despite local and regional resilience efforts. This chapter aims to support jurisdictions to plan ahead for recovery, so that when major climate disasters occur, they are well prepared to build back better. Notably, while this chapter specifically targets wildfire recovery, its guidance is broadly applicable to other climate hazards, such as tropical storms and floods.

Through planning ahead, recovery outcomes are aided by:

- **Improving coordination and efficiency**
  Defining roles and responsibilities and identifying local recovery needs can streamline efforts and reduce chaotic, ad-hoc, and inefficient resource allocation.

- **Identifying resources**
  Identifying and securing required supplies, equipment, and personnel ahead of time ensures required recovery resources are in place and can be mobilized when needed.

- **Building community preparedness and resilience**
  Identifying vulnerabilities and mitigating risks can strengthen community disaster preparedness by focusing on reducing risks to human lives and ensuring the safety of individuals during and after disasters.

- **Enhancing financial preparedness**
  Having financial plans and insurance in place can support recovery efforts. Every dollar spent on disaster resilience saves $13 in damages and economic loss.[12]

- **Supporting recovery for all communities**
  Integrating the needs of vulnerable communities into pre-disaster recovery planning ensures that resource allocation is inclusive and prioritization is informed by equitable considerations.

This chapter describes the wildfire recovery process, presents strategies for preparing recovery strategies prior to disaster, and outlines recovery frameworks for housing and infrastructure, socioeconomic factors including the economy, and vulnerable communities.

NAVIGATING THE PROCESS

7.1 DISASTER RECOVERY

Disaster recovery can be structured in three phases, addressing the immediate, intermediate, and long-term requirements of impacted communities and infrastructure (**Figure 10**). FEMA developed the National Disaster Recovery Framework (NDRF), which has been incorporated into the California Governor's Office of Emergency Services (Cal OES) 2019 California Disaster Recovery Framework. This section addresses elements included in the NDRF, while also highlighting that these frameworks serve as valuable resources for organizations to reference for guidance and support.

- **Short-term recovery** occurs over days to weeks and focuses on stabilizing critical systems and lifelines. This phase includes mass care, temporary housing, emergency repairs, and debris removal.

- **Intermediate recovery** lasts weeks to months and shifts focus toward restoring habitability and essential services, such as critical infrastructure assessments and interim housing solutions.

- **Long-term recovery** can extend over months to years and aims to rebuild and enhance resilience, incorporating permanent housing solutions, infrastructure reconstruction, and hazard mitigation planning.

Pre-disaster planning can support a more effective recovery process across all phases. It encompasses a comprehensive approach to disaster management that includes minimizing impact, efficient resource allocation, speeding up recovery, enhancing resilience, reducing costs, improving coordination, and ensuring compliance. By planning ahead, jurisdictions can reduce the impact of disasters on their operations and infrastructure.

[12] U.S. Chamber of Commerce. June 25, 2024. The Preparedness Payoff: The Economic Benefits of Investing in Climate Resilience.

Figure 10 Disaster Recovery Continuum[13]

This chapter breaks recovery planning into several sections:

PRE-DISASTER RECOVERY STRATEGIES
Section 7.2 outlines general pre-disaster recovery strategies, including establishing a recovery baseline and assessing agency capacity, planning efforts, and resource allocation.

HOUSING RECOVERY
Section 7.3 focuses on pre-disaster housing strategies to increase resilience and recovery phase actions to restore residential stability, support displaced populations, and facilitate long-term housing supply.

INFRASTRUCTURE RECOVERY
Section 7.4 considers wildfire impacts to infrastructure, such as transportation networks and utilities, and discusses incorporating infrastructure resilience needs into pre-disaster preparedness.

ECONOMIC AND WORKFORCE RECOVERY
Section 7.5 provides strategies to support recovery for local economies and workforces.

RECOVERY FOR VULNERABLE COMMUNITIES
Section 7.6 concludes with solutions to support health and resilience for vulnerable communities.

This comprehensive approach facilitates a recovery process that restores functionality and integrates resilience to reduce future risks.

7.2

PRE-DISASTER RECOVERY STRATEGIES

While individual disasters can be hard to predict, planning for recovery ahead of the disaster can help jurisdictions prepare a timely, organized, and effective response effort. Pre-disaster planning can help agencies define clear roles and responsibilities in advance, understand agency capacities and limitations, and establish partners. Through advanced planning, jurisdictions can shorten recovery timelines, build back better, save costs, and support communities. This section outlines a key set of pre-disaster recovery strategies that can be deployed in advance.

7.2.1

ESTABLISHING A RECOVERY BASELINE

A recovery baseline is a comprehensive assessment of the region's hazards, risks, demographics, and capacity limitations, providing a clear understanding of the challenges and resources available. Establishing a recovery baseline is crucial for effective and timely recovery. Once recovery baseline information is compiled, jurisdictions can then develop and implement targeted strategies that address their specific vulnerabilities and leverage their strengths, enabling them to respond more effectively when a wildfire occurs.

[13] U.S. Department of Homeland Security. December 10, 2024. FEMA. National Disaster Recovery Framework: Third Edition.

To establish a recovery baseline, a community must:

- Identify and assess its regional hazards.
- Understand population densities and demographics.
- Determine capacity limitations in planning realistic and effective recovery efforts.
- Identify opportunities for process optimizations, including data and management tools.
- Develop partnerships with mutual aid organizations to enhance disaster planning and recovery through collaboration, resource sharing, and community trust.
- Identify and understand critical infrastructure, housing, and economic centers.
- Enhance planning and land management in the WUI and other hazard-prone areas.

Refer to Chapter 2 for a guide to identifying and assessing hazards, while Section 4.1.1 offers data tools to identify community demographics, including vulnerable communities that might require greater assistance during and after disasters. The remaining steps to establish a recovery baseline are described further in this section.

7.2.2

PREPARING FOR DELIVERING RECOVERY SOLUTIONS

As part of pre-planning for recovery, jurisdictions should assess their own capacity, optimize processes, and establish partnerships with mutual aid organizations.

DETERMINING AGENCY CAPACITY

Agency capacity directly impacts the effectiveness and efficiency of response and mitigation efforts. A capacity assessment allows agencies to identify and address gaps and allocate resources effectively. It can also help agencies to tailor recovery plans to specific communities, enabling prompt response. A capacity assessment also facilitates coordination with other entities to leverage additional resources and expertise. Finally, it can inform action prioritization, including emergency response, community support, or infrastructure rebuilding, to maximize impact and minimize recovery time.

Knowing **agency capacity** aids in developing realistic and actionable preparedness strategies. It validates that plans are grounded in the actual capabilities of the agency, avoids overcommitment, and assesses readiness for various disaster scenarios. This proactive approach reduces the potential for economic losses and enhances resilience. **Table 11** outlines example considerations for evaluating agency capacity.

Table 11 Guiding Questions to Assess Agency Capacity

Preparatory Questions	Considerations
Which agencies or departments could oversee and manage disaster recovery solutions?	Public Safety/Emergency Management Health and Human Services Housing and Community Development Planning Facilities Technology Services
Cross-agency or department partnerships can play a crucial role in supporting disaster recovery planning and short- and long-term operations. What can these partnerships be leveraged for?	Share resources across agencies and departments: This can include personnel, equipment, and subject matter expertise. Strategic collaboration can allow for more comprehensive and effective mitigation and response efforts post-disaster. Increase efficiencies in communication and coordination: Numerous stakeholders are involved in the disaster recovery planning and response process, and partnerships can minimize the duplication of efforts. Include non-governmental organizations (NGOs) and the private sector: This is key to successful community-based recovery and ensures that recovery efforts are inclusive of all community members.
What is the capacity of other regional or municipal agencies to support disaster planning and recovery operations?	Evaluate if regional agencies have the staffing capacity to augment processes to support the implementation of a disaster recovery program or programs across multiple jurisdictions. Assess if capabilities can be expanded through the allocation of funds to support hiring, training, and workshops to increase local and subject matter expertise. This can provide a resource for jurisdictions to reduce the burden on individual agencies and increase consistency across the region on disaster response.

Evaluating **staff and surge capacity** is essential to determine if sufficient personnel are available to effectively oversee and implement large-scale programs. Adequate staffing influences the timeliness and efficiency of program delivery and supports adaptability during periods of heightened demand. This assessment, outlined in **Table 12**, helps organizations identify gaps, allocate resources effectively, and sustain progress for successful programs.

Table 12 Guiding Questions to Assess Staffing Capacity

Preparatory Questions	Considerations
Does the identified department or agency have enough staff to implement disaster recovery program(s)?	Large-scale disaster recovery programs require sufficient levels of staffing for oversight and implementation. For smaller programs and projects, staff roles can be combined or supplemented with staff augmentation via vendors and contractors supporting lead staff.
How can staffing and surge capacity limitations be addressed or augmented?	Establishing a pre-approved contractors list through a request for qualifications (RFQ) process can be useful to quickly stand-up operations and augment any capacity shortages.
What measures can be put in place prior to a disaster event to ensure staff are equipped to stand up a disaster recovery program(s) quickly and efficiently?	Implement ongoing training to handle the surge in program and project demands, such as permitting and inspection demands. Consider leveraging technology that will streamline processes and increase staff familiarity with disaster-specific building codes and standards.

ENHANCING DISASTER RECOVERY THROUGH OPTIMIZED PROCESSES & TOOLS

Optimized workflows and data tools with end-to-end management capabilities are vital for disaster recovery and planning. They streamline operations, reduce redundancies, and enhance scalability, enabling efficient management of complex disasters. Together, these approaches can lead to a coordinated and effective response, improving outcomes for communities. **Table 13** provides an overview of considerations to support process optimization.

Table 13 Guiding Questions to Support Process Optimization

Preparatory Questions	Considerations
What process optimizations can be implemented to improve efficiencies?	Implement efficient workflows, such as combining damage verification and scope-of-work inspections where feasible, to reduce redundancy and expedite processes and scalability.
Are existing financial system(s) able to handle a high volume of transactions?	Recovery efforts often involve distributing financial aid to numerous individuals, businesses, and organizations affected by the disaster. A system that can efficiently process these transactions can provide timely support and minimize delays that could exacerbate recovery challenges.
Are there existing data and management tools that can be comprehensively used for managing programs?	Utilize a comprehensive system of record with end-to-end management capabilities. Use GIS-enabled dashboards and data visualization tools to monitor progress, allocate resources effectively, and prioritize critical areas.

MUTUAL AID IN DISASTER MANAGEMENT

Mutual aid organizations are vital partners in disaster planning, response, and recovery, adapting their roles to meet the evolving needs of affected communities. During the response phase, mutual aid organizations focus on immediate relief efforts, such as providing emergency shelter, food, and medical care, while managing volunteers and donations. In the post-disaster phase, mutual aid organizations provide services such as housing repair, emotional support, advocacy, and community recovery planning, while also offering specialized resources for individuals with disabilities or underserved communities. These partnerships empower communities through engagement and training, fostering resilience and supporting sustainable recovery efforts.

Building collaborations with mutual aid organizations early in the pre-planning phase can enable agencies to enhance their disaster management through resource sharing, expertise pooling, and fostering community trust. **Table 14** provides guiding questions to develop and strengthen these essential partnerships.

Damage from the Eaton Fire in January 2025.
Ken James/DWR

Table 14 Guiding Questions to Form Effective Mutual Aid Partnerships

Preparatory Questions	Considerations
What are the specific roles and responsibilities of each partner organization?	Each mutual aid organization should have clearly defined roles and responsibilities to reduce overlap and confusion during disaster response and recovery efforts.
How do the goals and missions of the mutual aid organization align with disaster recovery objectives?	Ensure that the mutual aid organization's goals align with jurisdiction-specific disaster recovery objectives for a cohesive and unified approach to disaster management.
What resources and expertise does the mutual aid organization bring to the partnership?	Assess the resources and expertise that the mutual aid organization can bring to the partnership. Understanding their strengths will help to effectively leverage their capabilities.
How will communications, coordination, and data/information sharing be handled between partners?	Establish efficient communication channels and coordination mechanisms to facilitate seamless interaction with mutual aid partner(s). Understand and implement the appropriate compliance requirements for activities that may have legal or regulatory requirements. Develop protocols for secure, efficient data sharing between partners.
How will partnership success be measured and evaluated?	Consider defining how success will be measured and evaluated, including metrics that will be collected to assess the effectiveness of the partnership and opportunities for improvement.
How will the partnership be maintained and sustained over the long term?	Consider how the partnership will be maintained and sustained over the long term. This includes planning for ongoing funding, budget allocations, collaboration, and continuous improvement.

7.2.3

BEST PRACTICES AND CONSIDERATIONS FOR PRE-DISASTER PLANNING AND READINESS

Pre-disaster planning and readiness requires coordinated teamwork among state, federal, and local agencies to ensure an effective response during disasters. Local and regional jurisdictions benefit greatly from clear communication and defined roles for stakeholders. Example roles include:

- State agencies, such as Cal OES, take the lead in coordinating disaster response efforts, deploying resources, and supporting jurisdictions when their capabilities are exceeded.
- Federal agencies, including FEMA, provide additional resources, expertise, and funding, especially for large-scale disasters that require national intervention.
- Organizations and businesses contribute vital on-the-ground support and local knowledge, addressing specific community needs like evacuation routes and emergency shelters.
- NGOs and community groups play a crucial role by mobilizing volunteers and providing essential services.

Through pre-disaster collaboration, these entities can share information, conduct joint training exercises, and develop robust emergency response plans tailored to the unique risks of Southern California. This teamwork facilitates a smooth, coordinated response during disasters, strengthens community resilience, and enhances the capacity for recovery, ultimately safeguarding lives and property more effectively.

The following best practices and considerations can enhance pre-disaster planning and readiness for jurisdictions.

Establish a unified agency
Establishing a unified agency or task force for disaster recovery centralizes coordination and supports efficient use of resources and clear accountability. It allows for consistent implementation of recovery efforts and strategic planning, prioritizing assistance to vulnerable areas. The agency can develop expertise, manage resources effectively, and improve communication with stakeholders.

Scale up capabilities of existing teams
Invest in the existing workforce to enhance capacity to prepare for and respond to disasters effectively. Scaling up the capabilities of current teams leverages their established expertise and operational knowledge, ensuring that responses are efficient and informed by a deep understanding of the region's specific needs and challenges. Compared to creating new entities, this approach enhances collaboration through municipal partnerships, optimizes resource utilization, and reduces costs. If supported with dedicated funding streams and authority for proactive planning and program administration, existing teams can be empowered to expand their capacity to address disaster recovery needs comprehensively.

Build partnerships
Jurisdictions can capitalize on the SCAG membership network or other regional collaborations to build partnerships and identify opportunities for cross-sharing resources, mutual aid, and coordination. Through sharing resources, expertise, and best practices, jurisdictions can develop and implement more informed and effective disaster preparedness and recovery strategies, enhance their capabilities, and assist regional recovery efforts. For instance, if one member faces limitations in staffing or technical expertise, another SCAG member can provide support by lending planning staff to accelerate permitting or integrating regional planning efforts to cover a broader area. By leveraging their network, SCAG members can greatly enhance the efficiency of disaster recovery planning and execution, fostering a more resilient and well-prepared region.

Resilient development in wildland urban interface and hazard-prone areas
Jurisdictions should enhance planning and land management in the WUI and other hazard-prone areas. Through the use of tools such as Cal-Adapt and CAL FIRE's Fire Hazard Severity Zones (FHSZ) maps, jurisdictions can identify high-risk zones and implement strategies to guide new development away from these areas, enforce stringent building standards, and promote vegetation management practices. These measures, alongside adherence to relevant building codes and collaboration with residents for home hardening and resilience programs, contribute to safer, sustainable development and comprehensive disaster preparedness.

7.3

HOUSING RECOVERY

Housing is essential in every community as it underpins the well-being and stability of its residents. The threat of displacement following an event can emotionally affect residents. Losing a home and the sense of community can be profoundly impactful, leading to a significant loss of connection and belonging.

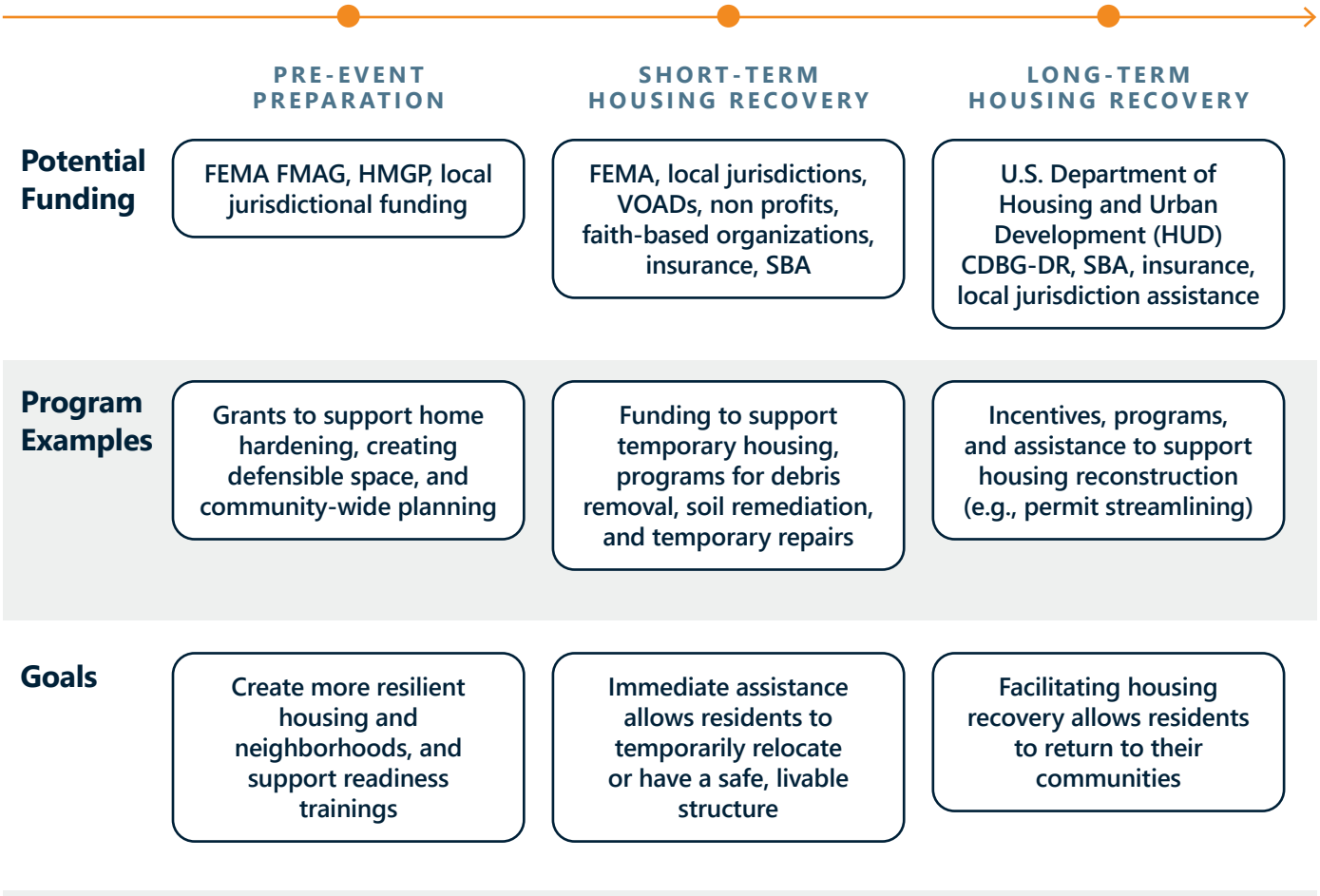
Every disaster event can bring unique challenges that may intensify the existing pressures on California's constrained housing market. Creating a framework of resilience and response actions is critical in restoring a community. **Figure 11** illustrates a timeline of considerations, actions, and funding for housing recovery. By updating codes and standards, investing in home hardening and retrofits, and establishing a recovery framework, jurisdictions can increase the resilience of their new and existing housing stock.

7.3.1

ESTABLISH CLEAR HOUSING PRIORITIES AND GOALS

General plans can serve as an appropriate mechanism to define jurisdictional housing priorities and goals, which can support resilience and recovery. General plan housing priorities will typically be set through goals, policies, and implementation actions in the housing, land use, and safety elements, with opportunities to reinforce these priorities in the conservation, open space, and environmental justice elements. For example, the Town of Paradise's housing element includes Goal HG-2 to "Improve, rebuild, and preserve safe, decent housing and neighborhoods for all Paradise residents, including preparation for wildfire resilience."

Figure 11 Timeline of the Housing Recovery Process



CDBG-DR *Community Development Block Grant Disaster Recovery*
FMAG *Fire Management Assistance Grant*
HMGP *Hazard Mitigation Grant Program*
SBA *Small Business Administration*
VOAD *Voluntary Organizations Active in Disaster*

Example general plan policies and implementation actions that can reduce wildfire risk for housing include:

- Increased building and landscaping requirements for fire resilience and assistance for vegetation management in Moderate, High, and Very High FHSZs.
- Home hardening assistance programs for existing buildings.
- Fire risk reduction education programs.
- Funding mechanisms to improve fire-safe construction and maintenance.
- Public acquisition of high-hazard parcels to serve as wildfire buffers.
- Engagement with insurance companies to align insurance policies and incentive programs with wildfire mitigation priorities.
- Coordination of meetings with housing developers working on innovative housing and disaster recovery solutions.

General plans provide an opportunity to proactively and transparently identify processes and funding mechanisms that will be employed during emergencies. General plans should identify how housing recovery policies and procedures will be implemented so that resources are accessible to all neighborhoods and residents.

7.3.2

NAVIGATE EXISTING REGULATORY FRAMEWORKS

Residential rebuilding and redevelopment projects are typically subject to environmental regulatory frameworks (i.e., the California Environmental Quality Act (CEQA) and the California Coastal Act where applicable), which include provisions to evaluate and minimize the impacts and risks of locating development in vulnerable areas such as flood plains, coastlines, and wildfire risk areas. However, CEQA includes an existing full statutory exemption for projects "undertaken, carried out, or approved by a public agency to maintain, repair, restore, demolish, or replace property or facilities damaged or destroyed as a result of a disaster in a disaster-stricken area in which a state of emergency has been proclaimed." (Pub. Resources Code, § 21080(b)(3).) The California Coastal Act also exempts development involving "the replacement of any structure, other than a public works facility, destroyed by a disaster." (Pub. Resources Code, § 30610(g). Governor Newsom's Executive Orders N-4-25 and N-14-25 reinforce and expand on these exemptions to reduce associated permitting process burdens for areas impacted by the Los Angeles wildfires, specifically by broadening the California Coastal Act exemption to include public facilities and properties or facilities substantially damaged in a disaster.

7.3.3

PRE-DISASTER HOUSING RESILIENCE STRATEGIES

Local jurisdictions can deploy the following actions and strategies to increase housing resilience against future wildfire events.

ZONING AND DATA

Jurisdictions should analyze local data and have plans to address fire risk and other concerns, listed below. This data can be acquired from different agencies and sources, which require coordination. Data should be available to homeowners and developers.

Zoning
As they grow, jurisdictions may shift local zoning laws. Jurisdictions should make zoning requirements easily accessible and actively communicate to homeowners the implications of zoning impacts and how they affect or potentially prohibit reconstruction.

Historic homes
Certain areas and neighborhoods throughout California are designated as historic districts or historic preservation zones and must continue to contribute to the area's original designs. Additionally, prior to the use of federal funds, homes over 50 years old must be presented to the State Historic Preservation Office to identify if the home is designated as historic.

Floodplain map
Reconstructing homes after an event requires compliance with all local floodplain requirements. Areas that have been mapped into a flood zone or floodway should be examined for potential reconstruction to a higher elevation or potential buyout.

Environmental concerns
Jurisdictions should identify environmental concerns that impact certain recovery actions (e.g., hazardous materials in homes). There should be a list of pre-identified locations that can accept and dispose of hazardous materials or chemicals.

HOME HARDENING AND RETROFITS

Home hardening can significantly reduce ignition and fire spread in neighborhoods. While building codes for new construction in the WUI and High or Very High FHSZs already require fire-resistant materials, jurisdictions should consider requiring them in Moderate FHSZs to protect neighborhoods from rapidly spreading fires. Hardening existing homes, particularly pre-2008 homes, is another key priority, and jurisdictions can adopt programs to incentivize, support, or require retrofits.

Review local codes
Evaluate local codes to determine how they can be strengthened to enhance community resilience. Examples include expanding defensible space requirements, increasing setback distances between structures, strengthening building codes, and mandating residential retrofits.

Construction/building standards
Review building standards to identify if requirements can be strengthened or incorporate home hardening measures into home construction. Examples of material upgrades include the use of Class A fire-rated roof coverings (e.g., clay tiles) and noncombustible materials for external walls.

Review innovations and new construction types
Local officials should meet with different vendors to determine construction methods that may provide additional protection for residential properties. This can be through using fire-resistant materials or installing additional fire preventative methods.

Fire-resistant home components for existing homes
Provide training or workshops on simple, fire-resistant components that homeowners can install on their own, such as metal gutters and downspouts, flame- and ember-resistant vents, and double-pane windows, all of which can significantly reduce the risk of home ignition. Offer financial assistance or incentives for more significant fire-resistant home upgrades, such as roof replacement for income-eligible residents. A new roof can reduce the risk of fire destroying a residential building by up to 27 percent, while home-hardening subsidies can save lives, support worker safety, and reduce financial costs of active wildfire suppression.[28]

Explore and pursue funding to make housing and the broader community more resilient to disasters
Jurisdictions should identify and apply for federal, state, and philanthropic funding sources to support housing retrofits, infrastructure upgrades, and community-wide resilience initiatives.

Consider a residential resilience audit and retrofit programs
Jurisdictions should offer or promote audit programs that assess home vulnerability and provide pathways for retrofitting structures to meet higher resilience standards.

BUILD POST-DISASTER CAPACITY

Establishing plans and building relationships in advance can increase a jurisdiction's capacity to support residents and rebuild more quickly in the aftermath of a disaster.

Maintain a 'Housing Program Toolkit'
Jurisdictions may elect to develop pre-approved housing plans that could be easily deployed if a large housing reconstruction program is implemented. These plans will reduce permitting time and can be designed to fit local neighborhood aesthetics. Additionally, jurisdictions should identify city-owned lots that could be used for individual or multi-family developments.

Identify community partners
Jurisdictions should maintain and update a list of organizations that can assist after an event. These range from VOADs, non profit organizations, faith-based organizations, legal aid (for titles/ownership concerns), SBAs, housing authorities, etc.

Establish pre-positioned contracts
Procure pre-qualified vendors to assist with recovery, e.g., by conducting an RFQ for builders, home vendors, outreach, inspectors, etc.

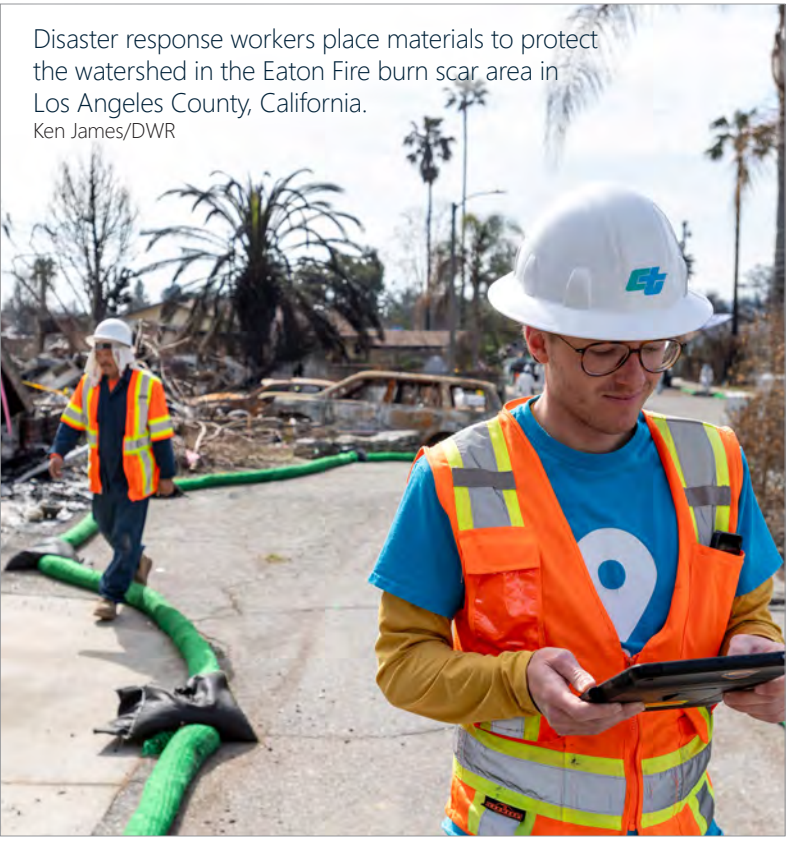
COMMUNICATIONS AND EDUCATION

A robust communications and education strategy can bring awareness of available resources, programs, and incentives available. Communications can also help people to understand their risk and take action to reduce them.

Establish a communication plan
Develop a plan that details key messages, distribution methods, appropriate languages, and responsibility for communications and outreach coordination. The jurisdiction can also encourage residents to stay connected and sign up for alert messaging.

Community education program for housing resilience
Develop and deliver educational programs that inform residents about home hardening retrofits for existing buildings, defensible space, and available incentives for mitigation and resilience upgrades.

Hold resilience workshops
Hold workshops to educate homeowners on the significance of home maintenance, clearing defensible space, reviewing and updating insurance coverage, and the benefits of upgrading their properties to better withstand future events. These initiatives can also include measures to enhance energy efficiency, integrate all-electric utilities, and incorporate solar energy solutions.



Disaster response workers place materials to protect the watershed in the Eaton Fire burn scar area in Los Angeles County, California.
Ken James/DWR

ADDITIONAL CONSIDERATIONS FOR THE WUI AND OTHER HAZARD ZONES

To support short- and long-term housing recovery while facing the reality of increased climate disaster severity, jurisdictions should consider improving planning and land management for the WUI and other areas where residential development interacts with hazard zones. These areas can be identified through tools such as Cal-Adapt, the Wildland Urban Interface map (Spatial Analysis for Conservation and Sustainability Lab), and CAL FIRE's FHSZ maps.

Once WUI areas are defined, jurisdictions should consider the following WUI management strategies:

Explore opportunities to guide new development outside of high-risk areas
Explore strategies to guide new development away from high-risk areas, such as the WUI and floodplains. For properties within these zones, jurisdictions can implement stringent standards to enhance safety and resilience. These standards could include maintaining defensible spaces to separate structures from hazardous areas, ensuring adequate space for emergency response operations, and retrofitting buildings with resilient materials to reduce risks such as flying embers, direct flames, radiant heat exposure, flood damage, or seismic activity. For earthquakes, this could involve reinforcing structures to withstand ground shaking and implementing land use planning that avoids building on fault lines or unstable soil. Additionally, jurisdictions might explore public acquisition of high-hazard properties within buffer zones to reduce risk exposure.

Provide support and assistance for home and structure hardening
Jurisdictions can promote tools like CAL FIRE's Home Hardening Self-Assessment for fire resilience, other hazard-specific resources, or the California Earthquake Authority's Earthquake Brace and Bolt Program to encourage residents to harden their homes. These strategies contribute to safer, more sustainable development practices and comprehensive disaster preparedness.

Implement vegetation management
Work with residents to sustain vegetation management practices through strategic clearing that effectively balances ecological preservation with the reduction of fire-prone brush. Support compliance with the provisions within Chapter 7A of the California Building Code, fire code, and local codes to a degree suitable to the jurisdiction's specific local conditions. Ongoing enforcement of required buffer zones and vegetation management practices is also critical to balance resilience and effective ecological preservation. Reference state requirements and guidance on defensible space at Defensible Space | CAL FIRE.

Evacuation routes and emergency vehicle access
Housing recovery in WUI areas, and particularly hillside communities or other areas with limited access points and narrow roads, should consider opportunities to improve evacuation routes and emergency vehicle access.

Adhere with existing code
California has codes and standards applicable to the WUI, focusing on fire safety and construction, beyond Chapter 7A. Development in the WUI involves adhering to specific building codes and standards designed to reduce the risk of wildfire damage. These codes are typically more stringent than those for non-WUI areas and include:

- **Chapter 49 of the California Fire Code**
  Focuses on mitigating conditions that might cause a fire to spread from vegetation to a structure, or vice versa, in WUI areas. It includes requirements for defensible space, vegetation management, and construction features that allow for more effective firefighting. Note that this applies to both new and existing structures.

- **Section R337 of the California Residential Code**
  Along with Chapter 7A, this provides guidance on construction practices and materials for new buildings in WUI areas, particularly for residential structures.

- **California Wildland-Urban Interface Code (CWUIC)**
  Title 24, Part 7, includes provisions for fire spread, accessibility, defensible space, and water supply in buildings near wildland areas. It also covers ignition-resistant materials.

More prescriptive policy mechanisms can be integrated into local general plans to manage redevelopment in high-risk areas, such as **climate adaptation overlay zones**, which include specialized guidance and regulations to address future risk and improve resilience. Overlay zones can set a binary designation or a tiered structure, with associated incentives or requirements to incorporate resilience measures such as specialized building standards, conditional rebuilding permits, or managed retreat strategies such as transfer of development rights for areas susceptible to location-specific climate hazards. For example, the Chesapeake Bay Critical Area in Maryland applies to a tiered zoning structure within 1,000 feet of the waterline critical area, used to designate sending/receiving areas for tools such as transfer of development rights.

7.3.4

SHORT-TERM HOUSING RECOVERY

LOCAL JURISDICTION ACTIONS

Immediately after a disaster, identify and provide assistance to displaced residents. This assistance addresses immediate needs and can continue for several months until long-term assistance aid and funding are available. Local jurisdictions can effectively supplement state and federal housing recovery efforts on a far more granular scale through a range of high-impact strategies, such as:

Concierge system
Designate knowledgeable and well-connected staff to meet with impacted property owners, help them navigate various agencies, and directly connect them with resources and technical assistance.

Technical assistance
Assist affected community members as they navigate complex regulations by providing clear, accessible explanations of state laws. Provide technical assistance to incorporate relevant climate resilience measures in development plans.

Process streamlining
Establish recovery-specific development approval processes, waive fees for expedited permitting, and dedicate staff resources to streamline review and processing time.

Procedural guidance
Provide clear, proactive communication and procedural guidance for properties identified as unsuitable for redevelopment and candidates for managed retreat practices through voluntary sale or eminent domain.

Connect residents to assistance
Depending on the extent of the damage, FEMA assistance may be available for housing repairs and rental assistance and may support other needs such as food allowance, transportation, etc. Other entities, such as VOADs and faith-based organizations, may provide short-term housing assistance, financial assistance, and shelter services, and may even assist with clearing disaster damage. Jurisdictions should distribute the pre-identified list of entities providing aid and FEMA contact information to residents, following the communication plan developed in the preparedness phase.

COMMUNICATION PLAN

From the onset of the initial event through the entire recovery process, jurisdictions should maintain communication with residents.

Share critical information to help individuals understand actions they can take to protect themselves and locate aid during an active event. Establish open lines of communications with all recovery partners to ensure that efforts are coordinated, responsive to community needs, and transparent.

INDIVIDUAL RESIDENT ACTIONS

- Homeowners and renters should document all damages from each event. This can be through photos, inspection reports, and by capturing information from local news sources (if residents were displaced). It is critical that all receipts and assistance are documented and retained.
- If an insurance policy was in place, the resident should contact the insurance provider.

CONSIDERATIONS FOR CDBG-DR PROGRAMS

CONSTRUCTION

How can homes be more resilient? Communities should strive to build back stronger. This can be through more resilient construction materials and techniques and through identifying resilience measures for other events such as heat or flooding (e.g., increasing energy efficiency, installing cool roofs, elevating two feet above base flood elevation or high-water mark if a home has had repetitive flooding).

ACQUISITIONS AND REPLACEMENT HOUSING

How to retain a community? Through program design, include incentives to keep residents within the community

MULTIFAMILY UNITS

How to maximize affordable housing with new construction? Jurisdictions should incorporate residents in the planning phase and explore options to build in mixed-use housing communities that would appeal to residents.

PERMITTING

Do jurisdictions have sufficient capacity for the volume of permitting work needed? Mutual aid for planning can include jurisdictions lending permitting staff to accelerate the permitting process. Other solutions include streamlining the permitting process and seeking a vendor to address the surge in workload.

VENTURA COUNTY WILDFIRE RESILIENCE

PARTNERS

Ventura County Resource Management Agency

SHOCKS/ STRESSORS ADDRESSED

Wildfire

OVERVIEW

Wildfires are a significant threat in parts of Ventura County, which has a plethora of open space, below-average rainfall, and strong westward-blowing Santa Ana winds. Since 2003, Ventura County (county) has experienced 23 wildfires declared as federal disasters, an average of more than one disaster each year.† Rising temperatures combined with changes in precipitation patterns mean the county is likely to continue to experience an increase in wildfire frequency and intensity, threatening homes, infrastructure, and natural habitats.

The most destructive wildfire in Ventura County to date, the Thomas Fire, began in December 2017. The fire burned over 281,893 acres, destroyed 1,063 structures, resulted in the evacuation of over 94,000 residents, and led to one civilian and one firefighter fatality.†† In light of the scale of rebuilding needed, Ventura County departments made a focused effort to streamline permitting, reduce costs, and provide tailored support to residents. While many factors such as resident characteristics, availability of materials and labor, and the state of the economy can influence the pace of rebuilding, Ventura County cites a shortage of architects and geotechnical engineers as one of the biggest bottlenecks. In 2025, an estimated one-third of the homes lost in the Thomas Fire still have not been rebuilt, largely due to permitting and design delays. However, since the Thomas Fire, Ventura County has altered processes and devised programs to expedite the rebuilding process for residents. In responding to subsequent wildfires, from the Woolsey Fire in 2018 to the Mountain Fire in 2025, the county has refined its response, establishing itself as a leader in local government wildfire recovery and response.

† FEMA. "Disaster Declarations for States and Counties." Accessed April 2, 2025. https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties

†† Ventura County Fire Department. (March 13, 2019). VCFD determines cause of the Thomas Fire – Ventura County Fire Department

LESSONS LEARNED

Ventura County focused on breaking down silos and providing direct connections to county staff, making it easier for residents to find and access information, navigate the rebuilding process, and receive technical assistance. The following are specific changes the county implemented to speed up recovery and establish itself as a model for disaster response.

Create a central hub where the public can access information related to recovery efforts and get personalized assistance.
After the Thomas Fire, the county established a separate website, Ventura County Recovers, to serve as a central repository to streamline wildfire recovery efforts. The website has been iterated to better support residents who lose homes in a wildfire. It now includes a debris removal tracker and frequently asked questions pointing residents to relevant departments and contacts.

Create a task force with the sole responsibility of helping residents rebuild.
In the aftermath of the November 2024 Mountain Fire, Ventura County appointed one staff member to serve as the lead coordinator of recovery efforts for the entire county. This lead, who is deeply familiar with departments and individuals within the county, created the Mountain Fire Planning Rebuild Team, a group of four planners dedicated to helping residents to rebuild. Each planner is responsible for a specific set of inquiries. The team has its own phone line and email that residents can contact to schedule an appointment to kickstart the rebuilding process. Conducting this process in-person with an experienced professional ensures the scope aligns with the owner's objectives and meets county requirements, eliminating multiple back and forth exchanges over proposed plans.

Streamline ordinances to reduce permitting time.
Ventura County met with management-level staff from each permitting agency to identify parts of codes and permits that could be modified. For example, a zoning clearance (official confirmation from the city that a proposed structure complies with regulations) is no longer required for fire rebuilds, so residents can go directly to the Building and Safety Division to apply for a building permit. The county also waived septic system and expedited permit fees. However, the county did not waive the health and safety code to ensure new buildings are safe for inhabitants.

Provide financial and technical assistance.
The county approved a series of fee waivers to alleviate the financial burden of rebuilding. Waivers cover specific planning, building and safety, environmental health, land development, roadway clearance, and fire prevention services up to a set dollar amount. The county also provides housing assistance for those displaced by wildfires.

NEXT STEPS AND IMPLEMENTATION

Though the county has set up procedures to expedite the recovery process, county staff emphasized that the biggest barrier to quick recovery is a lack of technical expertise (e.g., architects and geotechnical engineers) to support residents with developing buildable plans. There are opportunities for CBOs, non-governmental organizations, or regional agencies to provide technical assistance and resources to help residents develop building plans. Staff also identified a need for training and other resources on the wildfire recovery process to maintain staff expertise due to high rates of turnover in the permitting departments.

ADDITIONAL INFORMATION

Ventura County Recovers

After the Disaster - Ready Ventura County

7.3.5

LONG-TERM HOUSING RECOVERY

After each event, jurisdictions should assess the landscape of long-term recovery funding. HUD CDBG-DR funding has been a key resource for long-term housing recovery. These funds are appropriated after a major disaster declaration and primarily assist low- and moderate-income populations. Funded activities depend on specific community needs and can include:

- **Reconstruction/rehabilitation**
  Eligibility typically requires that the applicant owns the home, lived at the home during the disaster, and has direct impacts from the event.

- **Acquisition and replacement housing**
  Depending on the event, there could be a need to buyout homes if the area is unsafe to rebuild.

- **Renters**
  Programs can be developed to assist renters. This can be through homeownership assistance (e.g., downpayment assistance) or through constructing new housing for displaced renters.

HUD also allocates a portion of each appropriation for mitigation activities (CDBG-DR Mitigation Set-Aside). These funds can be used to support strategic activities to prepare for future disasters. Mitigation funds have greater flexibility in their application and can enhance effectiveness by integrating resilience into program designs. For example, single-family housing programs could include: flood-resistant materials, elevating homes above base flood elevations, and incorporating energy-efficient systems and appliances.

LOCAL FUNDING

Local funding sources provide a critical role in recovery. Special districts (e.g., enhanced infrastructure financing districts (EIFDs), climate resilience districts (CRDs); Section 8.2.4) may contribute to long-term recovery efforts and can be established before a disaster to fund both pre- and post-event resilience efforts. When implemented beforehand, they can prevent damage, enhance the availability and affordability of insurance, and expedite the recovery process. See Chapter 8 for more details on funding and financing.

Beginning of long-term housing recovery from the 2017 Tubbs Fire in Santa Rosa, California

Disaster recovery worker supporting wildfire recovery and watershed protection efforts in the Eaton Fire burn scar area in Los Angeles County, California.
Ken James/DWR

RECOVERY PLANNING

Jurisdictions should engage with stakeholders to validate that recovery plans align with community needs and priorities. This can enable jurisdictions to connect communities with essential resources. Both traditional outreach strategies and partnerships with mutual aid organizations can help make sure that individuals are informed and supported throughout the recovery process.

MUTUAL AID

As previously noted, mutual aid organizations can significantly enhance long-term recovery efforts. Several organizations, such as Habitat for Humanity and faith-based organizations, provide resources and funding to rebuild homes. They can also provide skilled personnel to support operations and develop strategies to streamline recovery workflows, fostering collaborative approaches that expedite recovery. Other mutual aid organizations offer supplementary services, such as case management and individual support, to create personalized recovery plans and access additional resources to address unmet needs.

7.3.6

REGIONAL PLANNING

While all regional planning efforts must weigh competing priorities, housing recovery introduces additional tensions between efforts to rebuild quickly and preserve the identity of impacted areas, against efforts to address long-term resilience. Post-disaster regional planning will require jurisdictions to establish clear recovery goals and priorities that carefully balance the impacted community's intentions to rebuild with state-identified housing goals and a variety of equity and sustainability factors.

Disasters and recovery efforts have regional implications for housing supply, housing markets, and new growth. Jurisdictions can work with regional partners to understand and adapt to these broader impacts through the following strategies:

Re-evaluate supply
Following a disaster, assessments of housing supply and future needs should evaluate the housing typologies and affordability levels of units lost or impacted, and demographic characteristics of displaced households. This allows jurisdictions to understand impacts on its housing supply and identify gaps.

Monitor demand
To the extent possible, local and regional jurisdictions should examine how displacements are transferring market demand across neighboring areas or jurisdictions. Understanding which markets are seeing heightened demand from displaced households due to similarities in cost of living, land uses, and other defining characteristics can provide important insight for future policy decisions. Monitoring shifts at a regional level can help understand cross-jurisdictional migration patterns, strains in market supply, the potential for short term market speculation, and stress upon existing infrastructure (e.g., wastewater, transportation).

Shifting development capacity to reduce hazard risk
A jurisdiction may determine that the relocation of existing development or infrastructure to other areas is necessary to address future hazards, which should be considered as part of long-term planning and policy decisions. Potential options include, for example, a policy designation allowing property owners to sell their development rights in a specific high hazard risk area to defined lower hazard risk locations, which can also increase density and address increased demand in defined growth locations.

Continue planning for growth
Beyond recovering housing lost in a disaster, local and regional planning efforts must continue to support new growth to address California's housing crisis. Ideally, jurisdictions should aim to prioritize growth in areas with lower hazards, while implementing mitigation strategies in other locations.

- LCI recommends using Cal-Adapt to identify climate hazards, which can be supplemented by regional planning tools including SCAG's Green Region Resource Areas (GRRAs) as identified in Connect SoCal. These hazards should be considered when determining future housing goals, capacity, and locational suitability. They may also potentially impact demand and development interest.

- To reduce risks, jurisdictions should evaluate the capacity of evacuation routes and emergency response infrastructure. For wildfires, jurisdictions can adopt the resilience strategies identified in Section 7.3.3 and adopt or incentivize fire-resistant building codes.

- Prioritization of growth areas should also consider areas that are most suitable to accommodate increased in-migration from disaster-related displacements or relocations. In other words, this can also be used as an opportunity to update infrastructure and attract growth to existing communities.

- In the long run, greater community ownership and participation in the development process can increase social resilience and new opportunities. For example, equitable community development through land banks and land trusts can incentivize resilience-focused growth, conservation and restoration, and innovative land use such as wildfire-resilient community spaces.

IMPACTS TO PUBLIC SERVICES AND INFRASTRUCTURE

Residents rely on a range of public services and infrastructure, and housing recovery efforts must be supported by—and planned in parallel with—adjustments to public service and infrastructure priorities, as discussed in Section 7.4. Jurisdictions should ensure that staff responsible for housing recovery and long-range planning are in close communication with public works departments, utilities, and other service providers to accommodate residential shifts.

7.4

INFRASTRUCTURE RECOVERY

Infrastructure supports a community's economy, life safety, and quality of life, and restoring infrastructure functions after disasters is a critical priority for resilience. **Table 15** lists infrastructure categories typically vulnerable to wildfire and other hazards. Of these, public safety, water, food, shelter, energy, healthcare, communications, and transportation are considered critical community lifelines, shown in **Figure 12**. They enable all other aspects of a community to function when they are stable and resilient. Re-establishing social infrastructure, such as schools and other community centers, is also critical to restore social normalcy.

INFRASTRUCTURE RESILIENCE TIMELINE

Developing wildfire-resilient infrastructure is an ongoing, cyclical process. It includes planning and implementing resilience improvements as funding becomes available, conducting maintenance, and making further upgrades as technologies and infrastructure needs evolve. Strengthening infrastructure resilience should remain a continuous objective. If a wildfire occurs, rebuilding damaged infrastructure becomes an essential part of the ongoing resilience timeline.

Infrastructure recovery should be incorporated into recovery plans. Short-term recovery efforts might require establishing temporary infrastructure in order to restore critical community timelines. Longer-term recovery presents an opportunity to enhance infrastructure resilience to future hazards. Planning and implementing these long-term efforts can help integrate disaster recovery planning with hazard mitigation and resilience planning.

Table 15 Infrastructure Categories Vulnerable to Wildfire

Communications	**Energy**
Food systems	**Shelter**
Natural infrastructure (e.g., public open space areas, future wildfire fuel, fuel break "buffers," drainage/debris basins)	**Social systems** (healthcare, schools, community centers, and others)
Public safety and first responder facilities	**Stormwater**
	Transportation & transit
	Water and wastewater

Figure 12 Critical Community Lifelines

7.4.1

INFRASTRUCTURE PREPAREDNESS

Infrastructure preparedness involves a cycle of planning, equipping, evaluating, and taking corrective action, with the goal of having functional and adequate infrastructure that is less vulnerable to disasters and more effective for response and recovery. Where possible, jurisdictions should work together to conduct training and planning and leverage available resources.

IDENTIFY CRITICAL STRUCTURE

Before disasters, jurisdictions should identify infrastructure vulnerable to damage. Similarly, they should identify infrastructure that must continue functioning or be rapidly restored to enable strong community recovery. Multiple planning documents and tools can assist in identifying critical infrastructure, assessing vulnerabilities, and prioritizing mitigation strategies (see Chapter 2 on identifying shocks and stressors, Chapter 4 on strategy development, and Chapter 9 for resources and tools). Vulnerability assessments for infrastructure should identify weak links in lifeline systems to assist emergency managers and decision-makers in understanding how infrastructure systems are inter-connected regionally.

Leaders from DWR and Los Angeles County Public Works supporting Eaton fire recovery.
Ken James/DWR

ASSESS CRITICAL STRUCTURE

Preparedness planning should include a baseline assessment of infrastructure systems with recurring updates to analyze gaps and vulnerabilities. These assessments can occur at different geographic scales (local, multi-jurisdictional, or regional) as appropriate to identify critical, interrelated infrastructure. Reassessments should consider lessons learned from previous disasters, new technologies, and new methods and advancements in disaster preparedness. Reassessments should prioritize corrective actions for improving preparedness. Priority infrastructure categories for preparedness include communications, water, food, critical facilities and utilities, detection and warning systems, and public safety and first responder facilities.

When assessing infrastructure, evaluate design and planned upgrades against future climate projections using tools such as Cal-Adapt and findings from California's latest climate change assessments. With the forthcoming release of California's Fifth Climate Change Assessment, Cal-Adapt is moving to the use of shared socioeconomic pathways (SSP), which link potential global warming levels (e.g., 2 degrees Celsius) and timeframes with global economic scenarios, allowing for a more nuanced evaluation. Under the Fifth Assessment, SSP 3-7.0 reflects a business-as-usual scenario for use in planning for extremes. However, the Fourth Climate Change Assessment version of Cal-Adapt also remains online as of early 2026. This version aligns with guidance in the 2020 California Adaptation Planning Guide, which recommends using the representative concentration pathway (RCP) 8.5 scenario—a worst case scenario—when planning for the mid-century timeframe or for more conservative, risk-averse assets. See Section 9.3 for more on Cal-Adapt. Planning for a worst-case scenario can ensure that critical infrastructure can maintain continuity of operations through climate extremes.

SECTOR-SPECIFIC INFRASTRUCTURE CONSIDERATIONS

Communications

Jurisdictions should evaluate and test the effectiveness of hazard detection, communication, and warning systems frequently, with a focus on technology improvements and effective communication protocols between emergency responders with the public. Systems should be interoperable among emergency managers and responders throughout the region. Advanced communication system technologies should be maintained for public use. Community-focused warning systems should be redundant, well-maintained, cybersecure, and flood- and fire-hardened, ideally supported by long-term back-up power sources. Redundancy may also mean temporary systems that can be quickly deployed immediately following wildfires and other disasters.

Resources and examples
National Emergency Communications Plan, Communications and Cyber Resiliency Toolkit, California Public Alert and Warning System (CalPAWS) Plan

Preparedness Assessments

Preparedness assessments may result in recommendations to increase baseline functionality of existing infrastructure, such as:

- **Capacity of debris basins**
- **Stockpile of materials for deployment during response efforts**
- **Trainings**
- **Redundancies in resources**

Water Infrastructure
Water infrastructure should be designed and built to accommodate peak-load demand, including having sufficient capacity for conflagration fire suppression. To support water availability for fire suppression, agencies should implement technologies that automatically stop water loss, such as shutoff valve systems, when components of water delivery infrastructure are compromised. To increase redundancy, both water storage and delivery systems should have redundancy; jurisdictions can explore distributed water storage solutions, such as rainwater, stormwater, and graywater capture and storage systems, which can also help to manage stormwater and reduce flood risk. To increase resilience, retrofit physical structures to be fire- and flood-proof with appropriate hardened landscaping to maintain functionality.

Resources and examples
State Water Resources Control Board – Water Resiliency, EPA – Creating Resilient Water Utilities, Water Resilience Assessment Framework Guidance for Water Utilities

Transportation
Transportation infrastructure is critical to resilience by supporting evacuations and access for emergency responders to both disaster-affected areas and critical community lifelines. Accordingly, preparedness for transportation infrastructure requires coordination between transportation planning agencies, transit agencies, jurisdictions, and county offices of emergency services.

At the jurisdiction level, evacuation plans outline critical routes and can identify areas of potential weakness, such as communities served by only one road. Transit agencies and transportation planning agencies can develop resilience plans to outline how they can maintain continuity of operations and support public safety, including serving evacuation needs, during a disaster. Key objectives include maintaining redundancy, service continuity, and supporting those without vehicle access. Preemptive coordination with CBOs and social service providers can ensure that community needs inform plans for multimodal evacuations, e.g. developing a bus evacuation service for census tracts with low levels of vehicle ownership.

Transit agencies should also consider the resilience of their routes and linear assets (roads, tracks), rolling stock (rail cars, buses, vans), facilities and stations, service infrastructure (fuel and power supply, communications and information technology systems), and staffing. Plans can also identify alternative routes, service plans, and staging areas where equipment, fuel, and resources can be deployed. Identifying and strengthening the most critical facilities increases resilience for the entire system (e.g., providing backup power to operations centers).

Preparedness assessments should also evaluate access routes for critical infrastructure to conduct repairs and maintain continuity of operations. Wildfire, high winds, flooding, and debris flows could all compromise access and thus also repair and maintenance work. For example, maintaining access to transmission and distribution lines is critical for vegetation management to reduce fire risk and repairs during outages.

Resources and examples
Bay Area Paratransit Toolkit, Ventura County Transportation Commission Transportation Emergency Preparedness Plan, Transit Resilience Plan Guidance & Template.

Energy
Preparedness for energy infrastructure should focus on maintaining operations during disaster conditions without elevating wildfire risk. Microgrid planning and deployment, especially for public buildings and critical facilities, can maintain electricity service during systemwide outages, especially in combination with solar and battery storage. Temporary systems, such as large generator systems at substations, can also be considered for future deployment. Pilot projects can help to demonstrate new technologies, such as vehicle-to-grid or vehicle-to-everything, which enables electric vehicles to power the grid, buildings, or other uses. Additionally, resilience planning should also account for the growing share of electric vehicles among households and maintain operations for electric vehicle charging equipment to support mobility during power outages and evacuations.

Resources and examples
Sandia National Laboratories Microgrid Conceptual Design Guidebook, Community Resilience Options: A Menu for Enhancing Local Energy Resilience, NREL Energy to Communities Program, Santa Ana Regional Transportation Center Microgrid Feasibility Study, North Coast Resiliency Initiative, Demonstrating a Secure, Reliable, Low-Carbon Community Microgrid at the Blue Lake Rancheria

Resilience Centers

Although critical facilities such as hospitals have dedicated resilience planning efforts, other emerging concepts like resilience centers or hubs are becoming critical to community resilience. These centers should be hardened to fire, earthquakes, heat, and flooding and be equipped with microgrids and backup power to enable residents to safely shelter in place, especially when evacuations are infeasible or dangerous. Resilience centers should be located in familiar locations, such as schools, community centers, and senior centers.

Resources and examples
Guide to Developing Resilience Hubs, California Strategic Growth Council Community Resilience Centers Program, Central Coast Community Resilience Hubs Toolkit

Centralized Critical Facilities Database

A centralized critical facilities database can provide efficiencies in long-term planning for resilient infrastructure. The database can be organized to allow for unified coordination and assessment of infrastructure vulnerabilities and improve collective disaster recovery, preparedness, and hazard mitigation actions at a variety of geographic scales. Focusing identification and assessment of infrastructure at a multi-jurisdictional level can allow for pooling of financial resources. This can enhance local and regional resilience, as infrastructure networks cross boundaries and serve multiple jurisdictions.

Disaster recovery workers place watershed protection measures in the Palisades Fire burn scar area.
Ken James/DWR

7.4.2

RECOVERY PROCESSES FOR INFRASTRUCTURE

Disaster recovery provides an opportunity for communities to rebuild resiliently to better withstand future wildfires and other disasters. Where possible, planning for infrastructure recovery and rebuilding should have a regional focus to enhance redundancy and create opportunities for pooling funding and other resources.

RESILIENT REBUILDING FOR HAZARD MITIGATION

Resilient rebuilding can demonstrate appropriate, resilient, and forward-thinking recovery for affected communities and other regions with similar hazards. Ideally, infrastructure can be rebuilt to meet or exceed established standards and requirements, reduce damage from future hazards, improve the potential for post-disaster functionality, and achieve other community priorities.

Infrastructure recovery projects can address multiple hazards, not only the original disaster event, by including other infrastructure improvements. This can improve funding efficiency and minimize potential disruptions due to constructure. Project designs should use climate-informed scientific approaches (e.g., use more heat-resilient materials to prepare for future extreme heat projections).

Examples of recovery projects that support hazard mitigation include:

- Expand stormwater retention and drainage systems to accommodate post-wildfire flood risks and stronger atmospheric rivers.
- Harden structures and materials against wildfire, flooding, and other hazards.
- While repairing electric systems, underground electric distribution lines, replace wooden poles with metal ones, or relocate transmission lines outside of wildlands.
- Manage and maintain landscaping and vegetation in community or open-space areas adjacent to developed areas according to a fuel-management plan that promotes vegetation types and structures that slow wildfire spread.
- Wildfire mitigation hardening at schools can include development of backup energy (e.g., solar) and water systems so that the schools can function as community resilience hubs during and following wildfires. Schools should also be rebuilt to incorporate fire-resistant building materials, updated HVAC systems, defensible space, and other components that enable it to serve as a resilience center.

Examples of infrastructure recovery projects that support broader climate or community priorities include:

- Repairs to electrical infrastructure could incorporate transformer upgrades to increase electricity service for older neighborhoods to support electric vehicle charging and building electrification.
- Reconstruction of drinking water supply could update pipe materials and designs to enhance seismic resilience, incorporate fire-resistant materials, and eliminate lead components.
- Reconstruction of stormwater infrastructure can upgrade capacities to account for more extreme rainfall events and capture and use for groundwater recharge.
- Buildings and structures can be designed and constructed to incorporate heat pumps, updated HVAC and air filtration systems, and cool roofs and walls.
- Rebuilding can follow fire-resistant landscaping methods and include appropriate spacing between vegetation and structures and between multiple structures.
- Rebuilding infrastructure within historically marginalized communities can be an opportunity to address past inequities and unequal provisions of municipal services.
- Urban agriculture and community gardens can be developed as a fire-resistant landscape that also serves as a local food source.

NATURAL INFRASTRUCTURE

Jurisdictions can incorporate natural infrastructure such as open space areas, fuel break "buffers," and drainage/debris basins as part of their wildfire recovery efforts. Concepts to consider include:

- **Rapidly deploying soil stabilization measures** (also known as erosion control measures) to protect burned open space areas from secondary post-fire impacts such as erosion, debris flow, and flooding. Short- to medium-term structural measures like jute netting, silt fencing, mulching, straw wattles, hydroseeding, and check dams can be deployed while vegetation regrows. Consider using endemic native seeds or seeds from a planting palette that matches a landscaping plan for the open space area (if one exists). Jurisdictions can prepare in advance by stockpiling materials and identifying qualified stormwater pollution prevention practitioners to design and implement soil stabilization measures.

- **Installing systems such as biofilters to maximize runoff infiltration.** Though soil stabilization can improve infiltration in burned soils, treatment systems might be necessary to intercept and remove pollutants from contaminated runoff. Conduct rapid assessments of burned areas to evaluate infiltration and the hydrologic effects of soil water repellency, identifying where added infiltration measures are necessary. Nature-based biofilter systems can improve infiltration after fires, while compost filter socks help capture toxic substances in runoff.

- **Evaluating, monitoring, and managing plant regeneration in open space areas.** Post-burn management of open space areas should evaluate the potential for native endemic plants to regenerate. Natural regrowth can occur through resprouting of burned stumps or fire-based stimulation of seed stock in the soil, which are common characteristics in fire-adapted ecosystems in Southern California, such as chaparral and oak woodland. Consider replanting in areas where regeneration will likely not occur. Resource managers should develop long-term adaptive management plans for vegetation, which should consider metrics for recovery and monitoring invasive species. Active control of invasive species might be necessary, especially for species that increase fire risk.

  In burned open-space areas adjacent to communities, jurisdictions should integrate wildfire hazard mitigation into vegetation management and maintenance during the regrowth and reestablishment phase. Management efforts should follow a fuel-management prescription that considers vegetation composition, structure, and future wildfire risk. Such prescriptions can be developed by qualified practitioners, including foresters, arborists, landscape architects, and ecologists.

- **Establishing fuel breaks and firebreaks** as part of long-term vegetation maintenance and fuels management plans. Fuel breaks intentionally alter vegetation composition and structure to slow wildfire spread and reduce wildfire intensity. Firebreaks should be wide enough to safely accommodate firefighting equipment. For an example program, see the city of Chula Vista's Hazardous Fuel Reduction Program, which includes vegetation management and fuel break implementation.

FUNDING CHALLENGES FOR RESILIENT INFRASTRUCTURE RECOVERY PROJECTS

Compare short-term financial burden on the community to broad social and economic benefits and costs of an unmitigated disaster.

Commit to realistic long term maintenance costs.

Reliance on a single organization or government body, such as FEMA, as a funding source can be risky.

Utilizing a broad portfolio of funding sources, including self-funding (e.g., tax increment financing such as EIFDs or CRDs, sales taxes, etc.), should be a goal and a method for creating and maintaining a resilient infrastructure.

Consider if multi-jurisdictional or regional projects could be fiscally effective, accounting for pooled financial and organizational resources.

7.5

ECONOMIC AND WORKFORCE RECOVERY

Wildfires and other disasters have devastating short- and potentially long-term impacts on local economies, including property destruction, workforce displacement, business disruption and closures, and straining community resources. These impacts are further compounded for low-income households, small businesses, and businesses that require workers to be physically present, such as hospitality, domestic services, agriculture, and construction.

Small businesses are the economic backbone of many communities but often face significant barriers to reopening post-disaster, leading to long-term financial instability and closures. Studies show that 40 percent of small businesses never reopen after a disaster, and an additional 25 percent fail within a year due to continued financial strain and operational disruptions.[14]

Economic and workforce recovery planning strengthens disaster recovery and resilience by:

- **Enabling rapid response and recovery**
  Immediate support helps businesses and workers recover faster and reduces impacts on long-term business and workforce stability.
- **Strengthening workforce resilience**
  Job training and skills programs help workers transition and respond if their industries are affected.
- **Securing financial resources**
  Identifying funding and financing strategies in advance supports timely access to aid, financially preparedness, and effective recovery.
- **Encouraging economic diversification**
  A diverse economy is more resilient to industry-specific disruptions and enhances regional economic stability.

Addressing health and community needs is a core part of economic recovery, because a resilient workforce can take care of their physical and mental health, care for their families, and meet their housing and food security needs. Some of these considerations are addressed here, and others in Section 7.6 – Recovery for Vulnerable Communities. The following section outlines actionable recovery strategies that jurisdictions and stakeholders within the SCAG region can adopt or promote to support local and regional recovery.

7.5.1

ECONOMIC AND WORKFORCE RECOVERY STRATEGIES

INCREASE REGIONAL RECOVERY CAPACITY

Increasing regional capacity supports more effective preparation for, response to, and recovery from disasters, through improved communication and coordination, effective resource allocation, and equitable and inclusive recovery efforts. The following strategies and actions build the foundation for a well-connected, informed, and responsive recovery ecosystem that underpins the success of other strategies outlined in this toolkit.

Integrate economic recovery actions to align specific local economic and workforce needs with mitigation planning efforts and to support increased access to funding opportunities.

Build a cross-sectoral network of stakeholders

- Create communication channels between agencies, departments, business and workforce representatives, and key local and regional organizations to promote and respond to business and workforce needs before, during, and after disaster events.
- Build peer-to-peer recovery support networks to establish quality mentorship programs and professional counseling services, such as one-on-one mentorship, financial coaching, and emotional support. Consider providing bilingual and culturally competent facilitators to expand reach and impact.

Develop post-disaster business reopening protocols that can be tailored to meet individual business needs and implemented quickly to support rapid economic recovery. Protocols may include reopening checklists, pre-disaster assessment templates, guidelines for financial recovery, insurance outreach guidance, and guidance for supply disruptions.

Collaborate with regional CBOs and businesses

- Partner with local CBOs and businesses to support workforce development, plan for disasters, and implement recovery efforts that build local expertise and promote post-disaster assistance.
- Provide resources to local CBOs and businesses that actively support recovery efforts. Resources may include educational and training, staff time, or technical assistance.

[14] Congressional Research Service, 2023. Small Businesses and Disaster Recovery.

SOUTHERN BORDER COALITION

Counties of San Diego and Imperial

FUNDING **California Jobs First Initiative**

Planning Phase	**$5M**
Project Predevelopment Activities	**$9M**

PARTNERS **San Diego State University (Fiscal Agent and Regional Convener), Comité Civico del Valle, the San Diego Regional Policy & Innovation Center, Universidad Popular, South Bay Community Services, the Imperial Valley Equity & Justice Coalition, the Imperial Valley Wellness Foundation, the San Diego & Imperial Counties Labor Council**

OVERVIEW

The Southern Border Coalition (SBC) was created in 2021 as one of 13 economic regions in the California Jobs First Initiative† (formerly the Community Economic Resilience Fund), The SBC aims to create high-quality, green jobs and foster long-term climate and economic resilience in San Diego and Imperial Counties. SBC consists of a diverse group of environmental justice organizations, regional economic development groups, labor unions, CBOs, local governments, educational institutions, and Indigenous Tribes.

The Jobs First Initiative consists of two phases: planning and implementation. The planning phase took place from 2022 to 2024, culminating in the production of the Southern Border Region Regional Plan, a regional roadmap focused on sustainable economic development. The plan identifies strategies that promote economic and climate resilience through data-driven research and community engagement, as detailed below.

LESSONS LEARNED

Use a two-phase approach to split up tasks
The SBC split up the development of the regional plan into two phases. In the first phase (Draft Regional Plan Part 1), the SBC created a regional summary, conducted stakeholder mapping, identified disinvested communities, and analyzed the strengths and weaknesses of the region's labor markets and industry clusters. This comprehensive research, based on the engagement process outlined above, provided a solid foundation for phase 2 (Draft Regional Plan Part 2), which develops a comprehensive roadmap to enhance economic development and climate resilience and identifies priority strategies for each sector and industry.

SHOCKS/ STRESSORS ADDRESSED

- Economic Shocks
- Climate Change
- Drought
- Flooding
- Severe Storms
- Biodiversity Loss
- Sea Level Rise
- Coastal Erosion

Develop a robust engagement strategy
The SBC's engagement methodology incorporates both qualitative and quantitative data, cross-cutting representation, and diverse data sources. The coalition relied heavily on statistical and climate data and hyper-local information, such as oral histories, to inform the planning process. Incorporating the lived experiences of residents ensures the plan accurately represents local priorities. Other jurisdictions can look to the SBC's approach to codify and incorporate qualitative and quantitative data into inclusive regional planning.

NEXT STEPS AND IMPLEMENTATION

Part 2 of the Draft Regional Plan outlines steps for implementing recommended policies and strategies, focusing on creating an effective governance structure, selecting projects, and closing funding gaps.

The plan emphasizes the need for an evolving governance structure that provides stakeholders with clear roles and responsibilities, designates decision-making authority across stakeholders, and determines the level of community involvement required to consider diverse perspectives while ensuring projects can move forward. Strengthening partnerships with local governments, community organizations, and state and federal agencies is a key next step to secure support for priority industry sectors.

The California Jobs First Initiative has pledged $9 million to all regions for a pre-development catalyst phase. These funds can be applied to all or a portion of a multi-phase project. Projects may include capacity building, strategic planning (e.g., feasibility studies, environmental assessments), and environmental infrastructure development. The SBC put out a formal request for projects in May 2025 and will evaluate and prioritize projects based on equity, sustainability, economic resilience, economic competitiveness, and job quality. Additional funding opportunities, such as philanthropy or impact financing, should be leveraged.

The SBC will establish a monitoring and evaluation framework to track the regional plan's implementation, measure progress, and ensure marginalized communities are included in decision-making. The SBC will provide technical assistance to catalyze projects aligned with priority strategies, while continuing community engagement, participatory policymaking, and partnership building efforts.

ADDITIONAL INFORMATION

Southern Border Coalition Regional Plan - Part 1 and Part 2

California Jobs First - Southern Border Coalition, Catalyst Pre-development Fund - Request for Proposals

California Jobs First – Southern Border Coalition - SDSU

Press Release: CJF

CERF Catalyst Program: Final Framework

† California Jobs First. (n.d.). California Jobs First Southern Border Coalition. https://cajobsfirst.sdsu.edu/

PROVIDE BUSINESS TRAINING AND TECHNICAL ASSISTANCE

Targeted training, technical support, and business continuity planning help businesses and communities navigate post-disaster challenges more effectively. Stakeholders equipped with the necessary tools and knowledge can better coordinate recovery efforts and support more adaptive and responsive strategies.

Support business continuity and emergency planning

- Provide local businesses and organizations with tools, resources, and guidance to develop customized business continuity plans that enable a rapid recovery and improve protection protocols for critical business files, records, equipment, and assets from physical damage.
- Deliver sector-specific post-disaster recovery training for businesses and the workforce, including case studies and simulations of recovery planning tools such as FEMA's Business Continuity Planning Suite.
- Establish peer-to-peer mentorship programs and professional counseling services, such as financial coaching. Consider providing bilingual and culturally competent facilitators to expand reach and impact.

North Coast Regional Water Quality Control Board Emergency Permits

In response to the 2017 Northern California wildfires, the North Coast Regional Water Quality Control Board issued temporary permits to stakeholders seeking to conduct emergency projects to repair property and infrastructure and minimize impacts to affected watersheds. Sonoma County offered reduced or waived fees for replacement structures and issued guidance to streamline rebuilding, helping reduce costs and delays for impacted businesses and property owners.

Southern Border Communities Coalition

The Southern Border Communities Coalition brings together 60 organizations and networks from across the southern border from San Diego, CA, to Brownsville, TX, to promote policies and solutions that improve the quality of life of border residents.

California Small Business Development Center

The California Small Business Development Center Network offers free disaster recovery and continuity planning consulting services to help businesses to recover faster after a disaster.

Remove barriers to post-disaster economic recovery

- Identify barriers to businesses reopening through outreach efforts such as surveys and listening sessions. Prioritize regional and local efforts that address the most common or disruptive barriers.
- Provide temporary and expedited permits for critical repairs and immediate reopening needs to allow businesses to operate while they complete the full permitting process.
- Temporarily waive or postpone fees for business licenses, construction permits, and inspections to reduce the financial burden on recovering businesses.
- Organize insurance literacy workshops and personalized support sessions to help businesses understand business interruption insurance, assess eligibility, and file claims.
- Partner with insurance experts and organizations to provide post-disaster pro bono claim support.

PROMOTE WORKFORCE DEVELOPMENT

Workforce development programs promote resilient, adaptable workforces and help communities recover more effectively through expanded employment pathways and improved access to essential services such as childcare and healthcare.

Develop workforce development tools and resources to increase preparedness for and recovery from disasters

- Design disaster simulation exercises to prepare employees for disaster scenarios.
- Develop training programs to educate workers on health and safety protocols, hazard prevention, and workers' rights, including programs like the California Workplace Outreach Project.
- Partner with labor advocacy groups to promote fair wages, worker safety, and protection from exploitation.
- Partner with day laborer centers to promote financial assistance programs, workforce training opportunities, legal assistance programs, housing assistance, and safety awareness campaigns.

Improve pathways to employment

- Create an employment center that connects job seekers with temporary employment in recovery sectors such as construction and logistics.
- Develop workforce training programs in housing and infrastructure repair, creating local job opportunities in reconstruction and long-term asset maintenance and operation.
- Leverage public works and transportation projects to absorb job losses resulting from disasters.
- Partner with state agencies, such as the Employment Development Department, to provide job placement services, training programs, and employment assistance for workers displaced by disasters.
- Partner with NGOs to provide dedicated support services to vulnerable members of the workforce, such as undocumented workers, independent contractors, or domestic laborers to support post-disaster stability and access to necessary resources.

California Department of Industrial Relations Workplace Outreach

The California Department of Industrial Relations is investing $25 million in the California Workplace Outreach Project, supporting Los Angeles fire recovery efforts by educating workers on health and safety, hazard prevention, wage theft protections, and immigrant worker rights.

Provide essential workforce recovery services

- Collaborate with local organizations and programs to provide affordable and quality childcare to improve labor participation.
- Partner with healthcare providers to establish mobile health clinics that provide immediate care in impacted communities, such as basic medical treatments and mental health support services.
- Train community health workers to connect people to healthcare access and provide immediate, community-driven medical assistance, especially for vulnerable communities pre-, during, and post-disaster.
- Address food access and security vulnerabilities such as supply-chain gaps, through partnerships with local supplier and supporting community pantries.

Los Angeles Trade-Technical College Workforce Development

The Los Angeles Trade-Technical College partnered with California Community Colleges to develop the Workforce Development Program to offer workforce development and retraining for workers affected by economic disruptions post-disaster. The program aligns with the needs of disaster recovery efforts and prepares employees for new roles in rebuilding and restoration.

IDENTIFY AND PROMOTE RECOVERY AND PLANNING FUNDING OPPORTUNITIES

Expanding business and community awareness of disaster recovery funding improves access to available programs and accelerates the implementation of recovery-focused projects, particularly for vulnerable populations

Streamline and centralize access to funding resources

- Create a "one-stop shop" resource hub for pre- and post-disaster funding and financing options across the SCAG region.
- Conduct outreach to ensure businesses and communities are aware of available aid and can navigate the application process.
- Provide applicant support and training to improve access to funding opportunities, including guidance on application submission and assistance with reimbursement processes.

Promote equitable access to funding sources

- Identify financing gaps and create programs that support micro and small businesses, low- and middle-income communities, and people of color.
- Provide targeted assistance for vulnerable populations, including help navigating funding programs, completing damage compensation applications, and accessing relief resources such as mortgage assistance, eviction protections, and property tax relief.
- Expand access to financial recovery programs, including Disaster Unemployment Assistance and state-funded aid that offers temporary support to workers who lose jobs due to a declared disaster.

Provide regional and local tax relief and funding programs

- Offer tax incentives to encourage businesses to stay and rebuild in affected areas by using tax relief programs and credits to offset recovery costs.
- Spread awareness of available federal tax relief programs and credits that are intended to reduce financial burdens.
- Create regional and local relief funds to support vulnerable parts of the economy, such as small businesses, self-employed workers, independent contractors, day laborers, and domestic workers.

Los Angeles Area Chamber of Commerce Small Business Disaster Recovery Fund

The Chamber established a relief fund for small businesses offering grants, disaster recovery webinars, and business advising to support affected businesses. Private enterprises contributed to the fund to support regional recovery.

For more information on funding and financing opportunities, please refer to Chapter 8. Funding and Financing Resilience and Recovery.

Los Angeles County Fire Department, CAL FIRE, and the Orange County Fire Authority (OCFA) crews conducting a prescribed fire in Tonner Canyon on June 5 and June 6, 2025.

7.6

RECOVERY FOR VULNERABLE COMMUNITIES

During a wildfire, factors such as resources, awareness, evacuation ability, job mobility, and housing conditions shape who is most at risk and how severely they are affected. Because these factors correlate with income, race, and other socioeconomic traits, disadvantaged communities face disproportionate exposure to wildfire danger and smoke. This section summarizes these social and health impacts and outline strategies jurisdictions can use to reduce harm to vulnerable populations.

7.6.1

DISPROPORTIONATE EXPOSURE AND REDUCED COMMUNITY RESILIENCE

Low-income people and communities of color are disproportionately impacted by wildfire. People who cannot afford housing in more urban areas might find more affordable housing in or near the WUI or in neighborhoods lacking adequate fire mitigation measures and building codes.[16] Over half (54 percent) of the homes destroyed by wildfire from 2013 to 2021 were located in low-income areas.[17] The 30-year risk of wildfire destroying homes is 29 percent greater in disadvantaged communities, due to low adoption of preventative measures like fire-resistant roofs, which are one of the most effective but costly ways to protect homes.[18] This risk compounds, as fire-resistant roofs also protect neighboring homes from ember spread.[19]

Black, Latino, and Native American people have a 50 percent greater risk of smoke exposure.[20] Even after a wildfire, socially and economically disadvantaged communities face greater challenges recovering due to limited access to aid and support. These challenges can prolong recovery and exacerbate existing disparities.[21] These same communities live adjacent to prescribed burning areas more frequently than affluent populations.[22]

The following discussion and recommendations are not an exhaustive analysis of communities most exposed to wildfire. Instead, this toolkit highlights a few subgroups of typically low-income populations with high exposure—including domestic and day laborers, unhoused people, and undocumented individuals—and provides strategies for jurisdictions to address these disparities.

Domestic workers (housekeepers, landscapers, and nannies, for example) are often the first to lose income and the last to receive aid in a disaster. In 2020, approximately 75 percent of domestic workers in California were considered low-income, earning wages significantly lower than the median for full-time workers in the state.[23] Many lose their primary sources of income as the homes they work in are destroyed or evacuated. Domestic workers are also more likely to be undocumented, which presents barriers in accessing disaster relief aid and emergency healthcare due to their immigration status.[24] For example, FEMA requires U.S. citizen, non-citizen national, or Qualified Alien status for a cash award under its Individuals and Households Program.[25] Legal uncertainties, economic constraints, language differences, and cultural disparities also lead to delayed medical care, exacerbating health inequities.

15 U.S. Department of the Interior. May 6, 2022. As Wildfire Smoke Increases, Some Populations are at Greater Risk.

16 Wildfire risk is an equity issue. (2021, December 9). https://www.tableau.com/blog/wildfire-risk-is-equity-issue

17 Stanford Woods Institute for the Environment. March 27, 2025. Social and Economic Disparities Impact Wildfire Protection.

18 This research is based on building permits from 16 counties in California with 2.9 million buildings (2013–2021) and the U.S. government's designation of disadvantaged communities (DACs), which classifies a census tract as a DAC if it meets a threshold for certain burdens, such as climate, environmental, and socio-economic.

19 Reining, S., et al. Nature Communications, 16(1), 463. 2025. Roof renewal disparities widen the equity gap in residential wildfire protection.

20 Davies, I. P., et al. PLOS ONE, 13(11), e0205825. 2018. The unequal vulnerability of communities of color to wildfire.

21 University of Freiburg. March 25, 2025. Social and Economic Disparities Impact Wildfire Protection.

22 D'Evelyn, S. M., et al. Current Environmental Health Reports, 9(3), 366–385. 2022. Wildfire, smoke exposure, human health, and environmental justice need to be integrated into forest restoration and management.

23 UCLA Labor Center, & California Domestic Workers Coalition. UCLA Labor Center. 2020. Profile of domestic workers in California.

24 University of Freiburg. Social and Economic Disparities Impact Wildfire Protection.

25 FEMA.gov. November 15, 2019. FACT SHEET: Citizenship Status and Eligibility for Disaster Assistance FAQ.

Wildfires worsen California's homelessness crisis by destroying homes and increasing housing shortages. The Tubbs Fire in northern California in 2017 and recent fires in Los Angeles demonstrate that many people, especially renters and those with inadequate insurance, ended up homeless after the disaster.[26] These events impede progress in reducing homelessness, displacing many who had recently found housing. Additionally, homeless service operators face increased demand for housing and services after fires.[27] Renters, too, are less likely to receive federal assistance, much of which is targeted for homeowners, compounding housing challenges.

STRATEGIES TO REDUCE EXPOSURE TO WILDFIRE AND SMOKE

The following section outlines planning and policy considerations to reduce the outsized exposure of socially and economically disadvantaged communities to wildfire risk.

- **Incorporate the Firewise USA and the Fire Safe Council Program into general plans.** The Firewise USA Program, administered by the National Fire Protection Association, focuses on encouraging individual homeowners and small communities to take proactive steps to reduce wildfire risks through education. The California Fire Safe Council operates at a broader level, involving cities and towns in creating Community Wildland Protection Plans (see Section 3.3) and sourcing grants for fuel mitigation and home resilience efforts. MySafe:LA is an example of an organization that supports both the Firewise USA Program and the California Fire Safe Council initiatives. MySafe:LA collaborates with these programs to help residents in the Los Angeles area reduce wildfire risks through community engagement, education, and risk assessments.[29] [30] [31] [32]

- **Promote street tree programs in low-income neighborhoods.** The devastating fires in Altadena, Pacific Palisades, and Malibu in January 2025 showed that some neighborhood trees survived the fires and acted as a barrier to stop embers from spreading. Many large trees—especially conifers and native oaks—survived due to their natural fire-resistant adaptations like thick bark and high moisture content. Tree maintenance and watering are imperative to urban forestry resilience.[33]

- **Proactively expand temporary housing and shelter options** for individuals displaced by wildfires through public-private partnerships with modular housing manufacturers that provide rapidly deployable and reusable shelters. Establishing partnerships in advance, securing funding, establishing governance, and engaging community stakeholders to spread awareness are crucial preemptive measures. Immediate access to safe shelter enhances community resilience and aides recovery efforts.[34] In March of 2025, FEMA showed support for use of modular housing in disaster recovery through the Alternative Transportable Temporary Housing Unit Modular Alternative Housing Addendum.

- **Collaborate with CBOs to offer disaster relief funds, legal assistance, emergency financial aid and grant programs for domestic and undocumented workers.** Partnerships with organizations such as the National Domestic Workers Alliance, the International Institute of Los Angeles, and the Latino Policy & Politics Institute can proactively ensure a safety net is in place, covering essential expenses during crises. By preparing in advance, funds can be allocated for personal protective equipment (PPE), essential supplies such as food and clothing, and support for evacuation efforts, facilitating a swift and effective response when emergencies arise.[35]

[26] Kendall, M. CalMatters, January 15, 2025. How the LA fires could exacerbate California's homelessness crisis.

[27] Service, P. N. Hey SoCal. Change Is Our Intention, March 25, 2025. LA County has cut homelessness, but wildfires impede progress.

[28] Reining, S., et al. Nature Communications, 16(1), 463. 2025. Roof renewal disparities widen the equity gap in residential wildfire protection.

[29] Firewise USA, April 4, 2025. Wildfire Los Angeles.

[30] California Fire Safe Councils. April 4, 2025. Wildfire Los Angeles.

[31] Auer, M. R. Sustainability Science, 16(6), 2163–2169. 2021. Considering equity in wildfire protection.

[32] Cohesive Strategy Crosswalk and Strategic Alignment report by the National Strategic Committee. (n.d.).

[33] Los Angeles Times, February 1, 2025. What trees survived in our terrible fires? And why didn't they burn?

[34] Pallet Shelter, March 26, 2025. Build a Pallet Shelter Village.

[35] National Domestic Workers Alliance, March 25, 2025. Grateful for Your Support.

- **Create boards or councils to provide domestic workers with a formal role or representation** in local government. Several cities have already created such boards, including Seattle's Domestic Workers Standards Board and Los Angeles' Public Health Councils (which is specific to compliance with county health orders, but provides a governance model for a domestic workers' coalition).[36]

- **Expand capacity building support for CBOs to enable more equitable disaster response.** Emergency management often follows the principle of "doing the greatest good for the greatest number of people," which can inadvertently exclude marginalized communities from receiving adequate protections and resources. Many CBOs are under-resourced and lack connections to funders. Despite these challenges, they consistently support their communities during crises. Agencies and other funders can provide a crucial role by providing multi-year general operating and capacity support to these organizations, enabling them to meet daily needs and engage in advocacy and systems-change work.

- **Pursue and support efforts to establish and maintain affordable insurance policies in high-risk areas or higher payouts for wildfire disasters.** In addition to government-funded programs, partnerships and collaboration with utilities and insurance companies can contribute to wildfire preparation. Although the insurance industry sometimes offers premium discounts for preparedness activities, these are often limited, and insurers often change their market presence based on risk profiles. Policymakers can collaborate with utilities, communities, and insurance companies to use conservation finance tools, like a forest resilience bond, to enhance forest restoration near homes and infrastructure.[37] As jurisdictions plan and invest in increasing the resilience of communities, neighborhoods, and individual buildings, there might be opportunities to work directly with insurance companies to identify strategies that can most effectively reduce risk and help achieve and maintain the availability and affordability of policies in higher risk areas.

Disaster recovery worker marks the placement of watershed protection materials in the Eaton Fire burn scar area.
Ken James/DWR

[36] Economic Policy Institute, March 25, 2025. The role of local government in protecting workers' rights: A comprehensive overview of the ways that cities, counties, and other localities are taking action on behalf of working people.

[37] Center for American Progress, July 25, 2019. Before the Fire: Protecting Vulnerable Communities From Wildfire.

7.6.2

DISPROPORTIONATE IMPACT ON HEALTH

Many of the same communities with disproportionate exposure to wildfire and wildfire smoke are also more vulnerable to its impacts. Within already vulnerable populations, sensitive groups including children, the elderly, pregnant people, and those with pre-existing respiratory and cardiovascular issues face even higher risks.[38] Wildfire smoke contributed to over 50,000 deaths in California between 2008 and 2018, according to a University of California, Los Angeles, study.[39]

The impact of particulate matter from wildfire smoke on the human body is well-documented. Health problems begin with inhaling fine particulate matter under 2.5 microns (PM 2.5), equivalent to about one-tenth the diameter of a strand of hair. People exposed to PM 2.5 have higher rates of respiratory disease like asthma, but recent research illuminates more severe impacts. Researchers have linked air pollution and particulate matter exposure to blood clots, stroke, and arrhythmia, memory loss and neurological pathways leading to Alzheimer's, higher rates of postpartum depression, and COVID-19 infections.

Wildfire smoke is up to 10 times more harmful than ambient air pollution, according to a 2021 study in Southern California. As smoke travels, it reacts with sunlight and other chemicals, which increase its toxicity. However, a larger dose of less toxic particles might still be more harmful than a smaller dose of more toxic particles. This means highly exposed groups like people experiencing homelessness are significantly more susceptible to the health impacts of wildfire smoke compared to those with homes.[40] [41] In addition to particulate matter, wildfires in urban areas like Los Angeles spread gases, chemicals, heavy metals, asbestos, per- and polyfluoroalkyl substances, and microplastics. These pollutants are released when buildings, cars, and household goods incinerate during wildfires. Effects range from headaches and cognitive issues to increased risk of heart disease and stroke, immune system disruption, reproductive health concerns, and increased cancer risk. These health risks may persist even after the smoke clears—building materials can absorb infiltrated smoke, creating potential exposure to harmful compounds for weeks and months afterwards.[42]

The following recommendations are not exhaustive, nor are they conclusive about the population groups most impacted by wildfires. However, these strategies provide jurisdictions with next steps to reduce the disproportionate health impacts of wildfire to vulnerable populations before they occur. By reducing exposure locally, these strategies increase community resilience and support a faster recovery at a regional level.

STRATEGIES TO REDUCE DISPROPORTIONATE IMPACT OF WILDFIRE AND SMOKE

- **Promote increased healthcare provider awareness and implement community-based interventions** to improve healthcare access and outcomes for undocumented migrants acting as response workers. Undocumented immigrants are more likely to encounter significant barriers to emergency healthcare, including legal, financial, linguistic, and cultural challenges.[43] Public health departments and agencies can improve access by developing community health programs that specifically serve undocumented migrants, offering services such as health screenings, vaccinations, and preventive care. Additionally, partnering with CBOs on outreach initiatives can spread awareness about available healthcare resources and how to access them.[44]

California Conservation Corps members supporting recovery and cleanup from the Palisades Fire.
Ken James/DWR

38 Salahi, L. Association of Health Care Journalists, January 9, 2025. Health impact of California wildfires to be felt for years to come.

39 University of California, September 5, 2024. You know wildfire smoke is bad for you. But did you know it's this bad?.

40 Fox, A. Scripps Institution of Oceanography. November 5, 2024. Unhoused People Are Highly Vulnerable to Wildfire Smoke.

41 D'Evelyn, S. M., et al. Current Environmental Health Reports, 9(3), 366–385. 2022. Wildfire, smoke exposure, human health, and environmental justice need to be integrated into forest restoration and management.

42 Kerlin, K. E. January 31, 2025. Long-Term Study on Health Impacts of Los Angeles Wildfires Launched. UC Davis.

43 Kisa, S., & Kisa, A. International Journal for Equity in Health, 23(1), 184. 2024. "No Papers, No Treatment": A scoping review of challenges faced by undocumented immigrants in accessing emergency healthcare.

44 Center for American Progress. April 28, 2022. Top 10 Ways To Improve Health and Health Equity.

- **Provide home-hardening or retrofit assistance for vulnerable or low-income households.** Updating homes to use materials or designs required for houses in the WUI can significantly reduce the risk of fire spread and ignition, but these retrofits can be out of reach for low-income residents. Clearing defensible space can also be costly. Jurisdictions can provide technical assistance and outreach to support residents to apply for home-hardening assistance programs such as CAL FIRE's California Wildfire Mitigation Program. Jurisdictions can also work with special districts (e.g., the fire district), to develop their own home hardening incentive programs, with targeted amounts or set-asides for low-income communities. Definitions of vulnerability should consider not only income but also those at greater risk during wildfires, such as seniors and people with disabilities, limited English, or limited car access. Examples of local incentives include those from the Montecito Fire Protection District and the Marin Fire Protection Authority. To broaden participation for communities with higher levels of government distrust, work with community partners to offer workshops and tutorials on low-cost retrofits that residents can undertake themselves and provide safety checklists.

- **Reduce wildfire risk in vulnerable communities through fuel treatments and forest management.** Fuel treatments can include thinning, pruning, chipping, prescribed burns, and mechanical removal of vegetation to reduce fire risk and fire severity. To increase the economic viability of fuel treatment, pilot programs can explore a market for end uses of removed vegetation (e.g., through developing innovative wood products such as cross-laminated timber) to support rural economies and jobs. In suitable landscapes, prescribed burning can incorporate indigenous knowledge in coordination with air quality monitoring and local air districts. However, not all landscapes are suitable for prescribed burning, which can lead to the spread of invasive species in certain habitats, such as chaparral. Partnerships with local resource conservation districts and other land managers is critical to identifying appropriate treatments on a location-by-location basis.

- **Increase community awareness of smoke impacts and safety measures.** Numerous strategies and tools already exist to protect public health and boost community resilience to smoke. These include emergency notifications, sheltering in place alerts, paid leave for workers during smoke events, and public education on effective mask use. Community education can be more effective through collaboration with public health departments and CBOs to design and disseminate educational materials about health risks and PPE use, in multiple languages, including indigenous languages. Partnerships with promotores programs can be especially effective; promotores are community health workers trusted within their communities to share information and resources. Other solutions include working with schools and community organizations to include wildfire smoke education in curricula and community programs.

- **Establish clean air centers, particularly in socioeconomically disadvantaged communities,** to reduce the health impacts of wildfire smoke. Clean air centers are equipped with up-to-date HVAC systems and highly rated air filters or air filtering devices to provide a refuge during wildfire smoke events. These centers should be located in places where residents feel comfortable, such as community centers and schools, and offer engaging programs and activities to attract participants. Additionally, creating joint heat-clean air centers can address both wildfire smoke and extreme heat, providing safe havens equipped with air filtration and cooling systems.[45]

- **Form partnerships between local governments, economic development organizations, and CBOs** to establish job placement programs that help workers find new employment opportunities after wildfires. These partnerships must be developed during the preparedness stages of disaster management, enabling quick deployment to address the urgent needs of workers who have lost their jobs or experienced reduced hours due to wildfire. Proactively establishing partnerships and governance will allow local collaboratives to rapidly take advantage of state and federal funding available in the immediate aftermath of a disaster. Involving CBOs will ensure these communities receive the benefits of job placement programming.[46] See Section 7.5.1 for other recommendations for workforce recovery.

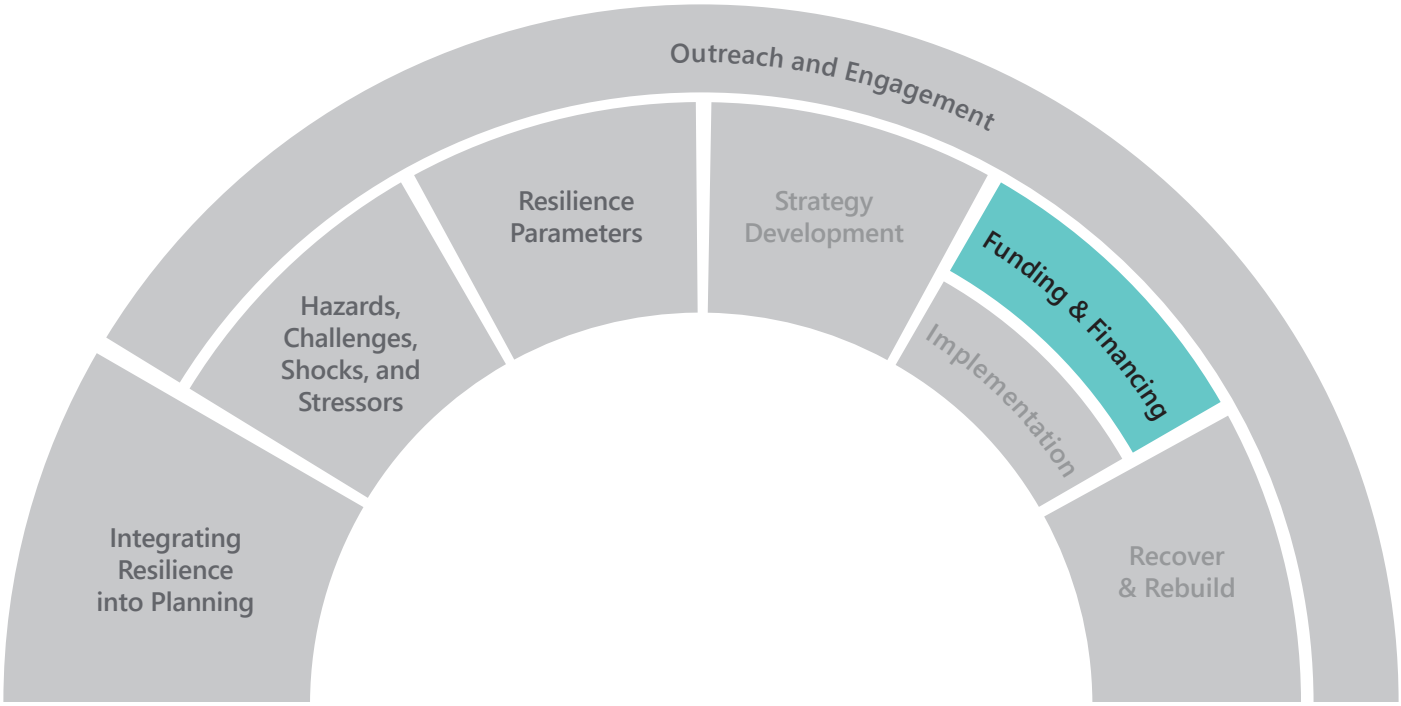
[44] New map shows where Californians can find relief during times of poor air quality. April 4, 2025. California Air Resources Board.

[45] Centering Undocumented Californians and Migrants in Disaster Resilience. March 26, 2025. SoCal Grantmakers.

Ojai, CA
Brandon Desjarlais

FUNDING AND FINANCING RESILIENCE AND RECOVERY

08



Planning for and implementing resilience and recovery efforts is an ongoing, resource-intensive process, requiring multiple funding and financing sources. Local jurisdictions should consider a diverse range of funding and financing opportunities that align with project goals, capacity, and community needs. By exploring opportunities like grants and financing mechanisms (e.g., municipal bonds, revolving loan funds, or public-private partnerships), jurisdictions and agencies can build a more robust and adaptive funding strategy. This multifaceted approach enables communities to leverage short-term recovery resources while establishing long-term financial pathways to support ongoing resilience investments.

As federal priorities evolve, jurisdictions and agencies should remain attentive to how these shifts may impact funding and financing opportunities for resilience efforts. Changes in federal policy can influence the availability, structure, and eligibility criteria of grant programs and financing tools—potentially opening new avenues for support or phasing out existing ones. By staying informed and adaptable, agencies can better align their strategies with current federal directions, maximize access to resources, and ensure that resilience initiatives remain competitive and well-positioned for long-term success.

The following chapter supports jurisdictions and agencies across the SCAG region to identify funding and financing sources to pay for resilience and recovery planning and implementation efforts. Resilience funding is broken down by federal and state opportunities, followed by a discussion on mechanisms for resilience and recovery, recovery-focused funding opportunities, and recommendations for developing financing strategies.

8.1

RESILIENCE FUNDING OPPORTUNITIES

Federal, state, and regional government agencies offer a range of grants to support resilience planning and project implementation. Grants provide funding opportunities that pay for projects fully or in part across development phases, including planning, capacity building, stakeholder engagement, technical assistance, and implementation (e.g., program deployment or planning, design, and construction). Together, these funding sources form a multi-layered landscape of opportunities that can provide SCAG and its member jurisdictions with critical resources that improve local and regional resilience.

Jurisdictions and agencies should consider sector-specific funding opportunities that support the delivery of resilience priorities and objectives (e.g., transit improvement projects that include climate adaptation investments) and blending grant funding with other tools, including local revenue sources (e.g., parcel taxes, special districts), financing strategies (e.g., bonds), and philanthropic and private investment. These complementary mechanisms can strengthen applications, support long-term project viability, and reduce reliance on short-term or one-off funding cycles.

The grant programs listed in this section are indicative of opportunities available to SCAG and its member jurisdictions as of August 2025. Additional relevant opportunities could be announced in the future.

8.1.1

FEDERAL GRANTS

Federal agencies provide a range of grant programs that can be leveraged to support resilience projects. Recent political and budgetary shifts have introduced uncertainty across many programs. Future funding levels depend on upcoming federal appropriations or reauthorization cycles. Agencies should monitor program-specific updates closely and consider pairing federal funds with state or local opportunities where appropriate. **Table 16** outlines federal resilience grant opportunities.

Table 16 Federal Resilience Grant Opportunities

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
U.S. Department of Energy				
Grid Resilience and Innovation Partnerships (GRIP) Program: Grid Innovation Program	Funding to deploy projects with innovative approaches for transmission, storage, and distribution infrastructure to enhance grid resilience and reliability.	Estimated award value is not included in grant guidelines.	None	Eligible for regional transmission, clean energy integration and connection to the grid, and energy storage projects that address weather threats and increased capacity.
GRIP Program: Smart Grid Grants	Funding to increase the flexibility, efficiency, and reliability of the electric power system, with particular focus on increasing capacity of the transmission system, preventing faults that can lead to wildfires or other system issues.	Estimated award value is not included in grant guidelines.	None	Eligible for cutting edge technologies that support distributed energy such as solar, battery storage, and improved grid performance, integrated renewable energy, and electric vehicle infrastructure projects.
U.S. Department of Transportation (U.S. DOT)				
Better Utilizing Investments to Leverage Development (BUILD) Grant Program	Funding to complete critical surface freight and passenger transportation infrastructure projects with significant local or regional impact that improve safety and sustainability, promote economic development, and enhance resilience.	$5,000,000 - $25,000,000	20%	Eligible for capital projects such as highway and bridge, public transportation, rail, port, and airport projects. Planning projects are also eligible.
Safe Streets and Roads for All (SS4A) Grant Program	Funding for projects that prevent death and serious injury on roads and streets involving all roadway users, including pedestrians, bicyclists, public transportation, and micromobility users.	$100,000 - $25,000,000	20%	Eligible for Comprehensive Safety Action Plans and the execution of strategies identified in the plan, such as building pedestrian and bike infrastructure and improving infrastructure in high-risk communities.

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
FEMA				
Flood Mitigation Assistance Program	Funding to projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program.	$250,000 - $750,000	25%	Eligible for mitigation projects that elevate structures, relocate flood-prone buildings, reduce flood risk, and divert and store flood waters.
Hazard Mitigation Grant Program (HMGP)	Funding to state and local governments to develop hazard mitigation plans and rebuild in a way that reduces future disaster losses. HMGP allocates funding for specific hazards, including wildfires, drought, extreme heat, earthquakes, and flooding.	$50,000 - $1,000,000	25%	Eligible for planning and enforcement activities that develop or adopt hazard mitigation plans, building acquisition and relocation, and code enforcement. Eligible projects also include flood protection projects, structural retrofits, and certain construction projects.
Pre-Disaster Mitigation Grant Program	Funding to state, local, and Tribal governments for sustainable cost-effective measures designed to reduce the risk to individuals and property from future natural hazards.	$200,000 - $10,000,000	25%	Eligible for developing hazard mitigation plans, infrastructure protection projects, property acquisition and relocation, hazard mitigation projects, and education and awareness programs.
Emergency Management Performance Grant	Implementation of the National Preparedness System and works toward the National Preparedness Goal of a secure and resilient nation.	$200,000 - $10,000,000	25%	Eligible for emergency operations plans, continuity of operations and government planning, staffing for emergency management agencies, incident management teams, emergency operation centers, equipment purchase, training and exercises, and education and outreach.
Regional Catastrophic Grant Program	Planning funding to support the building of core capabilities that are essential to achieving the National Preparedness Goal of a secure and resilient nation via housing, logistics, and supply chain management for infrastructure projects.	$200,000 - $10,000,000	25%	Eligible for post-disaster planning including temporary and long-term shelters, equitable approaches to housing recovery, logistics and supply chain management, community lifelines and critical infrastructure, catastrophic incident planning, and innovative solutions.

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
National Oceanic and Atmospheric Administration				
National Coastal Resilience Fund	Natural and nature-based solutions to enhance protection of coastal communities from the impacts of storms, floods, and other coastal hazards and to improve habitats.	Estimated award value is not included in grant guidelines	None	Eligible for community capacity building and planning, site assessments and preliminary design, final design and permitting, and implementation for nature-based solutions such as restored wetlands, dunes, oyster reefs, living shorelines, and floodplain reconnection projects.
Economic Development Administration				
Fiscal Year (FY) 25 Disaster Supplemental – Readiness Path	Funding to building and strategic planning projects that set the stage for future investment.	$250,000 - $500,000	20%	Eligible for strategy development to identify economic development projects and to lay the foundation for future transformational projects, organizational capacity building and staff funding, and pre-development costs, including permitting, preliminary design, and impact assessments.
FY 25 Disaster Supplemental – Implementation Path	Funding for standalone construction and non-construction projects that help communities recover from natural disasters and advance recovery and growth.	Non-construction: $100,000 - $5,000,000 Construction: $2,000,000 - $20,000,000	20%	Eligible for critical infrastructure, innovation and entrepreneurship, business lending, workforce development, and recovery and planning.
FY 25 Disaster Supplemental – Industry Transformation	Funding for coalition-led, multi-project portfolios that transform regional economies through targeted industry development.	$20,000,000 – $50,000,000	20%	Any project type eligible for implementation path funding can be proposed, but projects must be submitted by a coalition that includes private sector partners.

8.1.2

STATE GRANTS

California state agencies make resilience-related grant programs available on a recurring basis, including Grid Resilience and Innovation Partnerships (GRIP) Program, Cal OES, California Air Resources Board (CARB), California State Coastal Conservancy (SCC), California Ocean Protection Council (OPC), California Strategic Growth Council (SGC), and California Department of Transportation (Caltrans). The 2024 Safe Drinking Water, Wildfire Prevention, Drought Prevention and Clean Air Bond Act (Proposition 4) authorized $10 billion in bonds to fund climate resilience projects, heat mitigation, nature-based solutions, clean air programs, and the creation of parks and outdoor spaces demonstrating an ongoing commitment to provide critical funding streams to support local and regional resilience efforts. **Table 17** outlines California state resilience grant opportunities as of August 2025.

Table 17 California Resilience Grant Opportunities

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
CAL FIRE				
Wildfire Prevention Grants Program	Funding for projects in and near fire-threatened communities to reduce wildfire risk and improve public health and safety.	$100,000 - $2,000,000	None	Eligible for vegetation clearing, fuel breaks, tree thinning, and wildfire prevention planning such as CWPP, wildfire prevention education, and defensible space projects.
Community Wildfire Defense Grant	Assists at-risk communities in planning and mitigating against the risk created by wildfire, supporting the development and implementation of CWPPs.	$250,000 - $10,000,000	10-25%	Eligible for CWPP development or equivalent FEMA/Tribal hazard mitigation plan with a wildfire component and project implementation for strategies included in a CWPP that are less than 10 years old.
California Forest Improvement Program (CFIP)	Funding to encourage improved management of California forest lands and resources. Cost-share assistance is provided to private and public ownerships containing 20-5,000 acres of forest land.	Estimated awards are not available under grant guidelines.	10-20%	Eligible for preparation of a forest management plan by a registered professional forester (RPF), RPF supervision of reforestation, stand improvement, and forestland conservation and fish and wildlife habitat improvement.
Tribal Wildfire Resilience Grants Program	Funding to support California Native American Tribes in managing ancestral lands, implementing and promoting traditional environmental knowledges in wildfire resilience, and establishing wildfire safety for tribal communities.	$250,000 - $5,000,000	None	Eligible for wildfire resilience and forest health projects, such as tree removal, thinning, and planting of native vegetation, workforce development programs, and planning and assessment activities.

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Cal OES				
Fire Management Assistance Grant (FMAG)	Provides supplemental funding for the mitigation, management, and control of fires on public or private forests or grasslands that threaten destruction that would constitute a major disaster.	No fixed funding cap	25%	Eligible for firefighting operations, such as equipment use, repair, and replacement, and overtime and backfill of staff time, and emergency protective measures, such as evacuation, traffic control, and protection of critical infrastructure.
HMGP Post-Fire	Offers mitigation project funding to communities affected by fires where a FMAG has been approved, aiming to reduce risk to life and property from future natural hazards.	Estimated awards are not available under grant guidelines.	25%	Eligible for defensible space and ignition-resistant building materials and infrastructure, the repair, replacement, and upgrade of water systems, and post-wildfire and flooding prevention activities.
CARB				
Sustainable Transportation Equity Project	Increase transportation equity in disadvantaged and low-income communities via planning and capacity building grants and implementation grants.	Up to $20,000,000	20%	Eligible for clean transportation options, active transportation infrastructure, land use and mobility hubs, community engagement and capacity building, and planning and needs assessments.
OPC				
SB 1 Sea Level Rise Adaptation Planning Grants Program	Funding for local and regional governments to develop sea level rise adaptation plans and implementation projects.	$200,000 - $1,500,000	None	Eligible for pre-planning, data collection, and planning activities, including vulnerability assessments, adaptation plan development, and community engagement and outreach. Also eligible for the implementation of nature-based solutions, infrastructure retrofits, relocation or elevation of structures, and policy and regulatory updates.

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
SCC				
Climate Ready Program	Planning funding for multi-objective climate change adaptation strategies along the coast and implementing nature-based adaptation projects.	$200,000 - $5,000,000	None	Eligible for projects that address one or more climate-related threats including sea level rise adaptation and wildfire resilience with a focus on nature-based solutions, community resilience, and equity.
Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1) Grants	Funding for multi-benefit ecosystem and watershed protection and restoration projects that align with the goals of Proposition 1.	$50,000 - $1,000,000	None	Eligible for projects that provide multiple benefits and address water-related challenges including ecosystem and watershed restoration, water sustainability and quality, urban greening and climate resilience, and community and public access enhancement.
Proposition 68 Grants Program	Funding to improve communities' ability to adapt to the unavoidable impacts of climate change, including river and stream restoration and fish and wildlife habitat restoration.	$200,000 - $5,000,000	None	Eligible for pre-project feasibility studies, property acquisition, project planning including community involvement, design, environmental review, permitting, construction, and project-related monitoring that increases availability of beaches and parks, protects and restores natural lands and wildlife habitats, and increases community resilience.
SGC				
Regional Climate Collaboratives Program	Planning funding for under-resourced communities to enable cross-sectoral partnerships and deepen relationships, processes, plans, and projects that drive and sustain climate action.	$500,000 - $1,750,000	None	Eligible projects should build community capacity through relationship building, technical assistance, data collection, education and training, and community engagement and outreach.

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Caltrans				
Low Carbon Transit Operations Program (LCTOP)	Funding for transit agencies to reduce greenhouse gas emission and improve mobility, with a focus on serving disadvantaged communities.	Up to $1,000,000	None	Eligible for transit service expansion, intermodal transit facility improvements, vehicle and equipment purchase, fare reduction programs, and operational support.
Sustainable Transportation Planning Grants Program	Funding to encourage local and regional planning and projects that support sustainable, equitable and climate-resilient transportation systems.	$100,000 - $1,000,000	20%	Sustainable communities grants are focused on local and regional planning that supports the implementation of regional transportation plans and sustainable community strategies and reduces greenhouse gas emissions. Strategic partnerships grants focus on funding transit-focused planning projects that address multimodal transportation deficiencies.
California Energy Commission				
Community Energy Reliability and Resilience Investment Program	Funding to strengthen and modernize the grid to improve community resilience from climate hazards.	Estimated awards are not available under grant guidelines.	Varies by applicant type	Eligible for grid hardening and modernization such as distribution infrastructure upgrades and undergrounding power lines, community energy resilience such as energy storage, renewable energy integration, and resilient energy systems for critical facilities, and equity and energy justice.
California Department of Fish and Wildlife				
Proposition 68 Grant Program	Funding to support ecosystem restoration, climate resilience, wildlife conservation, and a community's ability to adapt to the impacts of climate change.	Estimated awards not available under grant guidelines.	None	Eligible for planning projects such as restoration plans, environmental compliance and permitting, and feasibility studies and assessments, implementation of projects such as river and stream restoration, habitat restoration, environmental enhancements, and climate adaptation.

8.1.3

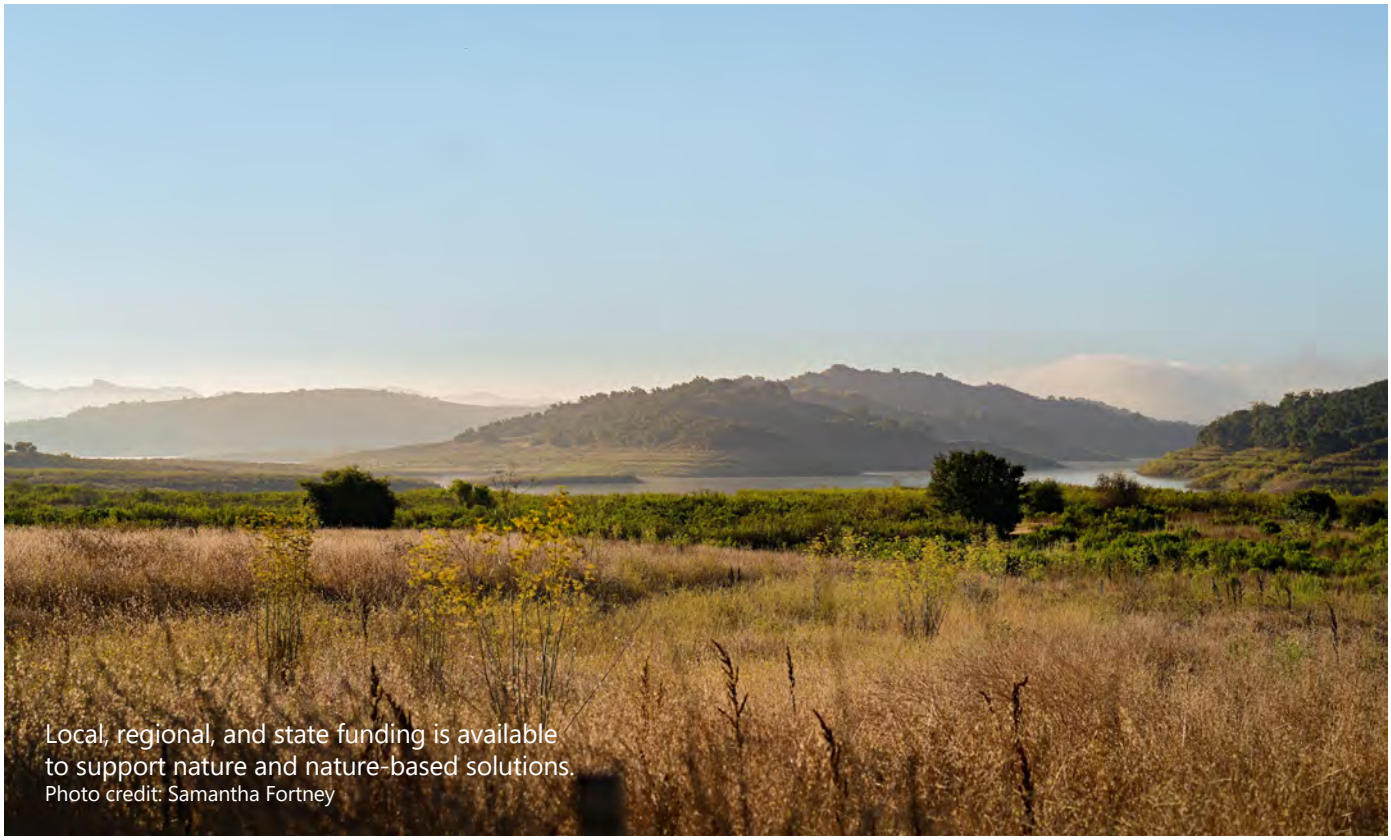
REGIONAL AND LOCAL GRANTS

Local and regional agencies within Southern California, such as local and regional utilities, air districts, and other special and regional districts, provide funding opportunities to jurisdictions and agencies. Local grant opportunities fund technical studies, project and program planning, and project implementation. **Table 18** demonstrates a range of local and regional grant opportunities that can be leveraged to support resilience efforts, although the list is not exhaustive.

Table 18 Local and Regional Resilience Grant Opportunities

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Santa Monica Mountains Conservancy				
Proposition 1 Grants Program	Funding to support multi-benefit ecosystem and watershed protection and restoration projects and protection and enhancement of urban creeks.	Does not specify strict minimum or maximum funding limits.	None, but encouraged	Eligible for land or easement acquisitions, water conservation, treatment, and improvement, planning and design, restoration projects, vegetation management, and other multi-benefit improvements that align with program goals.
Proposition 68 Grants Program	Funding for projects that protect and restore natural resources, enhance climate resilience, expand public access, promote equity and environmental justice, and align to the conservancy's goals.	Does not specify strict minimum or maximum funding limits.	Dependent on project type but encouraged	Eligible for resource protection and restoration, vegetation management and fire safety, visitor-serving development and improvement, and community access, education, and interpretation projects.

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Coachella Valley Mountains Conservancy				
Proposition 1 Grant Program	Funding to support watershed protection and restoration, water quality, water supply, and flood prevention.	$5,000-no maximum limit stated.	None, but encouraged	Eligible for land or easement acquisitions, water conservation, treatment, and improvement, planning and design, restoration projects, vegetation management, and other multi-benefit improvements that align with program goals.
Proposition 68 Grant Program	Funding to expand public access to safe parks, wildlife preserves, trails, and recreation areas, address the effects of climate change, and encourage water conservation and drought preparedness.	$2,500-no maximum limit stated.	None, but encouraged	Eligible for resource protection and restoration, vegetation management and fire safety, visitor-serving development and improvement, and community access, education, and interpretation projects.



Local, regional, and state funding is available to support nature and nature-based solutions.
Photo credit: Samantha Fortney

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy				
Lower Los Angeles-Urban Streams and Rivers Program	Funding to conserve and restore natural river and watershed functions, manage flood risk, enhance long-term ecosystem services, and address climate change and the environmental impacts of urbanization on the Lower Los Angeles River, floodplains, and habitats.	Does not specify strict minimum or maximum grant limits.	Does not explicitly require local match funding	Eligible for projects that align with the goals of the Water and Environment Plan Element of the Lower L.A. River Revitalization Plan.
Proposition 1 Grants Program	Funding to support ecosystem and watershed protection and restoration projects that protect and enhance the Lower L.A. River and expand access to diverse populations. Offers a very small grant program to promote a range of grant offerings.	Very small grants program offers grants up to $50,000. Larger grants are available with no indicated maximum limit.	None, but encouraged	Eligible for the acquisition, development, rehabilitation, restoration, and protection of land and water resources
Proposition 68 Grants Program	Funding that is specific to the Lower L.A. River corridor, considered within 1.5 miles of the main stem or tributary of the Lower L.A. River to expand access to diverse populations and to address the effects of climate change. Offers a very small grant program to promote a range of grant offerings.	Very small grants program offers grants up to $50,000. Larger grants are available up to $6,000,000.	None, but encouraged	Eligible for the development of urban recreation projects, habitat protection or restoration projects, and workforce development opportunities.
Southern California Edison (SCE)				
Microgrid Incentive Program	Funding to provide clean, local energy to communities facing outages, power shutoffs, and other events driven by climate change. The program includes an application development grant of up to $25,000.	Project engineering and development: up to $14,000,000. Utility equipment and services cost up to $3,000,000. Interconnection studies and equipment up to $1,000,000.	None	Eligible for community microgrid projects, including management, engineering, and development of front-of-the-meter batteries and clean generation resources, and application development-related costs.

8.2

RESILIENCE AND RECOVERY FINANCING MECHANISMS

Jurisdictions and agencies have access to several financing tools and mechanisms to support the planning and delivery of resilience projects and disaster recovery efforts. Financing creates opportunities to make large-scale investments without setting aside considerable upfront capital; instead, entities can make regular repayments on initial investments over an agreed upon period.

Additionally, jurisdictions can embed resilience-focused design and recovery considerations into traditional infrastructure and economic development investments to maximize opportunities presented by available financing mechanisms and tools to reduce long-term risk and realize co-benefits. Financing opportunities can be used alone or in combination with other financing tools or funding opportunities.

The following section outlines relevant financing mechanisms and tools that leverage debt capacity, make use of innovative financing tools, create potential new revenue streams, or promote partnerships with the private and philanthropic sectors.

8.2.1

FINANCING CONSIDERATIONS

Market conditions in the United States and California will influence an agency's ability to access financing. It is important to understand these factors to better navigate the financial landscape and identify tools and mechanisms that meet entity capacity and project needs. Key considerations include:

- **Tax base capacity:** Before implementing new financing strategies, such as bonds or taxes, consider the tax base's ability to take on further taxes.
- **Equity concerns:** Financial tools and strategies can inequitably increase financial burden for low-income or disadvantaged households.
- **Interest rates:** Fluctuations in interest rates impact the cost of borrowing and project feasibility. When rates are high, leveraging debt capacity may become cost prohibitive. Consideration should be given to the entity's ability to accommodate changing interest rates across the life of the project.
- **Market uncertainty and volatility:** Periods of economic instability and volatility can reduce tax revenues and increase borrowing costs, which may make it more challenging to finance new and existing projects.
- **Credit ratings:** Entities with lower credit ratings face higher borrowing costs and can have difficulty accessing capital markets, limiting the ability to finance projects.

8.2.2

DEBT INSTRUMENTS

Bonds and loans play a crucial role in funding projects, as they can spread project costs over time. They present opportunities that supplement existing annual budgets and allow immediate access to funds, without needing to wait for tax revenues to be accrued. An entity's ability to access bonds or loans is impacted by current debt levels and capacity to take on additional debt without compromising financial stability. **Table 19** and **Table 20** list relevant bonds and loans that can be used to fund resilience and recovery.

Table 19 Bond Opportunities

Bond Name	Description	Key Considerations	Eligible Uses
Green Bond	Bonds that finance projects that are broadly environmentally focused or will deliver environmental benefits.	Issuance costs can be slightly higher than traditional bonds due to additional reviews, reporting, certification, and verification requirements. Bond funds must be used for projects with environmental benefits. Cannot be used for ongoing program operations or maintenance unless tied to bond proceeds with measurable environmental performance.	Eligible for environmental projects such as renewable energy, green buildings, water infrastructure, biodiversity conservation and enhancement, and general sustainability related projects.
Climate Bond	Climate bonds are a subset of green bonds that specifically finance projects that tackle climate change through mitigation and adaptation.	Issuance costs can be slightly higher than traditional bonds due to additional reviews, reporting, certification, and verification requirements. Bond funds must be used for projects with climate mitigation and adaptation benefits. Cannot be used for ongoing program operations or maintenance unless tied to bond proceeds with measurable environmental performance.	Eligible for climate mitigation and adaptation projects such as renewable energy, low-carbon transportation, energy efficiency, flood defenses, drought resilience, sustainable water management, and reforestation.
Resilience Bond	Resilience bonds finance specific climate resilience and adaptation projects that reduce vulnerability and support community and infrastructure resilience to climate events.	Issuance costs can be slightly higher than traditional bonds due to additional reviews, reporting, certification, and verification requirements. Bond funds must be used for projects with climate resilience and adaptation benefits. Cannot be used for ongoing program operations or maintenance unless tied to bond proceeds with measurable environmental performance.	Eligible for climate resilience and adaptation projects such as flood defenses, stormwater management, drought-resilient infrastructure, ecosystem restoration, reforestation, resilient housing, heat mitigation, transportation infrastructure, energy infrastructure, disaster risk reduction, and climate resilient health and social infrastructure.

Bond Name	Description	Key Considerations	Eligible Uses
Catastrophe (CAT) Bond	An innovative, high-yield financing tool that allows issuers to receive funding in the case of a natural disaster, including climate hazards.	These bonds offer insurance companies a means of offsetting risk associated with underwriting policies. CAT Bonds are often used as reinsurance or additional insurance and may not be issued for specific infrastructure projects unless a specified disaster has occurred.	CAT bonds are used to cover post-disaster recovery or payout costs, not capital projects or long-term operations. They do not fund program delivery, design or maintenance.
Environmental Impact Bond	An innovative financing tool that uses a Pay for Success approach to provide up-front capital from private investors for environmental projects, either to pilot a new approach whose performance is viewed as uncertain or to scale up a solution that has been tested in a pilot program.	Private investors share the financial risk, which can reduce the burden on public budgets. Structuring these bonds can be complex and requires significant upfront planning.	Typically used to pilot or scale environmental projects. Eligible uses are limited to capital investments and performance-based outcomes and do not cover operations, maintenance, or ongoing staffing.
Revenue or General Obligation (GO) Bonds	Revenue bonds pay for projects that generate revenue, which is then used to repay the debt. GO bonds are issued for projects that do not have a revenue stream; debt is repaid through local tax revenue.	Several public agencies have issued GO bonds to fund climate adaptation projects, which include transportation investments.	Revenue bonds are used for capital projects with a dedicated revenue stream; GO bonds can support broader capital improvements. Revenue bonds and GO bonds are generally not used for operations, program delivery, or maintenance.
Utility Revenue Bonds	A type of municipal bond issued to finance a public utility project that repays investors directly from project revenues. Utility revenue bonds are used to fund capital projects in areas considered essential to public services including hospitals, fire services, water and waste treatment facilities, and improvements to the electrical grid.	Utility revenue bonds require a higher cost of issuance compared to other types of municipal bonds due to more complex credit analysis.	Eligible uses include utility-related capital infrastructure (e.g., water systems, electric grid upgrades). Some revenue may cover limited operations and maintenance, but utility revenue bonds do not fund general programs.

Table 20 Relevant Loan Programs

Loan	Description	Key Considerations	Eligible Uses
California Lending for Energy and Environmental Needs Program	Provides public financing to help meet state goals of greenhouse gas reduction, water conservation, and environmental preservation. This program consists of two subprograms: 1) the Statewide Energy Efficiency Program, which helps local governments and nonprofit organizations make energy-efficiency upgrades and projects and 2) the Light Emitting Diode (LED) Street Lighting Program, which finances the installation of LED streetlights for local governments.	The availability of funds might be limited based on demand. The application process is relatively competitive and requires detailed project proposals.	Funds energy-efficiency upgrades and equipment. Eligible uses include capital retrofits; loans do not cover ongoing maintenance, operations, or staffing costs.
Clean Water State Revolving Fund (CWSRF)	Provides low-cost financing for a wide range of water quality infrastructure projects, including wastewater facilities, nonpoint source pollution control, decentralized wastewater treatment systems, stormwater runoff mitigation, green infrastructure, estuary protection, and water reuse.	Revolving funds require significant documentation and compliance. CWSRF can fund a wide range of water quality projects, including climate resilience investments.	Eligible costs include capital construction, green infrastructure, and some planning. Cannot fund general operations or routine maintenance.
Climate Catalyst Revolving Loan Fund Program	Provides flexible, low-cost credit to local jurisdictions to help bridge the financing gap for advanced technologies. Relevant projects include sustainable vegetation management, forestry practices, and timber harvesting products.	Potential applicants should acquire written expressions of interest from other financing parties before completing the Climate Catalyst Intake Form to receive financing support.	Can fund early-stage or bridge capital for climate innovation projects. Typically focused on capital deployment and advanced technologies. Not intended to cover operations or general program administration.
Infrastructure State Revolving Fund (ISRF)	The ISRF Program (through IBank) provides low-cost public financing to state and local government entities, including municipalities, universities, schools, and hospitals, and to nonprofit organizations sponsored by public agencies for a wide variety of public infrastructure and economic expansion projects.	ISRF provides affordable financing for a wide range of infrastructure projects.	Covers capital infrastructure for public facilities and economic development. Eligible costs may include predevelopment and construction; does not support ongoing operations or maintenance.
Transportation Infrastructure and Innovation Act (TIFIA) Loan from U.S. DOT	Provides credit assistance in the form of direct loans and loan guarantees to large-scale transportation infrastructure projects, including bus rapid transit.	TIFIA supports significant transportation infrastructure projects, which must meet specific federal criteria to be awarded financing. The approval process is lengthy; it may take considerable time to secure financing due to federal review.	Eligible uses include large-scale capital transportation infrastructure. TIFIA funds cannot be used for program operations, long-term maintenance, or staffing.

8.2.3

REVENUE-GENERATING MECHANISMS

Dedicated sources of revenue are critical when accessing financing tools (i.e., to make payments) and to cover grant program local match requirements. While not all local jurisdictions have the administrative capacity to levy a new ballot measure or enter a community benefit agreement, partnerships between city and county governments can ease the administrative burden and time constraints needed to pass a new measure. **Table 21** and **Table 22** outline a series of potential revenue-generating mechanisms for local jurisdictions.

Table 21 Revenue-Generating Mechanisms - Fees

Fee Type	Description	Key Considerations	Eligible Uses
Development Impact Fees (DIF)	A type of non-property-related fee that can be imposed by local governments to pay for infrastructure and public services expansion. The fee rate determines the potential revenue amount.	Impact fees provide a dedicated source of local funding for infrastructure investments and improvements. Revenue depends on fee structure. DIFs should be tied to new or increased risks caused by new developments. Existing required repairs, upgrades, or resilience measures required regardless of new development are not eligible. Voter approval is not required.	Eligible uses include stormwater management improvements, utility system upgrades, and improvements to public facilities such as community centers that are also used as resilience hubs or disaster shelters.
Transit Development Act (TDA) Revenues	The TDA allows counties to establish a quarter-cent sales tax to finance a wide variety of transportation projects, including transit operations, bus and rail projects, special transit services for disabled riders, pedestrian and bicycle facilities, and transportation planning.	Agencies must meet certain performance criteria to receive funds for transportation projects. These funds may be applied to surface transportation and public transit projects in response to climate shocks. Requires local action to levy tax. Voter approval is required.	Eligible uses include investments in transit operations such as those required during or after an event, bus and transit resilience projects, pedestrian and bicycle projects that support access to resilience hubs and shelters or provide alternative routes when roads are damaged, integration of climate resilience measures into transportation planning, and evacuation planning.
Utility Fees, Including Stormwater Fees	Revenue generated from residential and commercial water, wastewater, and power bills may be used to fund municipal resilience and recovery programs.	The passage of utility fees can provide a direct source of funding for utility services, including for climate adaptation initiatives. Voter approval is not required but could require public hearings.	Eligible uses include wildfire mitigation and prevention, climate adaptation that address climate risks, grid resilience projects, community resilience hubs, and microgrids.
Benefit Assessments	Benefit assessments are charged to property owners to fund projects and initiatives that will provide direct benefits to their property or business. Benefit assessments should determine the amount of special or direct benefit each property is expected to receive from projects funded through the assessment.	Proposition 218 requires voter approval for new or increased assessments. Voting should be weighted based on the proportional level of benefit received by voters. Funds should not be used for projects that provide general public benefits.	A range of resilience and recovery projects are eligible, including flood and water management infrastructure and planning, wildfire resilience, community resilience centers, coastal adaptation and resilience projects, urban forestry, and nature-based solutions.

Table 22 Revenue-Generating Mechanisms - Taxes

Tax Type	Description	Key Considerations	Eligible Uses
Parcel Tax	Parcel taxes are assessed at a rate based on the characteristics of a parcel rather than the assessed value of the property and may be collected by jurisdictions.	New taxes can provide a reliable source of revenue for local governments. Ballot measures require significant staff, administrative time, and political effort. Typically, a two-thirds voter approval is required.	Eligible uses include wildfire risk reduction such as controlled burns and defensible spaces around homes, flood control and management, environmental restoration and conservation, and infrastructure improvement projects.
Hotel and Tourism Tax (Transient Occupancy Tax)	Taxes are levied on short-term accommodation such as hotels and vacation rentals. The tax is usually paid for by visitors.	Politically attractive as residents are not usually taxed but benefit from the revenue stream. Might require demonstrated benefit to the tourism industry. Requires voter approval, including two-thirds approval for special excise taxes.	Eligible uses include a wide range of resilience and recovery projects such as infrastructure improvements, disaster preparedness and emergency response, climate adaptation, and post-disaster recovery and economic development.
Excise Tax	Taxes are levied on specific goods, services, and activities, usually on a per-unit or percentage of price basis.	Local governments require state authorization to impose excise taxes. Limits could apply to the number or amount of excise tax. The amount of tax revenue received is based on consumer activity. Can disproportionately impact low-income households. Requires voter approval, including two-thirds approval for special excise taxes.	Eligible uses include transportation and infrastructure improvements, green infrastructure, housing construction and preservation, and general budget gaps or core services.
Ad Valorem Property Tax	General tax levied on assessed value for general purposes, limited to 1 percent of assessed value. Additional tax for voter-approved debt repayments is also available, typically for general obligation bonds for local infrastructure. The latter is most applicable to adaptation and resilience projects as the money generated by the 1 percent tax is often committed to existing services.	The use of property taxes for specific resilience and recovery projects should be confirmed against state laws. Voter approval is required for additional taxes. Ballot measures require significant staff and administrative time.	Eligible uses can include rehabilitation focused on enhancing resilience, including flood protection, wildfire mitigation, sea level rise adaptation, urban heat mitigation, and other climate-resilient infrastructure
New Sales Tax, including Fuel Excise Tax	Jurisdictions may levy a fixed increase in the sales tax rate for a defined term. Excise taxes, in addition to the SB1 Gas Tax, may be placed on gasoline purchases in local jurisdictions.	New taxes can provide a reliable source of revenue for agencies. Ballot measures require significant staff and administrative time. Requires voter approval, often by majority vote. Voter approval is required.	Eligible uses may include infrastructure investments prioritizing flood protection, sea level rise adaptation, and heat mitigation.

8.2.4

SPECIAL DISTRICTS AND GOVERNANCE ENTITIES

Special districts may be formed to raise revenue for a specific purpose. Special districts are defined as independent government entities, separate from cities and counties, that provide specific public services within a defined geographic area. There are 50 major types of special districts available in California, which operate under either a principal act (district focused on a topic area, like county services, fire protection, or community services) or special act (district tailored to the unique needs of a specific area).

Special districts may levy taxes, charge service fees, issue bonds, and apply for grants. These revenue sources enable special districts to finance specific investments independently of other local government budgets and decision-making processes. Notably, climate resilience districts are a type of special district dedicated to adaptation and resilience infrastructure investments.

The formation of special districts in California requires participating jurisdictions to develop a written proposal or petition outlining the district's purpose and governance structures, which is then reviewed by state or local authorities for approval. Depending on the district type and authorizing legislation, special district formation may require a vote by residents or property owners within the designated geography, though some districts may be established without a public vote. Relevant examples of special districts that support resilience and recovery projects are outlined in **Table 23**.

Table 23 Key Special Districts Examples

Special District Type	Description	Key Considerations	Eligible Uses
Climate Resilience Districts (CRDs)	SB 852 (2022) authorizes cities, counties, and special districts to form CRDs for the purpose of raising and allocating funding for projects that address climate change impacts.	CRDs are enhanced infrastructure financing districts, which can levy benefit assessments, special taxes, property-related fees, and other service charges or fees that might be listed elsewhere in this section. The tax increment component of CRDs is not a new tax; it captures a portion of the growth in property tax revenues. CRDs are authorized to issue bonds, which can be repaid using these revenue streams, enabling large-scale investment in resilience infrastructure.	CRDs are intended to raise and allocate funding for the operational expenses of projects that address climate mitigation, adaptation, and resilience. Eligible projects include sea level rise adaptation, extreme heat mitigation and adaptation, wildfire risk reduction, drought risks, and flooding mitigation and resilience.
Tax Increment Financing, including Infrastructure and Enhanced Infrastructure Financing Districts (IFD/ EIFD)	EIFDs are a financing tool intended to fund a wide range of public projects that support long-term infrastructure and economic development. EIFDs allow cities, counties, and special districts to capture and reinvest revenues without requiring additional property taxes to be raised.	A city or other governing jurisdiction can allocate tax increment revenues for up to 45 years to fund the planning, design, improvement, construction, or rehabilitation of assets with an estimated life of 15 years or longer. EIFDs are managed by a public financing authority. They do not require voter approval to issue bonds, but public hearings are required during formation.	These projects include but are not limited to highways, transit, water systems, sewer projects, flood control, and parks. Infrastructure projects that address climate shocks and stressors are eligible.

Special District Type	Description	Key Considerations	Eligible Uses
Mello-Roos Community Facility Districts (CFD)	A special taxing district where a special tax on property parcels, on top of the basic property tax, is imposed on taxable property within the district. CFDs are not based on property value. CFDs finance a range of public infrastructure improvements and services.	CFDs can issue tax-exempt bonds backed by the special tax revenue to fund upfront infrastructure costs. The rate of tax determines potential revenue amount. Formation requires two-thirds voter approval (residents or property owners).	CFDs finance a wide range of projects including disaster resilient infrastructure, climate adaptation projects, emergency response facilities and resilience hubs, public and safety upgrades, community disaster recovery and preparedness, and communication infrastructure enhancements.
Geologic Hazard Abatement Districts (GHADs)	GHADs are special districts formed to prevent, reduce, abate, or control a geologic hazard or a structural hazard partly or wholly caused by a geologic hazard, including wildfire-related impacts. GHADs can encompass both private and public land in hazardous areas and help to protect physical property.	GHADs possess many of the same legal authorities as local governments, including the power to tax and bond. GHADs can act swiftly and effectively to address hazards, as they happen, with authority and resources already in place. GHADs can apply for and receive grants.	Resilience and recovery projects financed through GHADs should address natural and unnatural ground movement hazards, such as landslide mitigation and stabilization, earthquake hazard management, soil erosion and sediment control, land subsidence and settlement control, coastal erosion protection and stabilization, and post-disaster recovery and monitoring.

Additionally, JPAs offer an opportunity for public agencies to work together to streamline and pool resources, coordinate between entities, and tackle cross-jurisdictional challenges. **Table 24** provides a high-level overview of JPAs.

Table 24 Joint Powers Authority Overview

Special District Type	Description	Key Considerations	Eligible Uses
Joint Powers Authority (JPA)	JPAs are separate legal entities formed between two or more public agencies to jointly exercise commonly held powers. JPAs can coordinate and finance regional or multi-jurisdictional projects and initiatives that individual entities are not able to plan or implement alone. JPAs can be formed to achieve agreed-upon objectives such as reducing the impacts of wildfire events through planning or project implementation.	JPAs are not permitted to levy new taxes or assessments but member agencies may levy their own taxes or benefit assessments and contribute the revenues to the JPA's operation if one of its member agencies has the authority to do so (CA Govt Code § 6509.5 (2023).) JPAs can also apply for and receive grants.	JPAs can fund a wide range of resilience and recovery projects, depending on the powers delegated to the JPA from member agencies. Eligible projects include disaster preparedness and response, climate adaptation and mitigation, seismic upgrades, environmental restoration and protection, nature-based solutions, and post- disaster recovery.

8.2.5

PARAMETRIC INSURANCE

Unique insurance programs offer new ways to support financing of resilience and recovery projects. Parametric insurance provides swift, pre-agreed payouts when specific events or triggers occur, instead of against actual losses. A trigger or event may be defined as temperature reaching 100°F for five days or more, or an earthquake magnitude of more than six. Parametric insurance can also address economic equity gaps by providing timely resources and strengthen fiscal and climate resilience. **Table 25** provides a high-level summary of parametric insurance.

8.2.6

ATTRACTING PRIVATE AND PHILANTHROPIC INVESTMENT

Resilience and recovery projects may attract private and philanthropic sector investments and public-private partnerships. By investing in projects, the private and philanthropic sectors can protect interests or assets and contribute to broader resilience goals. Private investors are increasingly focusing on environmental, social, and governance criteria and sustainability and resilience projects.

Resilience and recovery projects can reduce shocks that damage property and disrupt business operations. If the project aligns with a private and philanthropic entity's social responsibility principles and priorities, there can be a compelling case to invest, especially if the investment benefits locations where the entity has a significant presence or employee concentration.

In many cases private sector investment, particularly from real estate developers, is not purely voluntary, but rather the result of development conditions, permitting requirements, or impact fee obligations. While these improvements can support resilience goals, they can also increase development costs that can impact housing affordability. Careful consideration should be given to development obligations that increase development costs.

The private and philanthropic sectors can offer additional funding sources through low-interest loans, philanthropic donations, and specialized recovery programs to rebuild homes, support displaced residents, and revitalize businesses in the aftermath of a disaster. Investment can expand financial capacity for agencies by supplementing public funds and leveraging additional funding that would otherwise not be available.

Table 25 Parametric Insurance Overview

Tax Type	Description	Key Considerations	Eligible Uses
Parametric Insurance	Unlike indemnity insurance that requires a damage assessment to process payouts, this non-traditional insurance type distributes funds after an agreed-upon event or trigger.	Requires third-party verification the agreed-upon event occurred or trigger was met. It can be scaled across individuals, businesses, and governments. Supports coverage of less tangible impacts from events such as business interruptions or ecological impacts.	Payouts are not tied to specific damage or losses, which allow policy holders to use funds where they are needed. Due to the nature of the insurance, parametric insurance promotes using funds to increase resilience, adaptation, and mitigation projects such as infrastructure repair and enhancements, emergency response and recovery, ecological protection and restoration, and resilience upgrades to infrastructure and assets.

8.3

RECOVERY FOCUSED FUNDING AND FINANCING OPPORTUNITIES

Over the last five years, the United States has averaged over $150 billion annually in disaster recovery spending,[1] with over $5 billion annually in wildfire recovery in California alone.[2] Recovery is only one phase of the broader resilience continuum; strategic investments in planning and implementation prior to disasters can reduce exposure, lower costs, and accelerate recovery timelines. Investments made during recovery can support long-term resilience by integrating mitigation, adaptation, and resilience approaches.

Jurisdictions often bear the burden of immediate response and recovery costs and responsibilities while state and federal reimbursements are processed. Reimbursements can take several years to be disbursed, which leaves agencies with significant short- and medium-term financial gaps. Many agencies already face budget constraints or deficits and have limited financial capacity to access the credit needed to fund unexpected recovery efforts. Having financial plans and insurance in place before a disaster means that funds are readily available for post-disaster recovery efforts.

Preparedness and response funding might be available through the federal government, but state, local, private, or nonprofit funding should also be prioritized to fund planning and implementation efforts that increase resilience and reduce risks. Identifying and securing a diverse portfolio of funding sources reduces reliance on a single source or entity, supports effective recovery efforts, and enhances local and regional resilience. Successful disaster recovery is supported by:

- **Clear funding and financing frameworks** that are developed before disasters.
- **Awareness of available funding and financing strategies** including federal grants, local financing mechanisms, and creative financial instruments like insurance pools and resilience bonds.
- **Effective distribution of funding** to address the most urgent community needs such as housing, economic recovery, and rebuilding infrastructure.
- **Understanding equity implications of disaster events** and recovery on small businesses and residents, especially low- and moderate-income households.

8.3.1

FEDERAL RECOVERY-FOCUSED FUNDING OPPORTUNITIES

Federal grant programs have traditionally supported state and local post-disaster recovery efforts and the restoration and rebuilding of impacted communities. However, the political landscape and current federal legislative priorities might impact timing and availability of funding for recovery efforts. It is important to continually monitor the landscape for new opportunities.

As of August 2025, several key federal agencies provide grant assistance programs to state, local, and Tribal governments to support disaster recovery, including wildfire recovery. **Table 26** outlines current federal grant opportunities to support recovery efforts.

1 NOAA National Centers for Environmental Information. April 9, 2024. 2024: An active year for U.S. billion-dollar weather and climate disasters. Climate.gov. https://www.climate.gov/news-features/blogs/beyond-data/2024-active-year-us-billion-dollar-weather-and-climate-disasters

2 California State Assembly, March 5, 2025. Energy affordability: Wildfire spending oversight hearing background.

Table 26 Federal Recovery Grant Opportunities

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Community Wildfire Defense Grant Program (U.S. Department of Agriculture)	Funding to support at-risk local communities to plan for and reduce wildfire risk through the development of CWPPs and implementation.	Up to $250,000 for CWPPs. Up to $10,000,000 for implementation projects.	10-20%	Eligible for the development of CWPPs and implementation of projects identified in the CWPP, such as vegetation management, defensible space creation, infrastructure hardening, evacuation route improvements, and community education and outreach.
Public Assistance Program (FEMA)	Grants for disaster relief, including debris removal and infrastructure restoration.	$4,000 minimum, no maximum indicated.	25%	Eligible for emergency work such as debris removal and emergency protective measures and permanent work such as road, bridge, water management system, building and equipment, utility, and recreational facility repairs.
Community Development Block Grant – Disaster Recovery (HUD)	Funding for areas impacted by recent disasters to carry out strategic and high-impact activities to recover from disasters and reduce future losses.	Does not specify strict minimum or maximum grant limits.	25%	Eligible for disaster relief and long-term funding, housing repair and reconstruction, renter assistance, economic revitalization, planning and capacity building, and public services.

8.3.2

STATE RECOVERY-FOCUSED FUNDING OPPORTUNITIES

Several California state departments provide grant assistance programs to jurisdictions to support post-disaster recovery, with a particular focus on wildfire recovery. Programs were accurate as of August 2025. **Table 27** outlines California state grant opportunities to support recovery efforts.

Table 27 State Grant Opportunities for Recovery

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
California Disaster Assistance Act (CDAA) (Cal OES)	The CDAA administers a disaster assistance program to provide financial support for costs incurred by local governments resulting from disaster events.	Does not specify strict minimum or maximum grant limits.	25%	Eligible for additional wage costs for emergency recovery personnel, travel, supplies, materials and equipment, repair, restoration, and replacement costs, indirect and administrative costs, and local cost share required under federal assistance programs.

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
California Wildfire Fund	Provides funds to utility companies to cover eligible claims from wildfires caused by participating utilities.	Does not specify strict minimum or maximum grant limits.	None	Eligible for paying wildfire liability claims, supporting utility wildfire mitigation plans, and maintaining insurance market stability by reducing financial risk of wildfire-related utility bankruptcy.

8.3.3

PRIVATE AND PHILANTHROPIC RECOVERY-FOCUSED FUNDING OPPORTUNITIES

Jurisdictions should consider private and philanthropic recovery funding and financing opportunities post-disaster as a vital complement to public resources. These sources can offer flexible, rapid response funding, support innovative and community-driven solutions, and help fill gaps not covered by federal or state programs. Engaging private and philanthropic partners also fosters collaboration, encourages long-term investment in resilience, and amplifies the impact of recovery efforts by leveraging diverse expertise and networks. **Table 28** outlines several wildfire recovery-focused private and philanthropic funds.

Table 28 Private and Philanthropic Grant Opportunities for Wildfire Recovery

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Fire Prevention and Safety Grants (California Fire Foundation)	Offers competitive grants for fire prevention, preparedness, mitigation, and resilience to support community resilience.	Does not specify strict minimum or maximum grant limits.	None	Eligible for vegetation mitigation, firefighting equipment, training, and relief and recovery.
California Rises Program (California Fire Foundation)	Grants over $4 million to community organizations for mid- and long-term wildfire recovery.	Does not specify strict minimum or maximum grant limits.	None	Eligible for disaster relief, housing support, and economic recovery activities.
Wildfire Recovery Fund (California Community Foundation)	Provides funding for rebuilding homes, restoring livelihoods, and supporting mental health services in wildfire-affected communities.	Does not specify strict minimum or maximum grant limits.	None	Eligible for housing support, financial aid, and community rebuilding activities.
California Wildfires Recovery Fund (Center for Disaster Philanthropy)	Grants for community recovery, social services, affordable housing, and mitigation efforts.	Does not specify strict minimum or maximum grant limits.	None	Eligible for equitable recovery efforts, advocacy, housing support, and improving food access.

8.3.4

ECONOMIC AND COMMUNITY RECOVERY-FOCUSED FUNDING OPPORTUNITIES

Jurisdictions should actively explore economic and community recovery funding and financing opportunities post-disaster to accelerate rebuilding efforts, restore essential services, and support long-term resilience. These resources can help bridge critical gaps in local budgets, support vulnerable populations, and stimulate economic revitalization. By leveraging available funding mechanisms, agencies can reduce the financial burden on local taxpayers, enhance recovery outcomes, and build stronger, more adaptive communities prepared for future challenges. **Table 29** through **Table 31** outline a range of economic- and community-focused recovery funding and financing opportunities.

Table 29 Economic and Community Grant Opportunities for Recovery

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Federal				
Economic Adjustment Assistance (U.S. Economic Development Administration)	Grants supporting economic recovery, business development, and infrastructure in disaster-affected regions.	Does not specify strict minimum or maximum grant limits.	20%; in some cases 0%	Eligible for business recovery and workforce redevelopment.
Disaster Recovery Dislocated Worker Grants (U.S. Department of Labor)	Provides funding to create temporary employment opportunities to assist with cleanup and recovery efforts in areas impacted by disasters.	Does not specify strict minimum or maximum grant limits.	None	Eligible for workforce displacement due to disasters or major economic events.
Individual Disaster Recovery Assistance (FEMA)	Provides financial aid to individuals, households, businesses, and agricultural communities affected by disasters.	Up to $43,750 per household for Housing Assistance. Up to $43,750 per household for Other Needs Assistance.	None	Eligible for housing repairs, personal property losses, and health and welfare needs.
California				
State Supplemental Grant Program (California Department of Social Services)	Provides additional financial assistance to individuals who have received the maximum grant from FEMA's Individuals and Households Program but still have unmet disaster-related needs.	Up to $10,000 per household	None	Eligible for supplemental financial aid for disaster survivors.

Table 30 Low-interest Business Recovery Loans

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Business Physical Disaster Loans (SBA)	Provides funding to repair or replace damaged real estate, machinery, equipment, inventory, and other business assets.	Up to $2,000,000	None	Eligible for repair or replacement of damaged property, goods, and equipment.
Home Disaster Loans (SBA)	Provides loans of up to $2 million working capital to help businesses cover expenses such as fixed debts, payroll, accounts payable, and operating costs.	Up to $500,000 per primary residence. Up to $100,000 for personal property.	None	Eligible for expenses such as fixed debts, payroll, accounts payable, and operating costs.
Economic Injury Disaster Loans (SBA)	Provides loans to repair or replace real estate and damaged or destroyed personal property, including vehicles.	Up to $2,000,000	None	Eligible for property damage.
Small Business Emergency Relief Loan (PACE Finance Corporation)	Provides fast, flexible, and affordable financial assistance to individuals, families, and small businesses affected by the 2025 California wildfires.	Up to $5,000	None	Eligible for financial assistance for disaster survivors.

Table 31 Recovery Tax Relief

Grant	Description	Potential Funding Amount	Local Match	Eligible Uses
Federal Tax Relief for Disaster Situations (Internal Revenue Service)	Provides tax relief for individuals and businesses in federally declared disaster areas, including extended filing deadlines and options to claim disaster-related casualty losses on federal tax returns.	Does not specify maximum limits.	None	Eligible for tax filing extensions and casualty loss deductions.
State of Emergency Tax Relief (California Department of Tax and Fee Administration)	Offers extensions of tax return due dates, relief from penalties and interest, and replacement copies of records lost due to disasters for taxpayers directly affected by state or federally declared emergencies.	Does not specify maximum limits.	None	Eligible for tax filing extensions and penalty and interest relief.
Disaster Loss Deduction (California Franchise Tax Board)	Allows taxpayers to deduct losses incurred because of a disaster declared by the president or the governor on their California tax return, providing potential tax relief.	Does not specify maximum limits.	None	Eligible for state tax deductions for disaster losses.

8.4

DEVELOPING A FUNDING AND FINANCING STRATEGY

Successful planning for and implementation of resilience and recovery efforts requires comprehensive funding and financing strategies. It is important to consider the types of projects and initiatives being funded, the unique characteristics of opportunities, tools, and mechanisms, funding potential, burdens or challenges, resource requirements, and complexity to secure and administer funding. It is also important to consider the specific needs of the plan or project and ensure alignment to the funding source.

A well-defined funding and financing strategy supports:

- **Early identification and alignment** of funding and financing opportunities with potential resilience and recovery strategies to support coordinated, strategic, and effective approaches to securing funding.
- **Efficient resource allocation** to reduce potential delays caused by funding gaps.
- **Risk management** to reduce reliance on a single source by identifying a diverse range of funding and financing options.
- **Long-term sustainability** of projects throughout planning, strategy development, implementation, and operation and maintenance.
- **Stakeholder confidence** in the ability of jurisdictions to plan for and implement resilience and recovery strategies.
- **Equitable outcomes,** especially in circumstances where funding sources are tied to the prioritization of vulnerable and historically marginalized communities.

8.4.1

STRATEGY DEVELOPMENT FRAMEWORK

Developing an effective funding and financing strategy for resilience and recovery involves a structured, multi-step process that aligns financial planning with resilience goals, community needs, and implementation capacity. The following steps outline a suggested framework for jurisdictions to consider when developing a funding and financing strategy for resilience and recovery.

- **Define resilience and recovery goals and risks** (e.g., flooding, extreme heat, sea level rise) and set measurable objectives aligned with broader resilience, recovery, and hazard mitigation plans.
- **Conduct a financial needs assessment** that estimates the total cost of planned resilience and recovery measures, including capital, operational, and maintenance costs over time, and identifies funding gaps and potential cost savings from avoided damages.
- **Inventory funding sources** and opportunities from local and regional, state, federal, and philanthropic funding programs, identify internal budget allocations, and map out timelines, eligibility, and match requirements. More grant funding guidance is provided in Section 8.1.
- **Identify financing mechanisms and revenue stream opportunities** and evaluate risk-sharing and return-on-investment models. More financing mechanism and revenue stream opportunity guidance is provided in Section 8.2.
- **Prioritize projects for funding** using cost-benefit analysis, equity assessments, and risk reduction potential and engage stakeholders to ensure community priorities are reflected.
- **Develop an implementation roadmap** that aligns funding and financing sources with project timelines and implementation phases, creates a diversified portfolio to reduce reliance on a single source, and plans for long-term financial sustainability and maintenance.
- **Build capacity and partnerships** to strengthen internal financial and grant management capacity. Partner with regional agencies, utilities, nonprofits, and the private sector to reduce individual burdens and share resources.
- **Develop a monitoring and evaluation framework** that tracks funding and financing performance and project outcomes and adjusts strategies based on new opportunities, risks, or policy changes. Report outcomes and performance to stakeholders and funders.

8.4.2

FUNDING AND FINANCING STRATEGY CONSIDERATIONS

When developing a funding and financing strategy for resilience and recovery initiatives, jurisdictions should carefully assess a range of foundational considerations to ensure long-term success and sustainability. Each decision—from project scale to the availability of internal resources and external partnerships—can significantly influence eligibility for grants, the feasibility of financing tools, and the overall capacity to deliver and maintain projects. By thoughtfully addressing the factors outlined in **Table 32**, jurisdictions can align their strategic planning with realistic funding pathways, reduce risk, and build the institutional support necessary to implement impactful, community-centered resilience solutions.

Table 32 Preparing for Funding and Financing Strategy Development

Considerations	Relevance
Are you seeking funding or financing for a single plan or project or a program of projects?	Initiative type will inform grant eligibility, and which financing tools are appropriate. Funding (grant) opportunities often require or favor shovel-ready projects or sufficiently well-defined prior to selection. Grant opportunities might not support a program of projects. Grant opportunities are finite and do not provide long-term financing for operation and maintenance of successful grantees.
What level of resourcing (staff time, capabilities, funding) do you have available?	Grant applications can require significant staff time and resources. Establishing new financing tools can require significant resources, expertise, and public involvement. If jurisdictions are resource-constrained, the opportunity cost to invest resources into grant applications or establishing new financing can be prohibitive. Jurisdictions should prioritize projects and funding and financing that match their ability to secure necessary sources and deliver projects.
Do you have internal and external champions?	Building consensus with internal and external champions and stakeholders is key to effective project prioritization and delivery. When raising new revenue mechanisms or financing tools, internal and external champions will play a key role in building support and communicating messaging.
Do you have local funding sources/ financing in place/ available?	In some cases, federal and state grants require a local match, which can be burdensome for jurisdictions. If local financing tools and revenue mechanisms are already in place, this may support local match funding and support a diversified financing approach to deliver resilience projects. However, this can also limit agency capacity to take on more financing
Do you have local, regional, multi-jurisdictional, and cross-sectoral partners?	Non-government and local agency partners provide opportunities to share resources and burdens, especially when applying for grants. Local partners can play an integral role in the successful, long-term operation and maintenance of resilience projects. Partnerships provide opportunities to reduce risk and reliance on a single funding source.

8.4.3

CENTERING EQUITY

Funding and financing strategies for resilience and recovery should consider the financial needs of and the potential impacts of funding and financing opportunities on vulnerable and impacted communities. Strategies that do not adequately address current inequities can negatively impact communities. The following examples are not exhaustive, and a holistic assessment of impacts should be undertaken before implementing funding and financing strategies.

- Taxes, fees, and charges can inadvertently increase financial burdens on low-income households, which reduces a household's ability to pay for other essential needs.
- Communities with fewer resources will have less capacity to pursue and secure funding and financing, which if left unaddressed, can reinforce existing inequities.
- Financing can require innovative thinking to avoid existing inequities in institutional financing tools, such as the impacts of downgraded credit ratings post-disaster on a community's long-term ability to secure affordable financing and to pay for resilience and recovery projects.

When integrating equity into funding and financing strategies, jurisdictions should determine how funds are raised and spent. It is important to include community representation in the decision-making process, including low-income, communities of color, and frontline communities. Other examples of equity integration in funding and financing strategies are outlined in **Table 33**.

8.4.4

PREPARING TO APPLY FOR GRANT OPPORTUNITIES

It is essential for jurisdictions to prepare for grant opportunities ahead of time to avoid ad hoc reactions to opportunities. Strategic and proactive grant funding strategies save time and resources, improve competitiveness, strengthen partnerships, maximize funding opportunities, enhance grant management capacity, and align funding opportunities with community and stakeholder priorities.

- **Identify a grant monitoring and application lead** or coordinator and, if resources allow, establish a grant team including a project manager and finance, legal, and subject matter experts to manage the grant identification, application, and management processes.
- **Conduct an eligibility and feasibility assessment** to understand grant eligibility requirements, understand organizational capacity to apply for and manage grants, and evaluate the local match or cost-share requirements.
- **Explore partnering opportunities** with neighboring jurisdictions, agencies, and community-based organizations to reduce administrative and cost burden, increase grant impact, and develop more compelling and impactful grant applications.

Table 33 Examples of Equity Integration in Funding and Financing Strategies

Equity Consideration	Definition	Example of Equity Integration
Participatory Funding & Financing Process	Community members actively participate in deciding which funding and financing sources are pursued and allocated, promoting transparency and inclusivity.	The Duwamish Valley Program in Seattle, Washington, has developed a funding, finance and value capture program that centers residents' voices when pursuing grant funding from federal and state programs to make neighborhood-level resilience investments.[3]
Participatory Budgeting Process	Community members propose and vote on projects to determine how portions of public budgets are spent.	The city of Vallejo employs a participatory budgeting process in which community members recommend to the city council how to spend part of a public budget. The city has allocated over $8.3 million to fund a total of 47 projects, while engaging over 20,000 residents of Vallejo.[4]

3 City of Seattle. Municipal Financing Alternatives Review. September 2023.
4 City of Vallejo. Participatory Budgeting.

- **Prepare for the application process** by registering for required systems and submission portals, gathering required documentation, developing organizational mission statements and organizational charts, and gathering letters of support or MOUs from partners, if required.

- **Identify and engage required technical assistance** through the grant program if assistance is offered or from third parties as part of grant application development.

- **Develop grant application materials** including a proposal timeline with internal deadlines. Draft a compelling narrative and needs statement, a detailed budget and rationale, and evaluation process and metrics, making sure to align with the grant requirements and purpose.

- **Complete internal review and approval** to ensure completeness and compliance against grant requirements, secure leadership buy-in and support, and review for clarity, grammar, and formatting.

- **Submit the grant application** through the portal before the deadline, confirm receipt of the submission via system confirmations or email confirmations (if permitted), and save a complete copy of the submission application and receipts.

- **Plan for long-term sustainability** of the project beyond the performance period, including alternative funding and financing sources and integration of the project in capital and operational financial plans.

8.4.5

PREPARING TO MANAGE GRANTS POST-AWARD

Applying for grants is the first step but is not the only resource-intensive step in the process. Applicants should be prepared to comply with post-award requirements, which can be prohibitive if the grantee does not have sufficient staff time and financial resources budgeted. Ideally, applicants should estimate staffing costs for grant management for inclusion in the grant request. Most grants operate on a reimbursement basis, meaning grantees must cover eligible costs upfront and submit documentation for reimbursement. This can create cashflow challenges for under-resourced entities without access to additional funding. To prepare for grant award and support effective and compliant grant management, the lead grantee should:

- **Review and understand the grant agreement** to ensure a clear understanding of the specific grant agreement terms and conditions, including the objectives, allowable costs, reporting requirements, and key milestones and deadlines. Lead grantees should prepare a plan for complying with the grant agreement requirements.

- **Establish a MOU** with project partners to define roles, responsibilities, and budgets (if applicable or not completed during grant application process). If consultants or contractors are needed, follow grant entity procurement guidelines.

- **Establish or confirm internal program management and quality controls** including quality assurance and management, and procedures for budget management, procurement, expenditure tracking, and record keeping.

- **Maintain accurate records** for all grant-related activities throughout the grant lifecycle, including expenditure details to support progress tracking, compliance with grant requirements, and preparation for any required audits.

- **Monitor performance** against measurable goals and metrics to track progress. Lead grantees should establish approaches to adjust project delivery as needed to maintain progress and compliance with grant requirements.

- **Report project progress** in alignment with reporting requirements. Lead grantees should establish clear, effective procedures to prepare and submit reports on time and in the correct format.

Coastal homes in Ventura County
Oxnard, CA
Chris Ryan, Adobe Stock

09 RESOURCES

This chapter provides resources to support the resilience planning process, including general guidance, tool, and example plans for incorporating resilience. It also provides example strategies to address resilience for the built environment and social, economic, and natural systems.

9.1

GENERAL RESILIENCE PLANNING RESOURCES

There are a range of statewide and national planning efforts and frameworks to guide the development of resilience plans and integrating resilience into existing plans, programs, and processes. The following resources provide additional information on community engagement, climate resilience, and other relevant topics.

SCAG GUIDANCE

- Updated every four years, SCAG's Connect SoCal Regional Transportation Plan/Sustainable Communities Strategy outlines a vision for a more resilient and equitable future. The plan describes investments, policies, and strategies for achieving the region's goals through 2050. The implementation section includes strategies that will fulfill the goals of the plan in four focus areas: mobility, communities, environment, and economy. Each strategy describes SCAG's role and lists other responsible parties.

- The SCAG Equity Resource Guide provides local, state, and national examples of practices and approaches for advancing equity.

- The SCAG Adaptation Planning Guide and Appendices (2020) provide step-by-step guidance on the adaptation planning process and an overview of how the Southern California region can plan and prepare for the impacts of climate change, including extreme heat, increasingly frequent and destructive wildfires, and other climate-related issues. It provides tools, resources, and best practices to assist with adaptation planning at the local level.

GENERAL RESILIENCE PLANNING GUIDES

- FEMA National Resilience Guidance (2024) outlines how to incorporate resilience into planning efforts, policies, and project and program development. It describes how to prioritize projects, finance resilience efforts, and measure and evaluate resilience.

- The U.S. EPA Regional Resilience Toolkit describes five steps to resilience: engagement, conducting a risk and vulnerability assessment, identifying and prioritizing strategies, funding actions, and evaluating results and refining methods.

- The American Planning Association's Infrastructure Resilience Guide (2019) emphasizes the need to incorporate climate change into updated infrastructure design and planning processes. Multiple systems (e.g., community and social, economic and financial, infrastructure, environmental, governance, and housing systems) can become safer by strengthening resilience.

- The Biden Administration's National Climate Resilience Framework describes six objectives to strengthen resilience at all levels, including planning, the built environment, and land and water management. It also addresses capital investments and strategies to protect and support communities.

- The LCI Planning and Investing for a Resilient California: A Guidebook for State Agencies (2017) provides a framework for state agencies to integrate climate change into planning and investment.

- The National Institute of Standards and Technology's Community Resilience Planning Guide for Buildings and Infrastructure Systems provides guidance on determining performance goals for buildings and infrastructure systems based on community assessments of social needs and functions supported by the built environment.

RESILIENCE INDICATORS AND METRICS

- The LCI Resilience Metrics White Paper (2020) describes metrics that can be used to measure and monitor resilience.

- FEMA's Community Resilience Indicator Analysis: Commonly Used Indicators from Peer-Reviewed Research (2022) describes the most common indicators to measure community resilience.

9.2

EXAMPLE PLANS AND OPPORTUNITIES TO INCORPORATE RESILIENCE

Table 34 describes common examples of local and regional plans in California, their opportunities to incorporate resilience into their strategies and approach, and the advantages and disadvantages of each.

Table 34 Examples of Local and Regional Plans in California and Opportunities to Incorporate Resilience

Plan Type	Resilience Components	Advantages and Benefits	Disadvantages and Challenges
STANDALONE RESILIENCE PLANS			
Local Hazard Mitigation Plans	Required to incorporate climate vulnerability assessments (SB 379). Comprehensive approach to evaluate hazard likelihood, consequence, and risk. Identify specific resilience projects.	Established process with guidance and technical assistance from Cal OES and FEMA. Unlocks eligibility for hazard mitigation funding and other non-emergency funding from FEMA. Smaller jurisdictions and special districts can submit annexes to countywide plan.	Update process can be technical and often does not incorporate robust community input. Must be updated every five years.
Climate Adaptation Plans	A comprehensive planning effort to build communitywide resilience to climate change. Often incorporates a climate vulnerability assessment, goal setting, and strategy development.	Identifies a clear set of strategies and programs to build resilience to climate impacts. Community-wide focus. Opportunity to engage the public and stakeholders.	Lack of dedicated funding for strategy implementation, monitoring, evaluation, and plan updates. Strategy implementation might not be prioritized, especially for jurisdictions with existing resource and staffing limitations.
Sea Level Rise Adaptation and Coastal Plans	Develop strategies to protect communities and infrastructure from sea level rise.	Required by SB 272 (2023). Funding currently available from Ocean Protection Council.	Relatively new plan type with more limited guidance and examples. Existing funding does meet overall funding need.
Community Wildfire Protection Plans	Identify and map areas at risk of wildfires to prioritize areas for mitigation efforts. Provides strategies to reduce fire risk, increase preparedness, and minimize damages.	Develop specific actions to reduce wildfire risks. Build social capital by increasing community cohesion and trust. Opportunity to engage public and stakeholders.	Coordination of multiple groups (residents, land managers, businesses) can be difficult. Could have difficulty with funding and implementation.

Plan Type	Resilience Components	Advantages and Benefits	Disadvantages and Challenges
PLANS FOR RESILIENCE INTEGRATION			
General Plan	Safety element or LHMP required to include climate adaptation by SB 379 (2015); integration of LHMP into safety element incentivized by AB 2140 (2006). Safety element also required to include climate adaptation and resilience at each update of the housing element or the LHMP, at least every eight years. Consider exposure to hazards in zoning code updates and land use plans.	Can comprehensively enhance resilience by incorporating into each general plan element, such as housing, land use, circulation, etc. Individual elements can be updated on their own. Carries force of law. Established public process.	Not all elements are updated regularly. General plan update processes can take two to three years. Requires political will. Limited funding for planning and implementation, especially for smaller jurisdictions.
Community Plans, Specific Plans, and Master Plans	Translate and implement general plan policies at the neighborhood level. Ensure investments in development areas do not perpetuate vulnerabilities. Incorporate resilience strategies into specific design features, plans, and guidelines (e.g., green infrastructure).	Reduce infrastructure and community vulnerability to hazards. Locally focused; reflect community-specific shocks, stressors, and priorities/solutions.	Limited funding available beyond developer impact fees. Potentially long update cycle.
Agency Budget	Fund resilience-related programs, projects, policies, and staff. Create dedicated resilience funds. Build resilience into decision making and life-cycle processes.	Requires justification and thorough outlining of resilience projects, which increases transparency and provides a clear path for implementation. Updated annually. Enables implementation.	Limited financial resources and competing priorities. Could require policy or procedural changes to budget rules.
Capital Improvement Plan (CIP)	Fund specific resilience-related projects or incorporate resilience elements into existing planned projects. Embed resilience objectives into the overall goals of the CIP. Leverage funding opportunities for resilient infrastructure.	Ensures infrastructure investments are resilient. Updated annually, providing opportunity to prioritize new projects on a yearly basis.	Might require data, tools, and technical expertise. Regulatory or policy barriers that hinder the integration of resilience measures. Limited funding resources and competing priorities.

Plan Type	Resilience Components	Advantages and Benefits	Disadvantages and Challenges
Emergency Operations or Management Plans	Link response actions/ processes to findings from the hazard mitigation assessment. Opportunity to include emerging hazards such as extreme heat. Provide training, education, and resources to community.	Resilience can be built into training and implementation. Counties are encouraged to view plans as a "living document" and update regularly. After-Action Reviews allow for opportunity to evaluate and improve response.	Plans focus on emergency response and not on strategies to increase long-term resilience. Scenario testing and training can be costly. May be siloed from planning and other departments.
Countywide Transportation Plans and Long-Range Transportation Plans	Incorporate resilience into investments for transportation infrastructure. Align planned transportation infrastructure with future hazard projections. Identify projects that support resilience.	Updated regularly (every four to five years). Linked to state and federal funding. Facilitates cross-departmental discussions. Identifies long-range opportunities and goals.	Focus on transportation infrastructure resilience may limit community interest in engagement events.
Climate Action Plans	Can identify or prioritize greenhouse gas reduction actions with resilience co-benefits. Identify strategies that have resilience co-benefits (health, air quality, energy savings, etc.).	Community-wide focus. Opportunity to engage public. Multi-benefit strategies.	Strategy implementation can be limited or deprioritized due to agency resources and capacity. No regular update process.
Urban Forestry Management Plans	Incorporate future climate conditions into tree species planted and management practices.	Protect or create habitat. Focus on historically marginalized and vulnerable communities.	Could have difficulty with funding and implementation.
Sustainability Plans	Reduce use of water and energy through strategies that also enhance resilience.	Sustainability strategies can be tied to economic development, climate resilience, etc.	Could have difficulty with funding and implementation.
Comprehensive Economic Development Strategy	Identify vulnerable or declining industries and strategies to support them. Promote local procurement, training, and hiring and enhance opportunities to foster skillsets aligned with growing industries. Incorporate economic strategies that have resilience co-benefits.	Attract and foster diverse industries within community to reduce reliance on single industry. Build an educated local workforce and support training to upskill or transition workers into new industries. Align new economic development initiatives with community-level resilience efforts.	Must make a case for resilience to be included.

Plan Type	Resilience Components	Advantages and Benefits	Disadvantages and Challenges
Active Transportation and Community Mobility Plans	Incorporate future shocks and stressors in design and siting of transportation infrastructure. Encourage sustainable forms of transportation, lowering carbon emissions.	There is some dedicated state and federal funding. Align with other local goals, such as vehicle miles traveled reduction, vision zero, and greenhouse gas reduction.	Funding resources typically fall well short of need.

9.3

TOOLS FOR CHARACTERIZING SHOCKS AND STRESSORS

Many tools can be used to quickly access climate, economic, natural, and social system indicators for California communities, supplementing or as an alternative to the metrics in the Shocks and Stressors Matrix. Many of the metrics in the matrix are from these tools.

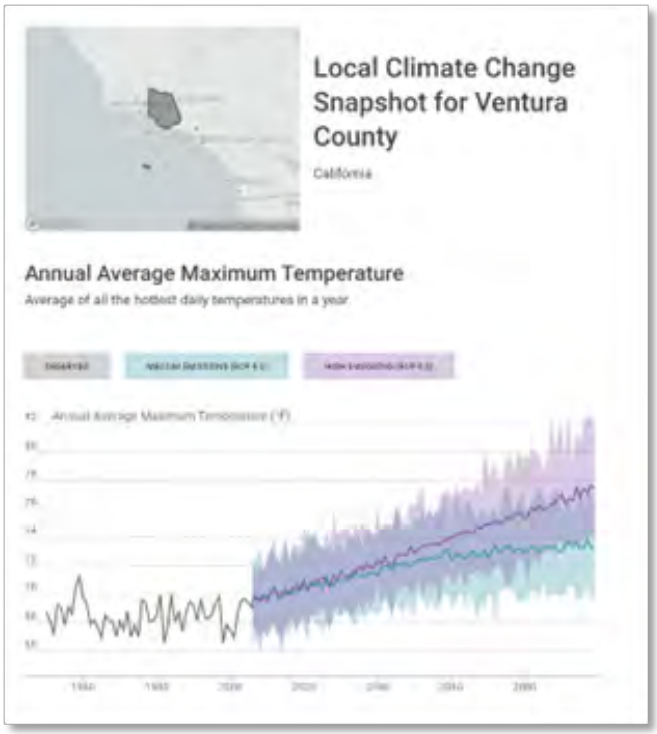
GENERAL RESILIENCE PLANNING GUIDES

- A California-specific tool, Cal-Adapt, offers a Local Snapshot feature that provides a quick overview of climate change projections for specific addresses, census tracts, cities, counties, or other areas. It is particularly useful for localized and detailed assessments, as users can download local climate projection data for more advanced analyses. Cal-Adapt offers additional guidance for users on selecting climate projections, timeframes, and scenarios. **Figure 13** shows how Cal-Adapt can be used to evaluate the trajectory of extreme heat through 2100 using the metric of number of days with maximum temperatures over 90°F.

- Resilience Analysis and Planning Tool includes infrastructure, community resilience indicators, hazard, and census data at the county level for the United States.

- National Risk Index identifies communities at risk from natural hazards by considering underlying socio-economic conditions and exposure to hazards. It includes measures of risk, expected annual loss, social vulnerability, and community resilience, which can inform resilience assessments and strategy prioritization.

Figure 13 Cal-Adapt's Local Climate Change Snapshot for Ventura County



SOCIAL RESILIENCE

- CalEnviroScreen identifies vulnerable communities by assessing environmental, health, and socio-economic factors. It can assess which populations are most at risk from climate-related hazards and which communities may experience socio-economic stressors that impact resilience.

- The Healthy Places Index (HPI) identifies vulnerable communities via a comprehensive set of health indicators and physical, social, and economic conditions that encompass social determinants of health. The HPI can help identify areas where community resilience efforts are most needed.

ECONOMIC RESILIENCE

- National Economic Resilience Data Explorer provides a consolidated source of economic data and research to support economic development and resilience, including data at the county level.
- The Economic Development Capacity Index provides 53 indicators across five capacity areas—human capital, financial, industry, infrastructure, and institutions and partnerships—to evaluate resilience across the built environment (e.g., electricity reliability), economic (e.g., percent homeownership), and social sectors (e.g., percent high school education and above, population near green space).
- **Scenario Analysis and Stress Testing.** These methods create hypothetical scenarios to assess how different shocks might impact the economy.

NATURAL SYSTEMS RESILIENCE

- The California Natural Resources Agency Open Data Portal is a comprehensive collection of datasets across the topics of oceans, water, wildlife, land management, energy, climate, and natural hazards.
- Conservation Planning Data and Tools, from the California Department of Fish and Wildlife, contains spatial data for conservation planning, including for vegetation, habitats (including connectivity and wildlife corridors), biological hotspots, species, and protected lands, among others. The Biogeographic Information and Observation System consolidates multiple datasets for ecosystems and biodiversity.
- California's Protected Areas hosts a dataset of lands protected for open space purposes by over 1,000 public agencies or nonprofit organizations, ranging from National Parks to neighborhood pocket parks. It also contains a database of lands protected under conservation easements.
- The Department of Conservation's Farmland Mapping & Monitoring Program maintains maps of agricultural land in California, categorized by soil quality and irrigation status.
- California has a wealth of data related to water. The Department of Water Resource's data resources include the Sustainable Groundwater Management Act data portal, the California Water Data Library, tools related to climate change, and reports. They also maintain the Water Use Efficiency Data portal, which includes mandatory urban water management plan data. The State Water Resources Control Board also maintains water data, including on drinking water, stormwater, and groundwater quality. The U.S. Geological Survey California Water Science Center hosts many water datasets.

9.3.1

RESOURCES FOR CHARACTERIZING CLIMATE-RELATED SHOCKS AND STRESSORS

Securing up-to-date, localized climate information from the best available sources will help jurisdictions understand and map future projections for climate-related shocks and stressors. The following resources provide updated data and climate change projections to support climate risk analysis.

- The Fourth **and Fifth (forthcoming) California Climate Change Assessments** provide comprehensive analyses of climate change impacts across California. They offer valuable insights into future climate scenarios, and the region-specific reports can help planners understand key climate hazards relevant to their area and their impacts on infrastructure, the economy, the environment, communities, and more.
- **Local Climate Change Vulnerability Assessments and Adaptation Plans.** These documents identify projected climate hazards for counties and cities. They often provide information on existing programs and policies to address hazards and outline additional plans. These resources can help planners understand what is already considered a hazard and what mitigation actions are underway or planned.
- 2024 California Ocean Protection Council Sea Level Rise Guidance. This guidance document outlines projections for sea level rise in California. It can help coastal communities understand the rate of sea level rise so they can prepare for and address the impacts of rising seas.

These resources represent a selection of what is available and can be a starting point for planners when assessing climate related disruptors.

9.4

RESOURCES FOR ENGAGING WITH VULNERABLE AND IMPACTED COMMUNITIES

SCAG practices equitable engagement in its planning processes and has developed best practices for conducting equitable engagement. In July 2020, SCAG adopted a resolution affirming its commitment to advancing equity, diversity, and inclusion throughout Southern California.

The SCAG "Climate Adaptation Planning Guide" emphasizes that public engagement is conducted at all phases of the planning process, and serves as a good resource on how to conduct engagement. In addition, the SCAG "Equity Resource Guide" provides examples from local, state, and national agencies with different approaches for advancing equity.

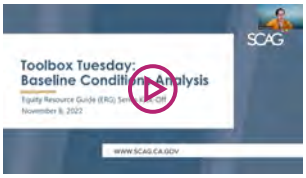
Additional Resources for Engaging with Vulnerable and Impacted Communities

SCAG offers free trainings on various topics for its members to leverage in the planning process. Below is a list of relevant past trainings and links to their recordings:

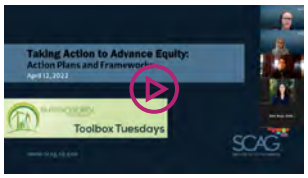
[Inclusive Contracting Toolkit]
January 2024

[Integrating Equity and Adaptation into the Planning Process]
April 2023

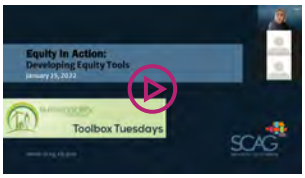
[Equity Series: Engagement and Co-Power]
April 2023



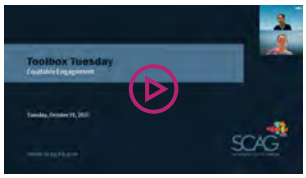
[Equity Resource Guide Kick-Off: Baseline Conditions Analysis]
November 2022



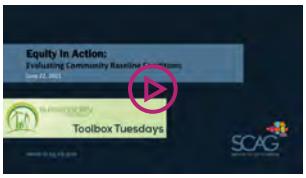
[Taking Action to Advance Equity: Action Plans and Framework]
April 2022



[Equity in Action: Developing Equity Tools]
January 2022



[Equitable Engagement]
October 2021



[Equity in Action: Evaluating Baseline Community Conditions]
June 2021

Other resources are also available through governments and NGOs:

[Environmental Resilience Tools Wizard]
U.S. EPA

[Key Strategies and Resources for Equitable Resilience]
HUD

[Resiliency Guidebook Equity Checklist]
State of California

[Guide to Equitable, Community-Driven Climate Preparedness Planning]
Urban Sustainability Directors Network

[Making Equity Real in Climate Adaptation and Community Resilience Policies and Programs: A Guidebook]
Greenlining Institute

9.5

EXAMPLE STRATEGIES

This section provides example strategies for the built environment, social, economic, and natural systems. Strategies listed here are a high-level and are not exhaustive, but a starting point to integrating resilience into plans and planning processes.

9.5.1

STRATEGIES FOR BUILT ENVIRONMENT RESILIENCE

Built environment strategies—generally projects, programs, or policies—enhance the resilience of physical assets and infrastructure to shocks or stressors. Strategies typically fall into five categories: accommodation, protection, preparation, avoidance, and retreat.

The most common strategy type are physical projects that construct, retrofit, or restore assets or areas. These strategies can be traditional, engineered "gray" infrastructure solutions, such as dams and sewage systems; "green" solutions that enhances or mimics natural systems to provide ecosystem services; or a hybrid of the two.

Critically, the built environment greatly influences social and natural system resilience. Poorly designed urban areas and infrastructure can exacerbate existing vulnerabilities for communities and ecological areas. However, planning neighborhoods that encourage relationship-building or designing infrastructure that minimizes its environmental footprint can simultaneously support physical, social, economic, and natural system resilience. Thus, built environment strategies should consider benefits and impacts to the environment, communities, and the economy to prevent maladaptation—decisions that worsen the overall situation or transfer challenges from one sector to another, or even one neighborhood or parcel to another.

ACCOMMODATION

Accommodation strategies allow assets to experience a shock or stressor without experiencing detrimental effects. These strategies involve changes to the asset's physical composition or structure.

- **Material upgrades** replace outdated components with newer or more advanced ones.. For example, upgrading electricity distribution line materials to withstand higher temperatures or replacing wooden elements of bridges in wildfire-prone areas with metal.
- **Elevate assets to accommodate future changes.** This may apply to repair and recovery projects after natural disasters, such as flooding, or to existing or new infrastructure projects. In some instances, only sensitive components (such as electrical equipment) will need to be elevated, while in others the entire asset will need to be raised. For example, the Gerald Desmond Bridge Replacement Project in Long Beach rebuilt an existing bridge at higher elevation to accommodate larger cargo ships.
- **Retrofits** enhance resilience to natural disasters or seismic activity by adding new features to existing structures. For example, seismic codes are updated every three to six years. Jurisdictions can prepare for earthquakes by ensuring all critical infrastructure (roads, bridges, medical facilities, etc.) is seismically retrofitted to the most recent standards.
- **Upgrade capacity** for assets designed based on historical data to anticipate future increases in hazard severity, intensity, or frequency. For example, culvert size by need to be increased to accommodate stronger storms. Fire hydrants capacity could require updates to handle greater fire intensity.

THE BUILT ENVIRONMENT SHAPES SOCIAL AND NATURAL SYSTEMS

The urban heat island is amplified in areas with low tree canopy and green space coverage and high percentages of heat-absorbing materials like pavements. Studies have shown that these areas are disproportionately home to historically redlined, low-income communities.

In Southern California, highways have led to habitat fragmentation for several endangered species. Fragmentation can set off a chain reaction that prevents species reproduction and can lower biodiversity over time. Highways also create barriers that enhance social and economic inequities among communities.

HARDEN

These strategies protect assets and infrastructure from potential physical exposure to shocks and stressors, reducing potential damage or disruption. These can include physical barriers, varying across the gray to green spectrum, from built infrastructure such as levees to nature-based solutions such as dune restoration and beach nourishment. These strategies are most useful in areas with a high concentration of communities and critical assets; for example, sea walls often protect ports and industrial facilities.

- **Physical barriers**, such as sea walls and levees, protect assets from exposure to shocks or stressors. Barriers are commonly used in flood protection in riverine and coastal environments. Solutions include marsh and wetlands restoration (green); vegetated riprap and living shorelines (hybrid or nature-based); and groins and bulkheads made of steel and concrete. Note that some barriers, such as sea walls, levees, and bulkheads, should be carefully designed and planned to avoid maladaptation or negative impacts to neighboring areas.

- **Defensible space** protects buildings and infrastructure from wildfire damage in fire hazard severity zones and the WUI through an intentionally maintained buffer between structures and surrounding vegetation..

AVOIDANCE

Avoidance strategies preserve undeveloped spaces or limit future development to prevent exposure to shocks. Although avoidance strategies aim to avoid direct hazard exposure, they can also support natural system resilience by steering development away from vulnerable ecosystems (see Section 9.5.4 for related natural system strategies).

- **Establish regulations or zoning restrictions** to prevent development in a floodplain, wildfire severity zone, or shoreline exposed to coastal erosion and inundation.

- **Acquire development rights or buy back properties** to avoid development or prevent rebuilding in areas vulnerable to shocks.

PREPARATION

Preparation strategies involve proactive planning to enhance the resilience of the built environment. These strategies integrate resilience considerations into plans, procedures, policies, and programs. There are a wide range of strategies in this category, from establishing early warning and asset monitoring systems to enhancing agency capacity to increasing frequency of roadway vegetation management.

- **Adopt building codes and standards** to ensure buildings are safe and sustainable. This can include encouraging, incentivizing, or requiring buildings to have backup power, energy-efficient building envelopes, or high-quality air filtration systems.

- Establish **disaster routes, emergency notification systems, and multimodal evacuation plans** to ensure cities and counties are prepared to assist residents in case of an emergency. Ensure that disaster routes are equipped to handle large volumes of traffic, notification systems are integrated directly with social media or mobile carriers to communicate information in real time, multimodal options are in place to support residents without vehicle access, and that critical facilities (such as hospitals and nursing homes) have evacuation plans in place.

- Support **power and communication redundancy** for critical facilities. For instance, microgrids are small networks supplied through a renewable energy source (e.g., solar panels or battery storage) that can provide backup power for buildings, while satellite services can provide communications back-up.

Tools for Identifying Areas to Avoid

These tools can provide a starting point for identifying areas to avoid in development and planning processes.

Shock or Stressor	Tool
Wildfire	Cal-Fire Hazard Severity Zone Viewer
Sea Level Rise and Coastal Hazards	Our Coast Our Future
Natural Disasters	FEMA National Risk Index

RETREAT

Retreat strategies, which relocate assets or infrastructure completely, should be a last resort. These strategies respond largely to shocks, not stressors, and often have high implementation costs. Retreat should only be initiated if risks are intolerable and present safety, health, economic, and related challenges that cannot be feasibly addressed through other strategies.

- **Relocate infrastructure** that lie within the future extent of projected flooding, sea level rise inundation, or wildfires. Critical facilities, such as hospitals and electricity infrastructure, can be relocated away from active faults. For assets exposed to slow-onset, long-term hazards, e.g., a coastal roadway projected to be inundated in 30-50 years, determine if another type of strategy (e.g., protect) can provide sufficient safety in the mid-term, in case retreat does not become necessary.

- **Restore** natural areas (such as wetlands or forests) following retreat for further mitigation against shocks and stressors. For example, coastal wetlands and marshes can protect against storm surge, and meadow restoration in the WUI can serve as a buffer against wildfire.

A Regional Approach to Social Resilience

Social resilience benefits from a regional approach as people do not live, study, work, recreate, and travel within solely one jurisdiction. Both high housing costs and limited resources within marginalized communities lead residents to make long trips for jobs, healthcare, groceries, and park access. Regional coordination on policies for housing, workforce training, education, economic development can lead to more investment within communities that enhance their innate resilience.

9.5.2

STRATEGIES FOR SOCIAL SYSTEMS RESILIENCE

Social resilience strategies strengthen the ability of communities and individuals to respond to and recover from shocks and stressors. While community engagement is important for all strategies, social resilience strategies should especially be developed with input from community members to ensure they address the community's self-identified priorities and are implemented with the support of community members.

CAPACITY BUILDING

Capacity-building strategies empower community members to participate meaningfully throughout the planning process and advocate for their priorities and needs. Capacity building can increase communities' understanding of key resilience challenges, access to resources and assistance, and ability to recover.

- **Establish a community workgroup** (or groups), steering committee, or other leadership structure for community members to formally participate in the planning process. Establish clear roles, responsibilities, and decision-making authorities for the group(s), make stipends available for all participants, and aim to make sure participant selection is equitable and representative of the community. This can elevate community perspectives in the planning process and equip community members with greater technical knowledge and experience with the formal procedures of local governments.

- **Partner with community-based organizations and trusted community members** (e.g., promotores) to lead community preparedness trainings and workshops tailored for vulnerable or historically marginalized communities. For example, a workshop on simple actions for home weatherization and to stay cool can protect residents, including renters, during wildfire smoke and extreme heat days.

- **Encourage and incentivize the development of community-serving resources**, such as schools, healthcare, supermarkets, childcare facilities, libraries, parks, community centers, job centers, and transit hubs within low-income and historically marginalized communities.

[51] Connect SoCal 2024. https://scag.ca.gov/sites/main/files/file-attachments/23-2987-connect-socal-2024-final-ch-02-our-region-today-040424.pdf

HEALTH AND SOCIAL VULNERABILITIES

Systemic disparities in access to healthcare, housing, transportation, healthy food, parks, green space, and a clean environment—key social determinants of health—have created long-standing health challenges that weaken community resilience. Environmental justice concerns emerge from chronic exposure to stressors such as extreme heat, toxic chemicals, and poor air quality. Addressing these social determinants strengthens health outcomes and increases individual and community resilience by improving land use, mobility options, and access to opportunities.

- **Increase access to open space and parks** in neighborhoods with the lowest amount of park access, such as those that do not have a park within one half mile or sufficient park acreage to meet population needs. Design parks to facilitate community cohesion, recreation, and physical exercise for all ages, abilities, and populations, and include climate-resilient features such as stormwater management, tree shade, and drought-friendly native landscaping.

- Develop **cooling centers in trusted spaces** widely used by community members, particularly vulnerable populations. For example, upgrading cooling capabilities at day labor centers and senior citizen centers can protect people who work outdoors and seniors—two groups who are more vulnerable to extreme heat—within facilities that they already use. Resilience hubs can also strengthen social resilience by providing a space for people to form relationships.

- Update **evacuation plans** to address the needs of people with access and functional needs, senior citizens, and people who live alone, lack car access, speak languages other than English.

HOUSING AND MOBILITY

Across the SCAG region, 55 percent of renters are rent-burdened, meaning that they spend more than 30 percent of their gross monthly income on rent, and nearly 30 percent are severely rent-burdened, spending more than 50 percent of their gross monthly income on rent.[51] High housing costs contribute to poverty, overcrowded housing, homelessness, and greater vulnerability to shocks and stressors. A shortage of affordable housing also leads to residents living far away from their workplaces, resulting in long commutes that further impact health and increase transportation costs. Strategies that increase affordable housing and mobility options can enable communities to build wealth and improve economic resilience.

- Encourage **development of affordable and senior housing in complete communities with a diverse range of mobility options and community amenities.** This supports residents to meet their daily needs (e.g., groceries, healthcare, education, recreation, and green space) with multiple mobility options, increasing health and social resilience. Identify barriers to affordable housing and adopt policies to encourage their development (e.g., inclusionary zoning).

- Explore and adopt **additional funding and financing** strategies that can support infill development such as tax increment financing districts (e.g., enhanced infrastructure financing districts), sales taxes, and other financing strategies that can leverage grant funding and other sources.

- Promote innovative strategies and partnerships to increase **homeownership opportunities** across the region with an emphasis on communities that have been historically impacted by redlining and other systemic barriers to homeownership for people of color and other marginalized groups (Connect SoCal 2024).

Tools to Support Social Resilience

Trust for Public Land
Provides maps to support open space development and park planning.

Healthy Places Index Policy Guides
The HPI Policy Action Guides provide evidence-backed policies across the topics of social, transportation, economics, housing, and more. For each HPI indicator, it provides policies, evidence, and links to tool and resources.

Resilience Before Disaster: The Need to Build Equitable, Community-Driven Social Infrastructure by the Asia-Pacific Environment Network, SEIU California, and BlueGreen Alliance focuses on resilience hubs and resilience at home as a framework for supporting the resilience for California's most vulnerable communities.

The Transformative Climate Communities (TCC) Program
The TCC Program evaluation reports, developed by the UCLA Luskin Center for Innovation, provide progress reports, lessons learned, and case studies on TCC implementation projects, which serve as models for comprehensive community-led action, including efforts to build social resilience.

9.5.3

STRATEGIES FOR ECONOMIC SYSTEMS RESILIENCE

Economic resilience strategies can help jurisdictions prepare for, withstand, and recover from macro-level downturns in the economy, sector-specific changes, and external disruptions like natural disasters and pandemics. Strategies should consider both short- and long-term goals and support preparation and recovery.

PREPARATION

These strategies outline approaches for pre-shock preparation and identify steps to attract and support a diverse economic ecosystem. To remain responsive, jurisdictions should review and update established strategies regularly to incorporate new information, leverage new partnerships, and reflect current priorities and economic conditions.

- Hold **business continuity planning** conversations at the local and regional level to understand broader-level challenges, opportunities, and support policies and systems, such as post-disaster regulatory processes.
- **Integrate business recovery into planning efforts**, such as disaster recovery plans, hazard mitigation plans, or emergency response efforts. This can help support greater coordination across departments and sectors, and accelerate post-disaster recovery.
- Establish **communication** protocols between partners and determine an approach for commercial outreach. Connect businesses to available resources and workshops for them to conduct their own resilience planning, such as the SBA's Business Resilience Guide.

RECOVERY

The International Economic Development Council states that "...recovery is the restoration of all aspects of the disaster's impact on a community and the return of the local economy to some sense of normalcy."[52] Often, response and recovery actions occur on a continuum, with overlaps between immediate support, short-term recovery, and medium- to long-term recovery initiatives. Actions should:

- **Support business recovery**
  After a shock or stressor, conduct outreach to local businesses to assess impacts and identify needs. Effective communication, identification of necessary business supports, and centralized business recovery resources are key to an effective response.
- **Review and adjust preparedness plans**
  Assess effectiveness of existing plans, update existing conditions assessments, adjust response protocols and communication plans, and track progress.

A Regional Approach to Business Community

A regional approach to economic development and business continuity can help smaller jurisdictions to identify their shared strengths, assets, and opportunities, and coordinate on complementary strategies. For example, San Bernardino mountain communities that rely heavily on recreation and tourism may benefit from collaboration to diversify their economy, as warming winters shorten ski seasons and wildfire risk may deter summer visitors. This could, for example, include enhancing broadband infrastructure to attract remote workers and small businesses.

[52] "Restore Your Economy – Phases of Disaster," Restore Your Economy, accessed December 17, 2024, Phases of Disaster - Restore Your Economy

Tools to Support the Preparation Phase

National Association of Development Organizations Resilience Workshop Planning Guide
Use a local or regional resilience workshop to identify economic resilience needs, connect local leaders with funding opportunities, and create action plans.

Comprehensive Economic Development Strategy
This place-based and regionally driven economic development plan serves as a mechanism to engage community leaders, leverage private sector involvement and relationships, build regional capacity for economic development, and embed resilience into strategic frameworks.

Communication Protocols
Establish a communication strategy to identify how partner organizations will communicate following a disruption and to facilitate the flow of correct information to local and regional businesses.

Ready Business Resources
Resources to promote business preparedness, emergency planning, training, and recovery.

GRRAs

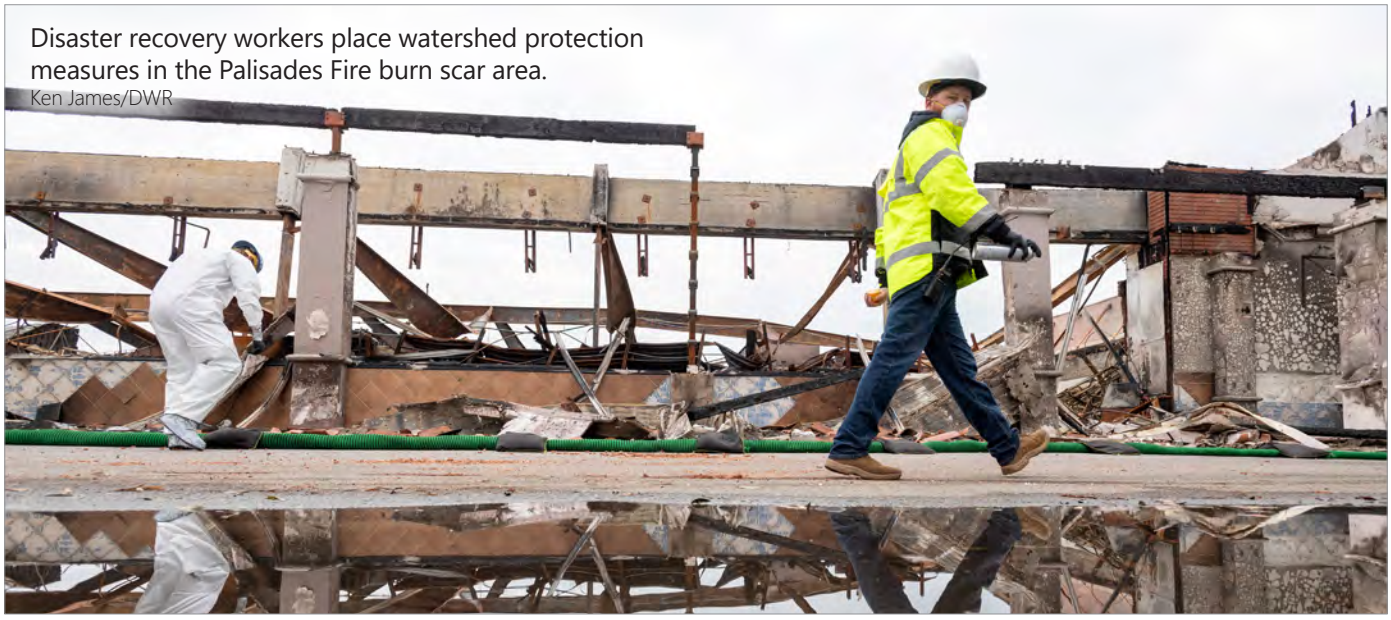
Identified by SCAG in Connect SoCal 2024, GRRAs include both areas where future growth could result in negative environmental impacts and areas that are exposed to climate hazards. By preserving GRRAs, the region can support resilience across multiple sectors and systems, and avoid potential disaster response and recovery costs.

GRRAs consist of:

Areas exposed to hazards
100-year floods, sea level rise, and wildfire (including the WUI)

Natural resource areas

- Publicly owned open space
- Locations of rare, threatened, and endangered species and plants
- Sensitive habitat areas
- Natural Community Conservation Planning and Habitat Conservation Plan areas
- Federally recognized Tribal lands
- Federally managed lands
- Farmlands



Disaster recovery workers place watershed protection measures in the Palisades Fire burn scar area.
Ken James/DWR

9.5.4

STRATEGIES FOR NATURAL SYSTEMS RESILIENCE

Resilience strategies for natural systems improve the capacity of ecosystems and habitats to respond to disturbances by resisting damages and recovering quickly. Healthy, resilient natural systems are foundational to people and economies, providing clean air, water, flood protection, carbon storage, pollination, and other critical services. Through sustainable management of wetlands, forests, open space, shorelines, and agricultural and working lands, the SCAG region can protect biodiversity, ecosystems, the built environment, and economic and social systems. Within the SCAG region, between 2012 and 2019, over 50,000 acres of natural lands and 40,000 acres of agricultural lands have been lost to development, making conservation a priority.[53] Within already fragmented ecosystems in an urbanized area, ecological connectivity becomes especially important for biodiversity and migration. Listed below are a few strategies that support the resilience of natural systems:

CONSERVATION

Loss of natural and working lands to development is a key challenge to natural system resilience in the SCAG region. SCAG has identified GGRAs throughout the region, which includes open space, sensitive habitat areas, and farmlands.

- **Support the development of easements and land trusts** to protect farmland, rangeland, or natural lands from development, with priority for those that provide significant resilience benefits and ecosystem services. Easements allow the landowner to retain private ownership and access to their land while restricting development rights; they can allow public access but it is not mandatory.

- Support practices that enable the diversification of **revenue streams on working lands**, which increases the economic viability and retention of agricultural lands. Alternative revenue streams can include agri-tourism, on-farm solar, or environmental credits for carbon sequestration, wildlife-friendly farming practices, groundwater recharge, or groundwater banking.

RESTORATION AND CONNECTIVITY

These example strategies focus on restoring and protecting connectivity for natural lands and habitats within developed lands, as fragmented habitats are more vulnerable to loss of biodiversity due to limited resources, exposure to disturbance, genetic isolation, and loss of migration routes. A regional approach for habitat connectivity allows for the identification of high-conservation value habitats regardless of jurisdictional boundaries. AB 1889, passed in 2024, requires cities and counties to identify and analyze habitat connectivity and planned wildlife passage corridors within the conservation element of their general plan.

- Coordinate with neighboring jurisdictions and regional and state agencies to **identify critical missing habitat linkages** and reconnect fragmented habitats in developed lands through conservation easements and wildlife corridors.

- Restore urban rivers, wetlands, and riparian corridors to reconnect aquatic habitats and restore natural flows, while reducing flood risk, increase groundwater recharge, and enhance recreation opportunities.

NATURE-BASED SOLUTIONS

Nature-based solutions rely upon the protection, sustainable management, and restoration of ecosystems to address societal challenges, while simultaneously protecting people and ecosystems.[54] Nature-based solutions can include both green infrastructure (vegetation or trees) and blue infrastructure (waterways, wetlands, and coastal habitats). They are often implemented within developed areas and on working lands to support biodiversity and deliver societal co-benefits.

- Support farmers to adopt **climate-smart agricultural practices** such as compost application to croplands and grazing lands to increase water retention, soil health, erosion control, and carbon storage.

- Develop **living shorelines**, which use natural materials such as vegetation or oyster reefs, to stabilize shorelines, protect against sea level rise, provide habitat, improve water quality, and support carbon storage.

[53] Connect SoCal 2024. https://scag.ca.gov/sites/main/files/file-attachments/23-2987-connect-socal-2024-final-ch-02-our-region-today-040424.pdf

[54] International Union for the Conservation of Nature. https://iucn.org/our-work/nature-based-solutions

Sonnie Hiles, Unsplash

Resources to Support Nature-Based Solutions and Conservation

30 x 30 California
In support of Governor Newsom's goal to conserve 30 percent of California's lands and coastal waters by 2030, this website provides resources, data, tools, and the Pathways to 2030 Strategy, which outlines nature-based solutions for key land types.

Vibrant Cities Lab
A comprehensive guide to support thriving urban forests, with research and case studies to back the multiple co-benefits associated with trees, and a toolkit to assist with urban forestry implementation.

California Council of Land Trusts
Advances conservation throughout California by providing knowledge, capacity building, funding, advocacy and other resources to support land trusts.

Tools to Support the Response/ Recovery Phase

Business Impact Assessment Survey (Example)
Surveys are useful tools to assess immediate impacts and identify short- and long-term business needs following disruptions or disasters. Timely outreach and follow up is key to understanding point-in-time business needs, in addition to tracking how needs evolve through response efforts.

Business Re-Entry
Following large-scale evacuations, prioritized protocols can be used to facilitate safe re-entry for businesses.

California Conservation Corps members supporting recovery and cleanup of the January 2025 fires.
Ken James/DWR

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