



Resilient IE Toolkit

SAN BERNARDINO COUNTY TRANSPORTATION AUTHORITY
WESTERN RIVERSIDE COUNCIL OF GOVERNMENTS



Resilient IE Toolkit

February 2020

Prepared for



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Chapter 1

Introduction

Introduction

Vulnerability Assessment

Evacuation and Transportation Route Hazard Mapping

Adaptation Strategies

Climate Resilient Transportation Infrastructure Guidebook

Resilience Template

The Regional Climate Adaptation Toolkit for Transportation Infrastructure project (Resilient IE project or this Toolkit) is a collection of resources that provides data on the risk from climate-related hazards and tools and resources for developing and implementing climate adaptation and resilience strategies to reduce these risks. The Toolkit specifically addresses the anticipated increasing risks and impacts of climate-related hazards on the inland areas of southern California.

This Introduction summarizes the assembled resources and provides guidance on how each analysis, dataset, tool, or guidance document in the Toolkit supports adaptation and resilience. This section describes the general project background, introduces the individual document components and organization, and summarizes the laws governing climate adaptation and resilience for local jurisdictions.

1.1 PROJECT BACKGROUND

The Resilient IE project is a joint effort between the Western Riverside Council of Governments (WRCOG)¹ and San Bernardino County Transportation Authority (SBCTA)² to prepare the western

Riverside County-San Bernardino County region for the increasing climate-related hazards. Current projections show that the region will most likely experience some of the most severe climate-induced effects in southern California. These impacts, as currently modeled, will exacerbate existing hazards, such as landslides, flooding, and wildfire risks, and are expected to strain the transportation networks and communities of both San Bernardino and Riverside counties.

History

To address these anticipated impacts, some agencies in the region have already begun resilience planning efforts. San Bernardino County completed a regional vulnerability assessment for unincorporated areas of the county in 2018, and prepared draft adaptation and resilience strategies to address these vulnerabilities.^{3,4} Similarly, in 2014, WRCOG prepared CAPtivate, a climate action plan for the western Riverside County subregion, which included a vulnerability assessment and adaptation policies.⁵ These individual planning efforts by both entities laid the groundwork for the development of this Toolkit, which builds on these existing efforts, as well as other resources prepared by State and regional agencies.

Intended Audience

Jurisdictions in both subregions can use this Toolkit to assess how climate-related impacts may affect them and to implement adaptation and resilience measures that will improve climate adaptation in the community. This Toolkit provides a summary of the anticipated climate-related impacts each jurisdiction is likely to confront, template language and model adaptation strategies that city and county governments can adapt for their own specific needs, and guidance for how communities can seamlessly incorporate adaptation into their individual existing efforts and comply with State-mandated resilience planning laws.

The WRCOG-SBCTA partnership prepared this Toolkit as a resource for member jurisdictions and other local governments, including city, county, and tribal governments. Any jurisdiction in the WRCOG-SBCTA region seeking guidance or reference data to incorporate into their own localized planning efforts should use this Toolkit. The Toolkit organizes its datasets, analyses, model strategies, and implementation guidance in such a way that jurisdictions can easily apply them to their local contexts. Additionally, local governments outside of the WRCOG-SBCTA region may find language or datasets useful for their own adaptation and resilience planning efforts, as may nongovernmental or private institutions.

Intended Use

The primary function of this Toolkit is to facilitate greater resilience and adaptive capacity in the face of climate-related impacts in the WRCOG-SBCTA region. This Toolkit supports existing or future planning efforts and community development and capital projects that will reduce loss of life, damage to property, interrupted services or economic activity, and overall threats to communities. This Toolkit follows the best practice process identified in resources from the State and other agencies on how

communities can conduct climate adaptation planning and improve resilience. While communities do not need to go through a complete climate adaptation planning effort to use the resources in this Toolkit, it is set up to support such efforts through the following process:

- ☐ Review Vulnerability Assessments (Chapter 2) to identify the major climate-related hazards present in a community and how the populations and assets in the community may be susceptible.
- ☐ Use the Evacuation and Transportation Route Hazard Mapping tool (Chapter 3) to see what the recommended evacuation routes are in the community, and how those routes may be exposed to harm from climate-related hazards.
- ☐ Look at the region-wide adaptation strategies (Chapter 4) and determine which strategies may be feasible and appropriate for the community.
- ☐ Review the Climate Resilient Transportation Infrastructure Guidebook (Chapter 5) to identify strategies, capital projects, and other efforts that can help protect transportation infrastructure, including evacuation mapping, from climate-related hazards.
- ☐ Use the guidance and resources in the Resilience Template (Chapter 6) to:
 - Adapt the region-wide adaptation strategies and resources in the Climate Resilient Transportation Infrastructure Guidebook into locally-focused goals, policies, and practices.
 - Prioritize adaptation efforts, such as capital improvement planning, infrastructure modernization projects, or community-wide safety outreach efforts.
 - Identify potential funding sources.
 - Develop a community engagement strategy.
 - Update planning documents to integrate adaptation efforts.

Jurisdictions should use the Toolkit as a resource they can cross-reference during planning and implementation efforts. However, jurisdictions should use the Toolkit's resources as guidance rather than ready-made components to be adopted into planning projects. For example, the evacuation-route mapping tool presents evacuation route networks that were viable at the time of the Toolkit's preparation in 2019 but may not be as viable under different development patterns or other future scenarios. Therefore, each jurisdiction should ensure that any evacuation routes they adopt into their General Plans are both viable and up-to-date and should carefully review and consider the applicability of evacuation networks contained in this Toolkit. Similarly, the Implementation Handbook discusses how jurisdictions can integrate resilience planning into general plan documents, but this guidance is only relevant so long as general plan guidelines and requirements for adaptation and resilience do not change.⁶

Jurisdictions who use this Toolkit must perform due diligence to check for new planning requirements in California law. They should also make sure that the resources in this Toolkit remain appropriate for their community and are consistent with changes in future land use, regulatory, climate, or other conditions. This Toolkit encourages jurisdictions to seek further guidance and to use a combination of reference sources, such as the California Adaptation Planning Guide, official Federal Emergency Management Agency guidelines for hazard planning, and climate datasets from Cal-Adapt, to ensure that jurisdictions produce the best quality climate adaptation and resilience projects.

Funding

The funding for this project effort comes from a California Department of Transportation (Caltrans) Adaptation Planning Grant program. The Road Repair and Accountability Act of 2017 (Senate Bill 1) authorized these types of grant awards.⁷ In total, Caltrans awarded approximately \$683,000 to the WRCOG-SBCTA partnership to finance the development of the Resilient IE Toolkit.

1.2 TOOLKIT COMPONENTS AND ORGANIZATION

The Toolkit consists of six sections:

- Section 1, Introduction: Describes the project background, the preceding planning projects leading up to its inception, its funding sources, and the legal frameworks that have shaped its development.
- Section 2, Vulnerability Assessment: Features vulnerability assessments produced for the western Riverside County and San Bernardino County subregions, lists the major findings from the analysis for each region, and explains the methodology used to prepare the vulnerability assessments.
- Section 3, Evacuation and Transportation Route Hazard Mapping: Discusses the purpose, approach, and data summary of the Evacuation Route Mapping tool.
- Section 4, Adaptation Strategies: Contains regional adaptation strategies to address the major vulnerabilities in the for the WRCOG and SBCTA subregions and help support a consistent adaptation approach across jurisdictions.
- Section 5, Climate Resilient Transportation Infrastructure Guidebook: Summarizes the Guidebook's purpose and its contents and contains a link to electronically access the document.
- Section 6, Resilience Template: Contains the model strategies that communities can use as a foundation to build their own adaptation approach. This section also contains the Implementation Handbook, which shows jurisdictions how to incorporate model strategies into their planning documents such as their safety, housing, and environmental justice elements; capital improvement plans; and other relevant local government planning documents that pertain to adaptation and resilience.

In addition to this toolkit document, there are several other documents that provide a technical foundation and additional context to this work. These files are the San Bernardino County and Western Riverside County vulnerability assessments, community-scale and region-wide evacuation and transportation route hazard maps, adaptation strategies for the San Bernardino County and Western Riverside County subregions, the Climate Resilient Transportation Infrastructure Guidebook, and community vulnerability profiles for each jurisdiction in the region. All files are discussed in greater detail elsewhere in this toolkit, and are available to view and download at the Resilient IE website, <http://www.wrcog.cog.ca.us/285/Resilient-IE>.

1.3 LEGISLATIVE COMPLIANCE

The Resilient IE Toolkit aims to help WRCOG and SBCTA member jurisdictions comply with California's climate adaptation and resilience laws and guidance. Many of these laws govern the required components of a general plan safety element, although climate adaptation can be integrated into other planning documents to help meet State requirements. The Toolkit provides guidance on updating safety elements and other elements of general plans and integrating local hazard mitigation plans (LHMPs) and other related planning documents to address unique adaptation and resilience issues. This Toolkit supports guidance provided by the Governor's Office of Planning and Research in the [General Plan Guidelines](#), which is a key resource available to jurisdictions updating their general plans. Below is a summary of the codes and bills that govern adaptation and resilience requirements for local governments in California.

California Government Code Requirements

California Government Code Section 65302(g) contains the requirements for general plan safety elements for county and city governments in California. Government Code Section 65302(g)(4) requires that cities and counties revise their LHMPs and/or safety elements to include a climate vulnerability assessment and climate adaptation and resilience strategies applicable to their jurisdiction. Jurisdictions must update their LHMPs (if any) with these adaptation and resilience strategies during any LHMP drafting or update process that occurs on or after January 1, 2017. If no LHMP exists, jurisdictions must address these adaptation and resilience considerations in their safety elements no later than January 1, 2022. The updated safety element must include the following components:

- A vulnerability assessment identifying risks to the jurisdiction arising from climate-related hazards.
- A set of goals, policies, and objectives based on the vulnerability assessment's findings to protect the jurisdictions from these anticipated risks of climate-related hazards.
- A set of strategies to implement the goals, policies, and objectives.

Government Code Section 65302(g)(4) further specifies how city and county governments can fulfill these requirements, stating that they may use LHMPs, stand-alone climate adaptation plans, or a similar plan if it "fulfills commensurate goals and objectives and contains the information required." If local jurisdictions elect to fulfill these requirements in stand-alone plans, the State requires that their safety elements demonstrate how the stand-alone plan addresses the requirements. Government Code Section 65302 (g)(5) requires that jurisdictions review and update, when appropriate, their safety elements during each update of the housing element or LHMP. These safety element reviews must occur at a minimum of every eight years. These reviews must identify any new information relating to flood and fire hazards as well as climate adaptation and resilience strategies that may apply that were not available during the previous safety element update period.

Government Code Section 65302(h)(1) requires cities and counties with disadvantaged communities within their jurisdictional limits to integrate environmental justice policies into their General Plan, either in a separate environmental justice Element or by integrating related goals, policies, and objectives throughout the other elements. This update, or revision if the local government already has environmental justice goals, policies, and objectives, must happen “upon the adoption or next revision of two or more general plan elements simultaneously any point after January 1, 2018.”

Legislature Bill Summary

This Toolkit provides resources to support compliance with four recent legislative bills related to climate adaptation and resilience:

Adaptation and Resilience:

- Senate Bill 379 (2015)
- Senate Bill 1035 (2018)

Evacuation Route Capacity and Safety: Assembly Bill 747 (2019)

Residential Developments and Evacuation Routes: Senate Bill 99 (2019)

In addition, some jurisdictions must address Senate Bill 1000 and environmental justice issues. These bills are codified in California Government Code Section 65302, which provides the authority for and scope of general plans. A more detailed summary of each legislative bill follows.

Senate Bill 379 (2015)

SB 379 requires that LHMPs or general plan safety elements adopted by local governments address climate adaptation and resilience upon the next update of the jurisdiction’s LHMP after January 1, 2017, or safety element beginning on or after January 1, 2022. The revisions to the LHMP or safety element must specifically include a vulnerability assessment that identifies risks of climate-related hazards and a set of goals, policies, and objectives based on the potential for harm identified in the assessment.⁸

Senate Bill 1035 (2018)

SB 1035 requires that the safety element address climate adaptation and resilience strategies and that jurisdictions update and revise their safety element during each update of their housing element or LHMP if additional information relating to flood hazards, fire hazards, or climate adaptation or resilience becomes available. It effectively links a jurisdiction’s general plan safety element and housing element on the same 8-year update cycle.⁹

Assembly Bill 747 (2019)

AB 747 requires jurisdictions to identify evacuation routes and their capacity, safety, and viability under various emergency scenarios in the jurisdiction’s safety element. The bill states that this must occur with the next update to a jurisdiction’s LHMP (or safety element if the jurisdiction does not have an LHMP) beginning on January 1, 2022. The jurisdiction may use its LHMP or emergency operations plan to comply with this law by incorporating descriptions of the evacuation routes’ capacity, safety, and

viability into those documents, provided that the jurisdiction's safety element references the document.¹⁰

Senate Bill 99 (2019)

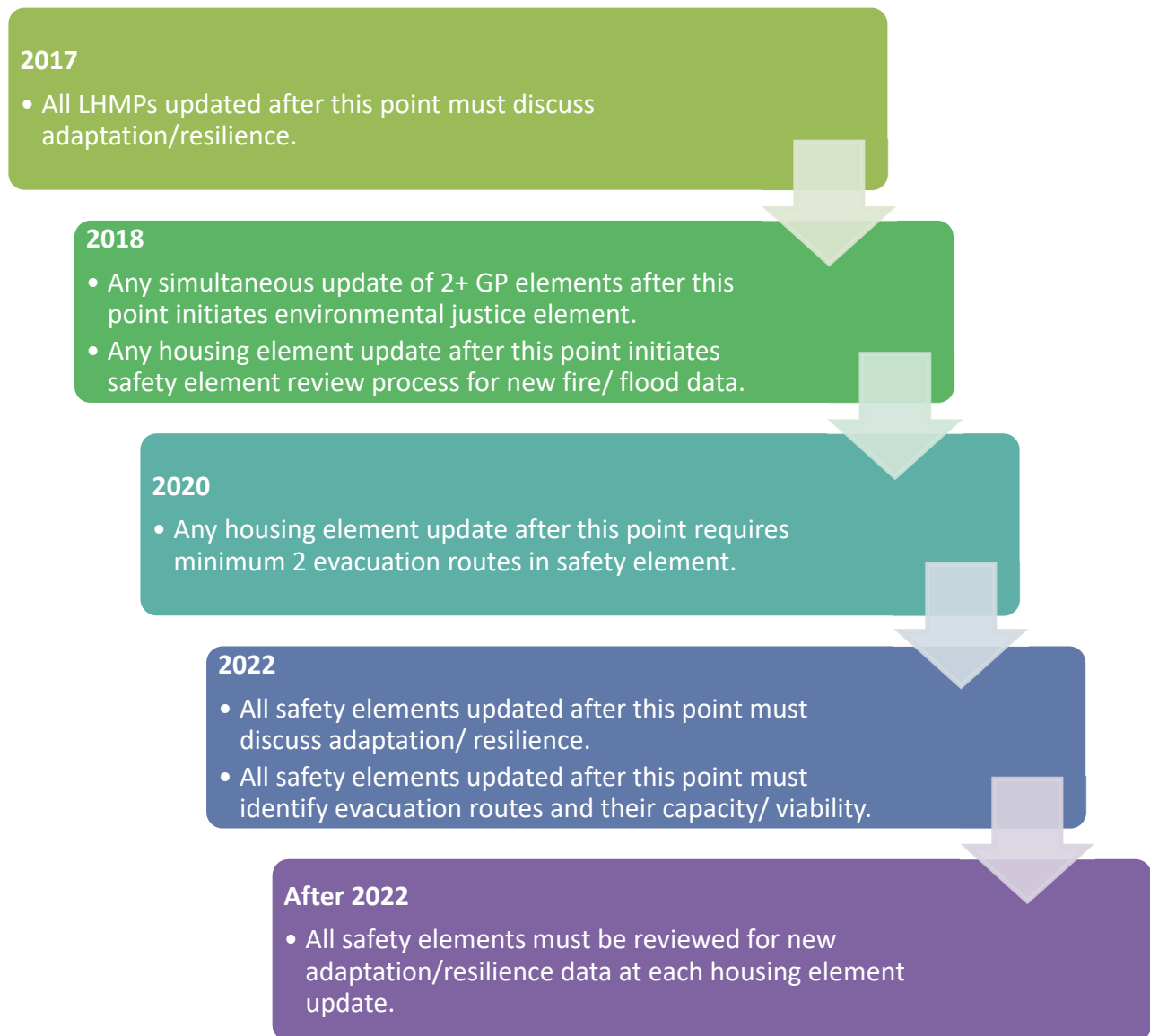
SB 99 requires city or county governments to identify in their safety element residential developments that do not have at least two emergency evacuation routes. This requirement applies when jurisdictions next update their housing element.¹¹

Senate Bill 1000 (2016)

Local governments that are updating their safety elements concurrent with one or more other general plan elements, could be subject to Senate Bill 1000, which requires cities and counties that have disadvantaged communities¹² to incorporate environmental justice policies into their General Plans, either in a separate environmental justice element or by integrating related goals, policies, and objectives throughout the other elements. An environmental justice policy aims to address past and/or present policies that have caused disadvantaged communities to experience environments and neighborhoods that are more polluted, are less safe for recreation, and feature more heavy industrial uses than other communities not deemed to be disadvantaged. An environmental justice policy, for instance, may seek to address the lower air quality that a disadvantaged community experiences because a highly used freeway bisects the community. In this scenario, an appropriate environmental justice policy may address the deteriorated air quality by implementing a congestion price to discourage use of the freeway during peak travel times. This update, or revision if the local government already has environmental justice goals, policies, and objectives, must happen “upon the adoption or next revision of two or more elements concurrently on or after January 1, 2018.” The bill also modified an earlier requirement that jurisdictions address geologic hazards, flooding, fires, and climate adaptation and resilience strategies for each subsequent update of their safety elements on or after January 1, 2022, if new information emerges that was previously unavailable. The bill requires that jurisdictions now only perform this update process for flooding and fire hazards.¹³

Figure 1-1 shows the legally required adaptation and resilience planning deadlines stemming from amendments to Government Code Section 65302(g).

Figure 1-1 Timeline of Required Adaptation and Resilience Planning Implementation



Chapter 2

Vulnerability Assessments

Introduction

Vulnerability Assessment

Evacuation and Transportation Route Hazard Mapping

Adaptation Strategies

Climate Resilient Transportation Infrastructure Guidebook

Resilience Template

2.1 INTRODUCTION

As one of the first steps in the Resilient IE project, WRCOG and SBCTA completed vulnerability assessments for both the incorporated and unincorporated areas of the subregions to create a better understanding of the major climate vulnerabilities within communities. These

assessments look at future climate conditions and hazards in the region and how susceptible populations, buildings, infrastructure, and other community resources and assets may be to these conditions. The vulnerability assessments used data and generated results used in subsequent phases of the project, such as the hazard data used for the evacuation hazard mapping analysis and a prioritized list of vulnerabilities used to create effective adaptation strategies.

VULNERABILITY: the degree to which a system is exposed to, susceptible to, and unable to cope with the adverse effects of climate-related hazards.

Both WRCOG and SBCTA conducted vulnerability assessments (see page 3 for links) based on guidance from the California Adaptation Planning Guide, which provides a four-step process for completing a vulnerability assessment, as shown in **Figure 2-1**.

Figure 2-1 The Vulnerability Assessment Process



Step 1. Identify Exposures

To identify exposures or the degree to which anticipated changes to climate-related hazards will impact communities, WRCOG and SBCTA used the best available climate science, projections, and data from sources such as Cal-Adapt and the California Fourth Climate Change Assessment. The assessments also relied upon data from agencies such as the Federal Emergency Management Agency (FEMA), the California Department of Forestry and Fire Protection (CAL FIRE), and the California Geologic Survey. The WRCOG vulnerability assessment identified nine exposures and the SBCTA vulnerability assessment identified eight exposures, listed in **Figure 2-2**. The two vulnerability assessments have slightly different exposures due to differences between the subregions, as shown in **Table 2-2**. For example, the WRCOG vulnerability assessment includes agricultural pests and diseases, which encompasses diseases and organisms that weaken or harm livestock, farm crops, and wild plants and animals. The SBCTA vulnerability assessment includes a similar exposure category but calls it ecological hazards. Therefore, in **Table 2-2** WRCOG has “N/A” for ecological hazards and extreme wind, and SBCTA has “N/A” for agricultural pests and diseases.

HAZARD: climate-related events that pose a risk to a community.

EXPOSURE: the degree to which a community or asset will experience or be impacted by a climate hazard.

Figure 2-2 Exposures by Subregion

WRCOG Exposures	SBCTA Exposures
•Agricultural Pests and Diseases •Air Quality •Drought •Extreme Heat •Flooding •Human Health Hazards •Landslides •Severe Weather •Wildfire	•Air Quality, Human Health, and Ecological Hazards •Drought •Extreme Heat •Extreme Wind •Flooding •Mudslides and Landslides •Severe Weather •Wildfire

Step 2. Identify Sensitivities

As the second step of the vulnerability assessment process, WRCOG and SBCTA identified sensitivities, or the populations, assets, and other community resources that are potentially vulnerable to climate-related hazards. These sensitivities are based on guidance from the Adaptation Planning Guide, and WRCOG and SBCTA refined the lists to reflect the specific populations and areas of special focus for their subregion. WRCOG identified five categories of sensitivities, and SBCTA identified six categories, as shown in **Figure 2-3**.

IMPACT: an effect of climate-related hazards on the structure or function of a system.

ADAPTIVE Capacity: the ability of a system to respond to changes in climate-related hazards, moderate potential damages, take advantage of opportunities, and cope with the consequences.

Figure 2-3 Sensitivity Groups by Subregion

WRCOG Sensitivity Groups	SBCTA Sensitivity Groups
•Biological Resources •Buildings and Infrastructure •Important Economic Assets •Key Community Services •Populations	•Biological Resources •Buildings •Economic Resources •Infrastructure •Populations •Services

Step 3. Assess Impacts and Adaptive Capacity

Step 3 of the vulnerability assessment process evaluated the impacts and adaptive capacity to identify overall vulnerability. Vulnerability is based on two characteristics: How is the sensitivity impacted by the hazard, and what adaptive capacity does the sensitivity have to the hazard?

WRCOG and SBCTA evaluated both primary and secondary impacts of climate exposures using a combination of qualitative and quantitative information to determine the severity of each impact. The agencies scored the impact for each sensitivity on a scale ranging from IM0 (minimal impact) to IM4 (severe impact) for each exposure.

WRCOG and SBCTA then evaluated the adaptive capacity through a primarily qualitative effort, giving each sensitivity a score ranging from AC0 (no adaptive capacity) to AC4 (high adaptive capacity) for each exposure. A lower score is preferable for impacts, and a higher score is better for adaptive capacity. WRCOG and SBCTA used these two scores to assess overall vulnerabilities using the scoring matrix shown in **Table 2-1**.

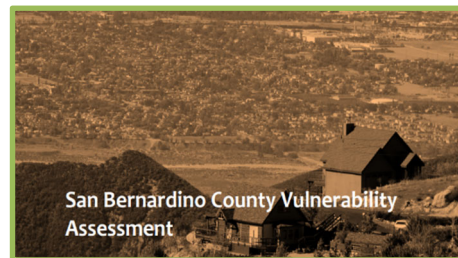
Table 2-1 Vulnerability Scoring Matrix

		Impact Score				
		IM0	IM1	IM2	IM3	IM4
Adaptive Capacity Score	AC0	V2	V3	V4	V5	V5
	AC1	V1	V2	V3	V4	V5
	AC2	V1	V1	V2	V3	V4
	AC3	V0	V1	V1	V2	V3
	AC4	V0	V0	V0	V1	V2

Step 4. Prioritize Vulnerability

Once scored, WRCOG and SBCTA prioritized the vulnerability and focused on those with scores ranging from V3 (moderately vulnerable) to V5 (severely vulnerable). Section 2.2 provides a summary of key findings from the vulnerability assessments.

The complete vulnerability assessment for each subregion, including a more detailed description of the vulnerability assessment process, can be found by clicking on the images below:



2.2 SUMMARY OF WRCOG AND SBCTA VULNERABILITY ASSESSMENTS

The prioritization of the vulnerability scores in the WRCOG and SBCTA subregions helped identify the most significant vulnerabilities in both western Riverside County and San Bernardino County. Here is a summary list of the highest scoring vulnerabilities in each assessment, which are ordered based on their respective reports, and the hazards that may affect the greatest number of populations and assets.

These lists are ordered based on the respective reports, which are organized as (1) populations, (2) buildings and infrastructure, (3), biological resources, (4) economic assets, and (5) community services:

Western Riverside County

- Persons experiencing homelessness and seniors are vulnerable to more exposures than other groups of people.
- Railways and energy delivery systems are the most vulnerable infrastructure.
- Drought, flooding, and wildfires can disrupt wastewater treatment plants and water delivery systems.
- Meadows and marshes, montane coniferous forest, and riparian scrub are the most vulnerable biological resources.
- Agricultural pests and diseases, drought, extreme heat, floods, and severe weather threaten agricultural land.
- Wildfires create more vulnerabilities than any other exposure.

San Bernardino County

- Persons experiencing homelessness, outdoor workers, and seasonal residents are vulnerable to more exposures than other groups.
- Extreme heat is projected to increase dramatically, which creates vulnerabilities for both populations and assets, including to disadvantaged communities.
- Power plants, road signals, bridges, and energy transmission infrastructure systems are the most vulnerable infrastructure.
- Wildfire, extreme wind, and landslides and mudslides (either on their own or resulting from another type of hazard like wildfire) can disrupt electrical services.
- Water resources are likely to become more vulnerable and stressed due to droughts and extreme heat.
- Pinyon-juniper woodlands are the most vulnerable biological resource.
- Landslides and mudslides create more vulnerabilities than any other exposure.

Table 2-2 shows the exposures impacting each jurisdiction, and **Table 2-3** and **Table 2-4** show the most significant vulnerabilities of each jurisdiction within the WRCOG and SBCTA subregions, respectively, following the order of the vulnerability assessment reports as described above. The vulnerabilities focus on the most important issues, or sensitivities with high vulnerability scores, for each community and are

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Table 2-2 Exposures Impacting Jurisdictions in WRCOG and SBCTA Subregions

Local Jurisdictions	Agricultural Pests and Diseases	Air Quality	Drought	Ecological Hazards	Extreme Heat	Extreme Wind	Flooding	Human Health Hazards	Landslides	Severe Weather	Wildfire
WRCOG Jurisdictions											
Unincorporated Riverside County	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Banning	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Beaumont	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Calimesa	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Canyon Lake	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City Corona	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Eastvale	N/A	✓	✓	N/A	✓	N/A	✓	✓	N/A	✓	✓
City of Hemet	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Jurupa Valley	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Lake Elsinore	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Menifee	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Moreno Valley	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Murrieta	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓

Table 2-2 Exposures Impacting Jurisdictions in WRCOG and SBCTA Subregions

Local Jurisdictions	Agricultural Pests and Diseases	Air Quality	Drought	Ecological Hazards	Extreme Heat	Extreme Wind	Flooding	Human Health Hazards	Landslides	Severe Weather	Wildfire
City of Norco	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Perris	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Riverside	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of San Jacinto	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Temecula	✓	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓
City of Wildomar	N/A	✓	✓	N/A	✓	N/A	✓	✓	✓	✓	✓

Table 2-2 Exposures Impacting Jurisdictions in WRCOG and SBCTA Subregions

Local Jurisdictions	Agricultural Pests and Diseases	Air Quality	Drought	Ecological Hazards	Extreme Heat	Extreme Wind	Flooding	Human Health Hazards	Landslides	Severe Weather	Wildfire
San Bernardino County Jurisdictions											
Unincorporated San Bernardino County	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Adelanto	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A
Town of Apple Valley	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A
City of Barstow	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A
City of Big Bear Lake	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Chino	N/A	✓	✓	✓	✓	✓	✓	✓	N/A	✓	✓
City of Chino Hills	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Colton	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Fontana	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Grand Terrace	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Hesperia	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Highland	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 2-2 Exposures Impacting Jurisdictions in WRCOG and SBCTA Subregions

Local Jurisdictions	Agricultural Pests and Diseases	Air Quality	Drought	Ecological Hazards	Extreme Heat	Extreme Wind	Flooding	Human Health Hazards	Landslides	Severe Weather	Wildfire
City of Loma Linda	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Montclair	N/A	✓	✓	✓	✓	✓	N/A	✓	✓	✓	N/A
City of Needles	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Ontario	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Rancho Cucamonga	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Redlands	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Rialto	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of San Bernardino	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
City of Twentynine Palms	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A
City of Upland	N/A	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓
City of Victorville	N/A	✓	✓	✓	✓	✓	✓	✓	✓	✓	N/A
City of Yucaipa	N/A	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓
Town of Yucca Valley	N/A	✓	✓	✓	✓	✓	N/A	✓	✓	✓	✓

Table 2-3 Key Vulnerabilities in WRCOG by Jurisdiction

Jurisdiction	Key Vulnerabilities
Unincorporated Western Riverside County	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Outdoor workers and seasonal/migrant workers are vulnerable to air quality, drought, extreme heat, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Dams are vulnerable to landslides. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfires. Agricultural land is vulnerable to agricultural pests and diseases, drought, and extreme heat. Water delivery systems are vulnerable to drought and wildfire.
City of Banning	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Banning Municipal Airport is vulnerable to flooding. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfires. Water delivery systems are vulnerable to drought and wildfire.
City of Beaumont	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfires. Water delivery systems are vulnerable to drought and wildfire.

Table 2-3 Key Vulnerabilities in WRCOG by Jurisdiction

Jurisdiction	Key Vulnerabilities
City of Calimesa	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfires. Water delivery systems are vulnerable to drought and wildfire.
City of Canyon Lake	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Railroad Canyon Dam is vulnerable to landslides. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Water delivery systems are vulnerable to drought and wildfire.
City of Corona	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Corona Municipal Airport is vulnerable to flooding. Oak Street and Mabey Canyon dams are vulnerable to landslides. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfire. The wastewater treatment plant is vulnerable to flooding. Water delivery systems are vulnerable to drought and wildfire.

Table 2-3 Key Vulnerabilities in WRCOG by Jurisdiction

Jurisdiction	Key Vulnerabilities
City of Eastvale	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Water delivery systems are vulnerable to drought and wildfire.
City of Hemet	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Outdoor workers and seasonal/migrant workers are vulnerable to air quality, drought, extreme heat, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Hemet-Ryan Airport is vulnerable to flooding. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfires. Agricultural land is vulnerable to agricultural pests and diseases, drought, and extreme heat. Water delivery systems are vulnerable to drought and wildfire.
City of Jurupa Valley	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding and landslides. Flabob Airport is vulnerable to flooding. Jurupa Valley Dam is vulnerable to landslides. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfire. Water delivery systems are vulnerable to drought and wildfire.

Table 2-3 Key Vulnerabilities in WRCOG by Jurisdiction

Jurisdiction	Key Vulnerabilities
City of Lake Elsinore	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Water delivery systems are vulnerable to drought and wildfire.
City of Menifee	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Outdoor workers and seasonal workers are vulnerable to air quality, drought, extreme heat, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Quail Valley Dam is vulnerable to landslides. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfire. Water delivery systems are vulnerable to drought and wildfire.
City of Moreno Valley	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Outdoor workers and seasonal/migrant workers are vulnerable to air quality, drought, extreme heat, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Sunnymead Ranch Dam is vulnerable to landslides. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Agricultural land is vulnerable to agricultural pests and diseases, drought, and extreme heat. Water delivery systems are vulnerable to drought and wildfire.

Table 2-3 Key Vulnerabilities in WRCOG by Jurisdiction

Jurisdiction	Key Vulnerabilities
City of Murrieta	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. The wastewater treatment plant is vulnerable to flooding. Water delivery systems are vulnerable to drought and wildfire.
City of Norco	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Water delivery systems are vulnerable to drought and wildfire.
City of Perris	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Outdoor workers and seasonal/migrant workers are vulnerable to air quality, drought, extreme heat, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Perris Valley Airport is vulnerable to flooding. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfire. Agricultural land is vulnerable to agricultural pests and diseases, drought, and extreme heat. Water delivery systems are vulnerable to drought and wildfire.

Table 2-3 Key Vulnerabilities in WRCOG by Jurisdiction

Jurisdiction	Key Vulnerabilities
City of Riverside	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Outdoor workers and seasonal/migrant workers are vulnerable to air quality, drought, extreme heat, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Several dams are vulnerable to landslides. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfire. The wastewater treatment plant is vulnerable to flooding. Agricultural land is vulnerable to agricultural pests and diseases, drought, and extreme heat. Water delivery systems are vulnerable to drought and wildfire.
City of San Jacinto	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Outdoor workers and seasonal/migrant workers are vulnerable to air quality, drought, extreme heat, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Railways are vulnerable to extreme heat, landslides, and wildfires. Agricultural land is vulnerable to agricultural pests and diseases, drought, and extreme heat. Water delivery systems are vulnerable to drought and wildfire.

Table 2-3 Key Vulnerabilities in WRCOG by Jurisdiction

Jurisdiction	Key Vulnerabilities
City of Temecula	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Outdoor workers and seasonal/migrant workers are vulnerable to air quality, drought, extreme heat, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Agricultural land is vulnerable to agricultural pests and diseases, drought, and extreme heat. Water delivery systems are vulnerable to drought and wildfire.
City of Wildomar	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Chronically ill individuals are vulnerable to air quality, extreme heat, human health hazards, severe weather, and wildfire. Residential structures are vulnerable to flooding, landslides, and wildfire. Energy delivery systems are vulnerable to extreme heat, severe weather, and wildfire. Water delivery systems are vulnerable to drought and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
Unincorporated San Bernardino County	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Agricultural land is vulnerable to drought and extreme heat. Conifer forests and pinyon-juniper woodlands are vulnerable to drought and wildfire. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Adelanto	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, and landslides. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, and severe weather. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
Town of Apple Valley	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, and landslides. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
City of Barstow	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, and landslides. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, and severe weather. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Big Bear Lake	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, severe weather, landslides, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Conifer forests and pinyon-juniper woodlands are vulnerable to drought and wildfire. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Chino	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, wildfire, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, and severe weather. Agricultural land is vulnerable to drought and extreme heat. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
City of Chino Hills	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Agricultural land is vulnerable to drought and extreme heat. Conifer forests and pinyon-juniper woodlands are vulnerable to drought and wildfire. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Colton	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Fontana	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
City of Grand Terrace	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Hesperia	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Agricultural land is vulnerable to drought and extreme heat. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Highland	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Conifer forests and pinyon-juniper woodlands are vulnerable to drought and wildfire. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
City of Loma Linda	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, human health hazards, and landslides. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, landslides, and severe weather. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to landslides and mudslides and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Montclair	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, human health hazards, and landslides. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Needles	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, severe weather, and wildfire. Bridges, energy transmission lines, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
City of Ontario	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Agricultural land is vulnerable to drought and extreme heat. Communication and electrical services are vulnerable to extreme wind, wildfire, landslides and mudslides, and extreme wind.
City of Rancho Cucamonga	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Redlands	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, severe weather, and wildfire. Energy transmission lines, power plants, bridges, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Agricultural land is vulnerable to drought and extreme heat. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
City of Rialto	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to severe weather, wildfire, and landslides and mudslides. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of San Bernardino	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, severe weather, landslides, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Conifer forests and pinyon-juniper woodlands are vulnerable to drought and wildfire. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Twentynine Palms	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, human health hazards, and landslides. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
City of Upland	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, severe weather, and wildfire. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Victorville	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, flooding, and human health hazards, and landslides. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, and severe weather. Bridges, energy transmission lines, power plants, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.
City of Yucaipa	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, landslides and mudslides, severe weather, and wildfire. Bridges, energy transmission lines, bridges, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Table 2-4 Key Vulnerabilities in SBCTA by Jurisdiction

Jurisdiction	Vulnerabilities
Town of Yucca Valley	Populations are potentially vulnerable to multiple hazards, which may include extreme heat, human health hazards, landslides, and wildfire. Individuals with disabilities and individuals with existing medical conditions are vulnerable to air quality, ecological and human health hazards, extreme heat, extreme wind, flooding, landslides and mudslides, severe weather, and wildfire. Bridges, energy transmission lines, and road signals are vulnerable to landslides and mudslides, severe weather, and wildfire. Senior care facilities are vulnerable to flooding, landslides and mudslides, and severe weather. Communication and electrical services are vulnerable to extreme wind, landslides and mudslides, and wildfire.

Chapter 3

Evacuation and Transportation Route Hazard Mapping

Introduction

Vulnerability Assessment

Evacuation and Transportation Route Hazard Mapping

Adaptation Strategies

Climate Resilient Transportation Infrastructure Guidebook

Resilience Template

The Evacuation and Transportation Route Hazard Mapping (or mapping tool) shows a proposed regional evacuation network for the WRCOG-SBCTA region. The tool also displays areas prone to natural hazards that could require evacuation or areas where climate hazards may complicate evacuation efforts throughout part of or all of the region. Jurisdictions should use this tool to help them develop their own evacuation network as required by California law (see Purpose section below). By reviewing the proposed evacuation network along with the projected hazard areas, jurisdictions can prepare and adopt an evacuation route network into their general plan safety element, local hazard mitigation plan (LHMP), or emergency operations plan (EOP) that is both viable and safe for residents to use prior to or during a severe hazard event that prompts mass evacuation.

This section of the Toolkit describes the tool's purpose and approach, includes the link to access the Evacuation and Transportation Route Hazard Mapping tool, provides instructions on how to use the tool and presents the main findings from the mapping process.

3.1 PURPOSE

Communities around the state have experienced the successes and challenges of evacuation during an emergency situation. The California Legislature has taken steps throughout the years to ensure communities address evacuation procedures as part of the planning process. In the recent Camp Fire of 2018, for example, the Town of Paradise’s evacuation routes became overwhelmed and unable to successfully evacuate victims in time before the fire.¹⁴ California law requires that jurisdictions identify routes that residents can use to evacuate in the event of an emergency. Specifically, Assembly Bill 747 (2019) requires that every city and county in California identify evacuation routes and their capacity, safety, and viability. Jurisdictions must identify and adopt these routes into their LHMP—or general plan safety element if a jurisdiction lacks an LHMP—no later than January 1, 2022. Jurisdictions may also identify the evacuation route network in their EOP if the safety element specifically states that the EOP contains the map and other relevant data to the evacuation route network. Furthermore, Senate Bill 99 (2019) requires that every city and county in California identify any residential development in hazard-prone areas where there are less than two evacuation routes in their safety element. This must occur whenever the jurisdiction updates their housing element after January 1, 2020.

This section helps jurisdictions in the western Riverside County-San Bernardino County region identify potential evacuation routes. Each local planning agency may review the routes in the online map and select the ones best suited to their individual needs. These routes can be formally adopted into a jurisdiction’s general plan, LHMP, EOP, or other relevant planning documents. This will increase overall adaptive capacity, resilience, and safety of the region in the event of a severe emergency that requires mass evacuation.

3.2 APPROACH

The project team developed the mapping tool in three phases:

Establish the proposed evacuation route network for jurisdictions in the WRCOG-SBCTA region.

The project team reviewed each WRCOG-SBCTA member jurisdictions’ safety element, LHMP (if available), and/or EOP (if available). Evacuation route networks identified in any of those planning documents formed the basis of the network, along with any State or federal roadways in the region. Member jurisdictions had a review period when they approved or provided feedback to adjust the initial network.

Identify every bridge crossing over or under the proposed evacuation route network in the WRCOG-SBCTA region.

This process involved an analysis of every bridge that intersected the evacuation route network. The analysis reviewed 2,330 bridge crossings (741 in the WRCOG subregion and 1,589 in the SBCTA subregion) either under or over the proposed evacuation network.

Identify every water course intersecting the proposed evacuation route network in the WRCOG-SBCTA region.

This process involved an analysis of every water course that intersected the network. The analysis reviewed 4,556 places where water courses (1,435 in WRCOG and 3,121 in SBCTA) intersected the proposed evacuation route network in some way. Examined water course intersections included surface-level brooks or streams, creek undercrossings, concrete stormwater canals, irrigation pipelines, or riverbeds.

The Evacuation and Transportation Route Hazard Mapping Tool helps cities and counties in the WRCOG-SBCTA region comply with updated requirements for identifying evacuation routes. The mapping tool identifies potential emergency evacuation routes for jurisdictions and overlays hazard data with the identified potential network. Primary hazards include wildfire, flooding, and landslide risk, as these were determined to represent the primary concerns to successful evacuations. Some segments of the identified network intersect one or more hazard-prone areas, and other segments do not intersect any hazard areas at all. The combination of the proposed emergency evacuation route network with hazard data can help local jurisdictions comply with AB 747, which requires that jurisdictions describe their evacuation routes' capacity, safety, and viability. By referring to hazard data, local jurisdictions can identify which segments of the proposed evacuation route network are more likely to be affected by a fire, flood, or landslide event and designate their evacuation network accordingly.

The mapping tool further seeks to help jurisdictions meet AB 747 requirements by identifying locations where road networks cross water courses. These locations face an elevated risk of flooding, which may impact the effectiveness or capacity of the evacuation route network. The mapping tool also identifies bridges that are part of the evacuation network. Because bridges may collapse during an extreme event and cause widespread disruptions to the transportation network, identifying bridge locations along evacuation routes can encourage retrofit activities and support efforts to find alternate routes. When bridges or water courses cross the evacuation route in identified hazard areas, it increases the risk that the evacuation will fail, since it is possible that a route could be impacted by both a hazard event and a bridge- or water-crossing failure.

3.3 INSTRUCTIONS

The mapping tool covers the entire WRCOG-SBCTA region with the proposed evacuation route network. The maps show evacuation routes in the WRCOG region in fuchsia and routes for the SBCTA region in purple. Users may zoom into any section of the network for a more detailed view. The "Details" panel at the left-hand side of the screen shows the "About," "Content," and "Legend" tabs. If the "Details" panel is not open, users can click on the "Details" button in the ribbon at the top left-hand corner of the screen. In the "Content" tab, users can activate or de-activate layers to overlay them on the proposed evacuation route network. These layers include:

Jurisdictional outlines

- Western Riverside County and San Bernardino County regional boundaries

- City-level boundaries

Transit routes

Hazard areas

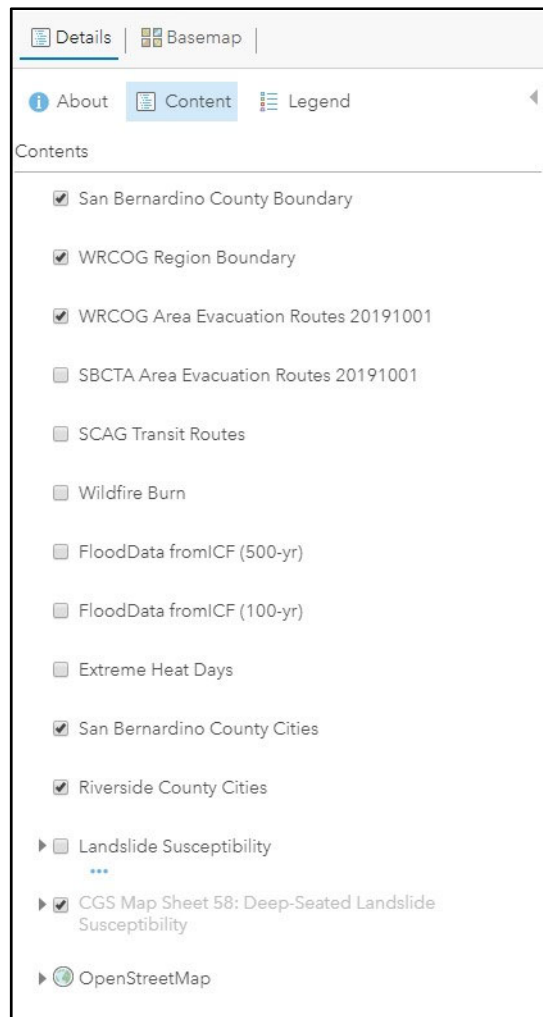
- Wildfire risk areas
- 100- and 500-year floodplains
- Landslide areas (defined by the United States Geological Survey) and deep-seated landslide areas (defined by the California Geological Survey).

Figure 3-1 shows the layers that users can apply to the map.

The mapping tool is available online at:

<http://www.arcgis.com/home/webmap/viewer.html?webmap=c09cde00ba924e7a83c872292ea631e0&extent=-118.4765,33.2943,-114.7933,35.1271>.

Figure 3-1 Legend and Toolbar from Mapping Tool



3.4 EVACUATION ROUTE SUMMARY TABLES

This section contains summary tables of the data presented in the online mapping tool. It describes the proposed regional evacuation networks’ vulnerabilities to certain hazards as well as any potential weaknesses related to water crossings or bridge overpasses and underpasses.

For western Riverside County’s proposed 1,918-mile evacuation route network, fire hazards may potentially impact approximately 28 percent of the total network,¹⁵ 100- and 500-year flood hazards may impact approximately 25 percent of the network, and landslide hazards may impact approximately 38 percent of the network. In the WRCOG subregion, there are 752 bridges and 1,457 water courses intersecting with the proposed evacuation route network. Within the 4,098-mile evacuation route network proposed for San Bernardino County, fire hazards may impact approximately 8 percent of the network, flood hazards may impact approximately 5 percent of the network, and landslide hazards may impact approximately 27 percent of the network. For San Bernardino County, there are 1,589 bridges and 3,121 water courses intersecting with the proposed evacuation route network. In both subregions, the unincorporated areas have the most bridges and water crossings. **Figure 3-2** summarizes the evacuation route network integrity data by WRCOG and SBCTA subregion.

Figure 3-2 Summary Data for Evacuation Route Network Impacts by Subregion

WRCOG	San Bernardino County
• 1,918 total miles of evacuation route network • Fire hazards may impact 28% • Flood hazards may impact 25% • Landslide hazards may impact 38%	• 4,908 total miles of evacuation network • Fire hazards may impact 8% • Flood hazards may impact 5% • Landslide hazards may impact 27%

Table 3-1 shows jurisdictions where most of the evacuation routes are in hazard-prone areas. **Table 3-2** shows how much of WRCOG’s proposed subregional evacuation network could be impacted by fire, flood, or landslide hazards by its member jurisdictions. **Table 3-3** shows how much of San Bernardino County’s proposed subregional evacuation network could be impacted by fire, flood, or landslide hazards by SBCTA member jurisdictions. **Table 3-4** lists the number of bridges and water-course crossings intersecting with the proposed evacuation route network for WRCOG. **Table 3-5** lists the number of bridges and water-course crossings intersecting with the proposed evacuation route network for San Bernardino County.

Table 3-1 Evacuation Route Network Vulnerabilities of Concern by Jurisdiction and Hazard

Subregion	Jurisdiction	Hazards Impacting Supermajority of Evacuation Routes
WRCOG	Unincorporated Western Riverside County	Fire hazards may impact 66% of routes
	City of Banning	Flood hazards may impact 77% of routes
	City of Calimesa	Landslide hazards may impact 76% of routes
	City of Canyon Lake	Landslide hazards may impact 93% of routes
	City of Hemet	Landslide hazards may impact 75% of routes
	City of Lake Elsinore	Landslide hazards may impact 77% of routes
	City of Murrieta	Landslide hazards may impact 68% of routes
	City of Temecula	Landslide hazards may impact 77% of routes
San Bernardino County	City of Barstow	Landslide hazards may impact 73% of routes
	City of Big Bear Lake	Fire hazards may impact 100% of routes Landslide hazards may impact 75% of routes
	City of Chino Hills	Landslide hazards may impact 68% of routes
	City of Yucaipa	Landslide hazards may impact 78% of routes

Table 3-2 Threats to WRCOG Subregional Evacuation Network by Hazard Type

Jurisdiction	Evacuation Routes in Fire Hazard Zones		Evacuation Routes in Flood Hazard Zones		Evacuation Routes in Landslide Hazard Zones		Jurisdiction's Total Evacuation Network (Impacted and Nonimpacted Routes)	
	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Share of Total Subregion Network
Unincorporated Western Riverside County	369	66%	129	23%	315	56%	563	29.3%
City of Banning	7	16%	34	77%	19	43%	44	2.3%
City of Beaumont	14	26%	12	22%	24	43%	55	2.9%
City of Calimesa	4	16%	3	14%	17	76%	23	1.2%
City of Canyon Lake	0.09	3%	0.51	14%	3	93%	4	0.2%
City of Corona	15	12%	51	39%	58	45%	129	6.7%
City of Eastvale	0	0%	1	2%	1	2%	40	2.1%
City of Hemet	2	4%	38	75%	5	10%	51	2.7%
City of Jurupa Valley	0	0%	24	21%	42	38%	110	5.7%
City of Lake Elsinore	35	59%	21	36%	45	77%	59	3.1%
City of Menifee	8	12%	13	20%	8	13%	65	3.4%
City of Moreno Valley	14	11%	32	25%	14	11%	129	6.7%
City of Murrieta	33	41%	5	6%	55	68%	81	4.2%
City of Norco	0.4	1%	11	39%	10	35%	29	1.5%

Table 3-2 Threats to WRCOG Subregional Evacuation Network by Hazard Type

Jurisdiction	Evacuation Routes in Fire Hazard Zones		Evacuation Routes in Flood Hazard Zones		Evacuation Routes in Landslide Hazard Zones		Jurisdiction's Total Evacuation Network (Impacted and Nonimpacted Routes)	
	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Share of Total Subregion Network
City of Perris	1	2%	27	34%	6	7%	79	4.1%
City of Riverside	9	3%	38	14%	58	21%	279	14.5%
City of San Jacinto	6	12%	37	70%	5	10%	53	2.8%
City of Temecula	11	12%	19	21%	71	77%	92	4.8%
City of Wildomar	17	49%	4	12%	20	58%	35	1.8%
Average	28.7	18%	26	30%	40.9	41%	--	--
All Jurisdictions (Total)	545	28.42%	500	24.65%	776	38.30%	1,918	100.0%

Table 3-3 Threats to SBCTA Subregional Evacuation Network by Hazard Type

Jurisdiction	Evacuation Route Impacted by Fire Hazards		Evacuation Route Impacted by Flood Hazards		Evacuation Route Impacted by Landslide Hazards		Jurisdiction's Total Evacuation Network (Impacted and Nonimpacted Routes)	
	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Share of Total Subregion Network
Unincorporated San Bernardino County	325	14%	61	3%	1,248	54%	2,314	56.5%
City of Adelanto	0	0%	0	0%	0	0%	45	1.1%
City of Apple Valley	0	0%	4	4%	25	23%	108	2.6%
City of Barstow	0	0%	20	28%	52	73%	71	1.7%
City of Big Bear Lake	12	100%	2	20%	9	75%	12	0.3%
City of Chino	1	2%	7	10%	1	2%	67	1.6%
City of Chino Hills	4	7%	4	9%	35	68%	51	1.2%
City of Colton	5	9%	12	23%	22	42%	52	1.3%
City of Fontana	14	9%	8	5%	15	10%	145	3.5%
City of Grand Terrace	1	11%	0	0%	2	34%	6	0.1%
City of Hesperia	1	1%	4	4%	27	27%	100	2.4%
City of Highland	7	19%	9	26%	11	31%	35	0.8%
City of Loma Linda	1	6%	2	12%	3	18%	17	0.2%
City of Montclair	0	0%	0	0%	1	2%	31	0.7%
City of Needles	0	0%	13	38%	22	63%	35	0.9%

Table 3-3 Threats to SBCTA Subregional Evacuation Network by Hazard Type

Jurisdiction	Evacuation Route Impacted by Fire Hazards		Evacuation Route Impacted by Flood Hazards		Evacuation Route Impacted by Landslide Hazards		Jurisdiction's Total Evacuation Network (Impacted and Nonimpacted Routes)	
	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Network	Miles	Percentage of Jurisdiction's Share of Total Subregion Network
City of Ontario	0	0.2%	97	52%	4	2%	187	4.6%
City of Rancho Cucamonga	29	19%	15	9%	32	21%	154	3.8%
City of Redlands	17	18%	13	13%	27	28%	95	2.3%
City of Rialto	11	16%	2	3%	7	10%	70	1.7%
City of San Bernardino	42	21%	27	14%	58	29%	196	4.8%
City of Twentynine Palms	0	0%	15	31%	17	35%	49	1.2%
City of Upland	11	18%	1	2%	12	19%	64	1.6%
City of Victorville	0	0%	5	4%	27	26%	103	2.5%
City of Yucaipa	20	38%	14	26%	42	78%	53	1.3%
City of Yucca Valley	8	21%	7	20%	21	57%	37	0.9%
Average	20.4	13%	13.7	14%	68.8	33%	--	--
All Jurisdictions (Total)	509	8%	342	5%	1,719	27%	4,098	100.0%

Table 3-4 WRCOG Member Jurisdictions' Bridges and Water Crossing Intersections with Evacuation Routes

Jurisdiction	Bridges	Percent of Subregion's Bridges by	Water Crossings	Percent of Water Crossings by Jurisdiction
Unincorporated Western Riverside County	158	21%	525	36%
City of Banning	22	3%	41	3%
City of Beaumont	28	4%	53	4%
City of Calimesa	11	1%	22	2%
City of Canyon Lake	1	0.1%	5	0.3%
City of Corona	78	11%	98	7%
City of Eastvale	24	3%	4	0.3%
City of Hemet	12	2%	17	1%
City of Jurupa Valley	56	7%	68	5%
City of Lake Elsinore	31	4%	38	3%
City of Menifee	16	2%	29	2%
City of Moreno Valley	34	5%	127	9%
City of Murrieta	34	5%	86	6%
City of Norco	22	3%	5	0.3%
City of Perris	33	4%	13	1%
City of Riverside	121	16%	177	12%
City of San Jacinto	6	1%	11	1%
City of Temecula	50	7%	108	7%
City of Wildomar	15	2%	30	2%
Average	40	5.3%	77	5.3%
Total	752	100%	1,457	100%

Table 3-5 SBCTA Member Jurisdictions' Bridges and Water Crossing Intersections with Evacuation Routes

Jurisdiction	Bridges	Percent of Subregion's Bridges by Jurisdiction	Water Crossings	Percent of Water Crossings by Jurisdiction
Unincorporated San Bernardino County	592	37%	2,158	69%
City of Adelanto	1	0.1%	33	1%
City of Apple Valley	6	0.4%	55	2%
City of Barstow	67	4%	64	2%
City of Big Bear Lake	3	0.2%	11	0.4%
City of Chino	30	2%	20	1%
City of Chino Hills	30	2%	81	3%
City of Colton	62	4%	31	1%
City of Fontana	59	4%	27	1%
City of Grand Terrace	3	0.2%	2	0.1%
City of Hesperia	20	1%	26	1%
City of Highland	37	2%	44	1%
City of Loma Linda	13	1%	6	0.2%
City of Montclair	14	1%	14	0.4%
City of Needles	48	3%	69	2%
City of Ontario	119	7%	88	3%
City of Rancho Cucamonga	108	7%	92	3%
City of Redlands	57	4%	50	2%
City of Rialto	34	2%	5	0.2%
City of San Bernardino	208	13%	111	4%
City of Twentynine Palms	7	0.4%	25	1%
City of Upland	24	2%	11	0.4%
City of Victorville	23	1%	32	1%
City of Yucaipa	21	1%	38	1%
City of Yucca Valley	3	0.2%	28	1%
Average	64	4%	125	4%

Table 3-5 SBCTA Member Jurisdictions' Bridges and Water Crossing Intersections with Evacuation Routes

Jurisdiction	Bridges	Percent of Subregion's Bridges by Jurisdiction	Water Crossings	Percent of Water Crossings by Jurisdiction
Total	1,589	100%	3,121	100%

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Chapter 4

Adaptation Strategies

Introduction

Vulnerability Assessment

Evacuation and Transportation Route Hazard Mapping

Adaptation Strategies

Climate Resilient Transportation Infrastructure Guidebook

Resilience Template

Adaptation involves making changes in response to current or future conditions, such as increased frequency and intensity of climate-related hazards, to reduce harm and take advantage of new opportunities and co-benefits. Adaptation strategies can include goals, policies, and programs that increase the ability of a community to prepare for, recover from, and adapt to climate-related disruptions, also known as resilience. This section provides a summary of the adaptation strategies prepared by WRCOG and SBCTA for the region.

CLIMATE ADAPTATION: Strategies that reduce the vulnerability of life, property, and natural resources to climate-related hazards.

CLIMATE RESILIENCE: The ability of an asset, system, or organization to withstand climate-related hazards.

4.1 HOW STRATEGIES WERE DEVELOPED

WRCOG and SBCTA developed adaptation strategies based on the findings of their respective vulnerability assessments. The method for development included the following steps:

1. Summarized the vulnerabilities of populations, assets, and services in the subregion.
2. Completed a comprehensive review of:
 - Previously adopted strategies
 - State requirements for addressing climate adaptation and resilience in the Safety Element of a community’s General Plan (California Government Code 65302(G)(4))
 - Guidance from the California Adaptation Planning Guide
 - Other best practices throughout California
3. Looked at existing adaptation strategies for the region prepared as part of previous efforts, and determined which strategies should be added, updated, and/or deleted to better align with current needs.
4. Conducted outreach (workshops and meetings) to determine what actions are currently being taken to mitigate impacts and what gaps could be addressed in this current effort.
5. Prepared a draft of recommended adaptation strategies based on the process in Steps 1 through 4.

CO-BENEFIT: A side result of an action to increase resilience that is beneficial but not directly related to increasing resilience. Examples include:

- Financial savings to community members
- Enhancing public health
- Improving mobility

When drafting the new or updated adaptation strategies, WRCOG and SBCTA considered the co-benefits of each strategy. Additionally, this process considered how the strategies could help address multiple hazards and a variety of vulnerabilities within communities, and which agencies could implement the strategies and support potential partnerships between local, regional, and State agencies.

4.2 WHAT THE STRATEGIES INCLUDE

To ensure the development of a comprehensive set of strategies, WRCOG and SBCTA used a “no regrets” approach to not only address current vulnerabilities related to transportation infrastructure and public health, but to increase resilience to mid- and long-term climate-related hazard impacts in all communities in the region. The WRCOG vulnerability assessment identified nine priority issues and the SBCTA vulnerability assessment identified seven priority issues. The adaptation strategies for each subregion are grouped together under these issues, as shown in **Figure 4-1** and **Figure 4-2**. The categories differ slightly between the two subregions because WRCOG’s were written to match the previously prepared vulnerability assessment from 2014 and SBCTA created categories to match the unique needs of its subregion. A complete list of adaptation strategies for each subregion is provided in **Table 4-1** and **Table 4-2**.

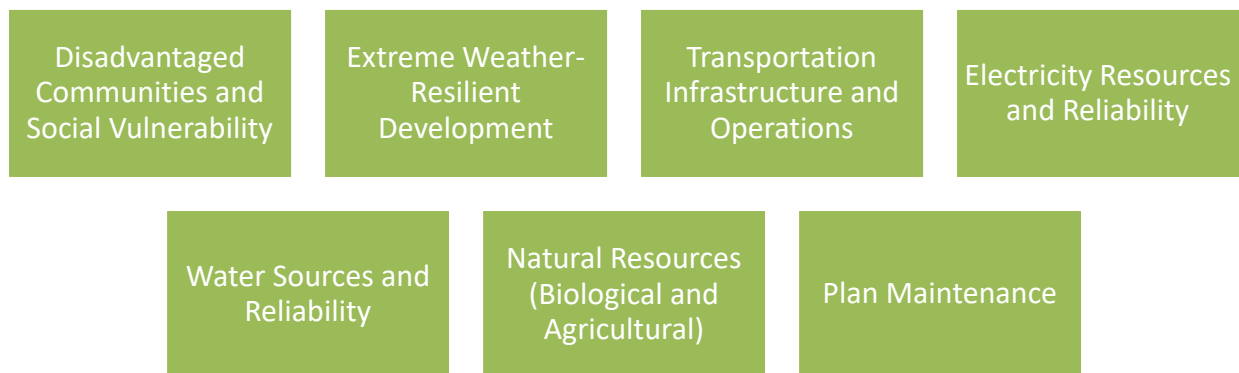
Figure 4-1 Adaptation Strategy Categories for the WRCOG Subregion**Figure 4-2 Adaptation Strategy Categories for the SBCTA Subregion**

Table 4-1 WRCOG Subregional Adaptation Strategies

Number	WRCOG Strategy
1. Planning and Emergency Response Frameworks	
1.1	Integrate climate change adaptation considerations into general plans, Local Hazard Mitigation Plans, emergency operations plans, and other public safety documents.
1.2	Incorporate extreme heat and air quality annexes into emergency operations plans.
1.3	Establish resilience hub locations in communities throughout the WRCOG subregion.
1.4	Collaborate with jurisdictions in the WRCOG subregion to protect existing critical facilities from extreme heat, flooding, landslides, severe weather, and wildfire.
1.5	Increase hazard monitoring to facilitate rapid response and recovery.
2. Disadvantaged Communities	
2.1	Continue to improve collaboration and information sharing between public agencies, disadvantaged communities, and community-based organizations.
2.2	Continue to develop resources and materials that effectively communicate with non-English speakers in emergency and evacuation situations.
2.3	Identify and map resilience hubs and cooling centers in locations accessible to vulnerable populations and establish standardized temperature triggers for when they will be opened.
2.4	Coordinate with emergency management services to establish backup power and water resources at emergency shelters, resilience hubs, and cooling centers in case of power outages.
2.5	Coordinate with transit agencies to identify ways for individuals with restricted mobility to reach cooling centers.
2.6	Coordinate with County of Riverside Continuum of Care and other existing programs to ensure that emergency shelters are available during extreme heat events, poor air quality, severe weather events, and other highly hazardous conditions. Ensure that the local homeless population is made aware of these resources.
2.7	Expand participation of PACE programs and other support services that provide funding resources for economically disadvantaged households and businesses.
2.8	Improve the social support systems to increase social capacity within local communities.
3. Public Health	
3.1	Augment training of employees and workers in industries with outdoor work, including assurance of adequate water, shade, rest breaks, protection from poor air quality, heat risks, and vector-borne disease avoidance.
3.2	Identify and remedy poor drainage areas to reduce disease risk from stagnant water. Expand outreach programs to educate communities about potential increases in vector-borne diseases from stagnant water.

Number	WRCOG Strategy
3.3	Explore the feasibility of installing microgrids at critical health care facilities, in addition to continuing energy efficiency upgrades.
3.4	Work with local volunteer emergency response teams to include air quality and extreme heat as a hazard of concern and update core competencies to address the health-related risks of poor air quality and extreme heat events.
3.5	Include public health topics in general plan safety elements, local hazard mitigation plans (LHMP), emergency response plans, and other public safety documents.
4. Transportation Infrastructure and Operations	
4.1	Use the <i>Climate Resilient Transportation Infrastructure Guidebook</i> strategies and design features in transportation infrastructure to improve resiliency to extreme events.
4.2	Facilitate coordination of traffic signal systems between adjacent communities.
4.3	Use available data and studies to simulate how expanded wildfire, flooding, and landslide impacts might affect the transportation system.
4.4	Study changes along designated evacuation routes associated with more frequent and severe wildfire, flood, and landslide events.
4.5	Coordinate with regional transit providers to identify alternative routes and stops if normal infrastructure is damaged or closed as a result of extreme events.
4.6	Ensure redundancy of critical transportation routes to allow for continued access and movement in the event of an emergency.
4.7	Update maintenance protocols to incorporate climate vulnerabilities.
4.8	Coordinate with local governments and regional transit providers to increase shading and heat-mitigating materials on pedestrian walkways and transit stops.
5. Resilient Development	
5.1	Continue to provide information to homeowners about statutory vegetation management requirements.
5.2	Encourage retrofits of hardscaped areas to use permeable paving.
5.3	Establish neighborhood and building design standards that minimize fire and landslide hazards in high wildfire hazard severity zones and high landslide susceptibility areas.
6. Water and Energy Resources and Reliability	
6.1	Promote and expand the use of drought-tolerant green infrastructure, including street trees, and landscaped areas, as part of cooling strategies in public and private spaces.
6.2	Amend the local development code to require high-reflectivity pavement or increased tree cover in large commercial parking lots.
6.3	Identify and implement municipal renewable energy projects for daily and emergency operations.

Number	WRCOG Strategy
6.4	Expand participation in PACE programs, identify additional improvements to finance through PACE programs, and consider new approaches to target neighborhoods for focused outreach.
6.5	Communicate climate risks to energy utilities and request they ensure that new and upgraded infrastructure is climate resilient.
6.6	Encourage energy and water efficiency in buildings through upgrading appliances and building infrastructure retrofits.
6.7	Invest in sustainable backup power sources to provide redundancy and continued services for critical facilities in the event of an outage.
6.8	Increase maintenance of water infrastructure for heavy precipitation events.
6.9	Encourage water utilities and consumers to implement water conservation programs and policies.
6.10	Increase the resiliency of water and wastewater systems to flooding and severe weather.
7. Agriculture	
7.1	Work with regional education and farming organizations (e.g., University of California, Riverside (UCR) and University of California Cooperative Extension) to develop and distribute best practices for responding to anticipated changes such as increases of hardier pests, new weeds, reduced water availability, and altered growing seasons.
7.2	Encourage efficient irrigation techniques and identify financial resources to support installation.
7.3	Promote secondary revenue streams that support a strong, sustained agricultural sector.
8. Biological and Natural Resources	
8.1	Incorporate climate change projections in future conservation and land use plans, including research and monitoring plans.
8.2	Continue to monitor and research the potential impacts of climate change on local habitat and wildlife.
8.3	Consider the ecosystem shift when updating conservation and land use plans.
8.4	Collaborate with local governments to establish fire fuel management practices in local and regional parks and open spaces.
9. Plan Maintenance	
9.1	Monitor and refresh climate change projections.
9.2	Continue to update the Adaptation and Resiliency Strategy when the Subregional CAP is updated and encourage local governments to update their own local adaptation plans concurrent with the local hazard mitigation plan update cycle.
9.3	Assess the implementation status and effectiveness of adaptation strategies.

Number	WRCOG Strategy
9.4	Assign an overseeing climate committee.

Table 4-2 SBCTA Subregional Adaptation Strategies

Number	SBCTA Strategy
1. Disadvantaged Communities	
1.1	Identify funding programs and other support services for local agencies to pursue that could help provide resources for economically disadvantaged communities to adapt.
1.2	Encourage local agencies to identify and map cooling centers and resilience hubs in locations accessible to vulnerable populations and established standardized temperature triggers for when they will be opened.
1.3	Identify ways for individuals with restricted mobility to reach cooling centers.
1.4	Encourage and coordinate emergency and cooling centers to establish backup power and water resources in case of power outages and emergencies.
1.5	Continue to develop resources and materials that effectively communicate with non-English speakers in emergency and evacuation situations.
1.6	Identify decision makers with authority over potential adaptation strategies and responses.
1.7	Coordinate with the San Bernardino County homeless partnership and related programs to ensure that shelters are available during highly hazardous events.
1.8	Improve social capacity in local communities.
2. Severe Weather-Resilient Development	
2.1	Avoiding siting important infrastructure and critical community facilities in or near high-risk areas.
2.2	Establish building and neighborhood design standards that minimize hazards in high risk areas.
2.3	Increase risk monitoring to facilitate rapid response and recovery.
2.4	Encourage water utilities to Establish redundancy in electricity reliability.
3. Transportation Infrastructure and Operations	
3.1	Integrate climate change adaptation into transportation plans.
3.2	Ensure redundancy of critical routes to allow for continued access and movement in the event of an emergency.
3.3	Use resilient materials and design approaches for transportation infrastructure.
3.4	Update maintenance regimes to incorporate climate vulnerabilities.
3.5	Use enhanced shading and heat-mitigating materials on pedestrian walkways.

Number	SBCTA Strategy
4. Electricity Resources and Reliability	
4.1	Encourage increased energy efficiency in buildings through upgrading appliances and building infrastructure retrofits.
4.2	Communicate climate risks to energy utilities and request they ensure that new and upgraded infrastructure is climate-resilient.
4.3	Invest in sustainable backup power sources to provide redundancy and continued service for critical facilities in the event of an outage.
4.4	Encourage jurisdictions to Improve cooling energy efficiency and reduce the urban heat island effect through the use of natural infrastructure.
5. Water Resources and Reliability	
5.1	Enhance maintenance for stormwater events and infrastructure.
5.2	Encourage water utilities and consumers to implement water conservation policies.
5.3	Encourage water utilities to acquire backup generators for use in emergency situations.
6. Natural Resources	
6.1	Encourage land managers to incorporate climate change projections in future conservation and land use plans, including research and monitoring plans.
6.2	Encourage farmers to develop best practices for responding to climate change.
6.3	Promote farmers to explore secondary revenue streams that support a strong, sustained agricultural sector.
7. Plan Maintenance	
7.1	Adopt agency-tailored adaptation strategies.
7.2	Integrate climate change adaptation considerations into public safety documents.
7.3	Improve public awareness of emergency response actions.
7.4	Ensure robustness and redundancy in communication and emergency response infrastructure.
7.5	Monitor and refresh climate change projections.
7.6	Assign an overseeing climate committee.
7.7	Assess the effectiveness of and implement adaptation strategies.

4.3 HOW TO USE ADAPTATION STRATEGIES

A detailed list of the adaptation strategies for each subregion can be found in the Adaptation and Resiliency Strategy documents accessible through the links below, in addition to Section 6, Resilience Template, of this Toolkit. Local governments can use the strategies in these documents by directly integrating them into general plan documents, LHMPs, stand-alone climate adaptation plans, or other appropriate mechanisms. WRCOG and SBCTA developed these strategies for jurisdictions to use them as a foundation for adaptation policies. Local jurisdictions can mold and frame these strategies to fit the unique needs of their communities. Click on the images below to access the adaptation strategies list for each subregion.



Adaptation Strategies

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Chapter 5

Climate Resilient Transportation Infrastructure Guidebook

Introduction

Vulnerability Assessment

Evacuation and Transportation Route Hazard Mapping

Adaptation Strategies

Climate Resilient Transportation Infrastructure Guidebook

Resilience Template

5.1 INTRODUCTION

The Climate Resilient Transportation Infrastructure Guidebook provides resources for member jurisdictions of the Western Riverside Council of Governments (WRCOG) and the San Bernardino County Transportation Authority (SBCTA) that will help increase transportation-system resilience. The Resilient IE Toolkit includes this Guidebook to help jurisdictions comply with State laws related to climate-related adaptation and resiliency and hazard planning, which include SB 379, among others.

5.2 PURPOSE AND BACKGROUND

WRCOG and SBCTA developed the Guidebook, with technical support from consulting firm WSP, to prepare the region's transportation infrastructure for the anticipated climate-related hazards. The Guidebook includes adaptation strategies, examples of best practices, tools, and other resources. It is meant to help jurisdictions make their segments of the regional transportation network better able to withstand current and projected climate-related hazards, which are anticipated to become more frequent and intense.

The Guidebook draws upon best practices and existing guidance documents from federal and State sources. These include the Federal Highway Administration's Adaptation Decision-Making Assessment Process, the Approaches to Climate Resiliency study, and data on climate conditions and climate-related hazards from Cal-Adapt.

5.3 ORGANIZATION

The Guidebook is arranged into six components.

Section 1 (Introduction to Guidebook) provides an overview of the Guidebook's purpose to address resiliency within the two subregions and summarizes information sources that provided guidance for the Guidebook's development. This section also summarizes the anticipated climate-related impacts to the regional transportation systems and infrastructure, and the unique geography and mobility issues in the region that can require specifically-tailored adaptation solutions.

Section 2 (Local and Regional Planning Agency Challenges and Solutions) outlines the funding resources available for use by the communities within the region to implement resiliency retrofits to regional infrastructure. This section also discusses the physical impediments and governmental or bureaucratic obstacles to successfully implementing the resiliency retrofits in the identified communities. Finally, this section includes a template for conducting future community outreach related to resilient infrastructure projects.

Section 3 (Climate Resilient Transportation Infrastructure Strategies) is the main component of the Guidebook and lists all the anticipated impacts to transportation infrastructure in the region. It provides recommendations to modify aspects of the infrastructure, such as physical design or operations practices, to enhance regional transportation infrastructure adaptation and resiliency. This section uses a set of icons in each impact discussion to allow readers to quickly understand which types of hazards and parts of the region each solution addresses.

Section 4 (Procedures and Case Studies/Design Examples) provides a template outlining how jurisdictions can initiate and manage the planning and design stages of resilient transportation infrastructure projects. It contains examples of considerations to account for details, such as drainage, parking, or maintenance, during each project. This section also features diagrams and photographs of case studies showcasing design interventions in other regions that have helped improve resiliency, such as street median improvements, curb extensions, and on-street water management.

Section 5 (Implementation) outlines the various aspects of successful implementation of a resilient transportation infrastructure retrofit project, spanning from the design characteristics to maintenance considerations. It also features a template cost matrix that jurisdictions can use to model project cost estimates, including costs for the project itself as well as anticipated annual maintenance costs. Section 6 (Conclusion) summarizes the project background and describes the intended use for the Guidebook.

5.4 GUIDEBOOK ACCESS

The Guidebook is accessible online in PDF format by clicking on the image below:



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Chapter 6

Resilience Template

Introduction

Vulnerability Assessment

Evacuation and Transportation Route Hazard Mapping

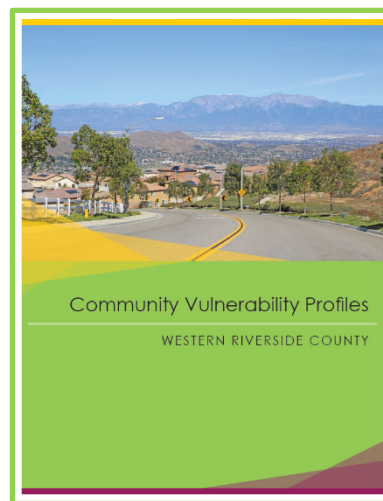
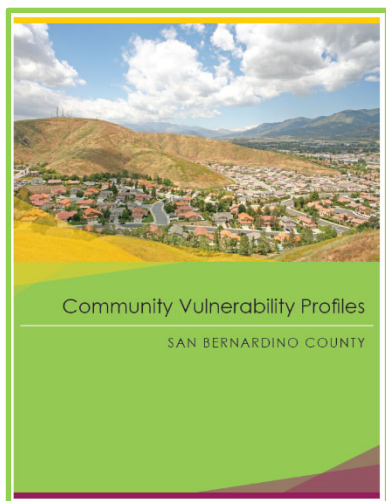
Adaptation Strategies

Climate Resilient Transportation Infrastructure Guidebook

Resilience Template

The Resilience Template is the last component of the WRCOG and SBCTA Regional Climate Adaptation Toolkit, or Resilient IE. This Resilience Template focuses on how individual jurisdictions can build resilience at the local level by developing specific climate adaptation efforts and integrating them into existing plans and processes. By using this Toolkit as a foundation for these local efforts, communities can develop specific adaptation responses that are unique to their own needs while being consistent with broader regional efforts and meshing well with efforts being undertaken by neighboring jurisdictions.

As a part of this project, WRCOG and SBCTA have developed Community Vulnerability Profiles for each of the incorporated communities and the unincorporated areas in the project region. These profiles provide additional information about the climate-related hazards in each jurisdiction, some of the major vulnerabilities of each community's populations and assets, and more details about each community's evacuation route network. These profiles are available by clicking on the links below:



6.1 PURPOSE

The Resilience Template supports local action on climate adaptation, using the framework and resources established by all components of Resilient IE. It helps communities take the information present in the other sections of this Toolkit and apply it locally.

This section will discuss the why WRCOG and SBCTA developed the Resilience Template, what the Template is, and how other components of the project integrate into the Template. It will also note how these strategies were selected. Users should note that there are other strategies beyond the examples given here.

6.2 HOW TO USE THE RESILIENCE TEMPLATE

The Resilience Template contains two sections: 1) model strategies and 2) measure prioritization. The first is a set of model strategies from the adaptation strategies lists presented earlier in this Toolkit. This section shows how these strategies can be refined and expanded to be more locally applicable. The second section is about how climate adaptation efforts can be integrated into existing planning mechanisms, ensuring a consistent and robust approach to climate adaptation across all municipal efforts.

The Resilience Template should be used by the key jurisdictional staff who are responsible for developing and coordinating climate adaptation efforts. Depending on the jurisdiction, this may include members of the planning/building/community development departments, public works staff, and staff in the city administrator's office, among others. If work is split across multiple staff, it often helps to have a designated adaptation lead or other person who can coordinate efforts throughout the jurisdiction. Staff who are not in charge of adaptation efforts but often implement them as part of their daily work should also be familiar with this section of the Toolkit. As with all adaptation planning efforts,

the overall project should include a mix of people from relevant agencies and organizations with a range of skills and responsibilities.

6.3 MODEL STRATEGIES

The adaptation strategies discussed in Chapter 4 and listed in the adaptation strategies reports are regional recommendations. They can be applied broadly throughout the WRCOG and SBCTA subregions, often in a partnership between multiple jurisdictions or agencies. However, communities can also use these regional strategies as a starting point for developing their own locally applicable strategies that provide greater detail and certainty than the regional ones or are tailored to address local issues that are not appropriately covered at a regional scale.

The model strategies shown here provide examples of how communities can adapt the regional strategies for local purposes. This section illustrates ten of the regional adaptation strategies from the adaptation strategies books as examples (the complete list of regional adaptation strategies is found in the adaptation strategies books mentioned in Chapter 4). For each strategy, this section discusses the strategy's purpose, what vulnerabilities it addresses, which communities it is most applicable for, examples of best practices in other communities, resources to support implementation, and model language.

The WRCOG and SBCTA Regional Climate Adaptation Toolkit expert project team selected these ten strategies by having individual members of the team identify the strategies that they felt were of the highest priority to the region based on their understanding of the region, the results of the vulnerability assessments, their professional experience and judgement, and any other factors. The ten strategies shown here are the ones that the greatest number of team members felt were issues of highest priority. Although this section provides detail of ten strategies, the full list of adaptation strategies, as described in Section 4, should also be a resource to Toolkit users.

Each of these ten strategies may not be applicable to all communities in the WRCOG and SBCTA region, and other strategies may be of greater priority to some jurisdictions. Although strategies are labeled as either WRCOG or SBCTA strategies, based on which adaptation strategies report they are taken from, they may apply across subregions (for example, San Bernardino County can use the strategies in the WRCOG adaptation strategies report as applicable). Communities should feel free to adapt any strategies given in the regional adaptation strategies list to meet their local needs, and to use this Toolkit and other resources to develop and implement any additional strategies that would help build local resilience.

Model Strategy 1

WRCOG Strategy 1.1: Integrate climate adaptation considerations into general plans, local hazard mitigation plans, emergency operations plans, and other public safety documents.

Explanation of Strategy

Climate adaptation is a topic that cuts across many other issues that communities regularly need to address. Many of these issues are covered in a community's existing planning mechanisms, such as a general plan, so it is very important for communities to ensure that climate adaptation is integrated into these existing documents. Even communities that prepare stand-alone climate adaptation plans will need to make sure that these dedicated plans are consistent and integrated with other community efforts. Often, planning documents that address public and environmental health and safety, such as general plans, local hazard mitigation plans (LHMPs), and emergency operations plans (EOPs), can be very effective vehicles for climate adaptation policies. Since these plans actively guide development and policy in a community, integrating climate adaptation into these documents helps ensure that adaptation strategies are implemented in a timely way. Other planning mechanisms, such as specific plans, building codes, and capital improvement plans, may also be good places for climate adaptation strategies.

By incorporating climate adaptation and resilience considerations into as many public safety planning documents, policies, and regulatory documents as possible, the community's overall ability to predict, prepare, and respond to emerging hazard events will improve. This enhanced adaptive capacity and resilience to climate-related hazards can help ensure that communities experience less damage to physical assets, suffer fewer disruptions to economic activity, maintain public services, and secure the overall public safety. To successfully implement this strategy, jurisdictions should refer first to the official guidance from the California Government Code prescribing the minimum climate-related hazard considerations standards for planning documents. Once communities have updated all the required documents following State regulations, jurisdictions should review them to make sure they are consistent with one another and that each document supports the others' goals, objectives, and policies. It is also helpful to identify metrics to monitor and report the progress of the policies and programs to ensure successful implementation.

When developing policy, it is very important to consider how the policy will be put into effect. At a minimum, communities should consider what agency or group is responsible for implementing the policy, what resources are needed for implementation, and how the success of the policy will be measured. Having the implementation plan worked out as the policy is being developed can help make sure that the implementation itself is smoother.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
All hazards	All populations and assets

This strategy can help address any of a community's climate vulnerabilities, depending on the specific policies and what planning mechanisms the policies are integrated into. Both populations and community assets can benefit from this strategy.

Types of Communities Where Applicable

This strategy is applicable for all communities since it can support building resilience for any and all vulnerabilities. The specific planning mechanisms that climate adaptation is integrated into may vary.

Examples of Best Practices

[City of Morro Bay General Plan and Local Coastal Plan](#). The City prepared a climate vulnerability assessment at the beginning of the planning process and used the assessment as a foundational document to develop policies for the general plan. Many of the public safety policies respond to specific concerns identified in the vulnerability assessment. Also, other climate-related hazard policies are in other sections of the plan.

[San Diego County Multi-Jurisdictional Hazard Mitigation Plan](#). The risk assessment in the plan identifies climate-related risks as major potential hazards to San Diego County. There is detailed information about how climate-related hazards are expected to change in the future. The hazard mitigation policies are drafted in response to the risk assessment, and many will help build resilience to climate-related effects.

Resources and Guidance

Determine which key vulnerabilities need to be addressed. This will determine which planning mechanisms to integrate climate adaptation into. For most communities, the safety element or comparable element of the general plan will be a natural place to start. Communities with a local or multi-jurisdictional hazard mitigation plan or an EOP can easily include climate adaptation policies in these documents. Other plans may also be appropriate. For example, a community facing significant ecosystem damage from climate-related hazards may want to include climate adaptation strategies in the conservation element of the general plan, or in a habitat conservation plan if one exists.

Communities can develop policies that expand or create new programs, develop new or revised regulations, provide public outreach and awareness, construct new physical projects, and change municipal practices, among others. Each of these types of policies can help address different vulnerabilities. For example, if homes in a community are located in wildfire-prone areas, policies that draft new regulations to promote wildfire-safe construction and retrofits may be a good idea. If there are concerns about whether community members can quickly and safely evacuate, consider a public engagement program around evacuations. The types of climate adaptation policy will also depend on the planning mechanism because not every type of policy will be appropriate for all documents.

For additional support and guidance on strategy implementation, consider these resources:

[California Adaptation Planning Guide](#). This detailed resource on how to conduct adaptation planning efforts includes a dedicated chapter on adaptation policy development. It walks communities through the steps of preparing adaptation policies and integrating them into other planning mechanisms. It also includes resources to support public engagement and outreach during policy development.

[Regional Resilience Toolkit](#). This resource on adaptation planning includes extensive information on strategy development. It lays out several key considerations and provides a number of example policies and implementation details to help prepare adaptation policies and incorporate them into planning mechanisms.

Model Goals, Policies, and Programs

Since the policies informed by this model strategy will vary widely depending on the specific vulnerabilities that each community needs to address, the model goals, policies, and programs given below are meant to provide examples of how adaptation issues can be integrated into other planning mechanisms. Communities are by no means limited to the topics discussed in the examples below.

Goals

Goal 1.1. All new development is protected from natural disasters to the greatest extent possible.

Goal 1.2. The community's water supply continues to meet the demand of all residents, businesses, and visitors.

Goal 1.3. Agriculture remains a thriving and vibrant part of the local community.

Policies

Policy 1.1. Restore degraded ecosystems to support increased resilience of threatened biological communities.

Policy 1.2. Upgrade storm drain capacity in flood-prone areas and expand storm drain maintenance and cleaning programs.

Policy 1.3. Enforce State regulations requiring that high-reflectivity roofs be installed, if not already present, as part of significant retrofits to existing buildings.

Programs

Program 1.1. Create a streamlined application process and zoning standards for community microgrids, including the appropriate types of permit(s), standards for supportive infrastructure, and amendments to existing development and zoning codes as needed.

Program 1.2. Develop a revolving loan fund to finance weatherization and home hardening for low-income homeowners and rental properties.

Program 1.3. Work with local nonprofit organizations and outdoor employers, including agricultural operators and construction companies, to distribute supplies and protective gear such as face masks, insect repellent, ice packs, and water to all employees during times of increased climate-related environmental health issues.

Model Strategy 2

WRCOG Strategy 1.3: Establish resilience hub locations in communities throughout the WRCOG subregion.

Explanation of Strategy

Resilience hubs are community-serving facilities, such as libraries or community centers, which can serve as a resource and shelter during emergency events. They should be able to provide communities with shelter, water, and electricity during extreme heat events, poor air quality, and other natural disasters. These hubs should also be able to serve as temporary heating and cooling centers during extreme temperature events or power shutoffs. These hubs should have other essential resources such as food, ice and refrigeration, charging stations, basic medical supplies, and other emergency supplies. They should have their own renewable energy, such as solar PV systems, and energy storage systems that should be able to operate up to 72 hours if a power outage occurs. When not used to provide services during extreme events, resilience hubs act as education centers where community members can go to learn about hazards, learn how to prepare and respond to them, and participate in efforts to enhance community connections to increase adaptive capacity. Resilience hubs can be built as new facilities, or existing facilities can be retrofitted to include these features. Site planning and establishment of resilience hubs, and their importance to emergency preparation and response, should be integrated into local government general plans and capital improvement programs.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Air quality, human health, and ecological hazards Extreme heat and wind Flooding Mudslides and landslides Severe weather Wildfire	All vulnerable populations

This strategy can help address climate vulnerabilities related to public health and well-being. Vulnerable populations, such as seniors or households in poverty, can benefit the most from the establishment of resilience hubs, to seek refuge during extreme heat, poor air quality, or other natural disasters. Resilience hubs can also serve as a form of community education, helping to improve knowledge and awareness of how to adapt among communities that may otherwise be unaware of this information.

Types of Communities Where Applicable

This strategy is applicable for all communities since it can support building resilience for all population vulnerabilities. This strategy can be integrated into capital improvement programs as upgrades to existing community facilities.

Examples of Best Practices

[Tuolumne County Community Resilience Centers](#). In June 2019, Tuolumne County received grant funding from the California Department of Housing and Community Development for the release of Community Development Block Grant Disaster Recovery funding to build two community resilience centers in the communities of Groveland and Tuolumne. These two resilience centers will be new buildings that provide both emergency and day-to-day use, a large conference room, commercial kitchen, parking, and services and programs provided out of the centers. This example provides site plans, environmental documentation, and a funding source for the creation of resilience hubs in California.

[POWER House Community Center, Baltimore Maryland](#). This POWER House Community Center opened in 2018 as one of the country's first solar powered, community-based resilience hubs. During a power outage and heat wave in July 2018, POWER House was the only building in the neighborhood that had power and where the community could seek refuge. When not acting as an emergency relief center, POWER House is a learning center that has education and career development, character and civic development, health and life skills, the arts and cultural enrichment, and health and wellness programming.

Resources for Implementation

Determine the location of existing community centers as the first step. Then assess what type of supplies, power sources, and programming may be suitable for the resilience hub. On-site renewable energy systems, such as solar and wind, should be combined with battery storage systems. Both should be sized to provide enough energy to the resilience hub even when utility service is disrupted. Sustainable energy supply to resilience hubs in the region include wind, solar, and battery storage. Some resilience hubs may act as sports complexes or educational centers when not used as resilience hubs. Others may be senior centers that have specific tools to help seniors during emergencies. Consider providing resources for all ages and needs, and in appropriate languages for the demographics of the community. Communities can develop programming and emergency operations that best meet the needs of their residents.

Local general plan safety elements, LHMPs, and EOPs provide the framework for emergency preparedness and response, and therefore should integrate site planning and establishment of resilience hubs. When establishing resilience hubs, local governments should focus on existing community facilities that can be upgraded, instead of building new centers, as these facilities are well known by the community and therefore are more likely to be used, although resilience hubs can be constructed as new facilities if needed. These facilities should be located outside of hazard prone areas and implementing agencies should consider ease of access to the site. Those with limited mobility or without access to transportation may be unable to travel to a resilience hub during an emergency; therefore, it is important to locate resilience hubs in areas that are easily accessible by transit. Resilience hubs should also be located in communities where they can be most useful, such as an area that has few air-conditioned homes or poor air quality. Local governments can work with community-based

organizations and neighborhood leaders to identify ideal locations and create outreach programs to spread information to seniors and linguistically isolated populations.

For additional support and guidance on implementing this strategy, consider these resources.

[USDN Resilience Hubs Guidance Document](#). This resource was developed by the Urban Sustainability Directors Network to help local jurisdictions establish resilience hubs in their communities. It provides a six-step process to initiate the project and activate the resilience hub once built.

[USDN Resilience Hubs web page](#). This web page provides the what, why, and how for resilience hubs. It also provides guidance on equity concerns, additional resources for resilience hubs, and potential partnering opportunities for implementation and adding sustainable energy to the buildings.

Model Goals, Policies, and Programs

The policies and programs informed by this model strategy will be similar depending on the specific vulnerabilities that each community needs to address. The model goals, policies, and programs given below are meant to provide examples of how resilience hubs can be integrated into planning mechanisms.

Goals

Goal 2.1. Build social cohesion and increase preparedness through community collaboration.¹⁶

Goal 2.2. All populations have a refuge location during periods of extreme heat, poor air quality, and natural disasters.

Goal 2.3. Community centers that act as both neighborhood activity centers and provide emergency resources.

Policies

Policy 2.1. Connect community organizations with experts and resources to guide and efficiently support the development of neighborhood resilience hubs.¹⁷

Policy 2.2. Create safe (and green) city community centers and shelter facilities.¹⁸

Policy 2.3. Launch a community resilience center program.

Programs

Program 2.1. Co-locate new community facilities in low- to moderate-income areas lacking access to city facilities and services. Ensure new facilities have the capacity to serve as shelters, evacuation centers, and/or disaster response hubs during emergencies and as community centers offering needed city services and resources for the surrounding community.¹⁹

Program 2.2. Evaluate where most vulnerable populations are located to establish the most effective locations for resilience hubs.

Program 2.3. Convert or upgrade existing community centers or senior centers to provide emergency services and at least 72 hours of backup power.

Model Strategy 3

WRCOG Strategy 4.6: Ensure redundancy of critical transportation routes to allow for continued access and movement in the event of an emergency.

Explanation of Strategy

Transportation routes, which often double as evacuation routes, are at risk of shutdowns during a climate-related emergency. In some areas of the region, this could mean the one major roadway that the community relies on for evacuation or movement of essential goods and services. If essential transportation and evacuation routes are closed or blocked due to hazardous conditions or major traffic delays, evacuations may not be possible. Critical services, such as healthcare and emergency response, may not be able to properly carry out their functions, and economic activities may slow or be halted. Working with regional and State transportation agencies to create redundancies in the transportation system can lessen the potential severe effects of a shutdown on critical routes. This strategy also helps ensure compliance with SB 99, which requires the identification of residential developments in hazard areas that do not have at least two emergency evacuation routes.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Air quality, human health, and ecological hazards Extreme heat and wind Flooding Mudslides and landslides Severe weather Wildfire	All vulnerable populations

This strategy addresses vulnerabilities in the sectors of emergency management, land use and community development, and transportation. It ensures that evacuation routes have adequate capacity for continued access and movement during emergencies. This may also include addressing vulnerabilities of bridges, major roadways and highways, railways, road signals/traffic control centers, and other transportation facilities and infrastructure components to ensure there are multiple viable evacuation routes.

Types of Community Where Applicable

This strategy applies to communities that do not have redundancy in critical transportation routes, such as those that rely on one roadway or highway for evacuations and the movement of goods and services, as well as communities that have multiple evacuation routes but are concerned about their resilience. These communities include those located in mountainous or rural areas that can easily be blocked by wildfire, flooding, or landslides.

Example Best Practices

[Freeway Management and Operations Handbook](#). The US Department of Transportation's Federal

Highway Administration published this handbook in January 2011. It provides examples of public outreach, evacuation-route analysis, and traffic management plans to ensure that critical transportation routes remain useable during emergencies. Examples include contraflow lanes, high occupancy vehicle lane usage, contingencies for continued operations, and training for emergency responders.

[Recommended Practices for Hurricane Evacuation Traffic Operators](#). The Texas Transportation Institute at Texas A&M University published this document in May 2006. It provides information on how to integrate contraflow, emergency shoulder lane, traffic signal controls, and intelligent transportation systems measures into evacuation planning. It gives examples of how to keep critical transportation routes open and accessible during emergencies. This resource is specifically intended for hurricane evacuation planning but is an example that can be adapted to other regions and natural disasters.

Resources for Implementation

The Evacuation Hazard Maps discussed in Section 3 of this Toolkit can be used to identify where redundancies are needed. Local governments should use these maps to study changes along designated evacuation routes associated with more frequent and severe flooding and wildfires, landslides, and severe storm events. In some cases, there may be multiple hazards that effect the capabilities of a critical transportation route. Local jurisdictions should identify high-risk nodes that can be hardened to ensure infrastructure remains operational during emergencies. Caltrans, WRCOG, and Riverside County Transportation Commissions can act as important partners for building new critical transportation routes or enhancing existing routes. The Climate Resilience Transportation Infrastructure Guidebook, which is part of this project, can help local jurisdictions implement this strategy.

For additional support and guidance on implementing this strategy, consider these resources.

[Planning Considerations: Evacuation and Shelter-in-Place](#). Published in July 2019 by FEMA, this document provides guidance for preparing transportation routes for evacuations, while still allowing for the movement of goods and services.

[U.S. Climate Resilient Toolkit](#). The US Climate Resilient Toolkit provides tools for creating resilient transportation infrastructure. It provides guidance and case studies of jurisdictions that have integrated adaptation policies and implemented projects to improve the redundancy of their transportation systems.

Model Goals, Policies, and Programs

The policies and programs informed by this model strategy will be similar depending on the specific vulnerabilities that each community needs to address. The model goals, policies, and programs given below are meant to provide examples of how redundant critical transportation routes can be integrated into planning mechanisms.

Goals

Goal 3.1. All neighborhoods have more than one access route.

Goal 3.2. A community with a redundant transportation system.

Policies

Policy 3.1. Identify alternative routes to vulnerable and critical transportation routes.

Policy 3.2. Assess where new routes could be constructed for use during emergencies.

Policy 3.3. Improve evacuation routes for emergency situations to serve both residents and visitors.²⁰

Policy 3.4. Plan transportation routes and transit systems that can support residents and visitors during evacuation situations.²¹

Programs

Program 3.1. Develop a contingency plan to reroute traffic if critical transportation routes are compromised.

Program 3.2. Analyze the potential to create and reinforce emergency nodes and routes of transportation, including new or alternative routes for single-access roadways.²²

Model Strategy 4

WRCOG Strategy 7.1: Work with regional education and farming organizations (e.g., University of California, Riverside (UCR), and University of California Cooperative Extension) to develop and distribute best practices for responding to anticipated changes such as hardier pests, new weeds, reduced water availability, and altered growing seasons.

Explanation of Strategy

Farmers and ranchers experience the direct effects of climate-related hazards, such as increased temperatures, drought, and severe weather, on their crops. The agricultural sector can increase resilience to climate-related hazards through more efficient irrigation practices, the use of biological control agents to target new pest organisms, changes to planting and land management techniques, and expanding into crops that are better suited for a warmer and drier climate. For example, altered crop rotation and soil management can help maintain soil moisture levels, protecting the crops from drought. In many cases, projected future conditions may better suit particular varieties of plants or livestock animals. Local governments do not control what varieties farmers and ranchers raise; however, they can work with farming and ranching groups, such as the County Agricultural Commissioner's Office and educational institutions such as UCR and UC Cooperative Extension, to encourage adaptation of best practices and help distribute information to reduce risks.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Agricultural pests and diseases Ecological hazards Drought Extreme heat and wind Flooding Mudslides and landslides Severe weather Wildfire	Agricultural lands and operations Outdoor workers Seasonal residents and migrant workers

The primary vulnerabilities addressed by this strategy are in agricultural land. This strategy addresses specific vulnerabilities of agricultural land, an important economic asset, to pests and diseases, drought, extreme heat, flooding, landslides, severe weather, and wildfire.

Types of Community Where Applicable

This strategy is applicable to rural communities that have active agriculture or ranching. These communities are primarily in the western Riverside County subregion and western San Bernardino County. (See Table 2-2 and Table 2-3).

Example Best Practices

[Santa Clara Valley Agricultural Plan](#). The County of Santa Clara adopted the Santa Clara Valley Agricultural Plan in January 2018, with the goal of long-term sustainability of agriculture, food security, greenhouse gas reductions, climate resilience, and ecosystem benefits. This plan provides an example of how a county assessed agriculture in the region and developed policies for land use, conservation, economic development, and education to increase the resilience of agriculture.

[UC Cooperative Extension, Riverside County](#). The UC Cooperative Extension provides Riverside County with resources such as drought resources, agricultural management, and farming practices that can help farmers and ranchers throughout the region. This organization also provides publications, seminars, meetings, and workshops to the community on best agricultural practices.

Resources for Implementation

UC Cooperative Extension and UCR are essential partners for this strategy. Both organizations have an abundance of information regarding best agricultural practices that can increase the resilience of agricultural operations. Local jurisdictions should identify specific agricultural issues within their communities and work with these organizations to collect and disseminate information that can help farmers and ranchers prepare for, respond to, and recover from stresses created by pests, drought, or temperature changes. It is also important to work directly with the farming and ranching communities to assess what they are already using to combat these problems. In consultation with farming groups, identify what changes to these techniques farmers intend to make, and review local regulations to make sure there are no unnecessary barriers to these changes.

For additional support and guidance on implementing this strategy, consider these resources.

[Drought Tips, University of California Riverside](#). The UCR's Division of Agriculture and Natural Resources developed a web page that farmers and ranchers can use to make the best of the water they have available. It has additional links to publications and resources that local jurisdictions can disseminate to the farming community.

[Healthy Soils Action Plan](#). The Healthy Soils Action Plan was developed in 2016 as an interagency plan to reduce greenhouse gas emissions and improve drought resilience by innovating farm and rangeland practices. This document contains actions and guiding principles for jurisdictions to work with farmers to support soil management.

Model Goals, Policies, and Programs

The policies and programs informed by this model strategy will be similar depending on the specific vulnerabilities that each community needs to address. The model goals, policies, and programs given below are meant to provide examples of how regional education on agricultural best practices can be integrated into planning mechanisms.

Goals

Goal 4A. The region's working lands are not only preserved, but clearly identified, understood and valued.²³

Goal 4B. A resilient agricultural community.

Policies

Policy 4.1. In partnership with surrounding cities and natural resources agencies, develop outreach or educational programs and initiatives that connect health, vitality, resilience, and culture to promote good stewardship of agricultural lands.

Policy 4.2. Support and participate in ongoing agricultural education programs aimed at informing the agricultural community about climate-related pest and disease hazards.

Policy 4.3. Encourage the long-range benefits of proper drainage control, tillage, cropping, soils amendments, and grazing techniques to minimize soil erosion.²⁴

Policy 4.4. Emphasize efficient water application techniques; the use of properly designed irrigation systems; and the control of runoff from croplands, rangelands, and agricultural roads.²⁵

Programs

Program 4.1. Create educational materials and programs with the National Resources Conservation Service and resource conservation districts that give examples of farmers as good stewards of soil and biodiversity, and on the cutting edge for climate-related hazard mitigation and adaptation.²⁶

Program 4.2. Create educational materials and programs with water agencies that give examples of farmers as good water conservation and water quality stewards.²⁷

Model Strategy 5

WRCOG Strategy 8.4: Collaborate with local governments to establish fire fuel management practices in local and regional parks and open spaces.

Explanation of Strategy

Local jurisdictions have a variety of open spaces and parks in both urban and wildland areas, from sports fields to state and regional parks. Some areas are not only in wildland areas, but also in high fire hazards zones. Local jurisdictions can partner with California State Parks, the Western Riverside County Regional Conservation Authority (RCA), the Riverside County Habitat Conservation Agency (RCHCA), and tribal nations to establish consistent fuel management practices, such as vegetation removal or prescribed burns, that reduce the potential for wildfire disasters and stabilize park buildings and trails to prevent future damage. Fuel management can also save local jurisdictions costs by preventing damage or destruction of park facilities.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Wildfire	All biological resources Campsites Children Individuals with existing medical conditions and chronically ill individuals Parks Public open space and protected land Senior citizens, including those living alone Sidewalks, bikeways, and trails State and federal land Tourism

This strategy addresses vulnerabilities associated with wildfire hazards and parks, tourism, and State and federally owned land. Fuel management practices can reduce the risk of damage or destruction of park facilities and ensure that parks can stay open for tourism and other recreational opportunities, especially in communities that depend on outdoor recreation as a key economic driver.

Types of Communities Where Applicable

This strategy is applicable to communities located in or near wildfire hazard areas, or within the wildland urban interface (refer to Table 2-2 and Table 2-3). Many local jurisdictions have parks and open space that are within these zones, and fuel management is an important method to reduce the risk of wildfires starting and spreading.

Example Best Practices

[Vegetation Management Plan for Bottle Peak Preserve](#). The Bottle Peak Preserve, managed by the County of San Diego Department of Parks and Recreation, has a vegetation management plan that was published in May 2015. This plan provides examples of how the County is managing the fuels within the

preserve, using techniques such as prescribed fire, fuel breaks, grazing, and mechanical equipment thinning.

[Grass Valley Fire Restoration](#). The Grass Valley Fire Restoration Project, located in the San Bernardino National Forest, was approved in October 2019 as a fuel reduction, reforestation, invasive species, and road repair project that will remove hazardous trees, reforest burned areas, repair roads and trails, and control invasive plant species. This project considers land within the wildland-urban interface and provides examples of how to go through the federal approval process for fuel management projects.

Resources for Implementation

Use the WRCOG/SBCTA hazard mapping tool to assess whether parks in a local jurisdiction are within wildfire prone areas such as the wildland-urban interface. Partnerships are essential, and California Department of State Parks, regional park managers, and local parks and recreation departments can work together to develop fuel management plans and projects that can reduce the risk of wildfire. The FEMA Hazard Mitigation Grant program and Forest Improvement Program are potential funding sources for planning and implementing fuel management projects, especially in areas that have recently experienced a major wildfire emergency.

For additional support and guidance on implementing this strategy, consider these resources.

[Fire Hazard Planning, CAL FIRE](#). The Fire Hazard Planning General Plan Technical Advice Series, published in May 2015, provides guidance on integrating fire hazard policies into general plan elements. This document provides specific guidance for all areas, including wildland, urban interface, and urban areas. This guidance also provides information on planning for postfire hazards, such as flooding and landslides.

[Vegetation Management, San Mateo County Parks](#). San Mateo County Parks developed a decision-making guide for vegetation management in June 2006. This guide includes vegetation management techniques and approaches, including long-term maintenance. This model can be adopted for park managers in the WRCOG and SBCTA subregions.

Model Goals, Policies, and Programs

The policies and programs informed by this model strategy will be similar depending on the specific vulnerabilities that each community needs to address. The model goals, policies, and programs given below are meant to provide examples of how fuel management best practices in local and regional parks and open space can be integrated into planning mechanisms.

Goals

Goal 5.1. Well-managed parks and open space that can withstand damage from wildfires.

Goal 5.2. Resilient parks and open space with effective fuel management.

Goal 5.3. Facilitating and assisting in removal of dangerous fuels to achieve optimal protection of people, property, and habitat.²⁸

Policies

Policy 5.1. Evaluate current and future land uses for wildfire risk reduction.²⁹

Policy 5.2. Identify fuel treatments that will reduce wildfire threat to park and open space facilities.³⁰

Policy 5.3. Develop a community wildfire protection plan for local and regional parks and open space.³¹

Policy 5.4. Seek grant funding for fuel mitigation to reduce wildfire risk.³²

Programs

Program 5.1. Cooperate with all neighboring agencies to identify opportunities for fuel breaks in very high hazard severity zones and to ensure that fire breaks are provided where necessary and appropriate.³³

Program 5.2. Obtain funding to hire licensed timber operators to work under the direction of or in cooperation with USDA Forest Service and County Fire personnel for the purpose of removal, thinning, ladder-branch trimming, hazard tree removal, chipping, hauling, land restoration, harvesting, or otherwise conducting fuel reduction activities.³⁴

Model Strategy 6

SBCTA Strategy 1.5: Continue to develop resources and materials that effectively communicate with non-English speakers in emergency and evacuation situations.

Explanation of Strategy

The frequency and severity of natural hazards and severe weather events, such as heat waves, wildfires, flooding, and landslides, are anticipated to increase. All residents should have access to pertinent information during these emergency situations, such as emergency status updates, calls for evacuation, and information regarding emergency shelters. Because some residents may not speak or read English, emergency managers and response personnel should ensure that this information is available in multiple languages, as well as identify leaders in non-English speaking communities with whom they can coordinate to disseminate critical information. California's 2019 Statewide Alert and Warning Guidelines also require public agencies to increase accessibility of emergency warning information, including to non-English speakers.³⁵

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Air quality, human health, and ecological hazards Drought Extreme heat and wind Flooding Mudslides and landslides Severe weather Wildfire	Ethnic communities and non-English speakers Linguistically isolated persons

This strategy addresses vulnerabilities associated with residents who may need to prepare for or respond quickly to natural hazards but may not have access to emergency information because they are not English speakers. The need to address this vulnerability is made more urgent due to projected increases in the frequency and severity of natural hazard events in the SBCTA-WRCOG region, such as heat waves, wildfire, flooding, landslides, and severe weather.

Types of Communities Where Applicable

This strategy addresses non-English speaking communities. The southwestern part of San Bernardino County and northwestern part of the western Riverside County subregion are densely populated and contain many non-English speaking communities. These areas can also have communities with high social vulnerability. A large proportion of these areas—41.6 percent in San Bernardino County and 40.6 percent in Riverside County—speak a language other than English at home.³⁶ In the three largest cities of San Bernardino County, over half of the population do not speak English at home; this includes the cities of San Bernardino (51.8 percent), Fontana (58.4 percent), and Ontario (59.0 percent). In the three largest WRCOG cities, at least 40 percent of the population does not speak English at home; this includes Riverside (43.5 percent), Moreno Valley (50.2 percent), and Corona (40.9 percent). Spanish is the most commonly spoken non-English language in the region (about one-third of the population), with smaller numbers of other non-English speakers, including Chinese (both Mandarin and Cantonese) and Tagalog.^{37,38}

Examples of Best Practices

[CAL FIRE “Ready, Set, GO!”](#) CAL FIRE developed a multimedia campaign toolkit that includes videos, brochures, and infographics to inform and prepare residents for wildfire risk. This campaign goes over topics such as how to maintain defensible space against wildfires around homes, evacuation preparation, and a wildfire evacuation guide. The website offers an option for visitors to explore materials in Spanish. All materials are designed to be quick and easy to use and are readily dispersible electronically.

[Ventura County Wildfire Action Plan and Flood Preparation.](#) Ventura County also has a “Ready, Set, Go!” campaign that includes Spanish versions of wildfire action and flood preparation plans. The wildfire action plan is similar to that prepared by CAL FIRE, and the flood preparation plan offers instructions on topics such as how to prepare a home for flooding, creating and setting up sandbags, and driving through roads in flood conditions.

Resources for Implementation

Emergency planners may wish to proactively build relationships with community leaders as a pre-disaster strategy. This could include visiting community locations and events, having multilingual staff and materials available at government or utility locations and events, and training staff to interact with communities in ways that are responsive to their cultural or language-specific needs. Local governments may also want to develop consistent regional messaging systems that inform residents, healthcare facilities, backup power generation operators, and other relevant emergency response agencies in the event of an emergency.

For additional support and guidance on implementing this strategy, consider these resources.

[Listos California](#). Governor Newsom signed AB 72 into law in 2019, which established the \$50 million California for All Emergency Preparedness Campaign, or Listos California. This joint initiative between the Office of Emergency Services and Cal Volunteers aims to ensure that at least one million vulnerable Californians can receive emergency support despite potential linguistic or cultural barriers. In addition, the campaign provides the following funding sources:³⁹

\$24.25 million in grants to community-based organizations across the state to prepare residents for natural disasters through education and resources designed to bolster resilience.

\$12.6 million to support community efforts to build resilience and respond to disasters by dispatching expert disaster teams to key regions and expanding citizen emergency response teams (CERT).

\$13.15 million to assist community groups in the development of a linguistically and culturally appropriate public awareness and outreach campaign, directed specifically at the most vulnerable California communities.

Listos California has already provided regional benefits. For example, as part of this campaign, the cities of Yucaipa, Redlands, and Ontario as well as the Rancho Cucamonga and San Bernardino County Fire Protection Districts received about \$800,000 to fund citizen emergency response teams in vulnerable areas and a Spanish-language emergency preparedness curriculum.⁴⁰

[El Sol Neighborhood Education Center](#). The El Sol Neighborhood Education Center serves as a community-based organization that provides no-cost preparedness strategies for vulnerable and underserved communities in both San Bernardino and Riverside County.⁴¹ Local governments may use this initiative as a template to implement their own related programs at a local level.

[Tips and Tools for Reaching Limited English Proficient Communities in Emergency Preparedness, Response, and Recovery](#). The US Department of Justice published a 2016 report with guidance on how to reach non-English speaking communities in emergency situations. This resource includes information on identifying non-English languages in the jurisdiction, disseminating information, dispersing notifications and warnings, and implementing recovery. The resource also includes an appendix with more federal, state, and local resources.

Model Goals, Policies, and Programs

The policies and programs informed by this model strategy will be similar depending on the specific vulnerabilities that each community needs to address. The model goals, policies, and programs given below are meant to provide examples of how resources that effectively communicate with non-English speakers in emergency and evacuation situations and can be integrated into planning mechanisms.

Goals

Goal 6.1. All residents of in the region have access to emergency preparation and response materials in their primary language.

Goal 6.2. Emergency evacuations for non–English speaking residents are successfully completed in the shortest time possible.

Policies

Policy 6.1. Make an increased number of CERT trainings available in languages other than English.⁴²

Policy 6.2. Government-held programs and events related to emergency preparation and response are required to have multilingual staff to support non–English speaking residents.

Programs

Program 6.1. Train town councils, neighborhood associations, and other community organizations to become CERTs.⁴³

Program 6.2. Work collaboratively with agencies like the National Weather Service to incorporate health outcomes as a criterion for heat warnings and disseminate information in multiple languages.⁴⁴

Program 6.3. Identify strategies to increase community resilience by improving social infrastructure, such as places and organizations that foster cohesion and support for non–English speaking residents.⁴⁵

Model Strategy 7

SBCTA strategy 2.2: Establish building and neighborhood design standards that minimize hazards in high risk areas.

Explanation of Strategy

Design standards are critical to sustaining safety and ensuring the ability of communities to bounce back in the face of more frequent and severe climate-related hazard events. Design standards with a climate resilience focus introduce a range of benefits, such as promoting long-lasting infrastructure and communities, increasing the capacity to withstand and recover from natural hazard events driven by a more chaotic future climate, and conserving energy and water.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Extreme heat and wind Flooding Mudslides and landslides Severe weather Wildfire	All new and substantially renovated buildings and infrastructure systems.

This strategy addresses vulnerabilities to buildings, infrastructure, homes, and neighborhoods in areas facing risk of natural hazard events such as wildfire, flooding, drought, extreme heat, and landslides. This strategy helps ensure that communities adopt neighborhood and building design standards to minimize wildfire and landslide hazards. These standards may include vegetation management, sizing,

siting, orientation, selection of materials, improvement of safety routes and connectivity and considerations of human health and comfort.

Types of Communities Where Applicable

This strategy applies to communities with high exposure and vulnerability to wildfire, landslides, drought, flooding, and extreme heat. Areas in the SBCTA-WRCOG region are projected to experience more severe and frequent natural hazard events. For example, 51,875 acres of residential land was located in an elevated fire risk area in the WRCOG subregion as of 2014. This area is projected to increase to 107,749 acres by 2039, not accounting for new development.⁴⁶ Similarly, low-lying desert locations in San Bernardino County could experience as many as 50 additional extreme heat days per year by midcentury. Many communities face socioeconomic barriers to improving their capacity to cope with or respond to natural hazard disasters, signaling the need to prioritize and address socially vulnerable areas. Local jurisdictions can adopt design guidelines and gradually require them as standards in development review, permitting, or funding processes, as applicable.

Examples of Best Practices

[Los Angeles City Planning's Climate-Adapted Design Guidelines](#). These guidelines provide examples of how to encourage projects that take local climate and urban environments into account to promote climate resilience. The climate-adapted design guidelines help to protect the site's natural resources and features; configure the site layout, building massing, and orientation to lower energy demand and increase the comfort and well-being of users; and enhance green features to increase opportunities to capture stormwater and promote habitat.

[Ironhorse Affordable Apartments](#). The Ironhorse apartments in Oakland, California, used California-specific design guidelines, such as Bay-Friendly (landscaping) and GreenPoint (green building) standards, to mitigate the urban heat island effect and conserve water and energy—strategies that will help protect its residents from extreme heat and drought and mitigate greenhouse gas emissions.

Resources for Implementation

To prioritize areas to implement design standards for improved resilience, local jurisdictions can use the WRCOG/SBCTA hazard mapping tool; risk zones established in hazard mitigation plans, emergency operations plans, and CAL FIRE's fire hazard severity zones; and maps characterizing both natural hazards and social vulnerability.⁴⁷ Maps and information sources that have incorporated future projections of climate-related hazards are preferred. Partnerships with other agencies—WRCOG, CAL FIRE, FEMA, etc.—can help advance adoption of building and neighborhood design standards.

For additional support and guidance on implementing this strategy, consider these resources.

[RELi Resilience Action List and Credit Catalog and the RELi National Consensus Standard](#). The RELi standard was adopted in 2017 by the US Green Building Council. The standard is similar and complementary to the LEED standard, but is focused on building community resilience to extreme events and disasters.

[Smart Growth Fixes for Climate Adaptation and Resilience: Changing Land Use and Building Codes and Policies to Prepare for Climate Change](#). This Environmental Protection Agency resource reviews strategies to help local governments identify land use and building policies to avoid climate-related hazards.

[Protect Your Property from Wildfire: California Edition](#). This resource produced by the Insurance Institute for Business and Home Safety summarizes California Building Code Chapter 7A (Materials and Construction Methods for Exterior Wildfire Exposure) and provides detailed information on reducing climate vulnerabilities associated with building components, defensible space, yards and gardens, and combustible materials.

[Wildland-Urban Interface Fire Area Building Standards](#). These standards establish minimum thresholds for materials and material assemblies to provide increased exterior wildfire exposure protection for buildings in wildland-urban interface fire areas.

Model Goals, Policies, and Programs

Policies informed by this model strategy will depend on the vulnerabilities that each community needs to address. The goals, policies, and programs given below provide examples of design standards that minimize climate-related hazards. The goals, policies, and programs listed below are only meant to be representative examples and are by no means comprehensive.

Goals

Goal 7.1. Plan and invest in building and neighborhood design standards that promote resilient communities in the face of natural hazards.

Policies

Policy 7.1. Integrate wildfire hazard overlay districts with development regulations based on factors like slope, structure, and fuel hazards.⁴⁸

Policy 7.2. Require new developments to submit a fire protection plan during site plan review.⁴⁹

Policy 7.3. Map “hot spots” and implement retrofits or changes in those places to reduce heat, such as green or reflective roofs on roofs with little to no slope.⁵⁰

Policy 7.4. Adopt the 500-year floodplain as the locally regulated floodplain.⁵¹

Policy 7.5. Design open space in floodplains for multiple uses/benefits.⁵²

Programs

Program 7.1. [CAL FIRE’s Ready for Wildfire program](#) works to educate the public on preparing for, preventing, and responding to wildfire.

- Program 7.2. The [Community Planning Assistance for Wildfire \(CPAW\) program](#) provides technical assistance to communities to incorporate wildfire risks into land use plans that manage development, building codes, and natural resources.

Model Strategy 8

SBCTA strategy 4.3: Invest in sustainable backup power sources to provide redundancy and continued service for critical facilities in the event of an outage.

Explanation of Strategy

The frequency and magnitude of natural hazards that cause power outages within the SBCTA-WRCOG region are expected to increase. Even with more climate-resilient energy systems, communities are still likely to experience outages, potentially prolonged ones, following extreme hazard events such as strong winter storms and wildfires. Communities in the region may also be increasingly impacted by Public Safety Power Shutoffs (PSPS) initiated during times of elevated wildfire risks. In response, local jurisdictions can play an active role in increasing community resilience to these types of events by investing in technologies designed to continue functionality of critical facilities, such as resilience hubs and public health and safety services, and make it easier for community members to adapt during power outages. Investments to increase backup power sources for critical facilities help build resilient communities equipped for long-duration outages and offer important co-benefits in turn, such as energy savings, improved grid reliability, and lower levels of air pollution.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Air quality Extreme heat and wind Flooding Mudslides and landslides Severe weather Wildfire	Community services Critical buildings and infrastructure Individuals with existing medical conditions and chronically ill individuals

This strategy seeks to mitigate community vulnerabilities related to power outages. Strategies that promote backup power sources for critical facilities increase the health and well-being of populations most vulnerable to natural hazards. For example, ensuring continued power to resilience hubs or hospitals during extreme heat events or periods of poor air quality increases the resilience of senior citizens or disadvantaged communities that may require medical assistance during these natural hazards. Also, backup power is particularly important during power outages that are simultaneous with or precede natural hazard events—when critical facilities are most needed.

Types of Communities Where Applicable

Investments in backup power at critical facilities are most beneficial for jurisdictions vulnerable to natural hazards or large disadvantaged communities in need of critical facilities during power outages. In practice, this includes much of the SBCTA-WRCOG region. Densely populated jurisdictions exposed to wildfire, strong winter storms, or extreme heat are primary candidates for planning and investment in backup power resources.

Examples of Best Practices

[Blue Lake Rancheria Microgrid](#). The Blue Lake Rancheria in Humboldt County, California, provides a range of critical facilities, including tribal government offices, EV charging, a convenience store, gas station, and water systems. The rancheria is powered by a microgrid that integrates a solar array and battery hybrid system, which provides sustainable backup power in a region frequently inundated by strong storms, wildfires, and resulting power outages.

[Marine Corps Base Camp Pendleton](#). The United States military is actively developing backup power generation and storage to minimize risks and promote resilient critical facilities. The US Marine Corps Camp Pendleton in Oceanside, California, uses solar installations and energy storage systems to ensure continued service in the event of a long-duration outage.

Resources for Implementation

Because no two communities are alike, local governments can explore tailored solutions to maintain power supplies to critical facilities based on community needs. Jurisdictions should consider providing backup power to a range of critical facilities, including those that serve public health and safety (e.g., hospitals and emergency medical facilities, emergency shelters and cooling centers, and communication infrastructure) as well as facilities that provide important public services (e.g., nursing homes and dialysis centers). This process can be guided by stakeholder outreach, including engagement with community boards, municipal officers and, importantly, energy utilities.

Jurisdictions can explore forward-looking power generation and storage to maintain power supply at critical facilities, such as hybrid energy solutions that dispatch multiple generating sources (e.g., solar and natural gas generation) and energy storage (e.g., batteries). In this way, deployed backup energy sources function as a type of “microgrid.” In contrast, traditional on-site diesel-powered generators are often considered insufficient because they are typically sized only for life safety needs and require a continuous supply of fuel, which may not be practical in emergency situations. Private companies, such as CleanSpark, can develop and install sustainable backup power generation and storage technologies to support critical facility resilience.

For additional support and guidance on implementing this strategy, consider these resources.

[A Novel, Renewable Energy Microgrid for a California Healthcare Facility](#). The California Energy Commission awarded funding to design, engineer, build, and operate the first renewable energy microgrid for a hospital in California. This white paper provides critical information on decisions leading to implementation as well as specific actions to overcome barriers to implementation.

[Microgrid Analysis and Case Studies Report](#). This document produced by the California Energy Commission outlines a wide range of projects deploying backup power sources in California, North America, and the world. The document provides guidance on technical characteristics, business models, costs, lessons learned, and contacts for each project.

Model Goals, Policies, and Programs

The policies and programs informed by this model strategy will be similar depending on the specific vulnerabilities that each community needs to address. The model goals, policies, and programs given below are meant to provide examples of how backup power providing continued service for critical facilities can be integrated into planning mechanisms.

Goals

Goal 8.1. Improve community coping and preparedness in the event of a power outage.

Goal 8.2. Maintain critical services serving broad cross-sections of citizens, including disadvantaged communities, in the event of outages and during periods of extreme heat, poor air quality, and natural disasters (including PSPS events).

Goal 8.3. Promote important co-benefits associated with backup power at critical facilities, including better blue-sky functionality and energy savings.

Policies

Policy 8.1. Ensure that community resilience hubs consider and plan for power supply requirements in the event of a long-duration outage.

Policy 8.2. Integrate backup power installations into capital improvement programs as upgrades to existing critical facilities.

Programs

Program 8.1. Connect community organizations with experts and resources to prioritize critical facilities for installation of backup power and energy storage.

Program 8.2. Partner with utilities to deploy hybrid power generation and storage systems at critical facilities, including resilience hubs and community centers.

Program 8.3. Evaluate where most vulnerable populations are located to establish effective locations for backup power for critical facilities.

Program 8.4. Convert or upgrade existing community centers or senior centers to provide emergency services and at least 72 hours of backup power.

Model Strategy 9

SBCTA strategy 5.2: Encourage water utilities and consumers to implement water conservation policies.

Explanation of Strategy

Communities can expect increased stress on their water systems. The SBCTA-WRCOG region's water resources are anticipated to be affected by anticipated changes to the amount, timing, and type of local precipitation as well as precipitation in other areas that provide the region with water. Due to shifts in precipitation patterns, the region is projected to have less water available during spring and summer, which are also projected to become drier and warmer. Less snowfall and less accumulated snow (i.e., snowpack) due to warmer temperatures will limit surface water flows in the region, increasing dependency on groundwater and other local water sources. Therefore, a range of water conservation strategies are needed to abate and manage these challenges.

Water conservation policies include diversifying and expanding the water sources portfolio (e.g., expanding wastewater reuse), conservation and efficiency ordinances for residents, increased use of recycled water, and management techniques that reduce water usage. Trade-offs should always be carefully considered when developing changes to water supply portfolios, such as impacts to downstream water use, habitat restoration, and other adverse impacts.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Drought	Cost-burdened households Water delivery service

This strategy primarily addresses drought and water shortages. Droughts are expected to become more frequent and intense throughout southern California by midcentury. The incidence of extremely dry years could triple by the end of century.⁵³ Drought may additionally constrain water resources, impacting water availability for households, agriculture, and natural resources. The likelihood of long-duration droughts in the region could increase significantly, with some studies showing a more than 80 percent chance of multidecade droughts by end of century.⁵⁴

Types of Communities Where Applicable

Many areas in the SBCTA-WRCOG region are vulnerable to water shortages and should look to water conservation initiatives. Desert communities in the region currently facing water availability challenges can expect continued challenges. Communities with water-dependent ecosystems (e.g., pinyon-juniper woodlands, conifer forests, and grasslands) can be affected by drought as those ecosystems are affected. San Bernardino Valley groundwater basins, including Bunker Hill Basin and San Bernardino Basin, were reportedly “historically low” in 2019. Many jurisdictions, such as the City of Ontario, import most of their water from upstate due to regional water shortages. Water managers encourage communities such as these to redouble water conservation efforts.⁵⁵ Communities that have not applied

a full suite of water conservation policies and actions should invest in the development of new policies and actions.

The effects of drought and decreased snowpack can have a significant effect on the water supply across the SBCTA-WRCOG region. Water shortages can particularly stress low-income households, which end up spending a greater percentage of their earnings on basic water service during shortages. Drought can also result in losses of production and revenue for the agricultural industry and harm to water-reliant natural resources.

Examples of Best Practices

[Water Revenue Adjustment Mechanism.](#) To counteract potential revenue losses in support of more aggressive conservation practices, the California Public Utilities Commission (CPUC) attempted to decouple water usage rates from revenue by adopting a Water Revenue Adjustment Mechanisms (WRAM) policy in 2008. The WRAM policy allowed excess-use charges to make up for revenue deficiencies that resulted from conservation practices of most customers. Furthermore, customer bills were not as strictly tied to their water usage, so while usage rates declined, customer savings did not change significantly.⁵⁶

[San Diego County Water Authority \(SDCWA\) Water Market Transfer.](#) The SDCWA negotiated an agreement with Imperial Irrigation District to pay farmers to reduce their consumptive water use via canal lining, fallowing of farmland, and water monitoring technology. Those water savings are transferred to SDCWA, providing more than one-third of the District's annual water supply.⁵⁷ Similar water sharing investment partnerships can be used to transfer water savings to communities or for ecological purposes.

[San Bernardino Valley Water Conservation District.](#) In 2015, the East Valley Water District's update of the Recycled Water Feasibility Study⁵⁸ recommended that wastewater recycled at a new recycled-water treatment plant be used to enhance recharge in the Bunker Hill Groundwater Basin because this would support continued local water supply reliability in the future. The district urged member agencies to buy California State Water Project water for basin recharge. In 2017, the district created additional sedimentation ponds that will assist in recharge.⁵⁹

[Santa Ana River Conservation and Conjunctive Use Program's \(SARCCUP\) Water Bank.](#) The water bank includes 180,000-acre feet of groundwater recharge and storage capacity; the program involves storage during wet years and use during dry periods.

Resources for Implementation

Support for water management policy change may come from universities, agricultural extension agencies, or nonprofit organizations (e.g., The Nature Conservancy). Communities may select water conservation solutions best suited for their specific needs, budgets, and constraints from a gamut of water conservation policies. Water management principles include prioritizing efficient maintenance and fixing leaky pipes, though more comprehensive strategies (e.g., water market transfers) may involve basin-wide coordination of water resources and anticipatory water resource planning.^{60,61}

For additional support and guidance on implementing this strategy, consider these resources.

[Public Policy Institute of California's Water Policy Center](#). This resource provides expert support on California's water management solutions, including preparation for drought.

[California Recycled Water Policy](#) (adopted 2009, amended in 2013 and 2018). This resource provides goals for recycled water use in California, guidance for use of recycled water and water quality, and criteria for streamlined permitting of recycled water projects.

[Sustainable Groundwater Management Program](#). California Department of Water Resources provides technical and financial support to local agencies that manage groundwater basins.

[WaterSense](#). This designation represents a voluntary partnership program sponsored by the US Environmental Protection Agency. The WaterSense label marks water-efficient products and represents a means to conserve water.

Model Goals, Policies, and Programs

The policies and programs informed by this model strategy depend on the specific vulnerabilities that each community needs to address. The model goals, policies, and programs given below are meant to provide examples of how water conservation practices can be integrated into planning mechanisms.

Goals

Goal 9.1. Maximized use of recycled water in areas where groundwater supplies are in a state of overdraft so that downstream water rights, instream flow requirements, and public trust resources are protected.⁶²

Goal 9.2. Increased annual volume of treated wastewater distributed for beneficial use and increased monthly volume of recycled water distributed.⁶³

Goal 9.3. Improved agricultural productivity per unit of water used.

Goal 9.4. Reductions in volume of water lost to leaks.

Goal 9.5. Improve integration of surface water and groundwater management to increase availability of surface water for underground storage.⁶⁴

Goal 9.6. Reduce water waste in industrial processes.

Policies

Policy 9.1. In partnership with surrounding cities, water districts, and policy advisors, develop opportunities for water market transfers, offsets, or credits that incentivize conservation.⁶⁵

Policy 9.2. Develop and implement groundwater sustainability plans in crucial groundwater basins, per the Sustainable Groundwater Management Act.⁶⁶ Plans may include water conservation strategies that reduce pressure on groundwater sources, such as increasing dry-season storage capacity, water banking, water trading, or diversifying water sources.

Policy 9.3. Enhance urban runoff capture, directing excess stormwater flows toward recharge basins or other beneficial uses.⁶⁷

Policy 9.4. Develop standards for water-efficient infrastructure and equipment upgrades for local industrial facilities to follow.⁶⁸

Programs

Program 9.1. Educate water users to use water wisely, including checking for leaks, improving efficiency, and retrofitting landscaping.⁶⁹

Program 9.2. Develop program for landscaping retrofits (e.g., lawn removal or xeriscaping) and training.⁷⁰

Program 9.3. Develop agriculture water trading partnerships to direct unused water to prioritized areas (e.g., groundwater basins).

Program 9.4. Encourage or incentivize use of water-efficient products (e.g., WaterSense).⁷¹

Program 9.5. Work with industrial companies to implement operating and maintenance procedures that incorporate water-efficient practices.⁷²

Program 9.6. Implement green infrastructure projects in neighborhoods to capture and redirect stormwater runoff.

Model Strategy 10

WRCOG strategy 6.2: Amend the local development code to require high-reflectivity pavement or increased tree cover in large commercial parking lots.

Explanation of Strategy

The average and maximum temperatures throughout California are expected to increase and lead to longer and more intense heat waves. In cities, this trend will worsen the urban heat island effect, where hard infrastructure such as roads and parking lots absorb heat and produce higher ambient temperatures than surrounding rural areas. For example, large parking lots often use dark asphalt surfaces that absorb as much as 95 percent of incoming solar rays and subsequently radiate heat, which raises temperatures in the immediate area and increases the intensity of extreme heat events.

Communities can address these problems by amending local development codes to require that large parking lots be constructed using materials that radiate less heat, such as high-reflectivity surfaces. In addition, shade trees, which communities can require for parking lots, also block light from being absorbed and create shaded areas, and evapotranspiration contributes to the cooling effect. Together, these strategies help ameliorate extreme heat impacts and improve public health.

Types of Vulnerabilities Addressed

Hazards	Populations and Assets
Air quality Extreme heat	Children Homeless persons Individuals with existing medical conditions and chronically ill individuals Outdoor workers Senior citizens, including those living alone

Increased temperatures present a public health threat and can be particularly dangerous for children, the elderly, people with existing medical conditions, those who work outside, and the homeless. Heat

can directly impact these populations through heat-related illness, and indirectly through strain on infrastructure and worsened air pollution and disease.⁷³ Air pollution is already a public health concern for the Inland Deserts region, particularly for minority and low-income populations that often live close to heavily traveled corridors.⁷⁴ In addition, surface temperature has a closer relationship to negative health impacts than air temperature—meaning that hot, dark pavements in parking lots and roads are a key source of harmful urban heat and a prime target for heat-mitigating strategies.⁷⁵

Extreme heat has other adverse impacts. Increased road and parking lot surface temperatures can accelerate their rate of material degradation. In addition, electric infrastructure is vulnerable to increased temperatures as higher temperatures drive transmission line capacity losses.⁷⁶

Types of Communities Where Applicable

The SBCTA and WRCOG region is projected to experience major increases in extreme heat days, particularly within the inland desert. The Inland Deserts regional report in California's Fourth Climate Change Assessment⁷⁷ found that the northern and eastern portions of the region had higher percentiles (40 to 100 percent) of households with no vehicle and the elderly living alone (populations more vulnerable to extreme heat) but very lower percentiles (0 to 20 percent) of tree canopy coverage (a heat mitigation measure). These areas also have higher projected changes in both daytime maximum temperatures and nighttime minimum temperatures. Built infrastructure and related heat retention and emission are particularly effective at raising nighttime temperatures, contributing to the urban heat island effect.⁷⁸

Examples of Best Practices

[Cool LA Neighborhoods](#). Los Angeles City Department of Public Works Bureau of Street Services, Recreation and Parks, and Department of General Services worked together to launch a pilot project in summer 2015. They covered part of the Balboa Sports Complex parking lot with Guard Top Cool Seal, a reflective pavement, and found that this part of the lot was 10°F cooler than the rest of the black asphalt lot.

These results helped the departments obtain funding to install cool pavement on one city block in each of the 15 council districts in 2017. These blocks showed the same results: 10°F cooler during hot summer afternoons compared to their black asphalt counterparts. Since then, LA has installed more cool streets, bike lanes, and parking lots.

[LA urban forestry](#). The Urban Forestry Division of Los Angeles' Bureau of Street Services manages nearly 700,000 street trees growing along 6,500 miles of public roads, making LA home to the largest urban forest in the United States. Development codes requiring shade trees or other green infrastructure should specify that all plants be low water use and drought resistant to provide benefits during water shortages. Ideally, tree species should be native to the region.

Resources for Implementation

Cool pavements are a relatively new technology and are still an active area of research. Some studies and pilot projects have looked at the relative costs and benefits associated with different cooling

materials. Therefore, calling for high-reflectivity pavement or trees for commercial parking lots in the local development code does not need to include prescriptive information on which materials or trees to use. However, some guidelines are useful to consider. For example, if a jurisdiction plans to cover existing surfaces, consider prioritizing low-income areas and those that currently have low vegetation cover, as these areas are likely most at risk for experiencing the negative impacts from urban heat. In addition, cool pavements in parking lots can help buildings obtain LEED credits. Consider noting this as an incentive in updated codes.

For additional support and guidance on implementing this strategy, consider these resources.

[LBL Heat Island Group](#). The Lawrence Berkeley National Lab has a Heat Island Group that researches the urban heat island issue as well as potential solutions. As part of its efforts, the group has collected resources related to cool pavements.⁷⁹ Jurisdictions can consider consulting the Lawrence Berkeley National Lab's [Life-Cycle Assessment and Co-benefits of Cool Pavements](#), which describes a tool the lab developed to help cities estimate the energy and environmental consequences of various pavement types.⁸⁰

[The EPA's Heat Island Compendium](#). Published in 2008, this document includes chapters related to using trees and vegetation⁸¹ as well as cool pavements⁸² to combat urban heat islands.

Model Goals, Policies, and Programs

The policies and programs informed by this model strategy depend on the specific vulnerabilities that each community needs to address. The model goals, policies, and programs given below are meant to provide examples of how reflective pavements and green infrastructure can be integrated into planning mechanisms.

Goals

Goal 10.1. Prepare and protect those most vulnerable to increasing extreme heat.⁸³

Goal 10.2. Reduce the urban heat island effect.

Goal 10.3. Support and maintain the urban forest.

Policies

Policy 10.1. At least 50 percent of commercial parking lots within the city boundaries should be covered with a reflective cool pavement and/or have a perimeter of shade trees.

Policy 10.2. With the assistance of the urban forester, the jurisdiction shall develop and revise a comprehensive urban forest plan.⁸⁴

Policy 10.3. Integrate co-benefit green infrastructure into street improvement projects.⁸⁵

Policy 10.4. Develop an urban heat vulnerability index and mitigation plan to prepare for higher temperatures and more frequent extreme heat.⁸⁶

Policy 10.5. When adding a requirement for tree planting around commercial parking lots, consider species that are native to the region and are drought tolerant to minimize the cost of upkeep and environmental impact.

Programs

Program 10.1. As part of the review of new paving technology, identify potential adjustments to pavement materials and equipment/materials specifications to account for increasing summer temperatures.⁸⁷

Program 10.2. Create an urban forest program that identifies tree canopy goals, establishes a budget, and presents implementation measures.⁸⁸

Program 10.3. Develop and launch a neighborhood retrofit pilot program to test cooling strategies that prepare for higher temperatures.⁸⁹

Program 10.4. Plant trees in communities with fewer trees to grow a more equitable tree canopy by 2028.⁹⁰

6.4 MEASURE PRIORITIZATION

Jurisdictions should consider the development and adoption of other strategies not mentioned in this Toolkit to suit their local contexts. Determining which strategies are more urgent or relevant for a jurisdiction to adopt is important for successfully adapting to current and future climate-related hazards. A prioritization exercise can aid jurisdictions in knowing which strategies to implement first.

Communities can take several different factors into account when deciding how to prioritize measures. For example, consider the following criteria:

Who is responsible for the strategy's implementation? Are there any monitoring activities that need to occur? If so, who will be responsible?

What is the cost? Is it the most cost-effective strategy or are there other alternatives? What is the return on the investment?

How can existing resources be used to fund the strategy's implementation?

Are the benefits of the sunk costs equitably experienced by all?

Does the strategy support compliance with existing laws?

Is there an appropriate nexus between the strategy and expected outcome?

What is the timeline for the strategy?

Communities can assess each strategy on these and other factors of importance and assign them a score, with higher scores indicating a higher rank for each criterion. Strategies that score the highest on the most criteria can be considered the highest priorities. Communities can also weigh different criteria differently, applying different levels of importance to each consideration.

Table 6-1 gives an example of how communities can prioritize different adaptation strategies.

Table 6-1 Example Strategy Prioritization Considerations

Strategy	Availability of Financial and Staff Resources	Urgency	Equity of Benefits	Support for Compliance with State Law	Total Score	Priority
Strategy 1	Low (1)	Medium (2)	Low (1)	High (3)	7	Medium
Strategy 2	High (3)	High (3)	Low (1)	Medium (2)	9	High
Strategy 3	Medium (2)	None (0)	High (3)	Low (1)	6	Medium
Strategy 4	High (3)	Medium (2)	Medium (2)	High (3)	10	High
Strategy 5	Low (1)	High (3)	Low (1)	None (0)	5	Medium
Strategy 6	None (0)	Low (1)	Medium (2)	Low (1)	4	Low
Priority scoring: 0-4: Low priority. 5–8: Medium priority. 9–12: High priority						

Jurisdictions can also refer to other resources, including the California Adaptation Planning Guide and the EPA’s Regional Resilience Toolkit, for additional guidance on prioritizing resilience measures.

6.5 MEASURE SUMMARY

Table 6-2 shows various kinds of planning documents and denotes which of the ten model strategies may be most relevant to each document—please refer to each model strategy for guidelines on how to incorporate resilience.

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Table 6-2 Relationship Between Resilient IE Toolkit and Planning Documents

Model Strategy		1	2	3	4	5	6	7	8	9	10
Planning Document Type	General Plan										
	-Land Use	•		•				•			•
	-Circulation	•		•							•
	-Housing	•		•				•			
	-Conservation	•			•	•			•	•	•
	-Open Space	•			•	•					
	-Safety	•	•	•	•	•	•	•	•	•	•
	-Environmental Justice	•					•		•		•
	-Air Quality	•							•		•
	Local Hazard Mitigation Plan	•	•	•	•	•	•	•	•	•	•
	Capital Improvement Plans	•	•						•	•	•
	Active Transportation Plans	•		•							
	Urban Water Management Plans	•			•					•	•
	Emergency Operations Plans	•	•	•					•		
	Building Regulations	•	•					•	•	•	•

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6.6 IMPLEMENTATION HANDBOOK

Introduction

This Implementation Guide aims to help jurisdictions in the SBCTA-WRCOG region implement climate adaptation strategies and actions, including the model strategies discussed above, in their own communities. It is important to think of resilience as a concept that applies not only to safety elements or LHMPs, but to all of a jurisdiction’s relevant planning documents, including the other elements of a general plan, climate action plans or sustainability plans, local government capital improvement plans, active transportation plans, urban water management plans, landscaping guidelines, and urban forestry plans. Resilience planning needs to be flexible and adapt to the variable effects of climate-related hazards. Likewise, jurisdictions need to update the resilience sections of their documents to ensure that they are up to date. This Resilience Template outlines how these planning documents relate to resilience planning and how jurisdictions can involve resilience planning into these different plans.

Table 6-3 describes various kinds of planning documents, their usual components, and how they could involve resilience topics. (Note: **Table 6-3** is for reference only and is not meant to replace official guidance for planning documents—guidance references included as available.)

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Table 6-3 Local Government Planning Documents Related to Resilience

Document Type		Description	Intersection with Resilience Planning
General Plan ⁹¹	Land Use	Governs the uses of all parcels and lots within a jurisdiction. Establishes the zoning code and divides a jurisdiction into zoning “districts.” Determines the general standards for new development in each zoning district and guides which sections of a jurisdiction experience new growth and development.	Can steer new development away from areas of elevated hazard risk. Can control and regulate land uses which affect resilience (hazardous materials use in flood zone, utilities facilities in fire zone, etc.). Can guide development to lower-risk areas.
	Circulation	Addresses infrastructure needs for the circulation of people, goods, and services, while correlating directly with the land use element. Defines locations of existing or planned rights-of-way, terminals, military airports or ports, and public utilities and facilities within a jurisdiction. Identifies policies and programs to balance multimodal transportation networks that meet the needs of all users of streets, roadways, and highways and both rural and urban contexts. Aligns with any existing regional transportation plans and congestion management plans.	Can require transportation infrastructure to be hardened against hazards or relocated outside of hazard-prone areas. Can identify evacuation routes and key nodes for ingress and egress of specific neighborhoods. Can identify mobility issues for special needs populations in case of evacuation.

Table 6-3 Local Government Planning Documents Related to Resilience

Document Type		Description	Intersection with Resilience Planning
	Housing	Identifies housing issues for special needs subpopulations in jurisdiction. Evaluates any potential constraints on new housing development. Includes an inventory of sites where potential new housing could occur and discusses any water supply and hazards concerns.	Can discuss impacts of climate-related hazards as a constraint on new housing development. Can examine the role of climate-related hazards in restricting water supplies to sites identified in potential housing inventory. Can establish programs to help low-income, senior, or renter residents conduct resilience retrofits on their homes.
	Conservation	Outlines priorities for preservation of biological and environmental resources (air quality, water, slope, drainage, and agricultural lands). Identifies water courses that could divert floodwaters to recharge groundwater supplies.	Can create programs to make forests, watersheds, and agricultural areas more resilient to climate-related hazards. Can examine how a jurisdiction can redesign and prepare watercourses and watersheds to anticipate for increased and/or decreased water flows. Can institute forest management practices to anticipate wildfires. Can conserve wildland areas to provide ecosystem service benefits to improve community resilience.
	Open Space	Lists an inventory of all open space resources in a jurisdiction. Identifies any areas that may have hazardous conditions, such as flood plains, watersheds, high fire risks, and unstable soil.	Can preserve open space for greater floodwater management capacity. Can create flexible open space that can serve both recreational and climate resilient purposes.

Table 6-3 Local Government Planning Documents Related to Resilience

Document Type		Description	Intersection with Resilience Planning
	Safety	Identifies hazardous or potentially hazardous conditions caused by weather/climate, geology/seismology, ecosystem, land uses, or other factors. Creates a system of programs to increase community safety against localized hazards or other safety threats.	Can identify climate-related hazards and develop policies to improve resilience to these issues. Can adopt findings of relevant climate resilience planning documents such as LHMPs, climate adaptation plans, climate actions plans, etc. Can propose evacuation program among jurisdiction departments and/or with neighboring local governments. Can describe unique safety issues confronted by disadvantaged populations in the jurisdiction.
	Environmental Justice	Details any issues of environmental injustice experienced by disadvantaged communities (if any) relating to pollution, food access, safe housing units, and equal access to recreation. Recommends strategies to address environmental injustices. Identifies policies that can foster greater involvement of disadvantaged communities in public decision-making processes.	Can coordinate with housing element to identify if disadvantaged communities are in areas where climate-related hazards create a significant potential for harm. Can work with land use element to relocate land uses that reduce resilience away from disadvantaged communities. Can encourage increased representation of climate resilience issues faced by disadvantaged communities.
	Air Quality	Compiles report of air quality data, greenhouse gas emissions inventory, and relevant State/federal air quality plans. Summarizes any government programs that could enhance local quality air sheds. Coordinates programs from other elements (land use, transportation, and air quality) to ensure comprehensive management of air resources.	Can support enhanced management of air resources to reduce effects of climate-related hazards. Can balance transportation demand with air pollution management on intense, hot days. Can model anticipated impacts of climate-related hazards on future air quality conditions.

Table 6-3 Local Government Planning Documents Related to Resilience

Document Type	Description	Intersection with Resilience Planning
Local Hazard Mitigation Plan ⁹²	Summarizes a profile of all hazards afflicting a jurisdiction. Conducts a hazard threat analysis of social groups and physical assets. Outlines a series of mitigation strategies to reduce hazard threats.	Summarizes a profile of all hazards afflicting a jurisdiction. Conducts a hazard threat analysis of social groups and physical assets. Outlines a series of mitigation strategies to reduce hazards threats.
Capital Improvement Plans	Inventories public facilities and infrastructure needs and proposed projects for a jurisdiction. Establishes timelines for project completion. Outlines plans to finance and implement each project.	Inventories public facilities and infrastructure needs and proposed projects for a jurisdiction. Establishes timelines for project completion. Outlines plans to finance and implement each project.
Active Transportation Plans ⁹³	Identifies the current active mobility network and any constraints or obstacles to the network. Compiles strategies and programs to increase active transportation. Creates roadmap to implement the plan.	Can demonstrate transportation network resilience through flexibility and options provided by more active-transportation choices. Can coordinate with circulation element and capital improvement plan to advance projects that improve climate resilience.
Urban Water Management Plans ^{94 95}	Details existing conditions of relevant water delivery and treatment systems, including watersheds, aquifers, and infrastructure. Describes existing water demand and supply. Creates plans for contending with water shortages and water demand management.	Can demonstrate the impact of climate-related hazards to existing watersheds and water delivery systems. Can incorporate resilience into water shortage and demand management planning. Can model future water supply and demand under future conditions.

Table 6-3 Local Government Planning Documents Related to Resilience

Document Type	Description	Intersection with Resilience Planning
Emergency Operations Plans/Emergency Management Plans ⁹⁶	Provides overview of potential emergency situations that may arise that can impact jurisdiction. Describes necessary emergency response from each jurisdiction's department and creates emergency management roles. Establishes hierarchical chain of command for jurisdictional leadership in the event of an emergency.	Can incorporate anticipated increases in natural hazard frequency and severity into emergency response. Can coordinate with safety element and LHMP to create unified climate-resilience response.
Building Regulations ^{97 98}	Establishes standards for construction, plumbing, electrical standards, water conservation, and utilities for all buildings in a jurisdiction.	Can mandate the use of materials and other design elements in new construction that reduce damage from certain hazards. Can apply special regulations for utilities infrastructure in hazard areas. Can permit buildings to use independent, self-sustaining energy sources that do not rely on a centralized power grid.
Note: Descriptions of planning documents are for reference only and are not to be construed for planning document guidelines. Please refer to official sources for planning document guidelines.		

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Financing Climate Resilience Implementation

Climate resilience projects may vary in their size, length of time, scope, and purpose but they all require funding sources to be successful. While large infrastructure projects may be very expensive, even smaller projects, like focused updates to a safety element, can require dedicated funding sources. Some projects may only require a one-time injection of funds while others may involve funding that arrives on an ongoing basis. In some situations, jurisdictions may find it preferable to use a combination of different sources if no single source sufficiently finances a project of interest. The following is a list of funding source examples:

Grants. The State and federal government offer grants to applying jurisdictions that meet certain criteria. Grants can be competitive (jurisdictions must demonstrate more need than the other applicants to win funding) or noncompetitive (grantors consider all applications equally if applicants meet basic criteria).

Taxes. Jurisdictions generally collect taxes from property owners, sales transactions, public bonds sales, or from usage fees of public services or infrastructure. Jurisdictions can also consider creating special tax districts, such as enhanced infrastructure financing districts (EFIDs), which allow jurisdictions to collect taxes from property owners in a designated area to fund specific projects or activities. Jurisdictions can impose new taxes if the existing tax base does not sufficiently fund a project of interest. Larger, more populated jurisdictions may have more ability to raise funds through taxation while smaller, less populated jurisdictions have a smaller tax base from which to collect revenue. However, other community characteristics such as property values and sales revenue also affect the viability of raising funds through taxes.

Private sector. This financing mechanism includes grants or donations from individual private citizens or private organizations. Private organizations can develop a grant program for resilience projects, or private companies may donate to a specific local government program.

State and Regional Funding Sources

Affordable Housing and Sustainable Communities Program⁹⁹ is a grant award that aims to reduce driving of private automobiles in communities by funding new housing construction that relies on alternative forms of transportation. Funding comes from California's Cap-and-Trade program. The California Strategic Growth Council receives and reviews applications. Awardees must demonstrate that the projects result in actual greenhouse gas emissions reductions and must be responsible for monitoring and reporting on the project's progress.

Proposition 1 Integrated Regional Water Management Grant Program¹⁰⁰ is a grant award intended to improve water supply reliability, rehabilitate watershed ecosystems, and make water systems more resilient to climate-related hazards. Funding comes from the California Department of Water Resources Proposition 1 bonds. The grant runs three subprograms: (1) Disadvantaged Community Involvement Program, (2) Planning Grant Program, and (3) Implementation Grant Program. The program aims to award applicants who employ new or innovative technology or practices, stack project benefits, and leverage funds. The grant divides the funds among 12 different hydrologic regions in California with different amounts for each area—San Bernardino and western Riverside Counties sit within three of

these regions and could be eligible for a portion of the following amounts: (1) Lahonton, \$24.5 million; (2) Colorado River, \$22.5 million; and (3) Santa Ana, \$63 million.

State Water Efficiency and Enhancement Program¹⁰¹ is a grant award designed to make agricultural irrigation infrastructure less greenhouse gas intensive and reduce the amount of water resources used on irrigating crops. Eligible uses could include drip irrigation systems and low-pressure irrigation infrastructure. Funding comes from the California Department of Food and Agriculture. The award could help communities with agricultural industries to withstand future variations in water supply due to drought and other climate-related hazards.

Sustainability Planning Grant¹⁰² is a grant award intended to help communities within the region encompassed by the Southern California Association of Governments (SCAG), which includes both Riverside and San Bernardino Counties, to lower their carbon footprint. Funding comes from the Sustainable Communities Program operated by SCAG. The award may be used to support higher integration of land uses with transit-oriented development and transportation; increased active transportation; and planning efforts to draft natural resources plans, climate action plans, and greenhouse gas reduction programs.

Transformative Climate Communities Program¹⁰³ is a grant award that seeks to support climate-related adaptation and resilient community development activity in disadvantaged communities. The California Strategic Growth Council receives and reviews applications. Awardees must demonstrate that the projects result in actual greenhouse gas emissions reductions and must be responsible for monitoring and reporting on the project's progress. The Growth Council evaluates applications based upon whether the applicant can demonstrate that the project avoids population displacement, engages the community, is resilient to climate change, and provides high-quality jobs for residents of the project area.

Urban Forestry Grants Program¹⁰⁴ is a grant award available to communities that reduce their greenhouse gas emissions through a tree planting program to sequester carbon. Funding comes from the California Department of Forestry and Fire Protection. Applicants must demonstrate how their project will reduce greenhouse gas emissions, must be located in an urban area, must ideally stack benefits, and must engage the local community during the project planning process. The award could help communities increase resilience by reducing heat island effect, enhancing urban water management, and improving air quality.

Federal Funding Sources

Choice Neighborhoods¹⁰⁵ is a grant award that strives to improve housing conditions for low-income or disadvantaged communities and can help to overhaul or replace public housing units, educational facilities, transportation infrastructure, or enhance employment opportunities in low-income communities. Funding comes from the United States Department of Housing and Urban Development. Funds can help increase adaptive capacity and resilience by retrofitting existing structures or infrastructure to be more energy efficient and more effective at countering urban heat island effect.

Community Development Block Grant¹⁰⁶ is a grant award that supports community development projects in low-income urban communities through housing rehabilitation, improving the local economy, and protecting the local environment. Funding comes from the United States Department of Housing and Urban Development. Block grant funds can support climate resilience implementation through, for example, renovating housing or other structures or facilities in low-income communities with materials that make them more durable to natural hazards or rehabilitating streetscapes to better manage heat and drainage. There are two types of Block Grants: (1) Entitlement Communities Grants, which target larger cities (principal cities of metropolitan statistical areas or cities with 50,000 people) and (2) States Program, which aim to serve smaller communities.

Flood Mitigation Assistance Grant Program¹⁰⁷ is a grant award that focuses on reducing flooding damage to existing structures insured by the National Flood Insurance Program. Funding comes from the Federal Emergency Management Agency (FEMA). Projects must be consistent with the State Hazard Mitigation Plan as well as a community's LHMP, if the community has one. The grant award could help communities increase resilience by mitigating the damages resulting from severe flooding.

Hazard Mitigation Grant Program¹⁰⁸ is a grant award that helps reduce loss of life or property from future disaster events. Funding comes from FEMA. Applicants may use the grant award to finance retrofits to structures to protect against strong winds or fires, expand floodwater management infrastructure, floodproof history structures, or draft an LHMP.

HOME Investment Partnerships Program¹⁰⁹ is a grant award that seeks to increase housing opportunities for lower-income households through land acquisition and building new or rehabilitating already existing housing provided it is affordable. Funding comes from the United States Department of Housing and Urban Development. The HOME Program can help new housing or rehabilitation efforts of existing housing become resilient to climate-related hazards by including energy-efficient design and materials and appropriate siting in the community's geographic context.

Pre-disaster Mitigation Grant¹¹⁰ is a grant award that prioritizes pre-emptive mitigation actions to reduce loss of life or property from future disasters. Funding comes from FEMA. The awards finance the update of a local hazard mitigation plan, which can discuss resilience strategies to adapt to hazard conditions, including climate-related hazards. Unlike the Hazard Mitigation Grant Program, Pre-disaster Mitigation Grant recipients must have an adopted hazard mitigation plan to apply and be selected for this grant program.

For more resources on funding climate adaptation and climate resilience-based projects, please refer to the Adaptation Clearinghouse operated by the California Governor's Office of Planning and Research: <https://resilientca.org/topics/investing-in-adaptation/> and the California Adaptation Planning Guide available at <https://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/hazard-mitigation-planning/california-climate-adaptation>.

Community Outreach and Engagement

Involvement of the local community in a jurisdiction's efforts to incorporate resilience and adaptation into their planning documents is an important part of the implementation process. Local knowledge and feedback can help ensure that resilience planning and infrastructure projects accurately address local issues. Communities in the SBCTA-WRCOG region vary by demography, geography, and size, so each jurisdiction must carefully tailor its approach. This Toolkit provides considerations and example materials that jurisdictions may use to develop their own outreach materials and content. Considerations are based on guidance from the California Adaptation Planning Guide and feedback collected from local agencies for this Toolkit.

For detailed materials and guidance, please refer to the United States Environmental Protection Agency's Regional Resilience Toolkit (Appendices A and B, Step 1):
https://www.epa.gov/sites/production/files/2019-07/documents/regional_resilience_toolkit.pdf.

For additional guidance on community engagement considerations and conceptual planning for the engagement process, please refer to the California Adaptation Planning Guide:
<https://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/hazard-mitigation-planning/california-climate-adaptation>.

Considerations

Frame the Context of the Project

Helping the community understand the underlying reason its local government is implementing a resilience project will help set the tone for the kind of feedback people should bring to meetings and engagements with the project's planners.

Did the community receive a grant that has made the implementation project feasible?

Is the jurisdiction required to implement the project?

Has the electorate indicated a strong desire for the government to implement resilience projects?

Is it a combination of some or all of these potential reasons?

Equity-Driven and Comprehensive Feedback from All Demographics

Climate-related hazards affect unique population groups in distinct ways, so gathering feedback from as many different segments of the population as possible ensures that the implementation project more accurately reflects the diverse climate resilience needs of the community. Some population subsets may be more able than others to participate in community engagement activities. Without accounting for these factors, jurisdictions may unintentionally collect feedback that overrepresents the needs and thoughts of one group over others. Jurisdictions should consider unique strategies for reaching groups that may be unfamiliar with climate resilience or may be less able to participate than other community members.

Anticipate and Gauge the Level of Feedback

Each project's unique context will require different amounts and types of feedback from the community.

For example, a small-scale, targeted resilience update to a jurisdiction’s general plan conservation element may not attract a large section of the community into the engagement process in the same way that a large-scale resilience upgrade to a jurisdiction’s highway network might. Controversial implementation projects may also elicit a substantial response from the community. For instance, an update to a jurisdiction’s general plan land use element that significantly increases density and urban infill development or that relocates new residential development away from fire-prone areas may pique the interest of many community members. Conversely, if a project receives minimal feedback from community members, the project planners may need to reconsider their outreach strategy to encourage more community members to participate.

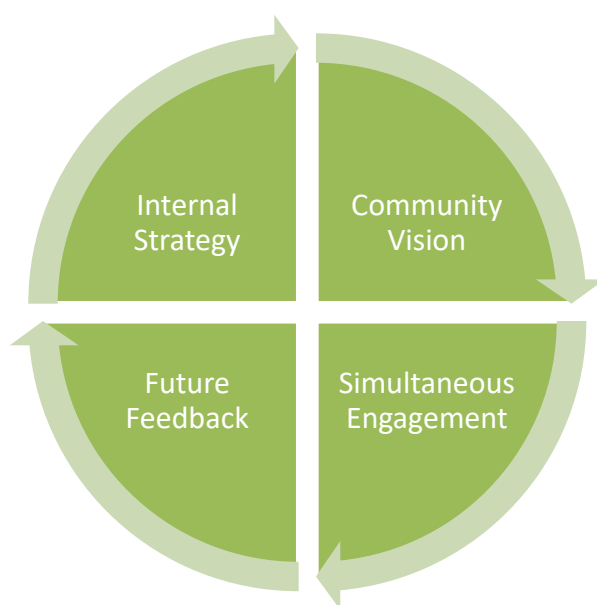
Control for Controversy

Climate adaptation is a sensitive topic, and some people may attempt to derail or impede a project when project staff discuss climate-related hazards. Jurisdictions can help defuse politically charged sentiments by focusing on the public health, safety, and well-being benefits that these projects have independent of the climate issues. For example, a jurisdiction can emphasize how a project can increase public safety, reduce hazard risks, enhance open space and recreational facilities, provide more mobility options, or lead to more affordable housing.

Outreach Process

Below is a model sequence for successful community outreach and engagement for implementing resilience projects. The model is based on outreach guidelines established by FEMA’s Local Mitigation Planning Handbook and the California Adaptation Planning Guide.¹¹¹ If jurisdictions adopt this model, they should adapt it to the specific needs of both the project and the community. **Figure 6-1** outlines the model sequence for engaging the community on resilience-based projects.

Figure 6-1 Model Sequence of Community Engagement



1. **Internal Strategy.** The project staff should develop their own internal strategy or plan to run the community engagement process.
2. **Community Vision.** The project staff should consult the community in drafting a vision statement for their future resilient community.
3. **Simultaneous Engagement.** Issues may arise during project implementation, so project staff should provide multiple, ongoing opportunities for the community to provide feedback until the project is done.
4. **Future Feedback.** Community priorities or issues may change in the future, so it is important to have engagement after project completion to ensure it is in alignment with more recent developments. Feedback collected after project completion can also help inform the development of upcoming projects.

Planning for Successful Implementation

Jurisdictions should undertake concerted efforts to carefully plan and coordinate their climate adaptation and resilience implementation projects. Preparing a project framework can help initiate the organization of a scope of work and outline the major goals, intended outcomes, stakeholders, and cost estimates to bring the project to a successful completion. This guidebook includes a model project planning tool that can help jurisdictions outline important considerations prior to a resilience project's beginning. **Table 6-4** shows the model project planning tool, and **Table 6-5** shows an example project of a housing and safety elements update that involves aspects of resilience. (Note: This is a hypothetical scenario only. Please do not use example content as a substitute for actual project planning.) The United States EPA's Regional Resilience Toolkit contains more detailed worksheets and project planning materials for resilience. **Table 6-6** highlights sections of the Regional Resilience Toolkit that jurisdictions may wish to refer to for additional guidance.

Table 6-4 Project Planning Tool

Project Name	[Provide the project name here]
Project Description	[Provide a brief, detailed description of the project. Include goals, intended outcomes, and the major deliverables.]
Agencies Involved	[List any departments, jurisdictional entities, State or federal agencies, or private organizations that are expected to be involved in the project.]
Expected Costs	[Identify initial projected costs. Approximate amounts are appropriate.]
Funding Sources	[List anticipated sources of funding.]
Timeline	[Include the anticipated time frame necessary to complete the project.]

Table 6-5 Example of Planned Resilience Project

Project Name	City of Hesperia Housing Element Update
Project Description	Update the City's Housing Element for the 2020-2028 housing cycle. Include a Housing Needs Assessment, Constraints and Achievements discussion, and Housing Inventory. Include discussions of resilience when appropriate. Update the Safety Element as required by SB 1035 to review and incorporate new resilience data.
Agencies Involved	Housing Element: San Bernardino County Community Development and Housing San Bernardino County Public Works San Bernardino County Housing Authority San Bernardino County Homeless Partnership California Department of Housing and Community Development Safety Element: San Bernardino County Fire Department San Bernardino County Emergency Services San Bernardino County Public Works California Department of Forestry and Fire Protection California Governor's Office of Emergency Services
Expected Costs	Approximately \$75,000
Funding Sources	SB 2 Planning Grant City General Fund
Timeline	9 months to 12 months
Note: This table is an example only and should not be used as a substitute for actual project planning.	

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Table 6-6 Regional Resilience Toolkit Worksheets and Tools Reference Table

Section	Page Number	Material Name	Material Type	Purpose
Step 1: Engage	Appendix B 1.2 to 1.5	Identifying Stakeholders	Matrix worksheet	Identify who should participate. There are three types of participants: the project team, an advisory group, and other targeted stakeholders. The project team should work through this worksheet with the department or agency stakeholders.
	Appendix B 1.6 to 1.7	Stakeholder Mapping	Quadrant Table worksheet	This worksheet can help the project team map out the interest and influence of the project's primary stakeholders, which can be used to understand the level of outreach needed for the process. This exercise can help the project team identify populations that may not be actively engaged but would be impacted by the project or policies or may substantially influence them.
	Appendix B 1.8 to 1.9	Workshop Checklist	Checklist and Room Layout Diagrams	This workshop checklist can be used to organize and plan an outreach event to ensure that all details are considered, including meeting room layout and required staff.
Step 2: Assess	Appendix B 2.2 to 2.3	Develop Resilience Goals Exercise Worksheet	Open-ended response worksheet	This worksheet can be used with an advisory group or small group in breakout sessions to track resilience goals and discussions.
	Appendix B 2.4 to 2.5	Develop Hazard Impact Statements	Matrix worksheet	Use this worksheet with the project team or advisory group to develop preliminary hazard impact statements.
	Appendix B 2.6 to 2.7	Identify Important Community Assets	Ranking worksheet	This worksheet can be used to develop a list of important community assets.
	Appendix B 2.7 to 2.12	Community Asset Data Identification	Checklist	This checklist can help guide the vulnerability assessment and help the project team focus on areas most impacted by climate-related hazards.

Table 6-6 Regional Resilience Toolkit Worksheets and Tools Reference Table

Section	Page Number	Material Name	Material Type	Purpose
	Appendix B 2.13 to 2.14	Vulnerability Assessment Scoping	Matrix with open- ended response worksheet	Use this matrix to help determine the degree of analysis needed for each asset type. It is important to note whether assessing the asset will help meet community goals.
	Appendix B 2.15 to 2.17	Rapid Vulnerability Assessment Exercise	Checklist and open- ended response worksheet	This Rapid Vulnerability Assessment Exercise expedites and simplifies the Vulnerability Assessment questions to provide a quick overview of the vulnerability of an asset.
	Appendix B 2.18 to 2.22	Vulnerability Assessment Questions	Open-ended response matrix worksheet	This worksheet provides assessment questions that should be answered by the project team.
	Appendix B 2.23 to 2.26	Vulnerability Assessment Questions: Asset Class	Open-ended response matrix worksheet	This worksheet provides questions to help understand the different types of vulnerabilities, such as physical, functional, and governance, applicable to an asset. These questions should be answered by the project team and department or agency staff.
Step 3: Act	Appendix B 3.2 to 3.3	Develop Initial Problem Statements	Open-ended response matrix	This worksheet provides a template to develop an initial problem statement for adaptation planning efforts.
	Appendix B 3.4 to 3.7	Strategy Idea Sources	References matrices and links	This handout presents several sources for strategies that address common hazards and asset classes.

Table 6-6 Regional Resilience Toolkit Worksheets and Tools Reference Table

Section	Page Number	Material Name	Material Type	Purpose
	Appendix B 3.8 to 3.9	Evaluation Criteria	Strategy-ranking matrix worksheet	The worksheet uses specific criteria to evaluate the effectiveness and co-benefits of adaptation strategies. It is important to include multiple voices and viewpoints in strategy prioritization.
	Appendix B 3.10 to 3.12	Strategy Development and Implementation Handout	Model Strategy Matrices	This handout provides specific examples of strategy development to help the project team fill out the Strategy Development and Implementation Matrix.
	Appendix B 3.13 to 3.14	Strategy Development and Implementation	Model Strategy Matrices	This blank matrix is a template for recording key information about a strategy that can assist in fleshing out the ideas put forth in the strategy as well as key information needed to move into implementation of the strategy.
Step 4: Fund	Appendix B 4.2 to 4.3	Funder Engagement Inventory	Matrix Worksheet	This worksheet can help the project team identify and strategize funding sources.
	Appendix B 4.4 to 4.5	Local Funding Source Inventory	Matrix Worksheet	This worksheet enables the project team to identify local funding sources, such as the general fund or capital improvements budget.
	Appendix B 4.6 to 4.7	Foundation and Other Grant Funding Alignment	Matrix worksheet	This worksheet enables the project team to identify private organization or other grant funding opportunities.
*These materials are in Appendix B of the Regional Resilience Toolkit document.				

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Guidance Checklists

This section features checklists that jurisdictions may use to guide themselves during a variety of scenarios to ensure they incorporate resilience planning into their planning documents and regulatory codes. The following are some potential scenarios that could cause a jurisdiction to consider an update to its plans or codes to include discussions of adaptation and resilience to climate-related hazards:

A government agency has issued an emergency or disaster declaration in response to a climate-related hazard event.

A representative from a local jurisdiction wants to apply for mitigation grant funding to enact a resilience project.

A local jurisdiction is preparing for its budgeting process and wants to allocate funds for a resilience project.

A local jurisdiction is updating its planning documents and needs to incorporate discussions of resilience as required by law.

How to Update Plans When a Disaster Has Been Declared

If a local jurisdiction's city council or board of supervisors (or director of emergency services if the city council/board of supervisors is not in session), the State of California, or the United States government declares a state of emergency, take the following steps:

- ☐ Update **Attachment 1** with information about the disaster or incident. Include information about the impacts of the emergency, including impacts that occur both within and outside of the borders of the jurisdiction.
- ☐ Collaborate with local emergency services officials, California Office of Emergency Services, and/or the Federal Emergency Management Agency (FEMA), depending on both the extent of the emergency event and the level of government which issued the emergency declaration.
- ☐ Rebuild or repair any local infrastructure or facilities owned by the jurisdiction to be more resilient in accordance with local adopted plans or guidance from other resources.
- ☐ Identify any deficiencies in infrastructure or emergency services that may have contributed to significant physical damage, substantial injuries, or death. Itemize a list of actions and develop draft programs to include in the next update of the jurisdiction's general plan safety element or other appropriate plans.
- ☐ Update the jurisdiction's general plan safety element, housing element, or land use element; local hazard mitigation plan; emergency operations plan; or any other planning documents or regulations that may be relevant (see "How to Incorporate Resilience into Planning Documents or Regulatory Frameworks," below).

How to Apply for Grant Funding

- ☐ Identify the grant program of interest. Review the requirements of the grant and determine whether the jurisdiction meets basic criteria.

- ☐ If basic criteria are met, confirm that the grant program is still receiving applications. Consult with the granting agency or organization and inquire whether the filing period is still open and when it ends.
- ☐ Review the jurisdiction's stated resilience and adaptation goals and how the grant award could be used to fund any projects, programs, or other efforts that would increase the community's resilience and capacity to adapt to hazard events, including climate-related ones. Cross-reference these considerations with the grant's stated application requirements and synthesize an application that bridges the resilience goals with the application requirements.
- ☐ Coordinate with the granting agency or organization to compile and submit application documents.
- ☐ If monitoring or reporting activities are required by the granting agency or organization, designate an individual or team to keep track of all expenditures and implementation progress. Submit reports as required by the granting agency.

How to Incorporate Resilience Planning into Jurisdictional Budgeting

- ☐ Review and compile a list of any resilience projects identified by the jurisdiction's general plan safety element, local hazard mitigation plan, or any other document. Consult with the jurisdiction's staff across all departments to confirm that the list is up to date.
- ☐ Remove any projects that have been completed and do not require ongoing maintenance work and note any projects that are underway. Evaluate which projects may be the most urgent given current or expected conditions.
- ☐ For each proposed project, identify the project cost, the initial timeline, and the agency responsible for implementing and/or monitoring the project.
- ☐ Present list of capital improvement projects containing resilience components to staff responsible for drafting the jurisdiction's capital improvement plan. Ensure that the most urgent projects are adopted by the jurisdiction's legislature (city council or board of supervisors).

How to Incorporate Resilience Planning into Planning Documents or Regulatory Frameworks

Safety Element

- ☐ Note if the housing element and/or local hazard mitigation plan are being updated. If so, prepare the safety element for a review process.
- ☐ Also note if the safety element has been updated since January 1, 2017. If so, note if (1) the safety element has vulnerability assessment for climate-related hazards and (2) the safety element has a set of goals, policies, and objectives to address the identified hazards in the vulnerability assessment. If not, ensure that the update to the safety element includes both components.
- ☐ Review the official guidance in California Government Code Section 65302(g)(1) for general plan safety elements.
- ☐ Check to see if any new data on natural hazards, including climate-related hazards, are available.
- ☐ Ensure that the jurisdiction's evacuation network is up to date and reliable and make modifications as needed to account for changes to infrastructure systems, land uses, and areas at risk of hazards.
- ☐ Review the mapping of known hazard-prone areas in the community. Insert updated maps if more recent mapping data are available.
- ☐ Identify any residential areas with fewer than two evacuation routes.

How to Incorporate Resilience Planning into All Other Documents or Regulatory Codes

- ☐ Identify the reason for incorporating resilience into the document or regulatory code in question, such as State law requirement, voter initiative, recent hazard event, consistency with updates to another document, etc.
- ☐ Review the official guidance (if any) for the document's or code's development.
- ☐ Convene a project team to review the currently adopted document or code (if this is an update). Itemize any areas that are inconsistent with resilience requirements or any policies related to resilience that are not working as originally planned. Determine the scope of revisions.
- ☐ Decide whether an outside consultant is needed for technical assistance. If so, the jurisdiction should select consultant(s) promptly, no later than a few months after the beginning of the project.
- ☐ Review any vulnerable populations in the community and decide whether it is necessary to include discussions specific to how hazards might impact them.
- ☐ Determine the level of community engagement that may be required. Small, targeted plan updates may only need minor revisions with minimal public review. Large-scale or complete updates of documents should involve the full participation of the community. For a large-scale or complete document update, develop a community engagement strategy that includes in-person and online engagement strategies, sample materials, and ideas for meetings and workshops. Draft community surveys, text for web pages and press releases, and other materials that will encourage the community to participate.
- ☐ Use **Attachment 2** to help identify any deficiencies or out-of-date content in the documents, and draft text and/or create new maps or figures that will address these problems and make the documents more up to date.
- ☐ Incorporate feedback from the community into the document or code, as feasible.
- ☐ Compile the proposed changes to the document or code and present the revisions to the planning commission for final public comment. Collect any final revisions and incorporate them into the draft.
- ☐ Transmit the documents to any relevant State or federal agencies for review and approval (if needed).
- ☐ Present the final version of the document or code to jurisdiction's legislature (city council or board of supervisors).

Attachment 1: Hazard Event Information Table

Date	Location	Impacts*	Declaration Details**
* Include number and type of injuries; deaths; type and length of services disruptions; and extent and cost of damages to physical assets, buildings, infrastructure, or property. **If a government agency declared an emergency, note the agency that issued the declaration, the area it addressed, and the length of the declaration.			

Attachment 2: Planning Document Maintenance Table

Document	Is any content inconsistent with new planning law requirements or new guidance document?	Is there new resilience-related content that could be added?	Can these plans address any recent problems or community conditions caused by climate-related hazards?	Are there any other additions, updates, or revisions that need to be made?
General Plan – Land Use Element				
General Plan – Circulation Element				
General Plan – Housing Element				
General Plan – Conservation Element				
General Plan – Open Space Element				
General Plan – Safety Element				
General Plan – Environmental Justice				
General Plan – Air Quality				
Local Hazard Mitigation Plan				
Capital Improvement Plan				
Active Transportation Plan				
Urban Water Management Plan				
Emergency Operations Plan/Emergency Management Plan				
Building Regulations				

Vulnerability Assessments

For the complete vulnerability assessments for the WRCOG and SBCTA subregions, visit the following websites.



Western Riverside County Vulnerability Assessment:

http://www.wrcog.cog.ca.us/DocumentCenter/View/7478/Western-Riverside-Adaptation-and-Resiliency-Strategy_Vulnerability-Assessment



San Bernardino County Vulnerability Assessment:

<http://www.wrcog.cog.ca.us/DocumentCenter/View/7477/San-Bernardino-County-Vulnerability-Assessment>

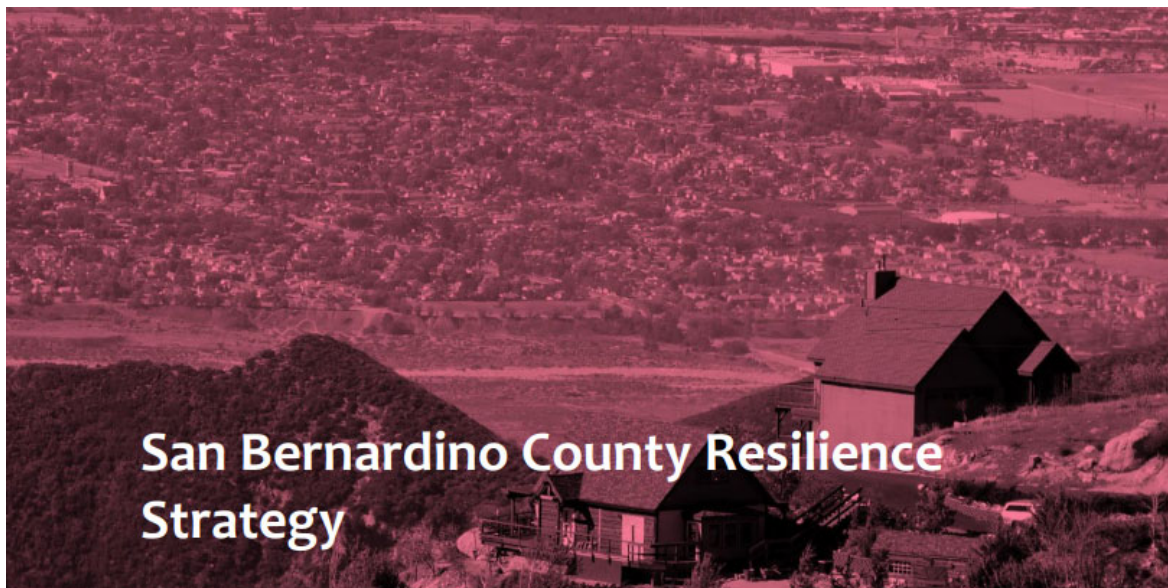
Adaptation Strategies

For the complete adaptation strategies for the WRCOG and SBCTA subregions, visit the following websites.



Western Riverside County Vulnerability Assessment:

http://www.wrcog.cog.ca.us/DocumentCenter/View/7538/WRCOG-Adaptation-and-Resiliency-Strategy-Part-2-Adaptation-Strategies_FINAL



San Bernardino County Vulnerability Assessment:

http://www.wrcog.cog.ca.us/DocumentCenter/View/7660/San-Bernardino-County-Resilience-Strategy2019_FINAL

Endnotes

Chapter 1

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- ² Representing the incorporated cities and unincorporated communities of San Bernardino County.
- ³ San Bernardino County Vulnerability Assessment:
<http://www.wrcog.cog.ca.us/DocumentCenter/View/7477/San-Bernardino-County-Vulnerability-Assessment>
- ⁴ San Bernardino County Resilience Strategy: http://www.wrcog.cog.ca.us/DocumentCenter/View/7660/San-Bernardino-County-Resilience-Strategy2019_FINAL
- ⁵ Western Riverside Council of Governments Subregional Climate Action Plan:
<http://www.wrcog.cog.ca.us/DocumentCenter/View/188/Subregional-Climate-Action-Plan-CAP-PDF?bidId=>
- ⁶ At the time of writing, the current General Plan Guidelines in effect are those published in 2017.
- ⁷ WRCOG-SBCTA Regional Climate Adaptation Toolkit: <https://resilientca.org/projects/3bb95b94-a4c8-4138-b0d0-12c1adf99033/>
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- ⁹ Full text of SB 1035 (2018):
http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB1035
- ¹⁰ Full text of AB 747 (2019): https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB747
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