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CALIFORNIA'S FIFTH
CLIMATE CHANGE
ASSESSMENT

Climate-Induced Human Displacement and Migration Statewide Topical Report

A Statewide Topical Report for California's Fifth Climate Change Assessment

Coordinating Agency

CA Governor's Office of
Land Use and
Climate Innovation

About California's Fifth Climate Change Assessment

California's Climate Change Assessments are the state's scientific foundation for understanding future climate-related vulnerability across California's regions and systems. Senate Bill 1320 (Stern, 2020) requires the State to report the impacts and risks of climate change across California at least every five years, beginning with California's Fifth Climate Change Assessment (Fifth Assessment). Building on decades of climate research and previous Assessments, the Fifth Assessment presents new findings about California's climate future, with a dedicated focus on Tribal partnerships, public engagement, and communities most vulnerable to climate impacts.

The Fifth Assessment's research and tools are designed to fill knowledge gaps about California's climate future, inspire strategic climate actions, and shape planning, investments, and policies at the state, regional, and local scales. Guided by research priorities identified by state, Tribal, and local leaders, community representatives, and subject matter experts, its findings are designed to help illuminate potential climate futures, the challenges they may present, and the opportunities to build resilience through adaptation pathways.

For the full suite of Fifth Assessment research products, please visit: www.ClimateAssessment.ca.gov.

Purpose of the Statewide Topical Reports

The Fifth Assessment Statewide Topical Reports highlight issues of statewide significance and how the impacts and risks of climate change affect human and natural systems. These reports deepen our understanding of critical and cross-cutting topics in California, including racial equity and climate justice, climate impacts to tribal and indigenous communities, climate-induced human displacement and migration, and climate impacts to the economy. They also highlight opportunities to build adaptation capacity and resilience to climate impacts in ways that can inform state and local planning, policy, and action, vulnerability assessments, adaptation planning, and community resilience efforts.

CALIFORNIA'S FIFTH
CLIMATE CHANGE
ASSESSMENT

Map of California

Climate Change Assessment Regions

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Any references in this Assessment to the lingering and compounding effects of racism and discrimination are drawn from academic literature and are not factual findings of, or legal determinations by, the State of California or any agencies of the State, of prohibited discrimination in any particular instance. Similarly, any descriptions of potential future harms are not findings of or admissions by the State of California or any agencies of the State.

The research was reviewed by expert reviewers, Tribal Advisory Group members, and approved by an external editorial board to ensure scientific rigor as well as appropriate representation of the practitioners and partners to whom each report applies.

Use of Artificial Intelligence (AI):

No AI tools were used in the preparation, review, or editing for this report.

Highlights

Climate change is already influencing patterns of human displacement and migration across California. Wildfires, flooding, extreme heat, drought, sea level rise, and their interaction with key infrastructure and services as well as existing social and regional inequities, shape whether residents remain in place, relocate temporarily, or migrate permanently. The resulting displacement pressures and outcomes are unevenly distributed, with renters, low-income households, undocumented residents, Tribal communities, rural populations, and workers in climate-exposed sectors facing heightened risk and pronounced impacts.

Globally, these dynamics are expected to scale substantially over coming decades, with projections suggesting up to 1.2 billion people could be climate-displaced by 2050 and an estimated 20–30 million people already displaced annually by climate-related events. In the US, disaster-related displacement already occurs at large scale, with millions of people experiencing evacuation or relocation each year due to wildfires, floods, hurricanes, and extreme heat events (Zurich Insurance Group, 2024).

California is already experiencing large-scale climate-related displacement pressures. During the major wildfire events of 2017–2019, more than one million Californians were ordered to evacuate, illustrating the scale at which wildfire risk can disrupt housing, transportation, schooling, employment, and community life across the state, and underscoring that California is operating within a broader national and global context of climate mobility (Wong et al., 2020).

Despite the intensification of these dynamics, climate-induced migration and displacement are not yet systematically integrated into state and regional adaptation planning, thus limiting the capacity to anticipate impacts, respond in equitable and coordinated ways, and build resilience in sending and receiving communities alike.

This report synthesizes current evidence on the drivers, pathways, and consequences of climate-induced displacement and migration in California, spanning intra-California mobility, interstate migration, and international migration to and from California. Drivers refer to the climatic, social, economic, and political factors that influence displacement pressures and mobility decisions; pathways refer to the forms, timing, and geographic patterns through which mobility occurs; and consequences refer to the resulting impacts on individuals, communities, infrastructure systems, public services, and regional economies.

This report focuses on vulnerable regions and communities as well as the interconnected challenges for key sectors, including housing, emergency management, transportation, energy and water, health, education, labor and employment, and community identity and cohesion.

This report also includes case studies where policies have been designed for planned adaptation—creating proactive, equitable, and resilient strategies for communities before emergencies occur.

Statewide Findings and Takeaways

- **Pathways and Drivers of Climate-Induced Displacement**
  - Climate-induced displacement in California occurs through multiple pathways, including sudden-onset disasters (e.g., wildfires, floods), slow-onset environmental degradation (e.g., extreme heat, groundwater decline, sea level rise), and compound events (e.g., sea level rise and subsidence together increasing vulnerability to earthquakes through increased liquefaction).
  - Displacement is rarely driven by a single factor. Instead, migration pressures emerge from compounded stresses across systems (e.g., housing, energy, water, transportation, health, education, and employment) that collectively undermine long-term habitability, economic stability, and community cohesion.
- **Housing as a Central Displacement Mechanism**
  - Statewide housing precarity already places a large share of residents at elevated displacement risk. For example, an estimated 1.7 million Californians at 80% area median income or below are at high or extreme risk of displacement due to housing precarity (Urban Displacement Project, 2022).
  - Housing systems are a primary mechanism through which climate impacts translate into displacement. Renters face disproportionate risk due to rent increases, lease non-renewals, habitability failures, and informal eviction, often even when housing units remain physically intact. Post-disaster housing markets can accelerate displacement through speculative activity and uneven enforcement of tenant protections.
  - In recreation-dependent regions, climate volatility can intensify housing pressure by accelerating the growth of second homes and short-term rentals, reducing the availability of stable workforce housing. As a result, climate-related disruption in tourism can translate into worker out-migration even when homes are not physically destroyed (e.g., through reduction in snowpack leading to declining low- and middle-income wages and service worker livelihoods).
- **Infrastructure and Essential Services Shaping Displacement Risk**
  - Energy and water systems play a central role in shaping displacement risk. Power shutoffs, groundwater depletion, water contamination, and infrastructure failures can undermine community stability, particularly in rural and Tribal communities. For more on Tribal communities, please see the Fifth Assessment's "Tribal and Indigenous Communities Statewide Topical Report".
  - Transportation systems influence both emergency evacuation and long-term recovery. Transit-dependent households, rural residents, and people with disabilities face barriers during evacuations, while displaced residents in receiving communities often encounter ongoing mobility constraints that limit access to jobs, schools, and services.
  - Emergency management and disaster assistance frameworks systematically exclude certain populations, including renters, undocumented residents, unhoused individuals, informal workers, people with limited English proficiency, people with disabilities, and some Tribal communities. These exclusions increase the likelihood that short-term disruption will become long-term or permanent displacement or entrench the condition of homelessness. Local knowledge and trusted messengers often determine whether emergency response systems actually reach the people most at risk.

- **Social Impacts: Health, Education, and Community Life**
  - Climate-related displacement has significant implications for health, education, and political life. Displaced populations experience heightened mental and physical health risks, disruptions in access to care, and interruptions to educational continuity, with long-term consequences for well-being and opportunity.
  - These disruptions also extend into civic and political life, including reduced access to voting, weakened representation in local governance, and diminished ability to participate consistently in community decision-making. For example, in wildfire-affected rural communities, repeated displacement and uneven recovery processes can fragment local governance capacity and reduce sustained civic engagement.
  - Community identity, governance capacity, civic participation, and social cohesion are critical yet under-measured dimensions of displacement. Displacement can erode cultural continuity and trust in institutions, particularly for Tribal communities and historically marginalized groups. For more on historically marginalized groups, please see the Fifth Assessment's "Racial Equity and Climate Justice Statewide Topical Report."
- **Labor, Livelihoods, and Economic Transitions**
  - Labor markets and economic structures shape both voluntary and forced migration decisions. Workers in climate-exposed and fossil fuel–dependent sectors face intersecting risks from environmental hazards and economic transition. Uneven or absent “just transition” planning (see the *Just Transitions* section in *2.5 Labor and Employment*) can exacerbate economic instability and displacement pressures. For more on labor markets and economic structures, please see the Fifth Assessment’s “Climate Impacts to the Economy Statewide Topical Report”.
  - Recreation- and tourism-dependent regions face distinct climate-induced displacement risks such as wildfire smoke, park closures, declining snowpack, and other impacts destabilize seasonal employment and income continuity for workers, including those who already face housing precarity.
  - Climate-related mobility can also generate uneven regional economic effects, as communities receiving evacuees or displaced residents may experience temporary increases in demand for lodging, services, and local businesses, alongside added pressures on housing and infrastructure.
- **Data, Planning, and Governance Gaps**
  - California lacks integrated data systems to track climate-induced displacement and migration, both forced and voluntary. Displacement is often undercounted, especially for slow-onset migration, limiting the state’s ability to plan proactively and equitably.
  - Current adaptation planning rarely incorporates migration and displacement explicitly. This disconnect constrains anticipatory action, reinforces reactive responses, and increases the risk that climate impacts deepen existing inequalities.
  - Addressing climate-induced displacement requires a cross-sectoral, forward-looking approach. Aligning climate adaptation, infrastructure investment, housing stability, labor transitions, and community-based governance can reduce displacement risk while strengthening the resilience of sending and receiving communities.

Regional Findings and Takeaways

- **North Coast**
  - Catastrophic wildfires in Northern California have produced large-scale displacement with particularly severe impacts in rural, forested, and mountain-adjacent communities where limited evacuation routes, housing loss, and infrastructure constraints intensify vulnerability. At the same time, low-lying coastal communities face increasing exposure to sea level rise, coastal erosion, and flooding, which may generate additional long-term displacement pressures.
  - Displacement in these contexts is often compounded by geographic isolation and limited recovery capacity.
- **Sacramento Valley**
  - Wildfire events such as the Camp Fire have resulted in large-scale displacement, especially in rural and foothill communities where evacuation constraints and infrastructure limitations amplify impacts.
  - Rebuilding has often favored higher-value, owner-occupied housing, excluding many renters and low-income households from returning, while nearby cities such as Chico have absorbed displaced residents and experienced pressure on housing, water, and transportation systems.
- **San Francisco Bay Area**
  - Sea level rise poses long-term displacement risks for low-lying shoreline communities and critical infrastructure in the Bay Area and Sacramento-San Joaquin Delta regions.
  - Adaptation planning efforts indicate that future displacement may occur not only through acute disasters, but through planned infrastructure decisions, land-use change, and housing market pressures linked to climate adaptation.
- **San Joaquin Valley**
  - Communities in the San Joaquin Valley face intersecting risks from extreme heat, drought, and flooding that disrupt housing stability, agricultural labor markets, and health.
  - These stressors often produce constrained mobility, where residents experience high exposure to climate impacts but lack sufficient resources or institutional support to relocate safely or permanently.
- **Central Coast**
  - Recurrent flooding in the Pajaro River watershed has produced repeated displacement, particularly among farmworker and immigrant communities.
  - Chronic infrastructure failures in Pajaro Valley and Monterey County, combined with limited access to disaster assistance and affordable housing, have transformed flooding from an episodic hazard into a persistent driver of housing instability.
  - Wildfire and mudslide events in Ventura and Santa Barbara Counties have also displaced undocumented and low-income households, where community-based disaster relief funds have played a key role in immediate recovery.
  - Sea level rise and coastal erosion pose additional long-term risks for low-lying coastal communities and infrastructure throughout the region.

- **Sierra Nevada**
  - Tourism-dependent communities in the Sierra Nevada face displacement pressures driven by wildfire risk, smoke-related closures, and declining snowpack that undermine tourism-based employment and local revenues.
  - Even when housing is not directly destroyed, repeated disruptions contribute to worker out-migration through income instability, seasonal job loss, and severe workforce housing constraints.
- **Los Angeles**
  - Wildfires in and around Los Angeles County highlight how transportation systems shape short-term displacement and evacuation capacity, particularly for residents without access to private vehicles. Transit shutdowns, temporary fare relief programs, and emergency transportation adaptations directly influence residents' ability to evacuate, relocate temporarily, and maintain access to employment and services during disasters.
- **San Diego**
  - San Diego faces increasing exposure to wildfire risk and extreme heat that can destabilize housing security and public health. These hazards disproportionately affect renters and lower-income households, who face greater barriers to evacuation, recovery, and long-term relocation when disruptions occur.
  - The region's coastal communities and infrastructure also face growing exposure to sea level rise and coastal flooding, creating additional long-term displacement risks.
- **Inland Deserts**
  - Inland desert communities face intensifying risks from extreme heat, drought, and infrastructure stress that affect housing stability, health outcomes, and economic security.
  - These conditions can produce gradual displacement pressures, where long-term environmental stress and resource constraints limit residents' ability to remain in place.

Table of Contents

Highlights.....7
Table of Contents.....12
Introduction 13
Glossary 21
Part 1: Infrastructure & Services.....24
1.1 Housing.....25
1.1.1 Housing Market Impacts on Displacement and Housing Stability 26
1.1.2 Climate Impacts and Push and Pull Factors.....27
1.1.3 Current Responses.....38
1.1.4 Adaptation Opportunities 39
1.2 Emergency Management.....40
1.2.1 The Structure of Emergency Management 40
1.2.2 Climate Impacts and Push and Pull Factors.....42
1.2.3 Current Responses.....42
1.2.4 Adaptation Opportunities 47
1.3 Transportation 48
1.3.1 Climate Impacts and Push and Pull Factors.....50
1.3.2 Current Responses.....52
1.3.3 Adaptation Opportunities 55
1.4 Water and Energy 56
1.4.1 Climate Impacts and Push and Pull Factors.....57
1.4.2 Current Responses.....61
1.4.3 Water Security in Response to Drought and Wildfires.....63
1.4.4 Adaptation Opportunities 64
Part 2: Social & Community Wellbeing.....66
2.1 Health.....67
2.1.1 Climate Impacts and Push and Pull Factors.....67
2.1.2 Current Responses.....72
2.1.3 Adaptation Opportunities 73
2.2 Education.....74
2.2.1 Climate Impacts and Push and Pull Factors.....74
2.2.2 Current Responses.....78
2.2.3 Adaptation Opportunities 80
2.4 Community Identity.....80
2.4.1 Historical and Current Context.....81
2.4.2 Climate Change Impacts, Displacement, and Relocation 82
2.4.3 The Community Identity and Resilience Connection 84
2.4.4 Current Responses.....85
2.4.5 Adaptation Opportunities 87
2.5 Labor and Employment 87
2.5.1 Climate Impacts and Push and Pull Factors.....88
2.5.2 Current responses 92
2.5.3 Adaptation Opportunities 93
Findings and Gaps.....94
Conclusion 105
References 107

Introduction

Climate change is reshaping communities, landscapes, and livelihoods across California. As rising temperatures, intensifying storms, protracted droughts, sea level rise, and shifting precipitation patterns escalate, residents in vulnerable regions increasingly face difficult choices: whether to stay and adapt, relocate temporarily, or migrate permanently. This phenomenon, climate-induced human displacement and migration, is emerging as one of the most complex and consequential challenges for the state.

Short- and Long-Term Climate Impacts and Migration Vulnerabilities

Climate-induced human displacement and migration unfold across distinct time scales. Short-term impacts are typically driven by sudden-onset or episodic climate events (e.g., heatwaves, floods, storms, or wildfires) that require emergency evacuation or temporary relocation. These events often trigger rapid, unplanned movement, placing immediate strain on emergency management systems, transportation networks, shelters, healthcare services, and housing availability. While some residents voluntarily relocate in advance and some displaced residents can return, others face prolonged instability due to damaged housing and infrastructure disruption.

Longer-term impacts, in comparison, emerge from slow-onset or cumulative climate stressors that progressively undermine the viability of remaining in place. Protracted drought, chronic wildfire exposure, groundwater depletion, and water quality degradation (e.g., soil salinization associated with sea level rise) can erode livelihoods, housing security, and public services over time. These conditions may not prompt immediate evacuation, but they create sustained pressures that drive more permanent forms of migration, both forced and voluntary, reshaping settlement patterns, labor markets, and regional demographics.

Importantly, short- and long-term impacts are often interconnected, with displacement pressures intensified by overlapping or cascading hazards such as flooding following wildfire or extreme heat occurring during drought conditions. These interactions can compound vulnerability to displacement and migration: repeated exposure to acute events may accelerate longer-term forced migration by amplifying financial loss while chronic environmental degradation can heighten vulnerability to sudden shocks.

Although the specific hazards vary across regions, the displacement dynamics associated with major climate-related disasters—including evacuation, temporary sheltering, housing disruption, infrastructure damage, and uneven recovery outcomes—are often comparable across events. As a result, lessons from climate-related displacement following hurricanes and other disasters outside California can provide valuable insights for understanding mobility responses to hazards more common within the state, such as atmospheric-river flooding, extreme heat, and wildfires.

Recognizing these distinctions and their interaction, as well as lessons afforded from elsewhere, helps to design policies that move beyond reactive emergency response toward anticipatory, equitable, and durable strategies for managing climate-related human mobility.

Current and Projected Climate Impacts and Migration Outcomes

Globally, human mobility tied to climate stressors is expected to scale substantially over coming decades, with projections suggesting up to 1.2 billion people could be climate-displaced by 2050 and an estimated 20–30 million people are already displaced annually by climate-related events. In the US, disaster-related displacement already occurs at a large scale, with millions of people experiencing evacuation or relocation each year due to wildfires, floods, hurricanes, and extreme heat events (Zurich Insurance Group, 2024).

In California, human mobility tied to climate stressors is not new. During the major wildfire events of 2017–2019, more than 1 million Californians were ordered to evacuate, illustrating the scale at which wildfire risk can disrupt housing, transportation, schooling, employment, and community life across the state, and underscoring that California is operating within a broader national and global context of climate mobility (Wong et al., 2020). Already, communities in the San Joaquin Valley confront repeated flooding and levee failures; coastal towns face chronic erosion and inundation; and rural areas grapple with wildfire impacts that reverberate through housing markets, labor systems, and local economies. These patterns underscore the multifaceted nature of climate-induced human mobility and the urgency of understanding such dynamics.

Empirical evidence from the California Fifth Climate Change Assessment (Fifth Assessment) data illustrates how these dynamics will likely intensify. Modeled projections based on downscaled CMIP6 (Coupled Model Intercomparison Project Phase 6) climate simulations from the Cal-Adapt: Analytics Engine document continued increases in extreme heat, wildfire risk, flooding, drought severity, precipitation variability, and sea level rise under multiple scenarios, with pronounced spatial variability across the state based on location, season, and timescale (Cal-Adapt Analytics Engine, n.d.). These projected patterns are illustrated in **Figure 1**, which shows the number of days exceeding 100°F (37.8°C) and the percentage of annual precipitation falling during very wet days across much of California between 2045 and 2074. Together, these projections highlight the growing exposure of communities to both chronic heat stress and intensified flood risk.

These projected trends are expected to exacerbate existing stresses on social and infrastructural systems that play a critical role in shaping whether people are able to remain in place, relocate temporarily, or migrate permanently. Taken together, the data suggests that climate-induced displacement and migration are foreseeable consequences of long-term climate change interacting with existing social and infrastructural conditions.

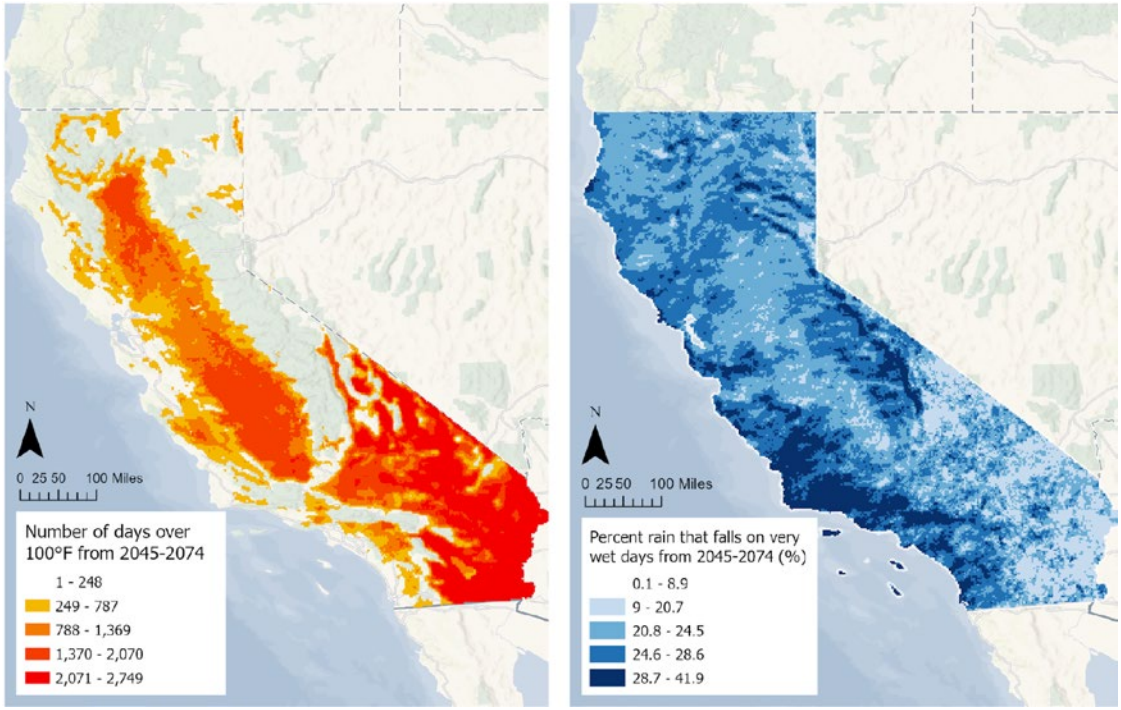

Figure 1: *Number of days over 100°F from 2045 to 2074 (left). Projected rain that falls on very wet days (rain that falls on days that have rain over the 95th historical percentile for rain) from 2045 to 2074, by percentage (right). Much of the state will experience over 2,071 days over 100°F (37.8°C) over a 30-year period, which amounts to 69 days per year on average. Source: LOCA 2 CA Hybrid Maximum Temperature Projections Data SSP370 and LOCA 2 CA Hybrid Precipitation Projections Data SSP370*

The urgency of these impacts is compounded by the fact that California is a magnet for internal migration (i.e., within the US and international migration driven by its large and diversified economy, major metropolitan labor markets, educational institutions, and established immigrant networks. Thus, while migration data from the US Census Bureau and Public Policy Institute of California show that California has experienced net domestic out-migration in recent years, the state continues to receive substantial inflows of international migrants and retains strong long-term migration linkages within the US (Johnson & McGhee, 2026). As climate stress intensifies in other regions, the state may experience increased inflows of climate migrants. At the same time, portions of the state may produce "climate push" migration, as residents depart for safer or more sustainable places within and beyond the state, potentially hastening broader trends of outmigration from the state (California Department of Finance, 2026).

These dynamics and pressures expose and amplify social, economic, and institutional inequalities, shaping who chooses to move, who is able to remain in place, who is forced to move, and under what conditions migration occurs. For example, vulnerabilities have been shaped by historical patterns of land dispossession, settlement, infrastructure investment, and resource governance. In California, settler colonialism fundamentally transformed Indigenous land systems through policies that displaced Tribal communities from ancestral territories, disrupted traditional resource management practices, and concentrated land ownership and political authority in non-Indigenous institutions. Subsequent land-use, water, and development policies often reinforced

uneven patterns of exposure and adaptive capacity. As a result, many communities that face heightened climate risks today—including numerous Tribal, rural, agricultural, and low-income communities—are also those whose vulnerability reflects long-standing histories of exclusion from decision-making authority, land access, and public investment.

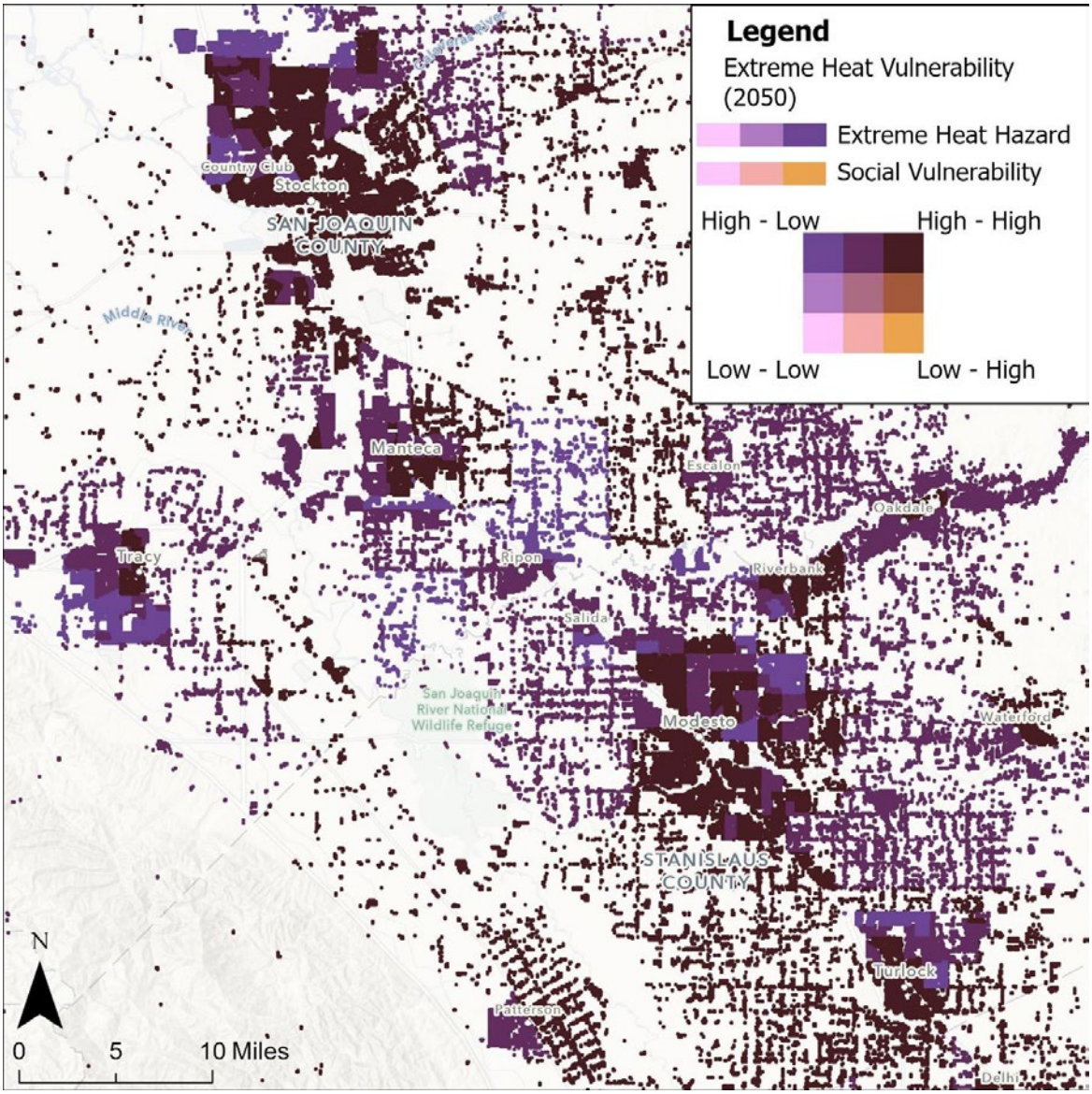

Figure 2: *Extreme Heat Vulnerability in the San Joaquin Valley (2050). The San Joaquin Valley is home to many climate vulnerable communities, particularly in the context of extreme heat. Legend shows the intersection between extreme heat hazard and social vulnerability. Source: Vulnerable Communities Platform.*

Ultimately, historically marginalized communities, including low-income households, undocumented residents (i.e., immigrants without adequate documentation), Tribal communities, and rural populations, are often disproportionately burdened by climate shocks while having fewer resources to adapt, recover, or relocate. And because forced migration decisions are mediated by social and economic vulnerability, understanding the geography—and historical

production—of such vulnerability is critical for assessing potential climate-related mobility. **Figure 2** identifies regions where projected climate hazards overlap with existing structural disadvantages. In places such as the San Joaquin Valley, the combination of extreme heat exposure and socioeconomic vulnerability may heighten displacement pressures by undermining livelihoods, increasing adaptation costs, and reducing households' capacity to remain in place safely and sustainably.

The intersections of outward, inward, and internal migration; short- and long-term climate impacts; and existing social and economic inequalities pose challenges across governance, infrastructure, health, housing, education, emergency management, and transportation. Addressing these challenges will require anticipatory planning, cross-sector coordination, and equitable, rights-based approaches to climate adaptation and human mobility.

Land Rights and Governance as a Lens for Understanding Climate Mobility

This report situates climate-induced mobility within a broader framework of land-based rights—the legal, political, and customary arrangements that determine who have authority over land, who can access it, and under what conditions people may remain, move, or return. These arrangements shape not only exposure to displacement, but also access to land, housing, infrastructure, and recovery resources that determine whether recovery, return, or long-term relocation is possible. The report draws on several bodies of practice that illustrate these dynamics. Post-disaster recovery and return policies show how land rights influence whether displaced households are able to reestablish themselves in their original communities. Planning processes that need meaningful community participation in relocation, adaptation, and land-use decisions demonstrate how governance structures can either protect or constrain local agency.

In California, contemporary land rights and governance systems are shaped by historical processes of settler colonialism that transformed Indigenous land tenure and authority. Policies such as the California Act for the Government and Protection of Indians (1850) facilitated the dispossession of Tribal lands and the reorganization of land ownership under state and private control. These shifts continue to structure uneven access to land, water, and infrastructure, with implications for differential vulnerability to climate impacts. In this context, Indigenous land governance frameworks in California and beyond highlight that, for many Tribal communities, relationships to land are inseparable from sovereignty, cultural continuity, and collective life, and that climate displacement often reflects long-standing histories of dispossession and constrained authority over ancestral territories (Haggerty, 2026).

These dynamics are reflected in existing Tribal climate adaptation and emergency preparedness practices in California, including Tribal hazard mitigation planning, evacuation planning, and community-based resilience programs such as the Pala Reservation Emergency Preparedness (PREP) initiative led by the Pala Band of Mission Indians. These efforts demonstrate that land governance and climate preparedness are already being actively operationalized within Tribal jurisdictions. International experience further reinforces these patterns. For example, efforts that integrate land restitution with post-conflict displacement responses demonstrate that durable

recovery and return depend on resolving questions of land tenure, access, and institutional authority alongside immediate humanitarian needs (Borras, 2026).

Taken together, these examples show that climate mobility is shaped by both environmental conditions and the land rights systems that structure access to land, housing, infrastructure, and recovery resources, as well as the conditions under which movement and return occur. This framing is used throughout the report as an organizing lens for understanding climate-induced displacement and migration.

Report Overview

This report examines the current and prospective dimensions of climate-induced human displacement and migration in California, including **intra-California mobility, interstate migration, and international migration to and from California**. It assesses the physical, social, and institutional drivers that precipitate movement; reviews case studies of affected regions (such as the Pajaro levee system, wildfire-prone areas, and rural agricultural regions); and highlights policy gaps, decision-making constraints, and systemic obstacles. It also articulates opportunities for California—across planning, funding, coordination, and equity frameworks—to mitigate harm, support resilient transitions, and address mobility in ways that strengthen communities.

The report is organized into two major parts:

Part 1: Infrastructure & Services addresses how the built environment and essential systems, including emergency management, energy and water, housing, and transportation, shape displacement dynamics and resettlement outcomes. These sections examine both the vulnerabilities that contribute to displacement and the adaptive capacities that can help stabilize communities.

Part 2: Social & Community Wellbeing focuses on the human dimensions of displacement, including community identity, education, health, and labor and employment. These sections highlight how migration intersects with equity, belonging, and opportunity, emphasizing the risks of deepening disparities and the potential for fostering resilience and cohesion.

The aim of this report is to explore outstanding questions about how climate change is shaping community displacement on short- and long-term timescales. In doing so, this report synthesizes findings from two often separate policy domains: (1) climate adaptation and resilience, and (2) the support, management, and regulation of migration. While adaptation and resilience planning has matured in many sectors, voluntary and forced migration and displacement are rarely integrated into adaptation and resilience strategies at the state or regional scale. This gulf inhibits anticipatory planning, leaves vulnerable populations unsupported, and may prompt reactive, piecemeal responses. This report seeks to catalyze a more holistic approach.

By seeking to reduce risks for those involuntarily displaced while strengthening the resilience of receiving communities–communities that absorb climate-induced displaced persons, short-term, long-term, or permanently–this report advances the notion of “two-way integration.” Through this approach, California can foster strategies that benefit all residents by investing in more robust and equitable infrastructure and services, and by reinforcing the social and community well-being

of those who relocate and those who host them. In this way, climate-induced displacement and both forced and voluntary migration can become an opportunity to build stronger, more inclusive communities across the state, rather than a source of strain or division.

In the pages that follow, this report:

- Traces the pathways through which climatic stressors induce displacement and migration, including sudden-onset disasters, slow-onset degradation, and compound events—and the processes that reinforce movement;
- Spotlights empirical examples across California—demonstrating how levee failures, wildfire migration, groundwater decline, and rural-urban pressures interact with institutional and social systems;
- Identifies critical gaps across data, governance, funding, cross-agency coordination, planning frameworks, and community engagement; and
- Proposes a suite of opportunities and recommendations to enhance California's capacity to anticipate, plan for, and respond to climate-related human mobility in an equitable, proactive manner.

This report is intended to serve as a resource for state and local decision-makers, planners, community organizations, and researchers. By elevating climate-induced human mobility as a strategic priority, California can harness foresight, cross-sectoral collaboration, and equitable and rights-based policy design to address one of the defining challenges of the century.

Glossary

For the purposes of this report, the authors use the following terms as defined below.

Climate Risk and Climate Shock: Climate risk refers to the probability or potential of adverse outcomes arising from climate-related hazards interacting with exposure and vulnerability. It represents the possibility that a climate-related event will occur and generate harm. Climate shock refers to the realization of that risk—that is, the actual occurrence of a climate-related event (often sudden and extreme) that produces measurable disruption or damage to assets, livelihoods, ecosystems, or wellbeing (De la Fuente, 2008).

Climate Vulnerability: Climate vulnerability describes the degree to which natural, built, and human systems are at risk of exposure to climate change impacts. Vulnerable communities experience heightened risk and increased sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts. These disproportionate effects are caused by physical (built and environmental), social, political, and/or economic factors, which are exacerbated by climate impacts. These factors include historical and ongoing oppression that operate on the bases of race, class, sexual orientation and identification, national origin, and income. In other words, vulnerability is not an inherent characteristic of individuals or communities, but a socially produced condition that influences how climate risks are experienced and distributed. Additionally, people facing multiple forms of marginalization and inequality will confront more intense climate change impacts and barriers to recovery (Integrated Climate Adaptation and Resiliency Program [ICARP], n.d.).

Precarity: A condition of persistent insecurity or instability in access to resources, livelihoods, housing, services, or legal protection that increases vulnerability to shocks and limits the capacity to adapt, recover, or remain in place. In the context of climate-induced displacement and migration, precarity describes the social, economic, and institutional conditions that make some individuals and communities more susceptible to displacement and less able to respond to climate-related hazards.

Community Identity-Resilience Nexus: Community identity refers to the shared sense of belonging, meaning, and mutual recognition that emerges from a community's relationship to its people, places, histories, and collective narratives; it is both a foundation of social resilience and a dimension of vulnerability when disrupted by displacement, inequity, or exclusion.

Climate-Induced Displacement: The involuntary movement of individuals, families, or communities as a result of climate-related hazards. It is often abrupt, disruptive, and destabilizing, forcing people into temporary shelters, unstable housing, or new geographies. Displacement differs from voluntary migration in that it is typically unplanned and reactive, leaving people with limited agency over the timing or conditions of their move.

Climate Migration: Movement in which climate change is a significant driver. Unlike displacement, which is often sudden and involuntary, climate migration can include preemptive or voluntary relocation, cyclical or seasonal movements, and both internal and international flows. It spans a spectrum from adaptive strategy to forced survival response.

Displacement vs. Migration vs. Forced Migration: Related forms of human mobility. Displacement is the involuntary movement of people from their homes or places of habitual residence due to actual or imminent harm and may be temporary or prolonged. Migration is the movement of people between places of residence, within or across political boundaries, regardless of motive or degree of choice. Forced migration refers to movement in which people have little or no meaningful choice but to relocate due to threats to their safety, livelihoods, or well-being. In this framing, displacement describes the experience of being uprooted, migration describes the broader category of movement, and forced migration describes the degree of coercion shaping the decision to move.

Typologies of Displacement Drivers: Acute, Slow-Onset, Direct, and Indirect

Climate hazards generate displacement pressures through different pathways:

- **Acute hazards** are sudden and high-intensity events such as hurricanes, wildfires, and flash floods. They can force rapid evacuation and mass displacement.
- **Slow-onset hazards** unfold gradually over years or decades, such as sea level rise, drought, desertification, or groundwater depletion. These create cumulative stress that eventually erodes the viability of living in place.
- **Direct drivers** are the immediate physical impacts of hazards that compel people to leave, for example, the destruction of homes, inundation of land, or imminent threats to safety.
- **Indirect drivers** are secondary pressures that arise in the aftermath of hazards or through broader systemic change. These include rising housing costs, loss of insurance, utility bill increases, job loss, or market speculation in safer neighborhoods.

This dual classification highlights that displacement is not only a product of the nature of the hazard (acute vs. slow-onset) but also of the mechanisms of impact (direct vs. indirect). They often combine. For example, an acute wildfire (hazard) may directly destroy homes, while also indirectly driving displacement through subsequent rent increases in neighboring safe areas.

Push Factors: Conditions compelling individuals or households to leave their place of residence. Push factors in California's climate context include wildfire risk, flood exposure, drought, and infrastructure deterioration that limits access to work, schools, or healthcare. They may also include post-disaster economic effects like reduced property values or loss of employment linked to infrastructure disruption.

Pull Factors: Conditions that attract people to a new location. In the context of climate mobility, pull factors include perceived safety from hazards, robust infrastructure, functioning transit networks, affordable housing, or stronger economic opportunity. Pull factors can also include the presence of resilience investments, such as reliable transportation and public services, which increase a region's adaptive capacity. Additionally, resilience investments, such as reliable transportation, climate-adapted infrastructure, and public services, can increase a region's adaptive capacity and attractiveness as a destination.

Planned Relocation: The intentional, organized movement of communities away from high-risk areas before hazards render them uninhabitable. Planned relocation is anticipatory, ideally participatory, and supported by long-term housing, livelihood, and cultural continuity strategies. At times it accepts withdrawal from hazard-prone areas as the most viable long-term adaptation.

It recognizes limits to defending or hardening infrastructure and raises ethical, economic, and cultural questions about loss of place.

Immobility: When individuals or communities remain in high-risk areas despite climate threats. Immobility may be voluntary, grounded in strong cultural ties or livelihood dependence, or involuntary, stemming from poverty, lack of access to housing elsewhere, health limitations, lack of transportation options, or restrictive immigration status. Immobile populations often face heightened vulnerability because they cannot use migration as an adaptation strategy.

Secondary (or Tertiary) Displacement: The repeated movement of people who have already been displaced, often due to inadequate temporary housing, recurring hazards, or unaffordable resettlement conditions. Multiple displacements compound trauma, destabilize education and employment, and erode social networks.

Receiving Communities: The towns, cities, or regions where displaced populations resettle. Receiving communities often face pressures on housing, infrastructure, and social services, but also benefit from new labor, cultures, and skills. Their readiness to equitably integrate newcomers is a key determinant of migration outcomes.

Sending Communities: Communities of origin that experience population outflows. These places may suffer economic decline, weakened governance, and reduced tax bases, but they also retain cultural significance for displaced populations and may become sites of return or ongoing connection.

Climate Gentrification: The process through which climate risks, adaptation investments, recovery efforts, or changing environmental conditions contribute to rising housing costs and neighborhood change that disproportionately displace lower-income residents and historically marginalized communities. Climate gentrification may occur when wealthier populations and investors move into areas perceived as more climate-resilient (e.g., higher elevation, less flood-prone), or when the costs of adapting to, insuring against, rebuilding after, or otherwise coping with climate hazards become unaffordable for existing residents. It underscores how climate adaptation and recovery, if not equity-focused, can exacerbate and produce new forms of displacement.

Resilience Hubs: Community-serving facilities that provide resources before, during, and after climate-related disruptions. Beyond shelter, food, and power, resilience hubs act as centers of social cohesion and collective response, reducing displacement pressures by helping people safely remain in place.

Two-Way Integration: A migration management approach that supports both displaced populations and receiving communities. Two-way integration emphasizes mutual benefit, equitable infrastructure investment, and shared resilience-building, reframing migration as an opportunity to strengthen communities rather than as a one-sided burden.

Governance Alignment: The coordination of agencies and jurisdictions responsible for climate adaptation, transportation, housing, and emergency management. Misalignment across state, regional, and local authorities can lead to fragmented responses and inequitable outcomes. Governance alignment ensures that transportation planning, evacuation management, and relocation policies function cohesively to support human mobility in a changing climate.

Part 1:

Infrastructure & Services

The sectors discussed in this part of the report encompass the built environment and essential services that support safe, stable, and functional daily living within climate-impacted and receiving communities alike. **Housing** explores climate-driven displacement and housing dynamics, including both permanent and temporary residential mobility; market impacts such as supply and price fluctuations; and critical issues related to rental vs. ownership, public housing, older or poor-quality units, mobile housing, temporary housing, and unhoused populations, while also considering strategic relocation strategies. **Emergency Management** examines how government disaster response interacts with community-level realities in shaping migration outcomes for displaced communities and those that receive them on a short-term basis. **Transportation** investigates the role of infrastructure in both causing and mitigating displacement, focusing on how it enables or obstructs safe resettlement, access to emergency services, and continuity in daily life for sending and receiving communities. **Energy and Water** addresses how climate change is disrupting California's energy systems and water supply, driving up costs for households and businesses, affecting urban growth, and shaping climate-induced displacement, migration, and resettlement.

1.1 Housing

In California, the crises of climate change and housing affordability are on a collision course. Slow-onset climate stressors and disaster shocks drive temporary and permanent migration and displacement, particularly of vulnerable populations. At the same time, California housing market dynamics—including the inability of incomes to keep pace with housing costs, insufficient construction of new market-rate and subsidized housing in dense urban areas, and the ineffectiveness of public policy and programs at stabilizing communities—also result in migration and displacement (Chapple & Loukaitou-Sideris, 2019).

Climate-induced migration and displacement can result in both the direct and indirect displacement of people from their homes and communities. Direct displacement occurs as a climate stressor or event physically destroys or damages property and infrastructure. Indirect displacement occurs from rising costs attributed to climate change. These might stem from increases in utility or insurance costs but also can come from housing stock shortages. Climate-driven shocks tend to drive direct displacement, while climate stressors create indirect pressure on the housing market that may destabilize communities (Cash et al., 2020). California has a variety of anti-displacement policies in place that encourage new housing development at all affordability levels in lower hazard locations and provide targeted disaster recovery and hazard mitigation programs (Chapple & Loukaitou-Sideris, 2021), but disaster recovery funds may arrive years after the disaster event, after many households have relocated.

This section examines climate-induced migration and displacement from the perspective of communities or neighborhoods, built housing stock, and residents. Some communities primarily send climate migrants while others primarily receive them, and many actually both send and receive, since displaced residents tend to relocate close to home whether temporarily or permanently. Housing markets, both the supply of housing available and the demand for units, shape migration and displacement directly (through supply shortages) and indirectly (through price increases). California also has a rich set of public policies, programs, and infrastructure

investments that together affect the ability of residents to stay in place. Yet, California regions are diverse, and private and public mechanisms to stem displacement vary widely.

The following first examines the housing market context in California and then looks at how different types of neighborhoods and housing stock experience migration and displacement under different climate shocks and stressors. The next section discusses mobility patterns, specifically where residents are temporarily or permanently displaced in response to different forms of climate change. After a discussion of the role of public and private sector interventions in spurring or mitigating displacement, the conclusion summarizes findings.

1.1.1 Housing Market Impacts on Displacement and Housing Stability

California has long struggled to build enough housing to meet demand (Landis, 2000). By 2021, the shortfall was an estimated 880,000 units, and by 2033, over a million additional units will be needed (Subin, 2024; Up for Growth, 2023). However, new housing construction in California is increasing, with annual new units rising from 90,000 in 2017 to 110,000 in 2024. In California, the media year built for housing is 1974, before contemporary building and safety codes were in place. Thus, newer housing is inherently more resilient to hazards than older housing (HCD, 2025a).

Although the precise displacement impacts of insufficient housing supply is still debated, supply shortages cause disproportionately large price increases (and thus rent burdens), disrupt normal filtering processes (i.e., instead of decreasing in quality and thus price over time, thereby becoming affordable to lower-income households, housing becomes more expensive), increase overcrowding, and exacerbate displacement (Been et al., 2025; Manville et al., 2022). Compounding the problem is the difficulty of building infill development in California due to a range of issues such as impact fees, site availability and assembly, and “not in my backyard” NIMBYist challenges (i.e., opposition by residents to proposed real estate or infrastructure developments in their local area), among others (Decker et al., 2020). This then pushes development into the wildland-urban interface (WUI), floodplains, and other high-risk areas (Chapple et al., 2021; Greenberg et al., 2021). Other factors affecting housing prices include building codes (e.g., energy efficiency and home hardening) and the increasing challenge of obtaining insurance (both discussed more below).

Even if its supply were adequate, the California housing market faces multiple issues related to demand. Particularly in geographically constrained areas such as the San Francisco Bay Area (which is also disproportionately impacted by sea level rise), housing development may be constrained and job growth tends to be rapidly and spatially concentrated, creating imbalances between the location of jobs and housing that results in long commutes and high housing prices in the urban core (Benner & Karner, 2016; Cervero, 1996; Chapple et al., 2004). The overbuilding of single-family homes in suburban areas has primarily benefited nuclear families, rather than other types of households, while also disrupting housing markets (as overhoused seniors age in place rather than letting housing filter to younger households) (Pfeiffer & Saadaoui, 2018). California’s rural and urban communities accommodate demand from tourists and second homeowners, despite the impact this has on local housing supply and prices (Swendener et al., 2024). The platform economy, including the ready availability of short-term rentals and the use of search websites such as Craigslist to obtain housing, tends to lead to exclusion and exacerbate shortages

(Boeing, 2020). California also has one of the lowest homeownership rates in the country, leaving a comparatively large share of households reliant on rental housing. Additionally, few renters carry insurance, leaving them more vulnerable to disaster losses (Shoag et al., 2023; US Census Bureau, 2026).

Because of these challenges in the California housing market, communities are ill-prepared to house temporary residents when a climate shock occurs. In the face of widespread housing affordability issues, Californians also tend to resist plans for strategic relocation (Bragg et al, 2021). Please refer to the Fifth Assessment's "Climate Impacts to the Economy Statewide Topical Report" for more detailed information about climate change and housing affordability.

1.1.2 Climate Impacts and Push and Pull Factors

California's diverse regions contain many different types of neighborhoods and housing types vulnerable to climate change and likely to act as impacted sending areas in the face of climate change (either slow onset or climate shocks) as the housing stock becomes uninhabitable and/or scarcity makes rental prices unaffordable. These include neighborhoods and housing in the WUI or floodplains; coastal, mountain, and desert areas; and built-up urban areas with heat island or environmental justice issues. In recent years, disasters have occurred with increasing frequency in these more vulnerable areas where residents and housing stock are inadequately prepared for climate instability. The following section looks first at how climate impacts different types of neighborhoods, and then at issues with different types of housing.

IMPACTS BY NEIGHBORHOOD LOCATION AND WEALTH

In the face of climate change, Californians of any economic background may be forced to leave home because of structural damage. Yet, outside of more affluent and exclusive coastal, mountain, and/or urban communities, most residents lack the capacity and resources to choose whether to adapt in place to climate stressors, rebuild post-disaster, or simply out-migrate. Systematic data on how many Californian neighborhoods adapt and rebuild and how many shrink or disappear are not available. However, research originally commissioned by the California Department of Housing and Community Development and recently updated by the Urban Displacement Project has estimated the overall displacement (i.e., heightened migration) and eviction risk across California neighborhoods (**Figure 3**) for low-income renter households.

Within this neighborhood-based framing of climate vulnerability, we also include Tribal reservations as a distinct but parallel category of place-based settlement. Like other communities analyzed in this section, reservations are spatially embedded in California's broader settlement system and are often located in or adjacent to high-risk landscapes, including wildfire-prone wildland–urban interface zones, floodplains, arid and semi-arid regions, coastal areas, and remote mountainous geographies. However, they differ from other neighborhood types in that their exposure is shaped not only by physical geography and development patterns, but also by the political geography of sovereignty, land tenure, and the long-term legacies of colonial dispossession, which structure both risk and mobility in distinct ways.

The Housing Precarity Risk Model uses machine learning to determine which variables are most strongly related to displacement and eviction at the household level and to predict tract-level displacement and eviction risk, where more low-income households are leaving than moving in; this reflects housing precarity, or a state of vulnerability or uncertainty about living arrangements. The model shows that approximately 2.3 million Californians at 80% area median income or below are at high or extreme risk of displacement or eviction (Urban Displacement Project, 2025). Moreover, many case studies document actual climate-induced out-migration and displacement, with a particular focus on vulnerable communities.

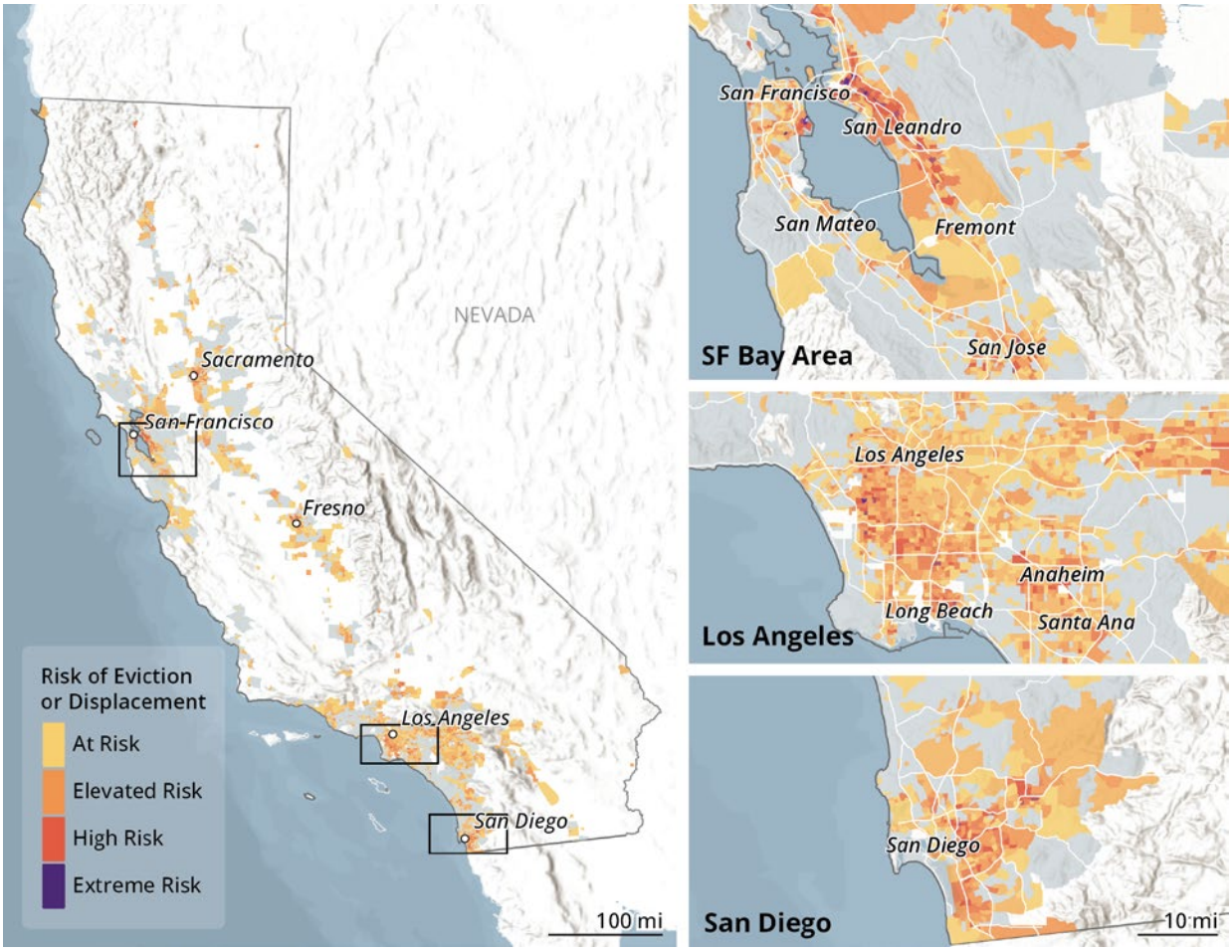

Figure 3: *Estimated displacement and eviction risk, focusing on the San Francisco Bay Area and Los Angeles and San Diego counties, each showing high displacement risk, 2022. Source: Housing Precarity Risk Model, Urban Displacement Project, 2025*

Overall, the model suggests that about 7% of the tracts, population, and housing units in California are at high or extreme risk of displacement due to housing precarity. The top variables explaining displacement and eviction risk include high rent burden, low household income, high share of renter and nonwhite population, and high share of multifamily housing.

Table 1: *California tracts, low-income population, and housing units by risk of displacement or eviction according to Housing Precarity Risk Model, Urban Displacement Project, 2025.*

Risk of Displacement or Eviction	% Tracts	% Population	% Housing Units
Low/No Risk	36.5	36.6	37.7
Early	30.0	29.4	29.6
Elevated	26.1	26.7	25.6
High	7.2	7.1	6.8
Extreme	0.3	0.3	0.2

Neighborhoods throughout the state are vulnerable to climate-related shocks of wildfire, storms, and floods, and landslides (e.g., in mountainous and coastal regions alike), as well as slow-onset climate stressors such as sea level rise, heat, and drought. Sea level rise is often experienced in its current phase primarily through episodic coastal flooding and high-tide ("nuisance") flooding events, as well as storm surge amplification. While these impacts are already increasing due to observed sea level rise over the past century, most coastal areas have not yet reached conditions of chronic inundation or permanent loss of land.

Table 2 thus analyzes the overlap between this displacement or eviction risk and various forms of climate risk by calculating the number of tracts, population, and housing units affected by each climate hazard and then determining if they are at risk (high or extreme) to displacement or eviction. We term this "double displacement": already on the verge of involuntary displacement because of unsustainable housing cost burdens, these households also experience disproportionate climate risks. Overall, over 400 tracts,1.9 million Californians, and almost 600,000 housing units are experiencing double displacement risks.

Table 2: *California tracts, low-income population, and housing units considered at high or extreme risk of displacement or eviction and their corresponding risk of climate hazards. Heat islands are defined by the California EPA as places with over 90 DegHourDays, (i.e., number of hours where the temperature is over the rural baseline divided by the number of days).*

Climate Factor	Tracts	Population	Housing Units
High or very high fire hazard	4	15,032	5,879
Landslides (1 or more)	1	2,939	1,229
100-year floodplains	121	595,525	177,439
Sea level rise of 3 feet	1	5,378	1,359
Heat island	87	378,282	123,670
Severe, extreme, exceptional drought	326	1,452,679	445,913
All climate risks	416	1,862,889	579,829

Sources: *State Responsibility Area Fire Hazard Severity Zones, Reported California Landslides, Sea Level Rise Map-Viewer, Urban Heat Island Interactive Maps, US Drought Intensity 2000 – Present, California FEMA 100-year Floodplains Map; Analysis by Karen Chapple.*

Due to the legacy of segregation, the siting of subsidized housing, and housing cost pressures, low-income and/or marginalized communities are often more likely than other residents to live in areas of higher risk to natural hazards. Residential areas in the WUI are most at risk of catastrophic fire yet are also experiencing rapid in-migration due to the lack of affordable housing supply in the state's urban centers (Berger & Susskind, 2018; California Wildfire Strike Force, 2019; Greenberg et al., 2021; NAIC, 2019). About 18,000 low-income residents in high or very high Fire Hazard Severity Zones or landslide hazards are also at high or extreme risk of displacement or eviction. This relatively smaller figure likely

reflects the concentration of higher-income households in some of the highest-risk WUI locations, including areas with second homes and high-value properties (**Table 2**).

In rapidly growing urban areas across California, housing shortages near urban cores have contributed to expansion into floodplains, where lower-cost housing is disproportionately located in higher-risk areas (Godschalk, 1999). Low-income homeowners are more likely to be underinsured for flood risk, increasing exposure to mortgage default and loss of home equity following flood events (Fitzmaurice et al., 2025; Liao & Mulder, 2024). Many disadvantaged communities are also disproportionately located near industrial facilities and hazardous material sites, increasing exposure to contamination during flood or storm events (Burby et al., 2003; Crowder and Downey, 2010).

Across California urban floodplains, roughly 600,000 residents at flood risk are also at high or extreme risk of displacement or eviction, illustrating how climate exposure and housing precarity combine to produce compounded displacement risk. California has among the lowest uptake of flood insurance in the entire country, despite having widespread outdated levees and low-lying development. California's interior riverine flood exposure is as great or greater than coastal flooding exposure. Many homeowners do not realize that home insurance does not cover flood-related losses. Additionally, many of California's high flood hazard areas, including around smaller tributaries and levees, are not included in FEMA's flood insurance maps, leaving households with inadequate information and protection (Neptune Flood, 2024).

Slow-onset climate stressors include heat and drought, with coastal flooding processes related to sea level rise representing a distinct but evolving risk category. Over two-thirds of California's population resides in coastal counties, which comprise only about 22% of the state's land area. At present, sea level rise primarily manifests through increased frequency and severity of high-tide flooding and storm-related coastal inundation, disproportionately affecting low-income communities and communities of color in some coastal zones (Curtis & Schneider, 2011; Hardy et al., 2017; Heberger et al., 2009). However, the transition from episodic flooding to chronic inundation and permanent land loss is a longer-term process that is not yet fully reflected in current migration or relocation patterns.

State climate resilience investments have totaled billions of dollars in recent funding cycles (e.g., $9+ billion in 2021–22) and are increasingly directed toward disadvantaged communities to address persistent inequities in exposure and adaptive capacity (California Air Resources Board, 2022; California Natural Resources Agency, 2022; U.S. GAO, 2021).

Overall, almost 5,400 residents experiencing sea level rise are at high or extreme risk of housing displacement or eviction (**Table 2**). This figure should be interpreted as reflecting present-day exposure to coastal flooding dynamics rather than full long-term displacement under scenarios of chronic inundation, which may significantly alter migration pressures in the future.

Urban heat island effects—where urban areas experience higher temperatures than rural peripheries by day but especially at night—also disproportionately impact low-income communities and communities of color, due in part to their lack of shade and vegetation (Jenerette, 2007; Jesdale, 2013; US Environmental Protection Agency, 2008). Neighborhood-level microclimates disproportionately impact vulnerable populations who are spatially concentrated, such as elderly, low-income, BIPOC, and other historically marginalized people (Harlan et al., 2006; Reid et al., 2009). California neighborhoods formerly redlined by the Homeowners' Loan

Corporation have on average higher land surface temperatures than non-redlined areas, in some areas by as much as 4°C (7.2°F) (Hoffman et al., 2020). Of the Californians living with heat risk, 380,000 are at high or extreme risk of displacement or eviction as well.

Rural areas also suffer from climate stressors. Multi-year drought events can displace farm laborers and farmers (Howitt et al., 2015). Heat waves can be particularly severe in the Central Valley, where Latinx farm laborer communities face high levels of heat exposure (Knowlton et al., 2009; Mera et al., 2015). Approximately 1.5 million residents at drought risk are at high or extreme risk of displacement or eviction as well. This again suggests the high vulnerability to these stressors and housing precarity.

As stated, Tribal reservations represent a distinct and often structurally underrepresented site and form of climate vulnerability that is not well captured by existing displacement models. As a result of colonial land dispossession and forced relocation, many reservations are located in hazard-prone geographies, including wildfire-exposed forests, floodplains, arid desert regions, coastal zones, and remote mountainous areas (Farrell, 2021). These conditions intersect with long-standing infrastructure deficits and under-resourced housing, water, energy, and emergency management systems, limiting adaptive capacity and evacuation options.

Additionally, for Tribal Nations, relocation away from reservation lands carries profound implications for sovereignty, place-based rights, and cultural continuity (Gilio-Whitaker, 2019; Whyte, 2018). In addition to physical displacement pressures, climate impacts can manifest as repeated evacuations, chronic disruptions to community life, or declining long-term habitability rather than permanent out-migration. Importantly, movement away from reservation lands can further disrupt Indigenous and Traditional Ecological Knowledges, weakening intergenerational cultural transmission and land-based practices (Whyte, 2018).

Due to their economic and social precarity, low-income, Tribal, and other marginalized communities are vulnerable, and thus likely to be forced to move when climate change makes the neighborhood uninhabitable. On the other hand, more affluent neighborhoods may house residents with the capacity and resources to adapt in place or rebuild. Case studies of recent climate disasters provide some evidence of preferences for staying in place. For example, after Santa Rosa's 2017 Tubbs Fire, the majority of homeowners chose to rebuild in place; some homeowners affected by Ventura's 2017 Thomas Fire also chose to rebuild in place, while others relocated, sometimes even to infill housing downtown (Chapple et al., 2021). Wealthy coastal communities planning for sea level rise are more likely to oppose the idea of strategic relocation than are less affluent areas (Bragg et al., 2021).

IMPACTS BY TYPE OF HOUSING STOCK

Households experience precarity not just due to personal vulnerability (e.g., related to age, health, education, race, and/or poverty), but also when living in housing stock that is particularly vulnerable to shock (Pendall et al., 2012). Push factors related to housing include property damage, utility disruption, and unsanitary conditions, among others (Paul et al., 2024). Particularly vulnerable housing stock to climate includes rental housing, substandard housing, public housing, rural housing, and factory-built homes like mobile homes.

After a climate shock, property owners have greater access to resources for rebuilding the community than renters (Chase & Hansen, 2021; Méndez et al., 2020). Yet displaced residents put pressure on the rental housing market, causing sharp price increases, while landlords are slower to renovate damaged rental units than homeowners are (Peacock et al., 2014). The costs of repairing buildings may be passed on to tenants in the form of increased rent, potentially displacing vulnerable renters (Hernandez & Phillips, 2015). The following section on Emergency Management delves further into preparedness, response, recovery, prevention, and mitigation as they relate to tenant vulnerabilities and protections and possible displacement and migration outcomes.

Poor quality or older housing stock, often found in more rural California areas, can also increase vulnerability to climate hazards. Low-income communities of color are disproportionately likely to rent substandard older housing with less maintenance, increasing the risk of structural collapse, damage, or bodily harm in a climate event (Burby et al. 2003; Fussell, 2015; Krause & Reeves 2017; Rosenbaum, 1996). Poor housing quality – specifically older, poorly insulated, and inadequately maintained units – exacerbates the disproportionate energy and utility burdens of low-income households, resulting in adverse health outcomes and compounding their need for relocation (Bednar, 2016; Boardman, 2013; DeShazo et al., 2021; Evans, 2004; Sencan, 2024). Simultaneously, outdated electrical infrastructure in substandard or temporary housing intended to provide a place to live for a brief period of time poses fire hazards, threatening the immediate safety of residents and raising the likelihood of sudden displacement due to structural failures (Rodriguez, 2024). In general, lower-income communities in California are less likely to have access to air conditioning than more affluent areas (Chen et al., 2020; Elmallah et al., 2024; Kim et al., 2021; Kim & Kim, 2023). However, lower cost housing in the WUI is not associated with disproportionate fire damage (Conlisk et al., 2024).

Public housing also suffers from serious maintenance backlogs that can exacerbate climate vulnerability and is also frequently sited in high-risk areas. For example, up to 9% of all subsidized or public housing projects are located in floodplains, often due to the availability of cheap land (Peri et al., 2017). While disproportionately less likely to be located in the WUI, subsidized housing units are disproportionately likely to be located in the hottest tracts in California (Gabbe & Pierce, 2020; Gabbe et al., 2020).

Mobile homes are particularly vulnerable to climate-induced storms (rain and wind), flooding, and heat (Kusenbach et al., 2010; Phillips et al., 2021; Pierce et al., 2022; Rumbach et al., 2020). Not only do mobile home parks concentrate socially vulnerable households, but they are also often overlooked in recovery plans (Rumbach et al., 2020).

Houseless residents are disproportionately exposed to climate shocks, particularly temperature extremes (Bezgrebelna et al., 2021). Organizations serving unhoused communities may be poorly prepared for disasters, which typically increase the unhoused population at least temporarily (Bezgrebelna et al., 2021; Gin et al. 2021). Please refer to the Fifth Assessment's "Racial Equity and Climate Justice Statewide Topical Report" for more detailed information about how unhoused populations are affected by the climate.

Rental Housing

In California, tenants and low-income community members contend with the biggest obstacles to become safely and permanently rehoused (Martín et al., 2023). Rising rent costs in California have historically led to displacement in vulnerable communities, prior to a disaster event. This reality

is exacerbated during and after climate-induced disasters due to rising rental costs and reduced housing stock availability. The vulnerability tenants face stems from socio-economic factors including racial bias in rental markets, price gouging in rental markets following disasters, gender-based wage gaps, and lower-income households spending more than the recommended one third of their income on housing, among other things (Arcaya et al., 2020).

Tenants also face barriers to accessing disaster relief funds compared to homeowners, cannot obtain adequate insurance to compensate for the financial impact post disaster, are often neglected by disaster mitigation programs, and are more likely to live in more affordable areas that experience heightened climate-induced disaster impacts such as floodplains and super-heated urban zones (Lee & Van Zandt, 2019). As **Figure 4** illustrates, areas with higher percentages of renters often overlap with 100-year floodplains, highlighting how climate-induced hazards disproportionately threaten tenants and exacerbate housing precarity. Improved tenant protections adopted by emergency management systems planners could mitigate displacement in such disaster-prone geographies (Brennan et al. 2021).

Without tenant protection policies, post-climate-induced disaster displacement is much more likely, including short term displacement and long-term relocation, as seen in Sonoma County in 2017 with 12% displacement from neighborhoods and 6% relocation outside of Sonoma County (Sharygin, 2020).

Price Gouging Protections

Currently, price gouging protections to prevent unnatural rent increases that tenants and displaced homeowners often experience in the aftermath of a climate-induced disaster are implemented in California once the Governor's Office declares a State of Emergency. Since California Penal Code Section 396, also known as the Price Gouging Statute, was passed in 1994, a few communities, such as Sonoma County in 2024, have passed Disaster Triggered Eviction Moratorium ordinances which prohibit evictions without cause temporarily after a disaster (Sisson, 2024). In communities that prohibit price gouging, there is greater community-wide housing stability and lower displacement numbers following climate-induced disasters (Stacy et al., 2021). Under the Price Gouging Statute, it is unlawful for a landlord to increase rent more than 10% post-disaster. While this protection is temporary, the intent is to prevent landlords from increasing rental costs that results in rental market destabilization.

Unfortunately, the price gouging prohibition alone does not generally prevent displacement due to lack of enforcement by local and state entities, poor understanding of the rules, and the existence of loopholes. Without an accompanying Just Cause Eviction ordinance or Disaster Eviction Moratorium, like the one Sonoma County enacted in 2024, tenants are frequently displaced due to rent increases that surpass the amount allowed under Penal Code 396. If utilized, Just Cause Eviction ordinances can prevent landlords from evicting a tenant without a good reason. In the aftermath of climate-induced disasters, tenants are systematically displaced from rental housing that was not directly impacted by the disaster event as a result of rental cost increases and reduced availability of rental units (Brennan et al., 2021). This displacement has been seen in all three of the largest fires in California in the past ten years—Tubbs, Butte, and Los Angeles (Wang, 2025). However, in 2025, Los Angeles CBOs worked directly with community members to prevent illegal displacement using a Just Cause Eviction ordinance in conjunction with Penal Code 396.

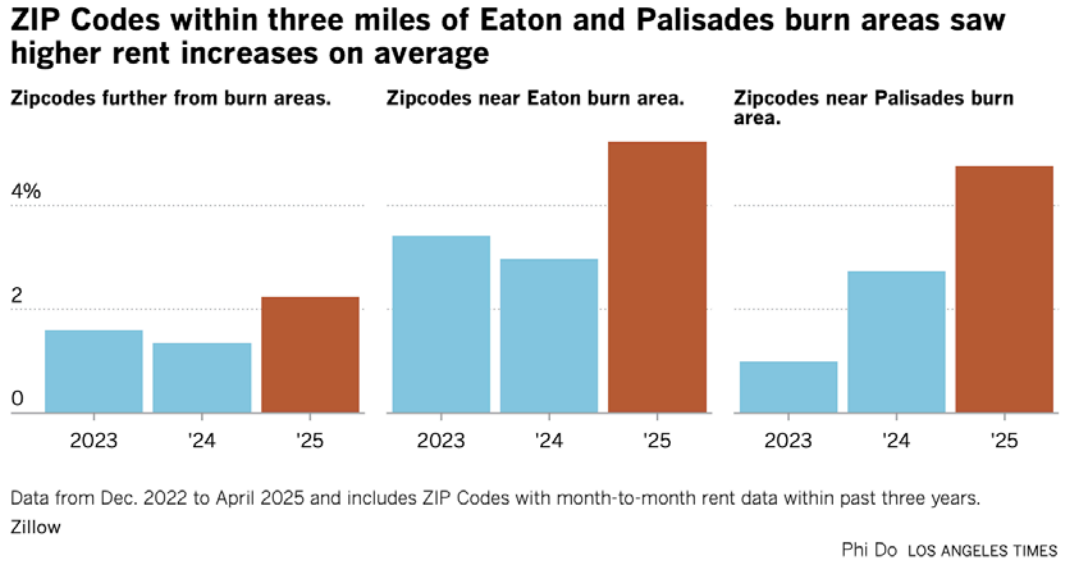

Figure 4: *Average rent increase (percent) in ZIP codes within three miles of Eaton and Palisades burn areas, and in ZIP codes further from burn areas–showing much higher rent increases in ZIP codes near Eaton and Palisades in 2025 (orange) as opposed to 2023 (blue). Source: Zillow, Los Angeles Times.*

This dynamic of effective, overlapping tenant protection policies was showcased during the COVID-19 pandemic in Sonoma County when data collected by county agencies during a period of eviction moratorium revealed reduced tenant displacement. Additionally, evictions did not significantly increase once the eviction moratorium was lifted, contrary to expectations of the landlord constituency. This type of protection did not lead to the nonpayment of rent as expected by the landlord community (Legal Aid of Sonoma County & North Bay Organizing Project, 2025). This data underscores how complementary tenant-protection measures like price gouging statutes and eviction moratoriums can stabilize the rental market and maintain housing for vulnerable tenants during and after disasters.

Rental Registry

A rental registry is a tool that helps enforce price gouging protections and eviction moratorium ordinances post-disaster. Although California's price gouging statute limits rent increases to 10% in the aftermath of a disaster, landlords can still evict the current tenant, then increase the rent beyond the 10% maximum for the next tenant. Because the existing tenant and new tenant do not know each other, it is not self-evident that the landlord violated the price gouging statute. Rental registries are a simple tool that can regulate the rental market during and after climate-induced disasters and provide stability to tenants (Policy Link, 2025). In 2009, the city of Los Angeles found that more than a quarter of renters had illegal rent increases and adopted a comprehensive rental registration system (City of Los Angeles Housing Department, 2009). Rental registries can successfully enforce compliance with rent rules when local governments actively engage in monitoring, information dissemination, and enforcement (Housing Solutions Lab, 2024).

Affordable Housing

Loss of affordable housing following climate-induced disasters leads to tenant displacement because affordable housing that is damaged or destroyed by a disaster event is rarely repaired or rebuilt. Affordable housing is more vulnerable to climate-induced disasters, typically underinsured, and often takes longer to rebuild than market-rate housing due to bureaucratic restrictions. Funding is needed to stabilize temporary housing during the rebuild process. As an example, CBOs have created Rapid Rehousing projects that provide rental assistance to help with temporary rental costs allowing survivors to become temporarily but stably rehoused while they are recovering (Teles et al., 2023). Additionally, CBOs have created Emergency Financial Assistance programs that can help fill the gap created by increased rental prices and the unforeseen burden of having to pay first and last months' rent as well as a new security deposit in a destabilized rental market (Graubard et al., 2020).

Mobile home parks and manufactured housing, which are permanent housing options, are an essential source of affordable housing across California, and these homes are uniquely vulnerable to hazard losses due to how land tenure and limited insurance and financing tools make recovery more challenging (Rumbach et al., 2020). This type of housing is also more likely to be destroyed by climate-induced disasters because they are less durable and often situated in disaster-prone locations, as well as subject to rising rental costs due to corporate investment trends (Howard & Fleville, 2024). Access to post-disaster assistance through the Federal Emergency Management Agency (FEMA) can be limited for mobile home residents by ownership verification requirements, particularly when residents lack formal or valid titles documenting ownership (Biron, 2019). Other federal disaster-recovery resources may support the repair or replacement of manufactured housing; for example, the Housing and Urban Development (HUD)'s Community Development Block Grant Disaster Recovery (CDBG-DR) funds can be used by grantees to replace manufactured housing units following qualifying disasters (HUD, 2024).

As more mobile home parks are bought by corporate investors, and climate-induced disasters put more pressure on low-income rental markets, mobile home residents are increasingly subject to unreasonable rent increases and therefore displacement.

By listening to and working directly in vulnerable communities, CBOs offer new insights on tenant protections, rental registries, and support for rebuilding affordable housing that can address housing stability and displacement in preparation for future climate-induced disasters.

Case Study: *Wildfires and Community-Based Organizations in Sonoma County*

In 2017 when Sonoma County was reeling from the loss of 7,000 structures to wildfire, residents of Little Woods Mobile Villa in Petaluma received letters from the park owner outlining rent increases averaging 44% (Beausang, 2017). Local CBOs including the North Bay Organizing Project and Legal Aid of Sonoma County worked with residents to ensure the residents understood their rights and had representation to address the onslaught of legal documents. As a result of tenant organizing and legal support, the mobile home park owners rescinded the rent increases, and the residents were able to remain safely housed. This work addressed the important role of CBOs in developing systems that prevent displacement due to housing market pressures that continue to protect vulnerable communities when disasters hit.

HOUSEHOLD RESIDENTIAL MOBILITY

When climate disasters displace residents from their homes and neighborhoods, Californians evacuate temporarily or relocate permanently to safer areas. Migration responses vary depending on hazard type, individual factors (e.g., household composition), social networks, and economic context (Hunter et al., 2015). The decision about whether to migrate in the face of hazard risks depends in part on capabilities pre- and post-shock, i.e., a household's ability to prepare, leave, return, and/or rebuild (Tinoco, 2023). When out-migration occurs, it is also driven by social networks, economic factors, amenity migration, and the desire to live near those of similar political views, among other factors (McConnell, 2022).

In general, place attachment and connections to existing social networks, employment opportunities, and civic infrastructure exert a strong pull on families, resulting in voluntary immobility for many (Carling, 2002; Schewel, 2020). In the face of a climate shock, most will stay in close proximity or return to their original home and community (McConnell et al., 2024; Yabe et al., 2019). For many Tribal Nations, however, staying in place is also shaped by Tribal sovereignty, treaty and land rights, and cultural continuity, where remaining in homelands is tied to collective governance and place-based identity rather than individual preference. At the same time, climate impacts can make staying effectively involuntary through repeated evacuation, resource constraints, or declining habitability, meaning Tribal climate mobility reflects constrained choices shaped by both sovereignty and structural exposure.

Slow-onset climate changes are relatively more likely to spur permanent out-migration (Kaczan & Orgill-Meyer, 2020). Although lower-income or disadvantaged households may be more likely to be displaced initially, due to their concentration in climate-vulnerable neighborhoods, higher-income households may be more likely to relocate permanently (Kaczan & Orgill-Meyer, 2020; Yabe et al., 2019). Natural disasters negatively impact wealth, debt, and credit worthiness, particularly for those already struggling pre-disaster (Ratcliffe et al., 2020), reducing the set of choices for many. Other groups in housing precarity, such as formerly incarcerated individuals or undocumented immigrants, may have even fewer choices in the wake of climate crises (Bradley et al., 2001; Hall et al., 2019).

Although there is no comprehensive data source that describes how many Californians have returned home or relocated post-disaster, the US Census Bureau's Household Pulse Survey indicates that disasters displaced just over 1% of US households in recent years, with about 86% returning home (Paul et al., 2024). When a climate shock occurs, displaced residents often find a convenient emergency shelter but then move to a temporary shelter that provides daily necessities, and from there, to temporary housing (or a series of temporary homes, such as hotels), in what can be a long and protracted process (Peacock et al., 2017). Accelerating this transition in part are post-disaster sanitary conditions, such as problems with sewage systems, contaminants released by flood and fire, and disease (particularly in overcrowded shelters) (Noji, 2000; Paul et al., 2024).

In the case of flooding in California, whether due to atmospheric river storms or tidal flooding, evacuees often struggle to return home quickly, and a small share will relocate. Not only are post-flood conditions hazardous but also flood damages are extraordinarily costly to repair, often delaying return or making rebuilding impossible in the absence of insurance (Bick et al., 2021;

Kaczan & Orgill-Meyer, 2020). Communities of color are typically slower to return home, in part because of living in higher-risk zones where homes incur more damage while social infrastructure is limited (Klein, 2007).

Likewise, wildfires can displace hundreds of thousands of families in a season, but the majority return; only the most catastrophic wildfires result in permanent out-migration or displacement (McConnell et al., 2024). For example, the 2017 North Bay Fires resulted in just over 6% of the population moving out of Sonoma County, although about 12% changed neighborhoods (Sharygin, 2021). In contrast, 22% of the residents impacted by the 2018 Camp Fire moved out of California altogether, and wealthier households tended to move further away from the fire risk area (Miller, 2024). At the same time, there is some evidence that a more affluent population has moved into Northern California wine country and mountain areas devastated by wildfire in a process of climate gentrification (Chase, 2024; Lambrou et al., 2025; Palinkas, 2020). Wildfire impacts migration decisions for residents living outside of wildfire areas as well; almost a quarter of California residents planning to move in the next five years report that wildfire and smoke are a motivating factor (Berlin Rubin & Wong Parodi, 2022).

Post-fire housing market dynamics shape relocation and displacement patterns. Home prices within 25 miles increase immediately (by about 13%) in the wake of a fire and stay high for months thereafter (Hennighausen & James, 2024). When thousands of displaced households live in a tight rental market, landlords may engage in price-gouging to take advantage (as in the 2025 Los Angeles fires) (Carroll, 2025; Florido, 2025; Friedman, 2025). For those receiving rental assistance from the government, tight rental markets may force renters out of the local area in search of housing; for example, HUD-assisted renters impacted by the Camp Fire often ended up living in higher poverty neighborhoods and/or dropping off assistance altogether (Din, 2023).

When those unable to rebuild or reoccupy their dwellings relocate nearby, these receiving communities also experience housing market stress. After the Camp Fire, Chico gained an influx of 19,000 new residents, exacerbating issues with inadequate housing, water, and transport infrastructure systems and resulting in a recall effort against the mayor (Palinkas, 2020; Spearing & Faust, 2020).

However, most California communities impacted by wildfires rebuild. After 28 fires between 1970 and 2009, 94% of structures were rebuilt in place, but with wide variation across communities (from 13–100%) (Kramer et al., 2021). Specifically in the Camp Fire, landowners, developers, and investors have been involved in reconstruction while low-income families are often excluded, and reconstructed buildings tend to be higher-value and owner-occupied (Lambrou et al., 2025; McConnell, 2022). Additionally, the highest hazard areas may not be the most disaster vulnerable areas, since more affluent areas have the resources to mitigate their risk (Hino & Field, 2023; Syphard et al., 2026).

Although slow-onset climate stressors such as sea level rise and drought are more likely to spur permanent out-migration, the exodus has generally been slow in California. Despite this, some communities and regions face pronounced risk, especially as sea level rise accelerates. For example, the “Adapting to Rising Tides (ART) Bay Area initiative” (Bay Conservation and Development Commission, 2020) represents the first region-wide, cross-sector analysis of sea level rise vulnerabilities and action plan for the short, medium, and long term. An assessment of

all the four systems identified key planning issues, one of them being “Rising Sea Level Will Amplify Existing Housing and Displacement Concerns.” The report notes that sea level rise will increase displacement, forcing residents to move if their neighborhoods are temporarily or permanently flooded (especially in places such as Humboldt Bay, which is experiencing the greatest rate of sea level rise in California). Renters, low-income households, and people of color are more likely to experience displacement risk, as these groups are disproportionately represented in many Bay shoreline communities (BCDC, 2020).

Excessive heat does not generally result in migration and displacement, except indirectly by increasing housing costs (Albouy et al., 2016; Fan et al., 2012). Sea level rise displaces people directly by making communities uninhabitable and indirectly, by decreasing viable housing supply and increasing costs. In much of the US, faced with flooding impacts, communities have invested millions of dollars and enormous effort in designing and implementing planned relocation projects (Pinter, 2021). While federally funded planned relocation is almost nonexistent in California (Siders, 2019), individual cities in the state have worked to move development back from the shoreline (Lester et al., 2022).

The broader scholarly literature on planned relocation offers frameworks directly applicable to California's situation. Hino et al. (2017) analyzed 27 cases of planned relocation across 22 countries and found that outcomes varied substantially based on two factors: who initiates the retreat and who benefits from it. Government-initiated retreats where residents do not benefit tend to generate the greatest opposition and the most inequitable outcomes, a dynamic visible in California's own post-disaster recovery record. Siders et al. (2019) further argued that retreat should be understood not as policy failure but as a strategic adaptation tool capable of serving broader societal goals—including equity and community revitalization—when embedded in proactive planning rather than executed reactively after disaster. However, implementing planned relocation equitably is consistently difficult: the literature documents that buyouts and relocation programs disproportionately compensate higher-income homeowners, leave renters and informal tenants without support, and can accelerate climate gentrification in receiving areas (Siders & Ajibade, 2021). These dynamics are especially relevant in California, where renter vulnerability and housing precarity already create pronounced displacement risk independent of climate hazards. Rental housing market adaptation to growing climate risks necessitates more rental housing development in lower hazard areas, with tenant prioritization options.

Low-income residents often express skepticism about sea level rise and mistrust of government initiatives such as planned relocation, while higher-income households resist interference with private property (Bragg et al., 2021; Richmond & Kunkel, 2024). Yet, properties likely to flood due to sea level rise are losing market value and, in some cases, experiencing negative equity (Federal Home Loan Mortgage Corporation, 2016; McAlpine & Porter, 2019). Meanwhile, nearby neighborhoods at higher elevation may appreciate in price in a process of climate gentrification (Keenan et al., 2018).

1.1.3 Current Responses

A variety of interventions, both government and market, help to reduce climate-induced migration and displacement, but may have unintended consequences. The following examines federal disaster assistance, insurance, and climate mitigation programs.

FEDERAL DISASTER ASSISTANCE

Government emergency assistance programs such as those run by FEMA help stem out-migration by funding recovery but have shortcomings and unintended consequences. Such disaster assistance programs are primarily designed to alleviate burdens post-disaster, and therefore primarily benefit homeowners, particularly those with more valuable properties rebuilding in place, rather than low-income homeowners or renters of any income level (Comerio, 1997; Zhang & Peacock, 2009). Delays in the disbursement of federal funding leave displaced households at risk as they await crucially needed funds (Olshansky et al., 2008). Recovery assistance levels are often inadequate to support rebuilding (Mockrin et al., 2015). The residents of communities hit by medium-sized disasters experience relatively large declines in credit scores compared with those experiencing major disasters (Ratcliffe et al., 2020). Moreover, the FEMA maps that inform the National Flood Insurance Program underestimate the population exposed to severe flooding risk, especially once accounting for new development and changing weather patterns; this then leads to underinsurance of communities within floodplains (Rosoff & Yager, 2017; Wing et al., 2018).

HOME INSURANCE

Lack of insurance, or rapidly increasing home insurance premiums, can result in the displacement or migration of residents in high-risk areas, whether from wildfire, flooding, sea level rise, or other climate hazards. Moreover, many renters lack renter's insurance or have insurance plans that do not cover relocation post-disaster (Marcus & Verma, 2017). Official data has compounded the problem: Like federal floodplain maps, California's fire hazard zones do not correlate well with actual fires experienced in recent years (Hino & Field, 2023).

Because of the recent series of fires, insurance companies have dropped policyholders, increased rates, and/or withdrawn from the market altogether (Almuhana, 2024; Law & Alvarado, 2025; Schrupp, 2024; The Allstate Corp., 2018). Average rates in high fire hazard zones within the WUI are 50% higher than other areas, sending many residents to unregulated "surplus" insurance plans or California's expensive Fair Access to Insurance Requirements Plan, which may not be sustainable due to its wildfire exposure (Law & Alvarado, 2025; Peterman et al., 2019). Homeowners (particularly more affluent ones) hit by higher premiums are more likely to relocate (Ge et al., 2024). Still, the average premium for Californians is below the national average, suggesting that increases alone will not be enough to increase out-migration and displacement (Law & Alvarado, 2025). Please refer to the Fifth Assessment's "Climate Impacts to the Economy Statewide Topical Report" for additional detail on climate impacts to home insurance markets.

1.1.4 Adaptation Opportunities

The housing system functions as a primary interface through which climate exposure translates into either stability or displacement. A key adaptation opportunity lies in leveraging housing not only as shelter but as a climate-buffering system that determines post-disaster recovery trajectories. While homeowners often return and rebuild, renters, precariously housed individuals, and those in substandard units face higher displacement risk. This observed pattern points to housing tenure as a critical adaptation axis. Thus, housing policy can function as a preventative adaptation tool by targeting investments to structurally vulnerable renters, unhoused populations, and residents in substandard housing.

There is significant opportunity in aligning recovery systems, including insurance frameworks and disaster assistance channels such as those administered through FEMA, with place attachment rather than purely financial loss replacement. Current dynamics, where recovery support can unintentionally increase housing costs or accelerate neighborhood-level price escalation, reveal an opportunity to redesign post-disaster rebuilding processes so that they stabilize affordability alongside physical reconstruction.

Wildfire and flood exposure emerge as acute displacement drivers, while slower-onset stressors such as sea level rise and heat may expand their influence over time, suggesting an opportunity to anticipate shifting hazard typologies in housing vulnerability mapping. Across these dynamics, housing precarity functions as a compounding condition—amplifying exposure, limiting recovery options, and shaping long-term migration pathways.

1.2 Emergency Management

In recent years, the compounding and complex impacts of climate hazards including wildfires, floods, extreme heat events, prolonged smoke exposure, earthquakes, power outages, and sea level rise have strained California's Emergency Management (EM) system (NOAA, 2025; Canon, 2024). These hazards become disasters when they disrupt access to basic needs like housing, food, clean air, and employment, causing vulnerable residents to migrate. Specifically, climate-induced disasters lead to migration and displacement because they create economic and social strain for those impacted due to loss of housing stock or loss of housing that is affordable and stable, increased food insecurity during power outages, and loss or restricted access to employment, among other impacts. The effects of these disasters can materialize as direct (e.g., fires destroy housing), indirect (e.g., failures in evacuation, shelter, and response), short-term (e.g., power outages causing food loss), or long-term impacts (e.g., accrued debt from lost wages during floods) and can come from both slow onset (e.g., droughts or sea level rise) or quick onset disasters (e.g., flash flood or earthquake).

1.2.1 The Structure of Emergency Management

EM in California has been historically led by the Governor's Office of Emergency Services (Cal OES). Cal OES supports impacted communities to ensure that response and recovery is possible by coordinating response and recovery efforts between the state government and localities across the state. California's emergency response is governed by the California Emergency Services Act (ESA) and the Standardized Emergency Management System (SEMS). The ESA grants the Governor’s Office broad emergency powers, while SEMS provides a standardized, multi-level command structure that directs resources from the local, operational, and regional levels up to the state. This system operates on the premise that when local jurisdictions become overwhelmed, higher levels of government will provide resources and support. The framework also includes dedicated bodies like the Office of Access and Functional Needs (OAFN), created in 2008 to ensure the needs of vulnerable populations are addressed. Various Emergency Support Functions (ESFs) coordinate critical resources and services during an emergency.

EM in California includes state level disaster assistance programs, wildfire evacuation protocols, and hazard mitigation planning, along with federal programs such as FEMA disaster declarations

and the National Flood Insurance Program, and non-governmental organizations like the Red Cross. Local EM entities include county emergency operation centers, cities, faith-based organizations (FBOs), CBOs, and Tribal Nations. Tribes are sovereign governments and many have their own emergency operations centers and disaster response services, including fire departments and firefighters that deploy across the state during wildfire disasters; local crews that respond to road closures and community water system failures caused by extreme weather; wildfire evacuation routes; and microgrids.

Currently, traditional disaster response systems in California are still not adequately designed to account for Tribal communities, both on and external to reservations (Whyte, 2017). This omission compounds the colonial impacts of Tribal land isolation and limited mobility and amplifies the risks Tribes and other overlooked communities face during wildfires, floods, and power outages. Tribal Nations often have limited mobility during climate-driven disasters because reservations were historically sited on marginal, isolated, or environmentally vulnerable lands as a direct result of colonial policies. This colonialist legacy creates significant evacuation challenges, including single-access roads, limited transportation infrastructure, and geographic isolation from emergency services. Unique cultural, legal, and governance circumstances impact Tribal climate displacement, and, unlike for other communities, the displacement of Tribal Nations carries layered implications tied to sovereignty, cultural continuity, ancestral relationships to place, and the ongoing impacts of dispossession.

Local knowledge, trust, and culturally and linguistically appropriate messaging are integral to making decisions with communities and responding swiftly to emergencies when they happen. Research shows that when local knowledge and relationships are established pre-disaster, they foster coordination and collaboration to support the exchange of information, expertise, equipment, funding, supplies, and other resources during disasters (Mathews et al., 2024). Pre-established trust also allows limited time and capacity during disasters to be used more effectively, reducing delays caused by having to build relationships during disaster, and enabling faster and more informed decision-making. When such relationships are already in place due to pre-disaster planning, government agencies are more likely to make decisions that reflect community needs since connections with trusted community members and leaders are already established. For example, in Sonoma County, the Community Organizations Active in Disaster (COAD), which was re-established following the 2017 wildfires, acts as a liaison between community members and the County government via COAD's seat on the Emergency Operations Center (EOC). This type of pre-disaster planning provides a direct pathway for local knowledge to move from communities to the COAD, informing the emergency response of the county and the state, land serving as a conduit for trusted messengers to share critical information about how the government is responding to disasters, like locations of disaster response centers.

Emergency response systems benefit from local response systems already being in place, as seen in counties across California over the past 10 to 15 years. During the January 2025 LA fires, VOAD (Voluntary Organizations Active in Disaster) and legal partners used on the ground information to address how to meet the needs and gaps in communities. In Sonoma County, the local COAD has a Guerneville sub-section representing the flood-prone geographic area of the Russian River where flooding predictably impacts vulnerable communities; the team brings concerns to the main COAD that then get uplifted to the county. This type of infrastructure supports meeting people where they are during emergencies by conveying specific needs to the county that can in

turn bring the resources into the community in a way that meets the needs based on the unique circumstances of each disaster. Likewise, women from impacted Spanish-speaking communities in the Promotora networks that developed in the San Francisco north bay region following the 2017 fires often have a better understanding of what vulnerable communities are experiencing as disasters unfold than do more formal nonprofit and government systems, for example where vulnerable groups go during evacuations (Martinez & Ricks, 2024). Because many COADs are themselves impacted, and they are already embedded in vulnerable communities, they have an established and nuanced level of trust and understanding that formal systems can't replicate.

Although advanced infrastructure exists in California to support disaster response, the California State Auditor reported in 2019 that many counties were not adequately prepared to address the needs of residents with access and functional needs, including lack of planning for people with disabilities and limited English proficiency (Howle, 2019). In 2025, the Legislative Analyst's Office noted there was no effective oversight mechanism of the Governor's Office emergency powers to declare an emergency, terminate such a declaration, and make decisions about spending during disasters (Petek, 2025).

1.2.2 Climate Impacts and Push and Pull Factors

Historic disparities in climate-induced disaster response throughout California have led to the creation of significant service gaps and systemic failures in EM throughout the state. This disparity often leaves CBOs and Tribes responsible to respond to community needs that arise within local contexts. For example, disparities between access to funding for federally and non-federally recognized Tribes create conditions where the federal recognition status of a Tribe impacts access to resources to prepare for and respond to climate emergencies. CBOs working on the frontline of climate-induced disaster response have interviewed partners throughout the state at the forefront of EM, and built relationships with directly impacted communities, illuminating common gaps within existing EM systems, and ways impacted communities have used ingenuity to respond. This section contextualizes intersectional disparities and identifies solutions used by CBOs to better address the needs of vulnerable community members impacted by climate-induced disasters. Work by CBOs has identified effective policy tools that can be adopted by local or state governments during EM planning moving forward.

An equity approach to EM acknowledges that climate-induced disasters will exacerbate pre-existing socio-economic disparities for frontline communities. A "just recovery" in emergency response emphasizes the need for the transformation of disaster-focused policies that prioritize vulnerable communities compared to traditional approaches that seek to reform existing emergency management systems that disproportionately serve less impacted groups (Jabola-Carolus et al., 2025). Without dramatically transforming existing emergency planning systems, residents with privilege will eventually recover, while vulnerable communities will struggle to do so (Raval et al., 2019).

1.2.3 Current Responses

This section highlights EM responses to climate impacts from across government and CBOs alike while highlighting critical preexisting vulnerabilities that are addressed or unaddressed by these responses. Preexisting vulnerabilities include unmet language access needs, housing instability, and the inaccessibility of emergency financial assistance from traditional disaster relief programs.

LANGUAGE ACCESS

The level of migration to California from other countries makes the state one of the most linguistically diverse in the nation. Almost half of state residents speak a language other than English at home, and 7 million individuals in the state primarily use non-English languages (Legal Aid Foundation of Los Angeles, 2022). These 7 million individuals are what we would refer to as non-dominant language users or linguistically marginalized communities. In a 2023 article written by California Rural Legal Assistance (CRLA), the authors make the case that in a multilingual society like that of California, decision-making bodies that function only in English perpetuates linguicism. Linguicism refers to the "ideologies, structures and practices which are used to legitimize, effectuate and reproduce an unequal division of power and resources (both material and non-material) between groups which are defined on the basis of language (on the basis of their mother tongues)."

While Spanish is the most commonly spoken non-English language (64%), roughly 2.4 million non-dominant language residents speak languages other than Spanish. Lack of language access or linguicism results in systematic exclusion of already vulnerable residents, and this is especially true for non-dominant language communities who have been repeatedly left out of lifesaving alert and warning communications systems during and after climate-induced disasters. Lack of language access can have a financial impact, e.g., unequal access to recovery funds, which in turn has a direct effect on migration because financial instability is one of the primary drivers of displacement (Méndez et al., 2020). Systematic exclusion results from policy or programmatic practices where people have unequal access to power and both material and immaterial resources, based on their language(s) (Skutnabb-Kangas, 2015). In EM we see systematic exclusion with English-only emergency alerts or directives at shelters, for example.

Since the adoption of SB 160 in 2019, California has seen advancements addressing language access gaps in EM planning. SB 160 mandates that cultural competency accounting for language access be embedded in jurisdictional Emergency Operations Plans, and the Governor's Office of Emergency Services Listos California disaster preparedness program includes at least six languages spoken by indigenous migrants, defined as Indigenous people from what is now known as Mexico and Central America (Listos also includes Spanish and Punjab) (Lee et al., 2024). Nonetheless, expanding existing community-led solutions that emphasize accessible language can alleviate barriers to safety and enhance resilience to disasters.

When EM system planners collaborate with and incorporate climate-induced disaster response lessons learned by CBOs, emergency alert systems serve all Californians. Several of these recent lessons include the critical nature of, and investment in, alert and warning systems. Unfortunately, these systems are often delayed, inaccessible linguistically, assume access to technology, and do not always account for the diversity of access needs, including those of elders, the unhoused, and incarcerated people who have limited or no access to emergency alerts. Further, alerts do not indicate details about the activation of emergency response and leave particularly vulnerable residents without critical resources for survival.

Linguistic diversity poses a challenge to EM planning and is routinely overlooked, leading to inequitable response and recovery efforts (Dadson et al., 2024; County of Sonoma, 2022; Hardman & Ensor, 2017). Traditional EM systems can adopt successful practices already used by CBOs

working together with migrant communities to increase language access. The following case studies identify solutions that prioritize language access.

Emergency Alert Systems in Indigenous Migrant Languages

During the 2017 Thomas Fires in Ventura County, Spanish speaking and migrant indigenous community members lacked critical information during the fire because emergency warnings were at first only available in English. Ventura County includes more than 40,000 farmworkers and roughly one in three speak Mixteco, Zapoteco, or another indigenous migrant language. The California Department of Public Health funded the development of the FRESAS (Farmworker-led Response to Emergencies through Simple Audio-based Systems) project, which created an audio alert system for farmworkers in Ventura County that is linguistically and culturally accessible because the information is being presented by people of similar cultural, linguistic, and lived experience. Partners on the FRESAS project include: Mixteco Indigena Community Organizing Project (MICOP), Líderes Campesinas, Central Coast Alliance United for a Sustainable Economy (CAUSE), and the Public Health Institute's Achieving Resilient Communities (ARC) project. The Ventura County Air Pollution Control District led the development of a new text and audio alert system for farmworkers that is currently active and sends alerts in Spanish, Mixteco, and Zapoteco when air quality reaches dangerous levels. (Public Health Institute, 2023). See also *Section 3.b. Immigrants and Undocumented Residents* in the Fifth Assessment's "Racial Equity and Climate Justice Statewide Topical Report".

Emergency Management Planning Incorporating Indigenous Migrant Perspectives

LA County is home to many immigrant communities including "Indigenous migrants." According to a 2024 preliminary report by Comunidades Indigenas en Liderazgo (CIELO) in collaboration with USC Equity Research Institute, there are at least 25 distinct Indigenous migrant communities that live in Los Angeles County, speaking at least 36 different languages. These communities often do not speak Spanish or English and instead speak at least one of the many languages spoken by Indigenous communities in Mexico and Central America such as Zapoteco (61%), K'iche' (12%), Chinanteco (8%), Mixe (5%), and many others (Lee et al., 2024).

CBOs like CIELO have used their expertise and standing as trusted community institutions with migrants from Mexico and Central America to supplement service gaps in traditional emergency response systems. Based in Los Angeles, CIELO is an Indigenous, migrant women-led CBO that has become a first responder to its community over the course of several climate induced disasters. They have responded to gaps in EM experienced by Indigenous migrant communities in California, while also serving as policy advocates who aim to codify more culturally relevant and competent EM systems.

EMERGENCY FINANCIAL ASSISTANCE AND COMMUNITY MUTUAL AID

Emergency Financial Assistance (EFA) helps in the response and recovery phases of EM. It is a critical lifeline for communities facing disasters, providing immediate relief and stability (Graubard et al., 2020). By addressing urgent needs (housing, food, medical care, etc.), it moves families

closer to recovery while mitigating the long-term economic and social impacts of displacement. Without the Federal Emergency Management Agency (FEMA), the State of California has limited resources to devote to EFA. Moreover, most counties in California do not have an EFA fund. Even with millions to billions of dollars allocated to recovery efforts from local, state, and federal government, there are immense gaps and pockets of communities left behind, as funding is often distributed through processes that sometimes fail to take into consideration barriers to language access and immigration status.

Community-based organizations and mutual aid networks play a critical role in shrinking the gap left by traditional government-funded programs (Spade, 2020). CBOs and mutual aid networks may be present and nimble enough to address emerging needs, and their on-the-ground work can inform the way government-funded EM assesses the efficacy of existing state-led EFA programs and ensure all residents are included.

Traditional EFA eligibility requirements often create significant barriers for vulnerable communities during and after climate-induced disasters (Méndez et al., 2020). Frequently, individuals who fill out lengthy applications for EFA learn at the very end that they do not qualify, often due to immigration status, informal employment, or missing documentation. These traditional EFA systems have been designed with rigid documentation processes that can exclude groups vulnerable to climate-induced disasters, such as informal wage earners, seniors, non-English speakers, renters, undocumented individuals, and people with low digital literacy and/or access. For example, informal workers like day laborers or domestic workers often lack formal pay stubs that are required when applying for most traditional EFA. Seniors may have mobility or transportation hurdles that limit their access. Non-English speakers face barriers that may delay or block their ability to apply for assistance. Renters with informal or oral leases have trouble demonstrating the impact of the disaster. And undocumented individuals are excluded altogether from formal assistance programs like FEMA.

The risk of immigration enforcement compounds the impact of climate-induced disasters for undocumented community members. The fact that FEMA operates under the Department of Homeland Security, an agency also responsible for immigration enforcement, creates a fundamental tension that discourages undocumented community members from seeking aid during disasters. During the megafires in LA and Sonoma County, undocumented community members were known to avoid community evacuation centers for multiple reasons, including fears of immigration enforcement, concerns about sharing their personal data with government agencies and being labeled a 'public charge', and lack of language interpretation (Bizjak, 2017; Pech et al., 2025). The fact that emergency evacuation centers are overseen by a government agency under a federal agency also responsible for immigration enforcement underscores the critical role of CBOs in planning and implementing emergency response systems.

Families unable to recover in place are often left with no option but to relocate, ultimately leading to migration to new cities or states. In this way, exclusion from EFA directly contributes to cycles of displacement, loss of cultural and community cohesion, and long-term economic insecurity. Communities of color, immigrants, people with disabilities, and working-class people who are already on the margins of traditional support systems experience displacement the most.

Mutual Aid

Mutual Aid is "a voluntary exchange of services and resources between members of society for mutual benefit… [People participating in mutual aid networks] are able to build new social relationships, giving what they can and receiving what they need. In the face of challenges such as economic crises, pandemics, and natural disasters, mutual aid is increasingly needed to fill current gaps in society and to meet people's needs. Mutual aid is a radical act of caring for each other while working to change the world" (Spade, 2020).

California has seen an increase in mutual aid networks in response to climate-induced disasters (Mitchell, 2025). These grassroots efforts provide immediate and critical relief in the face of unpredictable disaster impacts. They can allow communities to recover where they live and strengthen community interconnection.

Less than 72 hours after the 2017 Tubbs Fire devastated Sonoma County, UndocuFund for Disaster Relief (UndocuFund) was created by community-based organizations with established trust in the immigrant community. UndocuFund, a lifeline for impacted undocumented families who did not qualify for traditional assistance, provides mutual aid in the form of EFA, food, clothing, referrals to mental health services, and more. An advisory committee of leaders from the undocumented community made collective decisions which informed the content of applications, eligibility, how funds would be distributed, and how much assistance would be granted. This committee prioritized disbursing resources to impacted families as quickly as possible. Individuals and funders from across the country donated $6 million in response to the Tubbs Fire. This model has been successfully replicated across the state and country to support undocumented communities facing increased exposure to climate-induced disasters (Deutchman, 2023), alongside other such efforts cataloged in the Fifth Assessment's "Racial Equity and Climate Justice Statewide Topical Report".

There are many examples of California mutual aid disaster responses:

UndocuFunds: Originally founded by immigrant-serving CBOs in October 2017 in response to the Tubbs Wildfire in Sonoma County that destroyed over 2,800 homes, UndocuFund provides direct one-time financial assistance to immigrant families who do not qualify for federal assistance and are impacted by disaster. Recipients of this direct assistance self-identify how they will use their assistance with the majority of recipients choosing to cover housing costs. Over $17.5 million has been disbursed from 2017–2025 to over 10,000 households in Sonoma County in response to wildfires, power-shutoffs, winter storms/floods, and COVID-19. Over 30 UndocuFunds have now been created across the US, replicating the original model. 805 UndocuFund was created in response to the 2017–2018 Thomas Wildfire and Mudslides in Ventura and Santa Barbara Counties and has disbursed over $8 million to over 6,000 households. While UndocuFund Monterey Bay and other UndocuFunds were created in response to the COVID-19 pandemic, their pre-existing structure allows for quick mobilization during times of climate-induced disasters. For instance, UndocuFund Monterey Bay was able to quickly respond in 2023 to nearly 2,000 residents in Pajaro who were flooded from their homes.

California Relief Fund for Domestic Workers: Over the past decade, countless stories have emerged from the frontlines of California's wildfires, where domestic workers, other household workers, and day laborers are asked to stay behind to fight fires, guard homes or pets, work in

smoky conditions, and clean up toxic ash. These workers are further endangered when employers fail to inform them that the homes they work in are under mandatory evacuation orders. This mutual aid fund that provides immediate and sustained support to domestic workers who are disproportionately affected by wildfires and their aftermath can be a model for programs to support the informal workforce.

Mutual Aid LA Network (MALAN): Mutual Aid LA Network is a connector and information hub for mutual aid efforts, people, and resources across Los Angeles. MALAN maintains an extensive list of emergency aid resources available to those affected by wildfires which is constantly updated with new resources and calls for volunteers and donations.

Black LA Relief & Recovery Fund: This fund supports community organizations on the ground working to meet the immediate and long-term needs of Black communities displaced by wildfires. Historic and long-standing inequities add hurdles to the prospect of Black communities rebuilding. The Black LA Relief & Recovery Fund seeks to address those challenges, so Black communities have the ability to return, reclaim, and rebuild in the same way as other communities.

United American Indian Involvement (UAII): For more than 50 years, the UAII has been providing resources to struggling Native communities by providing healthcare that is culturally sensitive and inclusive of all patients, as well as community programs developed by and for Native and Indigenous communities. In 2025, following the Los Angeles Fires, they launched a mutual aid effort for Urban Natives impacted by the fires. They set up a temporary emergency evacuation shelter, distributed emergency supplies, coordinated housing, rides, and meals. This dedicated fund ensures Native communities' access to timely and culturally grounded support.

Ultimately, such local mutual aid networks are particularly valuable and effective in vulnerable communities because they are grounded in existing trust, cultural competency, and deep relationships within the community. As climate-induced disasters continue to increase, there is a growing need for policies that ensure equitable access to EFA and mutual aid programs for all impacted individuals across California.

1.2.4 Adaptation Opportunities

Emergency management systems operate as a critical mediating layer between climate shocks and population displacement. One major opportunity lies in expanding the role of emergency systems from episodic response structures into continuous, community-embedded resilience platforms.

Across California, emerging practices—such as multilingual alert systems, culturally grounded outreach strategies, and emergency financial assistance mechanisms—illustrate an opportunity to reduce information asymmetries and improve access to protective resources during crises. Within statewide coordination structures such as the California Governor's Office of Emergency Services, these approaches point toward a broader integration of equity-centered communication and response design.

Community resilience hubs and neighborhood-scale centers, including those supported by the Strategic Growth Council, represent another adaptation space where emergency response and everyday community infrastructure intersect. These sites function not only as disaster shelters but also as cooling centers, energy backup nodes, and coordination spaces during climate disruptions.

A further opportunity lies in expanding the role of lived experience in emergency governance systems, particularly among Tribal communities, unhoused populations, and other frontline groups whose knowledge systems already reflect climate exposure and mobility constraints. This creates a pathway for aligning institutional response design with grounded community adaptation practices.

1.3 Transportation

Transportation infrastructure refers to the physical facilities, systems, and structures that support the movement of people, goods, and services between different locations. It encompasses assets such as roads, highways, transit facilities, pedestrian and bicycle infrastructure, and bridges as well as the services that operate these assets such as public transit operators and maintenance staff. Transportation infrastructure is vulnerable to climate change, and its vulnerability is defined as "the degree to which the system is susceptible to or unable to cope with adverse effects of climate change or extreme weather events" (FHWA, 2014).

Climate or extreme weather events impact the functionality and reliability of transportation infrastructure. Wildfires, for example, are characterized as the most immediate threat to the transportation system because it is ubiquitous throughout the state. They often cause cascading impacts such as mudslides (Bedsworth et al., 2018). Landslides and mudslides (California Natural Resources Agency & California Energy Commission, 2018) may lead to road closures, preventing people from reaching the areas they want to reach. Wildfire debris may litter roadways making them unsafe and can clog culverts (Caltrans & WSP, 2021), hindering drainage of an area and making it more prone to flooding. During post-wildfire clean-up, rural roadways might be heavily impacted by frequent trips of heavy vehicles and equipment (Mendocino Council of Governments, personal communication, 2021), leading to the need for additional road interventions to keep them functional.

Sea level rise threatens mobility and transportation infrastructure in cities and counties along the California coast and Sacramento-San Joaquin River Delta. According to the California Fourth Climate Change Assessment (2018), significant long-term impacts of coastal flooding are projected on California's transportation infrastructure. For railways, the extent of rail lines exposed to coastal flooding is expected to increase dramatically, from approximately 115 miles during the 2020–2040 period to nearly 300 miles by 2100. This projected growth highlights the increasing vulnerability of critical rail corridors and the urgent need for adaptation strategies to maintain regional connectivity and system reliability. The Fourth Assessment also identifies growing risks for major airport and seaport facilities. Oakland International Airport and San Francisco International Airport are already experiencing flooding-related impacts, while Santa Barbara Airport and San Diego International Airport are projected to face flooding risks in future decades. Seaport infrastructure is similarly vulnerable, as rising sea levels are expected to compromise critical docking components and support facilities, including the Andeavor Long Beach Terminal 1 by 2080.

Flooding, sea level rise, and extreme heat can lead to modifying or relocating existing infrastructure, a shortened lifespan for new infrastructure (unless climate change effects are considered in the planning process), and a lack of adequate materials like the asphalt in pavement

to meet the demands of changing road conditions, such as extreme heat or cold (Petek, 2022). Rising temperatures also increase the probability of rail track buckling, which leads to costly travel delays and safety risks, and lead to a cost increase of 3–9% in road construction and maintenance over a 30-year period (Bedsworth et al., 2018). If transportation infrastructure degrades and fails, people may choose to relocate to better-connected areas. Thus, the resilient planning, design, construction, maintenance, and operation of this infrastructure by regional, state, and local transportation agencies becomes critical.

Management of state, local, and regional transportation networks, which encompasses both the infrastructure (roads, rail lines, etc.) and the services (private vehicles, transit operations, freight movement, etc.) that use that infrastructure, is a key element affecting climate-induced human displacement, in both the short- and long-term. For example, poor transportation management, such as the failure to maintain evacuation routes or inadequate transit service during extreme weather events, can isolate communities, and disrupt access to employment and essential services; ultimately this might force residents to relocate permanently. In contrast, adequate transportation management, through resilient infrastructure planning or multimodal evacuation systems can strengthen community adaptability, maintain social and economic connectivity during climate disruptions, and reduce the likelihood of climate-induced human displacement.

Several transportation agencies manage the transportation system in California. The California State Transportation Agency (CalSTA) is a cabinet-level agency that oversees California's transportation departments and programs. CalSTA's mission is to develop and coordinate the policies and investments that support an integrated, efficient, and sustainable transportation system in California (California State Transportation Agency, 2025). CalSTA leads the Climate Action Plan for Transportation Infrastructure (CAPTI) and sets the high-level climate, equity, and multimodal investment strategy for the state. CalSTA also oversees several departments and boards, including the California Department of Transportation (Caltrans) and the California Transportation Commission (CTC). Caltrans is responsible for planning, constructing, and maintaining California's state highway system (SHS) and major interregional routes. It also leads climate vulnerability assessments and adaptation planning (Caltrans & WSP, 2020, 2021). The CTC oversees funding allocations for transportation projects and ensures alignment with the state's climate and equity goals. The CTC administers the Local Transportation Climate Adaptation Program (LTCAP), a grant program supporting climate resilience and adaptation projects for local transportation infrastructure (California Transportation Commission, 2025).

In addition, at the regional and local level, metropolitan planning organizations (MPOs) play a role in distribution of regional funding for local transportation projects. Examples of MPOs include Southern California Association of Governments (SCAG), Metropolitan Transportation Commission (MTC), San Diego Association of Governments (SANDAG), Bay Area Governments (ABAG), and Sacramento Area Council of Governments (SACOG). For non-metropolitan or smaller urban areas, Regional Transportation Planning Agencies (RTPAs) are responsible for preparing regional transportation plans and funding local projects. Finally, at the local level, county and city departments of public works have a direct role managing transportation infrastructure that is not on the state highway system; they build and maintain local roads and streets, sidewalks, bike lanes, signals, and transit. Additionally, transit agencies operate buses, subways, ferries, light rail, and commuter rail.

Best practice suggests that if transportation agencies are well aligned, they are better prepared to address the short- and long-term effects of climate change and extreme events by providing: transit equity and access in disaster-affected and relocated areas; resilient evacuation routes; solutions for infrastructure damage due to fast-onset disasters (short-term); and resilience planning, design, construction, and operation of the transportation system infrastructure that considers long-term stressors that accelerate infrastructure deterioration (National Academy of Sciences, Engineering, and Medicine, 2023).

1.3.1 Climate Impacts and Push and Pull Factors

Two case studies illustrate how transportation is a key factor in creating and addressing push and pull dynamics vis-a-vis climate impacts across the state. These dynamics are best understood in relation to short-term and long-term displacement.

TRANSPORTATION AND SHORT-TERM DISPLACEMENT

Functioning public transit infrastructure, including publicly available ridesharing services, buses, and trains, is critical to the functioning of society. These transit options may make the difference for a person being able to maintain a job, access childcare services, and reach critical public benefits and services to maintain their health and wellbeing (Chief Sustainability Office, 2021). Public transit accessibility may also be a deciding factor for an individual or family with regards to where they relocate. Existing research highlights how weather events significantly impact the operations of urban transportation systems and change human travel behaviors (Han, 2024).

The 2025 Los Angeles wildfires demonstrated management of transportation service to support short-term displacement, highlighting the role of transportation in shaping push and pull dynamics. Specifically, in Los Angeles, transit played a critical role both in the evacuation of people and in ongoing transit needs following the January 2025 fires. The Los Angeles County Metropolitan Transportation Authority (LA–Metro or Metro) and public bus systems suspended fares while fires were active (Adeniyi, 2025). Metro also created a map to show transit access points for people in evacuation zones and impacted areas during the fire (City of Los Angeles, Department of Recreation and Parks, 2025). LA Metro resumed fare collection on January 27 but remained free for individuals who applied for wildfire assistance (Adeniyi, 2025). According to the LA Department of Transportation program criteria, after their initial 90 days in the assistance program, riders receive 20 free regional rides per month loaded onto their TAP card for three additional months. Once those free rides were used up, fares could be waived again after taking three rides in one day or 11 in one week (Luqman Adeniyi, 2025). These benefits last 6 months after people are enrolled. Once the benefits expire, individuals impacted by the fires have the option to enroll in other Metro reduced fare programs such as free transit pass for 90 days, 30 free rides every month (Metro, 2025).

These kinds of programs represent efforts to provide equitable access to transit for people who remain in a wildfire impacted area following an extreme fire event. However, they also significantly shape the geographic radius within which low-income individuals relying on transit subsidies are able to go. Without such a program, if a person is relying on public transit accessibility to keep their job, for example, they may be forced to relocate close to the location of the wildfire despite health risks from air quality or other exposures in the area. For more information on health,

please see *Section 2.1 Health*. Alternatively, if they are unable to afford or find new housing in the same city, they may lose their job(s) if they cannot create a new transit route. For more on labor, please see *Section 2.5 Labor and Employment*.

In this case, LA Metro is a countywide agency responsible for planning, building, funding, and operating the region's major transit systems—bus, rail, bus rapid transit, and highway. It acts as both operator and county transportation commission, which makes it easier to streamline approvals that require additional funding, such as the program mentioned before. In other counties, such as San Diego, the Metropolitan Transit System (MTS) operates buses and trolleys, and SANDAG handles regional planning and funding.

Shutdowns in transportation to and from the Los Angeles area impacted people's ability to relocate away from Los Angeles during the fires as well. Amtrak and Commuter trains shut down service beginning on January 11 for stops in the Los Angeles area while fires were burning (Amtrak, 2025). Following the wildfires, Amtrak's Pacific Surfliner then offered $10 train fares to aid fire relief. However, tickets had to be purchased by January 17 for travel before January 24 (Reynolds, 2025). Airlines such as American, Delta, and United also waived fees for those affected by the LA wildfire with varying terms and conditions including strict time frames when tickets had to be rebooked (Passalalpi, 2025). For people who do not have access to a car, these alternative transit options, including buses, trains, and planes are the most likely ways to temporarily relocate during a wildfire. These adaptations to service can directly improve the likelihood of an individual or family being able to relocate quickly. Alternatively, service suspensions drastically limit short-term/immediate migration options.

TRANSPORTATION AND LONG-TERM DISPLACEMENT

The San Francisco Bay Area faces the critical climate challenge of adapting to rising sea levels that threaten transportation systems and nearby communities, illustrating push and pull factors vis-a-vis long-term transportation dynamics. The "Adapting to Rising Tides (ART) Bay Area Initiative" (BCDC, 2020) represents the first region-wide, cross-sector analysis of sea level rise vulnerabilities and action plan for the short-, medium-, and long-term. One of the four regional systems assessed is the transportation network, which includes highways and bridges, commuter rail, freight rail, airports, seaports, ferries, buses, and active transportation, all of which are designated as asset types.

The report identifies regionally significant clusters of vulnerability or locations where high-consequence assets are co-located. High-consequence assets were identified based on consequence indicators. For example, for the system "transportation network" and asset type "Highways and Bridges" the consequence indicators are annual average daily traffic, annual average daily truck traffic, and lifeline route.

The Bay Area's transportation network is particularly exposed because many of its critical assets—bridges, highways, railways, ports, and transit hubs—are located along the shoreline. The ART Bay Area study identifies multiple "hot spots" where clusters of vulnerable transportation infrastructure intersect with vulnerable communities. These locations represent points of both physical and social risk: a single disruption to a transit hub can sever access to jobs, health care, and essential services, disproportionately affecting lower-income households and transit-

dependent populations. Compounding these transportation vulnerabilities is the Bay Area's severe housing affordability crisis. Many communities already face displacement pressures due to rising rents and gentrification (BCDC, 2020).

The action plan in the Bay Area Initiative models an approach to protecting transportation infrastructure and reducing displacement risks. Some of the strategies include: (1) prioritizing protection for critical transportation hubs that serve transit-dependent populations, ensuring that vulnerable communities retain access to affordable and reliable transit, reducing the risk of economic and geographic displacement; (2) transportation as flood protection, promoting a holistic evaluation of transportation assets that leads not only to the protection of the assets but the communities nearby, which will require transportation projects to extend beyond the current project scopes and may require new forms of financing; and (3) coordinated regional adaptation, recognizing that displacement and transportation vulnerabilities cross jurisdictional boundaries. For example, ART Bay Area calls for regional collaboration among agencies like MTC/ABAG, Caltrans, and local governments. Shared strategies include funding mechanisms for resilience, streamlined permitting, and coordinated shoreline adaptation projects.

A similar long-term resilience challenge is emerging along the Los Angeles–San Diego–San Luis Obispo (LOSSAN) Rail Corridor, reinforcing many of the themes identified in the ART Bay Area. The corridor, which supports both passenger and freight rail services, operates through a highly complex governance structure involving multiple infrastructure owners, operators, planning organizations, and funding sources. Climate-related damage in locations such as Santa Barbara, San Clemente, and Del Mar has exposed the vulnerability of coastal transportation infrastructure and demonstrated how recurring disruptions can undermine service reliability and regional accessibility. Similar to the Bay Area's identification of transportation "hot spots" where infrastructure vulnerabilities intersect with socially vulnerable communities, the LOSSAN case highlights the broader consequences of transportation disruptions, including reduced mobility, constrained regional connectivity, and long-term threats to economic and community stability (Giuliano, 2025; Resilience Study Advances, 2025).

Both cases emphasize that resilience cannot rely solely on reactive emergency repairs. In the LOSSAN corridor, emergency repairs are described as costly, complex, and often insufficient to address recurring climate threats, while long-term solutions such as infrastructure hardening or relocating rail segments to safer ground require extensive planning, coordination, and sustained investment. This mirrors the Bay Area approach, where resilience planning extends beyond asset protection toward integrated regional adaptation strategies that simultaneously protect infrastructure and nearby communities. In both examples, transportation resilience is framed as a regional governance and planning challenge requiring interagency coordination, long-term funding strategies, integrated service planning, and collaborative adaptation efforts capable of addressing increasing climate pressures while maintaining mobility, accessibility, and community stability over time.

1.3.2 Current Responses

Within the transportation sector, current responses to short-term and long-term human displacement due to climate change are the following.

SHORT-TERM IMPACTS AND RESPONSES

Short-term responses relate to how the roads and other transportation infrastructure serve as the means for people to move from unsafe to safer areas, as well as how the service is managed to allow people to move.

Evacuation Routes

The Rural Transit Emergency Planning Guidance (Caltrans, 2008) provides best practices and step-by-step guidance on rural transit systems in California to prepare for, respond to, and recover from various types of emergencies. While the document does not explicitly use terms like "climate change", it does include natural disasters as a central theme. Wildfires, floods, earthquakes, and storms are all cited as critical threats that the transit system can prepare for. Furthermore, the Caltrans Emergency Services supports a resilient transportation network by preparing for, protecting against, responding to, recovering from, and mitigating the impacts of all-natural and man-made disasters and emergencies (Caltrans, 2025). For more information on emergency management, please see *Section 1.2 Emergency Management*.

Transportation Service Management

The San Francisco Bay Area Regional Transportation Emergency Management Plan (RTEMP) (Metropolitan Transportation Commission, 2018) is designed to ensure that transportation agencies across the nine-county Bay Area can act in a coordinated way during climate-related or other regional disasters. The plan distinguishes between emergency transportation (moving injured or at-risk people out of danger, bringing in first responders, equipment, and supplies) and basic transportation services (restoring transit so residents can meet their needs such as work, school, and health care). Further, 15 major Bay Area transit agencies have a mutual aid agreement that allows them to share buses, trains, ferries, equipment, and personnel across county lines if one system is incapacitated. The plan covers freeways, arterial roads, buses, rail, ferries, airports, and ports, ensuring that surviving parts of the system are used for mass movement of people and goods. The RTEMP acknowledges that extreme events can force communities to relocate temporarily or permanently, and it integrates transportation planning to support displaced populations. For example, the plan indicates that during recovery (ranging from weeks to months), temporary transit services and alternate routes are established to ensure that displaced residents can still access work, schools, and health facilities. Long-term displacement, however, is addressed in more general terms by indicating that transportation recovery is tied directly to the restoration of communities and activity centers—emphasizing that rebuilding mobility aligns with supporting residents' return or resettlement but without indicating who would be responsible for this effort.

LONG-TERM IMPACTS AND RESPONSES

Long-term responses specific to transportation include considering resilience in the planning, design, construction, and operations of transportation infrastructure to make it less vulnerable to climate change impacts.

Resilient Planning, Design, Construction, and Operation

The CAPTI (CalSTA, 2025) outlines a holistic framework that aligns California transportation infrastructure investments with the state's climate, health, and social equity goals. This document establishes key actions to deliver equitable outcomes, such as a commitment to encourage transportation project applicants to engage and partner with environmental justice groups and local and regional agencies to demonstrate that projects are accounting for displacement and other climate impacts within these communities. Further, the Caltrans Climate Change Vulnerability Assessment report (2021) has initiated a series of steps for Caltrans to continue to assess climate change vulnerability and prioritize assets, evaluate different types of facility levels, and incorporate resilience into project development based on the assessment (Caltrans & WSP USA INC, 2021). Specifically, the Caltrans Climate Change Adaptation Strategy Report (Caltrans & WSP, 2020) highlights the potential impacts to communities that depend on reliable transportation and community lifeline strategies when emergencies occur.

Caltrans has Climate Change Adaptation Priorities reports for each of its districts where it prioritizes the order in which assets found to be exposed to climate hazards will undergo a more detailed asset-level climate assessment. For example, in district 4, the Novato Creek Bridge located in state route 37 EB is one to be further assessed based on the cross-hazard prioritization score. The prioritization includes, among other things, "the timing of the climate impacts, their severity and extensiveness, the condition of each asset (a measure of the sensitivity of the asset to damage), the number of system users affected, and the level of network redundancy in the area (Caltrans & WSP, 2018). In railway, adopting sensor technology could mitigate economic losses by allowing for localized, rather than blanket, speed restrictions during heat events (Bedsworth et al., 2018).

The last step of the process is the consideration of what adaptation strategies may be included in transportation projects to make them more resilient. The Climate-Safe Infrastructure Working Group (2018) summarized the following adaptation and planning strategies:

Transition to forward-looking data, where transportation agencies move from using historical climate records to guide infrastructure design and construction to considering forward-looking climate projections to better evaluate future vulnerabilities and long-term infrastructure risks.

Adaptive design, including modular and flexible highway design strategies. For instance, transportation infrastructure may initially be constructed to accommodate one foot of sea-level rise while incorporating a structural foundation capable of supporting future elevation increases if conditions worsen beyond current projections.

Safe-to-fail principle that recognizes that infrastructure failure may eventually occur and therefore prioritizes limiting impacts, preserving critical functions, and enabling rapid recovery. As part of this approach, Los Angeles County Metropolitan Transportation Authority has developed a Resiliency Indicator Framework that incorporates safe-to-fail metrics into project evaluation and planning.

Decision-Making Frameworks, for example, Caltrans has also adopted the Federal Highway Administration's Adaptation Decision-Making Assessment Process (ADAP), an 11-step framework designed to systematically integrate climate change considerations into transportation planning and project design.

Other approaches are suggested in the document Caltrans Adaptation Strategies (Caltrans, 2023). For example, sea level rise could be addressed in transportation projects by considering re-location or elevation of existing infrastructure. In the case of wildfires, one adaptation strategy is to create buffers between the infrastructure and the vegetation surrounding it; another option could be to use fire-resistant landscaping. The report recommends that the decision process of adopting any long-term strategy weighs the impact of the strategy on human displacement, as suggested in **Table 3**.

Table 3: *Selected long-term strategies and human displacement considerations*

Climate Change Issue	Long-Term Strategy	Human Displacement Consideration
Increased greenhouse emissions	Transition from carbon fuel based to electric vehicles (EVs)	Question 1: Are the mining areas required to obtain raw materials to produce EV batteries affecting and displacing communities? Question 2: Is the site of EV related power-generating and battery storage facilities affecting and displacing communities?
Sea level rise	Strategy 1: Existing infrastructure: Relocate or elevate to safe areas. Strategy 2: New infrastructure: Avoid areas of sea level rise	Question 1: How does the relocation infrastructure impact a user's access to their houses, jobs, health care, etc.? Question 2: How does the infrastructure relocation impact supply-chain activities and workers' job access?
Wildfire	Strategy 1: Create buffers between the infrastructure and vegetation surrounding it. Strategy 2: Use fire-resistant landscaping	Question 1: How do buffers affect communities living/ working close to the infrastructure? Question 2: Does fire-resistant landscaping require a new skilled workforce?

1.3.3 Adaptation Opportunities

Transportation systems form the operational backbone of evacuation, recovery, and longer-term mobility decisions, making them a central adaptation domain. A key opportunity lies in reframing transportation infrastructure as a climate-resilience system that maintains connectivity under disruption rather than solely optimizing routine mobility.

Existing state-level initiatives led by Caltrans, including vulnerability assessments and CAPTI-aligned planning, provide a foundation for integrating climate risk into infrastructure design. An important adaptation space emerges in linking these efforts more directly with housing stability and emergency response systems, since mobility constraints often determine whether households can evacuate, return, or remain in place.

Rural and underserved communities present a distinct opportunity space, where conventional transit systems often fail under climate stress. Community-led mobility models—such as shared van networks and culturally grounded ride systems—demonstrate how adaptive transport solutions can emerge outside traditional infrastructure planning. These models highlight the potential for flexible, decentralized mobility systems that maintain access during disruptions.

Across these dynamics, transportation resilience is increasingly tied to equity in access during climate events rather than only long-term emissions or congestion metrics.

1.4 Water and Energy

California's water and energy sectors are inextricably linked systems that shape how communities experience climate change and recover from its associated impacts, like drought and wildfire. The water-energy nexus describes this relationship, recognizing that the resilience of each system depends on the sustainability of the other (Taylor-Miesle, 2025). Water supports the state's energy production through industrial uses such as cooling, hydraulic fracking, and hydropower generation, while California's water system itself is highly energy-intensive (Escriva-Bou et al., 2022; Taylor-Miesle, 2025). Water use consumes approximately 20% of California's electricity and 30% of its natural gas, largely for residential and commercial heating throughout the state (Escriva-Bou et al., 2022). Groundwater pumping and water treatment also require significant energy inputs to maintain water access and water quality amid California's long history of water insecurity.

Despite their interconnected nature, California's water and energy systems are governed separately, through distinct agencies and regulatory frameworks. The California Public Utilities Commission (CPUC) regulates investor-owned energy and water utilities under distinct rules and rate structures, while the Department of Water Resources (DWR) manages the State Water Project (SWP), which coordinates water delivery across the state. The California Energy Commission (CEC) operates as a broader planning and regulatory body, setting the state's energy codes, which include water heating and efficiency standards to conserve both municipal water supplies and the energy required to deliver them—further illustrating how water and energy are linked even when governance is not. This fragmented structure of management adds complexity as the state strives to address climate stressors that simultaneously impact water security, energy costs, labor, affordable housing, and public health.

Advancing the state's water and energy systems will require an environmental justice framework to protect frontline communities and Tribal Nations who have been historically dispossessed and displaced by invasive water and energy projects. This includes ensuring that water and energy projects comply with the Native American Graves Protection and Repatriation Act (NAGPRA) (1990) and AB 52 (Chapter 532, Statutes 2014), which require meaningful consultation with Tribal Nations and protection of cultural resources, sacred sites, and tribal heritage. In instances where projects have not led to direct displacement, unaddressed harms to tribal economies, cultural practices, and community health still erode the conditions that allow people to remain on their ancestral lands. As the climate crisis accelerates, these compounding harms increase the risk of future displacement if left unmitigated.

Hydroelectric power illustrates this tension directly. While it supports water accessibility during dry years and contributes to California's diverse energy portfolio, poorly sited projects can lead to environmental and cultural degradation. The Klamath River Hydroelectric Project illustrates this risk: before its removal, hydroelectric dams blocked hundreds of miles of salmon spawning grounds, which are culturally and economically significant to the Yurok Tribe (Sherriff, 2024).

This chapter assesses how intersecting pressures, along with the strategies implemented to address them, may serve to either attract new populations or push existing communities to relocate. The chapter will also identify the frontline communities most vulnerable to these stressors and offer opportunities to reduce harm and cost burden to create resilient regions that prepare communities to resist displacement pressures.

1.4.1 Climate Impacts and Push and Pull Factors

This section explores how climate change strains energy and water systems, with consequences that can accelerate conditions that lead to displacement. It highlights the convergence of industrial infrastructure and rising resource demand with increasingly fragile ecosystems weakened by extraction, drought, and depletion. By understanding the factors that drive displacement and the areas that absorb displaced populations, we gain a fuller picture of the social and geographic consequences of energy-water system vulnerabilities under changing climate conditions.

PUSH AND PULL FACTOR: FOSSIL FUEL INDUSTRIES

Burning fossil fuels for electricity, heat, and transportation is the largest source of greenhouse gas emissions from human activities in the US (US Environmental Protection Agency, 2023). Despite California's ambitious decarbonization goals, oil and gas remain a significant part of the state's economy and energy system. While California significantly relies on natural gas for electricity generation, accounting for 36% of California's energy mix in 2022, the use of oil for energy generation is minimal (US Energy Information Administration, 2025a, 2025b, 2025c). California's main application for oil is in the transportation sector. This section focuses on natural gas given its dominant role in electricity generation and examines its impact on water sources and local communities, presenting indicators of climate stress and potential for displacement or population growth.

In the Central Valley, where natural gas extraction permitting is most prominent, the oil and gas industry has historically drawn workers seeking employment opportunities, serving as a pull factor that contributed to the region's population growth (Schnalzer, 2021). In 2025, the fossil fuel industry employed an estimated 94,000 people, making up 10% of all energy jobs in the state (Bohn et al., 2025). For more on labor, please see *Section 2.5 Labor and Employment* of the report. Low-cost housing also influences migration to oil and gas producing regions. Central Valley communities near oil and gas extraction sites tend to have lower housing costs, making these areas more attractive to Californians struggling with the state-wide housing affordability crisis (Borrego, 2022). This nexus of job opportunity and low-cost housing leads lower-income communities to the front lines of fossil fuel extraction sites, continuing the history of environmental and public health inequities that disproportionately impact disadvantaged communities (Shonkoff & Morello-Frosch, 2024; Manke, 2023a, 2023b).

Communities living near oil and gas extraction sites face increased risks to air quality and groundwater contamination, both of which have direct public health consequences. Regions with the highest concentrations of oil and gas wells have the greatest risk of groundwater contamination, which can disrupt access to clean water and lead to temporary displacement. As of 2021, Kern County, California's most active county for oil and gas extraction (Kern Economic Development Foundation, 2021), has approximately 50,000 wells with suspected methane leaks (based on an extrapolation of data from Lebel et al., 2020). Around 10,000 of those wells are located within 200 feet of a river or creek, underscoring how fossil fuel extraction—as a part of the state's broader energy system–can threaten groundwater resources and exacerbate contamination risks, particularly in regions already experiencing water stress. (Lebel et al., 2020). Statewide, approximately 2.17 million Californians live within 2,500 feet of operational oil and gas wells, and more than 7 million live within a one-mile radius (Ferrar, 2020). Since 2018, California's Oil and Gas Methane Regulation implements requirements for methane leak detection and repair to reduce the number of leaks (CARB, 2024).

Underground well injections, used in oil and gas extraction for both enhanced oil recovery and wastewater disposal, pose a threat to local water supplies. These wells work by pumping water, often mixed with toxic chemicals, deep underground at high pressure. When not properly contained, injected fluids can migrate into nearby aquifers (California Department of Conservation, 2025), contaminating the drinking and agricultural water that communities depend on. (Mall, 2024), thus exacerbating the potential risk of harm and displacement within frontline communities and Tribal Nations.

While the risks have been historically downplayed, assessments by the US Geological Survey (USGS) and California water regulators have detected petroleum-related gases and fluids migrating into protected groundwater sources, including aquifers that supply drinking and agricultural water to hundreds of thousands of residents (Rosecrans et al., 2021). Although the full extent of groundwater contamination is still understudied and difficult to quantify, early findings of contamination in places like Ventura and Kern counties highlights the urgency of rigorous monitoring and regulation to prevent contaminated water resources (Gannon, 2025). Contaminated water that cannot be remediated reduces the total supply of usable water available to communities and agriculture—a compounding risk in a state increasingly vulnerable to drought.

Tribal Nations are disproportionately affected by the risk of drinking contaminated water, and in many cases, lack access to regular water quality testing (Mok et al., 2022). The ongoing impacts of oil and gas extraction on Tribal lands—through degraded water, air, and public health—represent a continuation of the settler colonial practices that originally displaced Indigenous peoples, further threatening their ability to remain on ancestral lands (Thomas-Muller, 2005). Water contamination leads to dispossession and displacement by undermining fishing, damaging Tribal cultural resources and landscapes, and generating public health crises that make continued habitation untenable. This is not incidental: today, 20–35% of the nation's oil and gas reserves are located within US designated Tribal lands, meaning Indigenous communities bear a share of the environmental health risks and are at the frontlines of displacement pressures due to energy development (Tallman et al., 2023; Thomas-Muller, 2005). For more information on health, please see *Section 2.1 Health*.

Historical disasters tied to oil and gas operations illustrate how extraction infrastructure can trigger displacement. The 2015 Aliso Canyon gas leak in the San Fernando Valley region of LA County and the 2019 oil spill affecting groundwater in Kern County are two examples of how failures in energy infrastructure can force residents from their homes. (Akpan, 2016; Mernit, 2021; Kay & Katz, 2021). These events also raise the difficult question of return. While the "right to return" is a common discussion for post-disaster recovery, the return of the Porter Ranch community's return following the Aliso Canyon gas leak provides an example where the opportunity to return may not always indicate the safest option for displaced residents (Stone, 2025). Hundreds of Porter Ranch residents reported ongoing respiratory illness, chronic coughing, and higher than expected low-birth-weight babies following the clean-up by the Southern California Gas Company (Mckenna, 2016; Paul et al.,2025).

Oil and gas operations also contribute to broader climate conditions that drive large-scale displacement events. Emissions from natural gas extraction and other oil and gas activities also contribute to aridity and extreme heat conditions that increase wildfire risk. Recent research found that emissions from fossil fuel industries have contributed to approximately half of the

increase in heatwave intensity since the 17th century (Quilcaille et al., 2025). These studies have directly linked these emissions to deadly heat events like the 2021 Pacific Northwest Heat Dome, which killed approximately 200 people and contributed to the dry conditions that preceded the Dixie, McFarland, and Caldor fires that same year in Northern California (US Department of Agriculture, 2021; Wigglesworth, 2024).

Taken together, these examples demonstrate that the fossil fuel industry, and its associated emissions, contribute to displacement in many ways–through acute disasters, large-scale climate events, and the slower, cumulative health and environmental burdens that make extraction-adjacent communities less livable over time. While chronic health impacts near extraction sites may not trigger immediate relocation, they can gradually make these areas less desirable places to live, shaping long-term population patterns.

PUSH FACTOR: WILDFIRES AND URBAN FIRES

Fossil fuel-based energy production contributes to heat and drought conditions that intensify wildfires, but energy infrastructure itself can also amplify fire-risk. California's aging energy infrastructure combined with fire-vulnerable housing stock, and the state's long history of fire-suppression, creates compounding fire risk in both urban and rural areas. When fires occur, thermally degraded water infrastructure and homes threaten local water resources and contribute to displacement pressures.

Extreme heat strains the energy grid in at least two ways. First, high temperatures increase energy demand through uses like air conditioning, pushing infrastructure and the grid to its limits (Burton et al., 2025). Second, extreme heat can physically impact energy infrastructure, causing power lines to sag and expand and transformers to overheat. In 2022, Southern California Edison power lines sagged under extreme heat conditions and made contact with a communications line igniting dry vegetation nearby and starting the Fairview Fire in Hemet. The fire burned more than 28,000 acres and temporarily displaced thousands of residents (Montalbano & Sacks, 2023).

This is not an isolated case. Between 2016 and 2020, electrical power was responsible for 10% of wildfires statewide, resulting in more than 3.3 million acres burned (Burton et al., 2025; California Public Utilities Commission, 2024). In 2024, the state's investor-owned utilities reported four wildfire-related incidents involving their equipment, including two linked to Southern California Edison (Penn, 2025). As climate change accelerates more frequently and severe heat and drought, the risk of electrical infrastructure initiating fires will grow. In some regions, the likelihood of fires occurring near critical transmission lines is projected to increase by more than 300% by 2100 (Sathaye et al., 2011).

Housing affordability pressures compound this risk. As high housing costs push residents into the wildland–urban interface (WUI), the boundary where developed areas meet fire-prone wildlands, energy infrastructure becomes a higher risk, increasing the likelihood of housing loss due to electrical fires (Greenberg et al., 2024). The 2018 Camp Fire in Paradise, California, caused by a downed power line, is a notable example of how the convergence of aging infrastructure in fire-vulnerable conditions can result in catastrophic loss (Greenberg et al., 2024; Dale et al., 2018). Future wildfire risk is expected to increase rapidly in many parts of the state, including in mountainous areas near Santa Barbara and Sacramento (Dale et al., 2018).

Wildfires also contribute to displacement pressures through the contamination of local water resources. For communities that have the opportunity to rebuild following a wildfire or urban fires, costly damages to the local water system and widespread contamination of water resources further complicate their ability to safely resettle. After the 2018 Camp Fire, the most destructive wildfire in California history, early testing in Paradise revealed that approximately 172 miles of pipeline had been contaminated with cancer-causing chemicals, an effect that also followed the Tubbs fire in Northern California, which was known as the most devastating wildfire in California history the year before (Terrel, 2023; Siegler, 2019). Yet, due to the combined constraints of housing affordability and limited insurance coverage, many residents were forced to return to burned properties that lacked access to potable water (Bizjak, 2019). In these cases, water testing is expensive, and those unable to relocate or sell their homes often resort to purchasing costly water tanks to secure access to clean water. Older homes without backflow prevention systems are particularly vulnerable. During the recovery process, homeowners bared responsibility for replacing contaminated service lines running into their homes and businesses (Bizjak, 2019). For residents whose housing remains uninhabitable following a displacement event, the inability to secure potable water can act as a displacement pressure (Bizjak, 2019). For more on housing, please see *Section 1.1 Housing*.

The effects of wildfires are especially impactful to rural communities with smaller, under-resourced water agencies. For instance, the LNU Lightning Complex Fires exacerbated existing water access inequities in San Lorenzo Valley. The constraints that urban areas face with low water pressure to fight wildfires are amplified when addressing rural systems with smaller capacity systems never intended to support the defense of multi-acre structure fires (Becker, 2020).

Severe wildfires can also disrupt the overarching processes responsible for maintaining access to drinking water. By disturbing soil and removing the stabilizing effect of roots, severe wildfires (followed by heavy rain) can increase sediment and toxins in waterways and reservoirs, and lead to mudslides, like those seen in Montecito in 2018 following the Thomas fire (Dahl et al., 2023). Los Angeles County Public Works, for example, is planning a major sediment removal project at Big Tujunga Reservoir, where the 2009 Station Fire substantially increased sediment accumulation; sediment removal is tentatively scheduled to begin in 2027 (Los Angeles County Public Works, 2026). Many of these costs are then passed on to consumers through expenditures for prevention, suppression, recovery, and infrastructure repair (Dahl et al., 2023).

As wildfires become more frequent and destructive, there will be fewer regions safe from wildfires for fire-displaced communities to resort to. Nationwide patterns reveal that residents who feel most impacted by wildfires and smoke are more likely to plan relocation to another state or out of the country (Jordan, 2021). Further research is needed to understand how the impacts of wildfires and its subsequent impact on water resources may discourage population growth in fire-prone areas in California.

PUSH FACTOR: DATA CENTERS

The rapid expansion of artificial intelligence (AI) data centers is emerging as an additional stressor on California's water and energy systems, with implications for climate-induced displacement and migration. Data centers are often sited in rural or water-stressed regions due to land availability and infrastructure considerations, placing their growing resource demands in direct competition

with local residential, agricultural, and Tribal water and energy needs (Nickelburg, 2025). In hotter regions, cooling requirements for data centers further increase water use, and rising chip density has intensified energy demand even within existing facilities (Yañez-Barnuevo, 2025). Industry data illustrate the scale of this growth: Google reported that its US data centers consumed 6.1 billion gallons of water in 2023, a 17% year-over-year increase (Google, 2024), while California data centers saw electricity use nearly double and water consumption increase by approximately 96% between 2019–2023 (Lui et al., 2025). Beyond on-site use, data centers also drive indirect water demand through fossil fuel-based electricity generation, which relies on water-intensive steam processes (Guidi et al., 2024; Siddik et al., 2023). In drought-prone regions, these compounded pressures may contribute to longer-term resource insecurity, rising energy costs, and reduced community viability—factors that can exacerbate climate impacts and thus indirectly shape patterns of climate-induced displacement and migration.

1.4.2 Current Responses

This section will explore the tools available at the state, regional, and local level that can address the unique stressors discussed earlier in the chapter. These tools are organized into distinct strategies to address resiliency in the water and energy sector: clean energy planning, grid resiliency, and water security amidst drought pressures due to extreme heat and wildfire contamination. This chapter will also highlight how these interventions might inform the push and pull dynamics of climate-induced displacement and relocation.

CLEAN ENERGY PLANNING

Diversifying the state's energy generation portfolio is a reliable, cost-effective measure to support widespread energy access as the state improves energy resilience and transitions from the fossil fuel industry (The Climate Center, 2024). Supporting the transition from oil and gas operates as a measure to mitigate future displacement pressures (i.e., fire-related displacement events, extreme heat, water contamination in connection to fossil fuel–based energy production). Alternative energy such as solar, wind, and geothermal ensure stability against supply shocks. California's hydropower rebound in 2023 illustrates how climate variability (in this case, extreme rain) can also serve as a resource when water resources are managed strategically (Long et al., 2024). This kind of strategic water management has mutually beneficial outcomes for water conservation and encourages energy diversification. Investments in a more diverse energy generation portfolio also uplift new employment opportunities following a shift away from fossil fuels (Cha, 2020).

Another example of the state's effort to create more resilient systems within the water and energy sector is the California Department of Water Resources (DWR) State Water Project. The State Water Project is California's cleanest major power portfolio, with approximately 55% of its electricity generated through carbon-free hydroelectric power. As California transitions toward clean energy, DWR is reducing reliance on fossil fuels, supporting grid reliability, and pursuing a goal of achieving a 100% carbon-free power portfolio for the State Water Project by 2035, through strategies such as expanding solar integration.

The state has committed to reaching 100% carbon-free electricity by 2045, including intermediate requirements of 60% renewable generation by 2030, 90% carbon-free electricity by 2035, and 95% carbon-free electricity by 2040 (SB 100, 2018; SB 1020, 2022; Szinai et al., 2021).

However, water heating is the most energy-intensive end-use of water and is still largely done using natural gas water heaters. Therefore, energy programs in the state have begun to provide incentives for switching natural gas water heaters to more efficient and less GHG-intensive electric heat pump water heaters (California Energy Commission [CEC], 2025a).

While energy diversification can help mitigate climate displacement, the state has a documented history of disrupting Tribal communities, cultural landscapes, and relationships to ancestral lands to accommodate new energy infrastructure, including renewable energy. As solar projects are increasingly fast-tracked to meet urgent climate goals, these processes routinely overlook Tribal sovereignty, Tribal cultural resources, and community health (CEC, 2023, 2025b; California Strategic Growth Council, 2026). This pattern is not new. Decades of colonialism and industrialization have eroded the foundation of trust, consent, accountability, and reciprocity that meaningful government-to-government tribal engagement requires. When clean energy projects are approved without genuine Tribal participation, they risk repeating the same cycle of harm that fossil fuel development has long imposed on Tribal communities (Whyte, 2018). The Palen Solar Electric Generating System illustrates this problem directly. The Bureau of Land Management and the California Energy Commission fast-tracked the project on a timeline that did not allow adequate time to identify and protect Tribal cultural resources. The Quechan Tribe and the Colorado River Indian Tribes objected that they were not meaningfully consulted, and that the project's cumulative impacts to tribal cultural resources were never fully analyzed (Cohen, 2013).

Across multiple solar projects in the California desert, Tribal cultural resources and sacred landscapes have been damaged or destroyed, with industrial construction affecting several thousand acres of culturally significant land. In Northern California, construction of a solar installation in Santa Clara County was halted after the site was identified as a Muwekma Ohlone burial ground (Clarke, 2013; Louie, 2016). These examples are not exceptions—they demonstrate a recurring pattern in which the urgency to address climate change is used to justify bypassing the time needed to build trust and obtain genuine Tribal consent. Equitable clean energy development requires more than procedural compliance. Positive outcomes can be reached when Tribal communities are included as decision-making partners from the start—before projects are sited, designed, or approved. With this commitment, clean energy development can avoid repeating the same harms as fossil fuel extraction and prevent displacing Tribal communities, damaging Tribal cultural resources and Tribal cultural landscapes, and undermining Tribal self-determination.

GRID RESILIENCE

Grid hardening is a strategy that replaces California's aging and fire-prone electrical infrastructure, reducing fire risk and, thus, the risk of displacement due to utility-caused fires. By undergrounding lines and replacing exposed power lines with covered conductors in high fire risk areas, utilities can significantly reduce the chance of ignitions during extreme weather events and prevent outages to ensure a more reliable power supply (Southern California Edison, 2026). Utilities and federal agencies alike are taking steps to improve grid resilience and address the energy sector's role in wildfire risk. In response to the 2025 Los Angeles fires, a 2025 executive order committed state agencies and the Federal Energy Regulatory Commission (FERC) to focus on wildfire mitigation. This order requested that agencies assess existing rules and policies that may negatively impact wildfire response, support state and local land-management efforts, and support the use of new technologies to enhance wildfire preparedness (Graves, 2025).

Investments in modernized, fire-resistant transmission can also prevent utility-caused fires and enhance confidence in the grid (Governor Newsom's Strike Force, 2019). Federal profit incentives, such as the Federal Energy Regulatory Commission's (FERC) return on equity (ROE) incentives, provide subsidies that pay electric utilities for the costs of transmission projects and accelerated cost recovery options to encourage private investment towards transmission enhancement projects and participation in regional transmission organization. Due to their role in regulating interstate electric transmission assets, FERC may be able to incentivize greater fire prevention and grid hardening investment in the utility sector (Governor Newsom's Strike Force, 2019). While transmission enhancement incentives intend to reduce costs and increase energy reliability for consumers, additional research can help identify whether such incentives result in widespread reduced energy costs for residents and whether private companies are ultimately passing the costs of development to customers.

Public incentives for funding may prove more beneficial as public entities are able to borrow at lower rates than private companies to finance the work, thus offering lower rates to utility ratepayers (Brill et al., 2025). SB 254 (2025) offers a framework for how to implement public funding to achieve expedited transmission improvements to address wildfire risk and the development of clean energy infrastructure, while cutting costs for consumers (Brill, 2025; Clean Air Task Force, 2025). Insight from this bill's implementation will help to inform how public incentives can support fire prevention and transmission enhancement strategies to protect residents from wildfires.

1.4.3 Water Security in Response to Drought and Wildfires

California has adopted policies recognizing access to clean, safe, and affordable water as a human right, while acknowledging the social and environmental inequities that shape water access across communities (DWR, 2021). In 2021, DWR adopted its Human Right to Water Policy to guide operations, grantmaking, regulations, and program development with a greater focus on equity and long-term water security. This policy has created resources for residents in rural California who may be experiencing dried wells due to the ongoing drought or Tribal communities facing the loss or contamination of their water supplies due to the drought.

DWR created the State Water Project Adaptation Strategy, which evaluates water conservation projects and strategies, including the Forecast-Informed Reservoir Operations and energy infrastructure upgrades (DWR, 2025d), strengthening the state's ability to manage water vulnerability while continuing to deliver water to millions statewide. Water resilience strategies often rely on energy infrastructure and technological systems to function, demonstrating the operational overlap between water management and energy planning. In 2026, favorable hydrologic conditions, alongside sustained state investments in water management, contributed to reduced water strain and improved drought conditions statewide (Office of Governor Gavin Newsom, 2026). In addition to California's policies and programs to support access to clean water amidst climate pressures such as wildfires and drought, there are additional local and community-level strategies that can reduce long-term damage to compromised water systems and ensure water resources are reliable in emergencies.

DEFENSIVE AND PROTECTIVE WATER INFRASTRUCTURE

Wildfires can affect water quality long after a fire is contained, as heavy rainfall can trigger erosion and post-fire runoff that carries ash, sediment, and contaminants into waterways and water pipes damaged by thermal degradation, leaching contaminates into the drinking water systems connected to homes (Roberton, 2026; Landers, 2022). Even water resources used by firefighting response teams pose a threat to water safety, as depressurized water systems that were depleted by fire response teams often recirculate contaminated water back into residential communities—an issue identified as one of the key sources of water contamination following the Camp Fire (Meadows, 2022). Backflow preventers offer a solution to prevent this. Backflow preventers are a one-way plumbing device that stops toxic substances from flowing back from homes into the broader municipal water system. Some impacted communities have already started to implement these tools: Paradise Irrigation District started installing backflow preventers on every new service lateral after 2018's Camp Fire. Another example of protective water infrastructure is the design of wildfire-resistant pipes. Pipes damaged or melted in extreme heat can contaminate entire systems (Associated Press, 2025). Expert recommendations suggest burying pipes at least three feet underground, setting structures and vegetation back from meter boxes, and using metal or concrete covers to protect the water from burned matter and protect water systems during a fire event (Associated Press, 2025).

REMOTE SHUT OFF VALVES

Remote shut-off valves can also improve wildfire response by conserving water potentially lost by fire-damaged, ruptured pipes. Installing remote valves on distribution lines allows utilities to redirect water quickly to where it's most needed, eliminating the need for firefighters to manually stop water flow where it's not needed (Associated Press, 2025).

Emergency water resources like "heli-hydrants"—helicopter accessible tanks with the capacity of thousands of gallons—have proven useful in using water resources to fight fires. During the 2024 Garden Fire in San Diego's Fallbrook area, firefighters accessed a 5,000-gallon heli-hydrant nearly 30 times. This system was established after the 2017 Lilac Fire, where poor refill options slowed suppression efforts (Smith, 2024; Associated Press, 2025).

Additionally, dedicating high-pressure water pipes for firefighting can increase fire preparedness and address efficiency with water resources. Following a major fire in the early 20th century, San Francisco established 135 miles of pipe, a reservoir, backup tanks, and underground cisterns designated for major fires (Associated Press, 2025). Experts from the San Francisco Water District suggest that such infrastructure could have significantly helped the 2025 Pacific Palisades fire in Los Angeles.

1.4.4 Adaptation Opportunities

Energy and water systems represent foundational climate infrastructure because they determine whether communities remain habitable during and after climate shocks. A central adaptation opportunity lies in treating these systems as interdependent resilience platforms rather than separate utility sectors.

Grid stress, wildfire ignition risk, flooding impacts, and drought conditions all converge on these systems, revealing an opportunity to design infrastructure that is both physically hardened and structurally decentralized. Microgrids, distributed energy systems, and localized water treatment capacity represent one pathway for reducing system-wide failure cascades during extreme events.

These systems also intersect directly with housing patterns and land use decisions, particularly in high-risk wildfire corridors and flood-prone zones. This creates an opportunity to integrate infrastructure planning with settlement patterns, reducing exposure before displacement pressures emerge.

Energy and water systems also function as public health infrastructures supporting cooling during heat events, maintaining drinking water safety, and enabling emergency communication systems. This overlap suggests an opportunity to more explicitly align infrastructure investment with health and emergency resilience outcomes.

Part 2:

Social & Community Wellbeing

The sectors addressed in this part of the report are core to individual and collective well-being, fostering belonging, personal development, and quality of life within climate-impacted and receiving communities. **Health** explores how climate threats affect healthcare systems and how migration shapes health outcomes for migrants, host communities, those who remain immobile, and vulnerable populations facing widening disparities. **Education** examines both the immediate disruptions of disasters on students and schools and the long-term inequities in outcomes for displaced populations, while also highlighting schools' dual role as critical social infrastructure—serving as shelters and community hubs—yet often strained by displacement pressures. **Community Identity** underscores the importance of identity in understanding the social and psychological impacts of climate threats, including disruptions to cohesion and heritage, while recognizing the cultural, social, and political significance of identity for Tribes and Indigenous peoples in California. **Labor and Employment** investigates climate impacts on California's economy, with attention to employment dynamics in key sectors such as energy, agriculture, and tourism, and their connection to migration and displacement, while distinguishing rural and urban contexts and considering the labor migration implications of climate adaptation efforts.

2.1 Health

Climate-induced migration patterns are greatly impacting the health and well-being of those living in California. Though the Intergovernmental Panel on Climate Change (IPCC) raised the alarm on climate and health in their first report in 1990 (Intergovernmental Panel on Climate Change, 1990), scientific and political action on this intersection has been slow moving on an international scale. It was not until COP28 in 2023 that health became a priority issue in larger climate negotiations (Osewe, 2023). The 2022 Lancet report (Romanello et al., 2022) underscores how pivotal recent health-system response and support has been: "...At this critical juncture, an immediate, health-centered response can still secure a future in which world populations can not only survive but thrive."

Climate-induced migration has many ripple effects on the health and well-being of both sending and receiving communities. Migrants can face a multitude of health problems due to a lack of access to adequate healthcare, financial resources, and nutrition, greater risks of experiencing violence, and infectious and non-communicable diseases. The resulting health outcomes are felt disproportionally by certain population groups, including but not limited to those with low-income, undocumented people, older adults, those with disabilities, those with underlying health conditions, and some communities of color. In both communities which migrants leave and those they move to, healthcare facilities can become strained—both overused and under-resourced—following climate migration.

2.1.1 Climate Impacts and Push and Pull Factors

CLIMATE IMPACTS ON HEALTHCARE INFRASTRUCTURE AND SERVICE CONTINUITY

Climate events such as wildfires, floods, and heat waves can disrupt healthcare by directly impacting the infrastructure of hospitals, clinics, laboratories, and care facilities, supply chains, and the caregiving workforce (Dresser et al., 2024, LaTourrette et al., 2018). These direct impacts may in turn impact migration dynamics (e.g., causing patients to seek care in new settings or by

unprepared caregivers). During Hurricane Sandy in New York City, a large hospital was forced to close temporarily and transport complex patients elsewhere. Many low-income, publicly insured Californians rely on the California Department of Social Service (CDSS)'s In-Home Supportive Services program that provides in-home assistance to eligible individuals who are older, blind, or have a disability as an alternative to out-of-home care. Climate disasters may impact the homes, essential caregivers, and durable medical equipment that enable such individuals to remain safely in their own homes (CDSS, 2025). Climate events, such as when Hurricane Maria in Puerto Rico destroyed a saline manufacturing plant, can interrupt access to lifesaving drugs and other supplies essential to patient care, even beyond the directly impacted area (Mazer-Amirshahi, 2018).

PATHWAYS THROUGH WHICH CLIMATE MIGRATION AFFECTS HEALTH

Migration itself is a social determinant of health because of its potential to impact health outcomes at individual, community, and societal levels through changing living conditions and access to resources and healthcare (Cissé, 2022; Davies et al., 2009; World Health Organization, 2008, 2022). Climate change can influence migration directly, such as through displacement from sea level rise, floods, or hurricanes; and also indirectly, by amplifying the socioeconomic and political drivers of migration, such as poverty, conflict, and lack of access to resources such as healthcare and education. Pathways linking climate-related migration and health are complex and multifaceted. The following sections outline key mechanisms and pathways for how climate-induced migration affects health, including health system strain; access to care, water, and food; financial insecurity; livelihood disruptions; mental health stressors; and physical, sexual, and emotional violence. Government policies may worsen or help alleviate migration-related health disparities.

Health System Access and Strain

Climate migration affects the healthcare system by increasing demand for services and straining resources. An influx of climate migrants with multifactorial, climate-exacerbated morbidity can overwhelm local health infrastructure. While California-specific evidence remains limited, studies from climate-affected and displacement-affected contexts globally suggest that this can be particularly true for areas with limited resources or places already coping with pre-existing health hazards (Negev et al., 2019; Schwerdtle et al., 2018).

In California, wildfire smoke exposure has been associated with increased emergency department visits and hospitalizations for the general population and especially among those with pre-existing respiratory diseases like asthma or chronic obstructive pulmonary disease (Jerrett et al., 2024). In addition to respiratory effects, wildfire smoke exposure has been linked to an increased risk of cardiovascular disease due to fine particulate matter (Malig et al., 2021). Fires initially interrupted routine care with a reduced rate of outpatient visits following smoke exposure during recent California wildfires (McBrien et al., 2023), followed by increased health care utilization. In addition to physical health impacts, there are important mental health impacts of climate-related migration, which are compounded by the fact that the mental health system in California is already strained (Lawrence et al., 2022). Costs to the healthcare system can be substantial, for example, the 2018 wildfire season caused an estimated $32.2 billion in health costs in California (Wang et al., 2021). In addition to costs, important health information, such as electronic medical records, can be fragmented and lost during climate emergencies or in transition between health systems.

Similarly, extreme heat events in California have been linked to increased hospitalization rates and overall negative health outcomes. The California Fourth Climate Change Assessment details how heat-related health events are projected to worsen in severity, duration, and timing and provides a tool to better inform local public health officials to protect the public during climate-exacerbated extreme heat events (https://www.cal-heat.org). A 2025 study of heat, morbidity, and hospital use found that California emergency room visits increased significantly during hot days, with patients presenting with higher rates of health issues including injuries and mental health conditions (Gould et al., 2025). Extreme heat is also associated with higher rates of violent crime (Heo et al., 2025). A 2021 study looked at data from the Los Angeles Police Department and found that days over 75°F (23.8°C) saw a violent crime increase of over 5%. This was especially true in lower-income neighborhoods (Heilmann et al., 2021). Further, during climate events, local healthcare facilities can face a number of different impacts, including damage, destruction, and power loss, severely limiting or halting access by patients (Melnychuk et al., 2022). As a result, affected community members often must travel to neighboring areas for medical care, placing additional strain on surrounding healthcare systems to accommodate this sudden increase in patient volume.

Climate-related migration can contribute to suboptimal management of common conditions such as diabetes, hypertension, and chronic obstructive pulmonary disease through disrupted healthcare access. Limited access to preventive care and screening can delay diagnosis of chronic diseases (Derose et al., 2007) and cancers (Hiatt & Beyeler, 2020). Interruption in medical care was the primary cause of sustained high mortality in the months after Hurricane Maria in Puerto Rico (Kishore et al., 2018). Individuals may lose insurance coverage when crossing state or county lines or losing employment, leading to lapses in healthcare, medication access, and worsening health outcomes (Jerrett et al., 2024). For example, Hurricane Katrina exacerbated pre-existing healthcare issues such as poor access to care, limited health infrastructure, and mistrust, which complicated relief efforts especially for dependent patients in nursing homes or requiring medical equipment (Rudowitz et al., 2006). During relocation, lack of continuity of reproductive healthcare can result in poor access to contraception or disrupted prenatal and postpartum care (Ha, 2022; Miranda et al., 2023). Furthermore, migration may result in precarious employment or housing options that increase occupational health hazards and exposure to environmental risks such as extreme heat, poor air quality, and housing-related toxins, further compounding health risks (Morello-Frosch et al., 2011).

Water Insecurity

Water insecurity is a critical pathway through which climate migration affects health. Climate change-induced hazards, including droughts and flooding, can compromise local water systems, triggering migration patterns (Hunter et al., 2015) as communities leave in search of more reliable water access. But these large-scale climate disasters represent only part of the story; water insecurity can also be exacerbated by pollution and poor local infrastructure, which create a "slow drip" push factor that drives people out of these communities (Stoler et al., 2021). For more information on water, please see *Section 1.4 Water and Energy*.

In both sending and receiving communities, water insecurity multiplies health risks. For those who stay behind in areas with scarce water access, they may experience dehydration and hunger (Mark et al., 2025), or consume contaminated water, exposing them to various water-borne

infectious diseases. A study examining drinking water contamination after the 2018 Camp Fire in Butte County, California found that the concentration of benzene—a contaminant known to cause severe gastrointestinal problems as well as certain cancers—had increased 80 times in local drinking water following the fire (Proctor et al., 2020). During the January 2025 wildfires in Los Angeles, city officials advised residents to avoid drinking tap water in fire-impacted neighborhoods. This advisory helps to protect residents from ingesting these harmful chemicals but may also put them at risk of dehydration in the process. Emergency services that deliver safe drinking water to disaster affected communities therefore become a public health intervention. Bottled water was distributed through the California Department of Public Health and California Department of Health and Human Services following the 2025 Los Angeles wildfires.

Even after arriving in receiving communities, people may continue to experience water insecurity as increased migration can strain local water infrastructure (International Organization for Migration, 2023) and can compromise water access, particularly if the region already faces climate change-induced water security issues (DWR, n.d.). Meeting the increased demand for water has been especially challenging in the Central Valley (US Geological Survey, n.d.), which has had one of the state's largest areas of population growth (California Governor's Office, 2025b). Research from disaster and displacement contexts globally suggests that, in addition to dehydration (Miller et al., 2021), water insecurity is associated with a myriad of other issues including anxiety and distress, and gender-based violence (Epstein et al., 2025). Ultimately, water insecurity serves as a major driver in climate-induced migration and can also be experienced by migrants after their resettlement, as well as by those who stay behind.

Food Insecurity

Food insecurity is an important driver of climate-induced migration and is deeply connected to issues of health inequity. Climate change impacts several dimensions of food insecurity. It impacts the availability of food, as drought, high temperatures, and heavy rains contribute to crop loss, death of food animals, and the migration of fish. Further, it reduces food access through the economic impacts of climate change, such as income loss and unemployment. There is also reduced food utilization, or the ability to consume a nutritious diet, through food and water contamination, and worsened diet quality since elevated C02 levels contribute to a decline in the amounts of protein, iron, and zinc in key crops like wheat and rice (Smith & Myers, 2018; Myers et al., 2014). Finally, lessons from global contexts illustrate that the stability of the food system is compromised through market volatility and increased food prices, and climate-related political instability and conflict (Schmidhuber & Tubiello, 2007; Wheeler & von Braun, 2013).

As a result, food prices in some areas increase, leaving many communities (especially low-income communities) with limited access to healthy and reliable food. This inadequate access to food sources can push families and individuals to other regions where they may find more viable land. However, upon arrival, food insecurity may persist or even worsen as migrants struggle with accessing employment or other economic resources.

Food insecurity is associated with numerous adverse health outcomes such as hypertension (Seligman et al., 2010), diabetes, (Nagata et al., 2019), and chronic kidney disease (Crews et al., 2014), and with neurologic and mental health problems such as cognitive decline (Tan et al., 2020), and stress and anxiety (Whittle et al., 2019). These impacts are felt disproportionally by certain

populations including the chronically ill (Whittle et al., 2015). The combined stress of displacement, food insecurity, economic hardship, and a lack of access to adequate healthcare can create a vicious cycle that pushes people further into hunger and poverty (Ejiohuo et al., 2024). Climate-induced food insecurity is expected to worsen in coming years. According to the Fifth National Climate Change Assessment, increased flooding and drought in California's San Joaquin Valley will disrupt the state's crop supply.

Mental Health Implications: Loss of Home, Social Networks, and Cultural Ties

The mental health implications of climate-induced migration are multi-faceted. After losing one's home and/or livelihood in a climate disaster, many survivors are forced to relocate elsewhere either temporarily or permanently. Displacement thus has profound mental health impacts as it can disrupt social support networks, community culture, identity, educational continuity, economic stability, and access to care (Shultz et al., 2019; Torres & Casey, 2017). Extensive evidence highlights that forced migration increases risks for depression, anxiety, sleep disturbances, and post-traumatic stress disorder (PTSD) due to trauma, loss, and ongoing uncertainty (American Psychiatric Association, 2023; Schwerdtle et al., 2018; Torres & Casey, 2017).

In studies of Hurricanes Katrina (Fussell & Lowe, 2014) and Harvey (Fitzpatrick, 2021) survivors found that these adverse mental health impacts were significantly more pronounced for those who migrated out of the disaster-impacted area than those who stayed behind—underscoring the acutely disorienting and isolating experience of losing one's social and cultural ties and the stress of having to navigate a new community entirely. Low-income survivors are more likely to be forcibly relocated as they have a harder time adapting to the soaring local rental market that occurs after disasters and more often occupy roles in manual labor industries that might have been disrupted by the disaster. Furthermore, rebuilding in the same area requires time and resources and might not be safe depending on the type of climate disaster, such as mold from flooding or ashes from wildfire smoke exposure (Jacobo & Forrester, 2025).

Mental health effects can be prolonged—for example, families displaced by Hurricane Katrina experienced high rates of PTSD and major depression even years after the event (Kessler et al., 2006). In fact, increased length of displacement is associated with poorer mental health outcomes (Mental Health Europe, 2018). Among children and adolescents, internal displacement has been linked to behavioral problems, academic decline, and long-term mental health challenges due to instability, toxic stress, and exposure to adverse childhood events. Family separation leaves minors particularly vulnerable to post-traumatic stress disorder (Blackmore et al., 2020; Shadid & Sidhu, 2021).

Whether someone migrates or stays behind following a disaster, the prevalence and severity of mental health outcomes are strongly correlated with their access to social services. One study investigating unmet healthcare needs following California wildfires (Jenkins et al., 2009) found that half (50%) of households that needed mental health support could not access services. These access issues can be especially challenging in rural and low-income communities (Rosenthal et al., 2021) that have limited resources. Further, migrants who do not speak English may have a harder time finding mental health support in their language. In California, over 5.5 million adults are currently living with a mental health condition (National Alliance on Mental Illness, 2023). Climate-induced disasters and the migration patterns that follow amplify the severity and prevalence

of these conditions. Further, as mentioned above, migrants may struggle with food and water insecurity as well as housing and employment access, all of which can cause and exacerbate depression and anxiety.

Physical, Sexual, and Emotional Violence

Per the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, climate hazards are both a growing driver of involuntary migration and displacement and a contributing factor to violent conflict. Interpersonal and community violence can be generated by conflict over scarce resources (International Organization for Migration, 2019), for example, and has been associated with environmental exposures such as warming temperatures (Tiihonen et al., 2017) or extreme rainfall (Hsiang et al., 2013). Violence is inequitably distributed across and within societies. For example, sexual and gender-based violence, rooted in structural and gender inequalities, can disproportionately affect women and LGBTQ+ populations and is increased among people with insecure migration status (Innes et al., 2024). While California-specific evidence remains limited, studies from climate-affected and displacement-affected contexts globally suggest (Epstein et al., 2020; Munala et al., 2023) that climate extremes and associated displacement may be linked to higher rates of intimate partner violence, homicides, suicides, and all mental health outcomes combined, which may be due to the stressors of economic loss, food insecurity, and psychological distress.

2.1.2 Current Responses

Government policies that punish or restrict migrants play a critical role in shaping how strongly climate migration contributes to poor health. Several policies have sought to enforce restrictions on migrants, including the Migrant Protection Protocols, also known as the “Remain in Mexico” policy, which prohibited migrant asylum seekers from entering California until their immigration court dates. Many people subsequently suffered health harms due to a lack of access to safe and sanitary conditions—a phenomenon experienced disproportionately by youth, Black, Indigenous People of Color, (BIPOC), and LGBTQ+ communities (University of Pennsylvania, 2022). Recent Immigration and Customs Enforcement (ICE) crackdowns and raids in workplaces, health centers, and schools have caused widespread fear and panic in non-citizen migrant communities across California. Fears of deportation prevent people from accessing basic needs such as employment, social services, and healthcare, which worsens any prior psychological, mental, or financial hardships (Pillai et al., 2025). Many who sought refuge in California are being forcefully returned to the countries they left, many of which are facing extreme climate vulnerabilities and associated crises (Angelo, 2022). Such policies ultimately restrict the safety, health, and basic humanity of all migrants, including climate migrants.

Case Study: *Wildfires, Migration, and Healthcare Access*

California wildfires, such as the Camp Fire (2018) and the Palisades and Eaton Fires (2025), have triggered widespread displacement. The Camp Fire destroyed nearly 90% of homes in the mountain town of Paradise (Alexander, 2019)—five years later, only one-third of the town's pre-fire population had returned (Siegler, 2023). The Palisades and Eaton fires collectively displaced thousands of households in the LA area in early 2025 and many had not returned to those communities six months later (Phillips, 2025). Displaced residents face both immediate health threats, such as smoke inhalation and disrupted care for chronic illnesses as well as longer-term effects, including mental health challenges and housing insecurity. Populations with medical vulnerabilities experience these health impacts more acutely: those taking certain medications that interfere with cognitive functioning or mobility are at greater risk from toxic exposure to ash, soil, and contaminated water. Immobile individuals, such as older adults or those with disabilities also face highly disproportionate risk: the majority of the fatalities that resulted from the Palisades and Eaton fires were disabled and elderly residents who were unable to evacuate in time (Zacarias, 2025).

These groups also often suffer heightened respiratory and cardiovascular conditions, which can be exacerbated by sustained exposure to fine particulate matter in wildfire smoke. A 2020 study examining the health risks of wildfires in the state noted that exposure to thick wildfire smoke was correlated with a 70% increased risk of out-of-hospital cardiac arrest—and this risk was particularly high for those with low socioeconomic status (Jones et al., 2020). Housing prices often soar after wildfire events. After the Camp Fire, local housing prices increased 13% for homes in the surrounding area and this surge was still in effect at least 10 months after the fire. Early reports from the 2025 LA-area fires found that local rental prices increased by up to 200% in some areas following the disaster (Ma, 2025). Low-income families who lack financial resources needed to meet housing price increases may therefore become vulnerable to the numerous health issues associated with housing insecurity. For more on housing, please see *Section 1.1 Housing*.

Displaced residents may have moved far from their primary care providers and/or pharmacies to restart care in their new communities with practitioners who are unknown to them and unfamiliar with their medical records. Concurrently, they may also be dealing with the stress and logistics of rebuilding their homes or navigating the complexities of homeowners or rental insurance and have less time to devote to their healthcare. Healthcare facilities themselves may have limited capacity following a wildfire and may be unable to adequately respond to the increased demand on healthcare services among migrant populations.

In January 2025, the state implemented a number of measures to protect and promote healthcare access for wildfire survivors, including simplifying enrollment and renewal for Medi-Cal, extending free mental health services, and eliminating barriers to refilling medical prescriptions (California Governor's Office, 2025a). However, California's healthcare system often becomes overwhelmed during wildfire crises as emergency departments overflow, primary care access is disrupted, and the number of available health care providers decreases. Clinics may be destroyed or forced to close, especially those that are near the fire or other climate disaster where most people seek care. These events highlight the need for climate-resilient health infrastructure, targeted support for immobile and marginalized groups, and a more coordinated disaster response framework.

2.1.3 Adaptation Opportunities

Health systems sit at the intersection of climate exposure, displacement, and long-term vulnerability. A key adaptation opportunity lies in strengthening continuity of care across geographic disruption, ensuring that mobility—whether voluntary or forced—does not interrupt access to essential health services.

Climate-induced migration also introduces a set of compounding risks, including mental health stressors, chronic disease disruption, and loss of preventive care access. These risks are unevenly distributed, with heightened impacts among low-income populations, undocumented residents, older adults, and individuals with existing health conditions, creating an opportunity to design targeted continuity systems for high-vulnerability groups.

Cross-sector coordination between health systems, housing agencies, and emergency management offers an additional adaptation space, particularly in aligning data systems, care

delivery, and disaster response frameworks. Health infrastructure also functions as a stabilizing force in place-based resilience, suggesting an opportunity to reduce displacement pressures by strengthening care capacity in high-risk regions.

2.2 Education

This section discusses the impacts of climate change-induced migration and displacement on education, with attention to acute climate disasters within California and migration to California from other states or countries. It explores the impacts of climate migration and displacement on different levels of the schooling system, ranging from students and families to teachers and individual classrooms to school sites and school districts. Case studies highlight a variety of mechanisms used to respond to the impact of climate migration and displacement on education.

Although schools are intended to provide equal opportunities to learners, California's schools are starkly unequal places, a reality that is exacerbated by climate change-induced migration and displacement. Schools that serve minoritized populations—such as students of color, immigrant-origin, and low-income—are funded at lower levels than other schools (Weathers & Sosina, 2022). Inequality of resources contributes to inadequate buildings and facilities (Vincent & Quintero, 2025) and an inability to retain qualified teachers (Darling-Hammond et al., 2018). Outside of school, minoritized students are also more likely to experience housing and food insecurity (Burns et al., 2021), which compromises their ability to learn. Climate change and climate disasters exacerbate these factors. While minoritized communities are more likely to experience climate impacts, they typically have limited access to resources to adapt to and recover from climate change-induced displacements.

2.2.1 Climate Impacts and Push and Pull Factors

The case study below, focused on the 2023 Pajaro Levee Breach, illustrates the educational fallout from an acute climate disaster, highlighting the communities that were most impacted and showing how climate change exacerbated existing inequities in basic needs and schooling for farmworker families. The Pajaro Levee Breach resulted in mental health impacts on students and created instability in an already under-resourced school system.

Case Study: *Pajaro Levee Breach*

On March 11, 2023, an atmospheric river caused the Pajaro Levee to be breached by floodwaters. More than 200 homes and a middle school were flooded in a community of primarily low-income Latine farmworker families (Vives & Gomez, 2023). The disaster amplified preexisting barriers to children's participation in schooling by contributing to unstable employment, poor working conditions, a lack of safe and affordable housing, a lack of access to medical care, and concerns about immigration enforcement (Feliciano, 2024).

Climate Change as Exacerbator: It should have been no surprise that this disaster impacted an already marginalized community (Rust & Vives, 2023). Structural issues in the Pajaro Levee had been well documented. However, the homes and farmland in Pajaro were deemed to be of low economic value by the Army Corps of Engineers, so the area was not prioritized for investment. In the words of Santa Cruz County Supervisor Zach Friend, "It would be hard to find a better example of federal discrimination in flood funding" (Mishanec, 2023).

Basic Needs: After the flood, 3,000 people were forced to flee their homes. Pajaro offered some of the lowest-cost housing in the immediate area; after the flood, many families lived in more crowded conditions or moved far away for affordable housing (Romero, 2024). In addition, many farmworkers lost opportunities for income due to the loss of crops from the flood. Help from the state and federal government was slow to come. Many families also faced accessibility challenges, including fears related to documentation status, a lack of information in families' home languages, such as Mixteco (Vives & Gomez, 2023), and other bureaucratic hurdles (Altenburg & Soto, 2024). Given these challenges, many families simply moved away from the area in search of more affordable homes. For more on housing, please see *Section 1.1 Housing*.

Students' Participation in Schooling: Since Pajaro Middle School was flooded, hundreds of students relocated to schools in other areas (Ojeda, 2024). These students had to travel longer distances to get to their new schools and, in some cases, experienced socioeconomic discrimination and colorism (Pajaro environmental justice activist interview, 2025). Given these conditions, chronic absenteeism rose to almost 40% (Ojeda, 2024). When the middle school reopened, enrollment was lower than before the flood, indicating a permanent disruption to the community.

Mental Health: In a community with limited access to basic health care and mental health care, students continue to experience trauma related to evacuation, displacement, and other forms of marginalization. As one student shared in a photovoice project, "Every rainfall, storm, or weather event, I fear of being left behind again or hurt" (Regeneración, 2024). While some community-based mental health care was offered, such as the Farmworker Equity Express (Torres, 2024), broader efforts were limited, and schools were not given any additional resources for this work. Today, these traumas are compounded by ICE raids, which have caused families to stay home out of fear (Ortiz, 2025). For more information on health, please see *Section 2.1 Health*.

Impacts on the Schooling System: The flood strained an already under-resourced school system. Though the majority of cleanup costs and renovation costs in the flooded middle school were covered with FEMA funding, the school still had to pay upwards of half a million dollars in recovery costs (Ojeda, 2024). These costs, along with the decreased student population, contributed to a broader budget crisis in the district. At the end of the 2024–2025 school year, 30 staff members were issued pink slips warning of potential termination, though many were ultimately retained. The district has predicted that the 2025–2026 academic year will be more challenging and that more staffing reductions will need to be made (Greenspan, 2025).

STUDENTS AND THEIR FAMILIES

Acute climate events may cause students and their families to lose housing, leading them to live in vehicles or in crowded homes with family or friends (Romero, 2018). Families with limited financial resources may struggle to find temporary housing (Hamideh et al., 2022) and are more likely to be pushed out of their community to find adequate shelter (Jamali, 2020). Families in temporary housing may lack access to electricity, healthy food, phone and internet access, and medical care, all of which compromise their children's ability to participate in school (Hamideh et al., 2022). For more on housing, please see *Section 1.1 Housing*.

After the Camp Fire, educators in Paradise identified student mental health as their top concern (Hamideh et al., 2022). Students experienced traumatic events, including being abruptly evacuated

from schools amid smoke, while wondering if their families and friends were safe (Associated Press, 2018). In the recovery period, students mourned the loss of family members and friends, as well as the loss of homes that held their memories. Many families struggled financially after the fire; some lacked adequate housing and had to commute long distances to get to school, introducing new stressors that hindered students' ability to process fire-related trauma. Although little research on mental health after climate disasters has been conducted in California, studies in other contexts show that more than a quarter of youth reported moderate to severe PTSD after a fire (Yelland et al., 2010). Mental health impacts of acute climate events can persist for decades (Buckles, 2022), yet only a small fraction of California's schools have the recommended counselor-to-student ratio (American School Counselor Association, 2020). For more information on health, please see *Section 2.1 Health*.

TEACHERS

After acute climate disasters, families often look to schools for stability and help finding resources. However, teachers and other school staff face similar challenges to those of their students. They, too, experience grief from losing their homes and loved ones and are processing trauma (California Teachers Association, 2018; Cano, 2019). One teacher in Paradise reported, "There were trees burning on the side of the road. The smoke was so thick you couldn't see...We had very traumatized teachers who were certain they were going to die in the car with their students" (Jones, 2018). Teachers may also have other challenges to navigate, such as supporting impacted family members, finding new childcare arrangements, or commuting long distances to get to school.

SCHOOL FACILITIES

Acute climate disasters may damage or destroy school facilities, depending on the degree to which investments were made to protect school sites. The level of investment varies both within and across districts in ways that reflect and reproduce ongoing disparities between schools. For example, during the Camp Fire, districts that invested in defensible space around schools experienced less damage to district structures than those that did not have the resources or collective will to make this investment. School facilities may be temporarily closed to remove debris or remediate toxic substances (e.g., Pasadena Unified School District, 2025a, 2025b) or may be closed for months or years for repairs (e.g., Ojeda, 2024).

Temporary school facilities that are used after acute disasters are often inadequate. After the fire in Paradise, high school students met in a commercial center without boundaries between rooms. With many classes in one space, students were often unable to hear their teachers. In other cases, schools are relocated to shared spaces such as a Boys and Girls Club, where teachers may spend significant time packing up their classroom each day to make the space available to other users (Hamideh et al., 2022).

CLASSROOMS, TEACHING, AND LEARNING

During acute climate disasters, school closures can contribute to learning loss. Some schools have incorporated "smoke days," that is, extra days in their schedule to accommodate short climate-related school closures and still meet minimum instructional time guidelines. More commonly, students experiencing climate-related displacement and migration may experience periods of

no instruction or remote instruction. After climate disasters, student absenteeism often rises as families struggle to meet basic needs. When students are in school, they may struggle to focus due to both prior trauma and ongoing challenges. Since families may not have stable housing, teachers may have a hard time communicating with them to develop systems of support for students.

Moreover, teachers may lack the resources needed to enact effective instruction, including their own curated sets of lesson plans and materials, familiar textbooks, access to technology (e.g., computers, projectors, and photocopiers), or even basic supplies (e.g., notebooks and whiteboards). Retaining qualified teachers is difficult in normal circumstances, given the time, energy, and emotional labor the profession requires (Darling-Hammond et al., 2018). In the wake of a climate disaster, these pressures are amplified as teachers navigate increasingly challenging circumstances.

IMPLICATIONS FOR DISTRICT STABILITY AND PLANNING

Immediately after acute climate disasters, districts are in crisis mode as they scramble to communicate with families, set up new school sites, and distribute resources. At the same time, climate disasters introduce long-term planning uncertainty. Two years after the Camp Fire, district officials reported a 55% drop in student enrollment and a 41% reduction in staffing (Auvil, 2020). District officials identified fiscal uncertainty as a hindrance to recovery, saying that the district did not know "when, or if, residents will return to Paradise and whether the district's enrollment decline is permanent or temporary" (Auvil, 2020). Other financial stressors included increased transportation costs, uncertainty about building costs, and an increased need for substitute teachers given the instability teachers were experiencing in their own lives. Eight years after the Camp Fire, the district still required an exemption from the required teacher-student ratio, explaining that the district was still in "rebuilding mode" (Gutierrez, 2025). That same year, the district finally broke ground on a new elementary school to replace the one that was destroyed in the fire (Gutierrez, 2025).

RECEIVING SCHOOL DISTRICTS

The impacts of migration and displacement from acute disasters often extend to other schools. In the short term, nearby schools may function as relief centers, distributing resources, housing displaced families, and in some cases, even housing displaced livestock (former county office of education employee, interview, August 12, 2025). Such activity strains staff and resources at these sites and may even lead to safety concerns related to increased numbers of visitors. In the medium term, nearby school districts may take in new students, creating new challenges such as crowded classrooms, insufficient staffing, and interruptions to services such as special education. In some cases, even distant schools may receive large influxes of students. For example, one educator we spoke to recalled receiving an influx of students from New Orleans after Hurricane Katrina while student-teaching at Travis Air Force Base in California. She recalled not knowing "what's going on, not really understanding ... the trauma that they're dealing with and ... what it feels like to be displaced." In addition to climate-related trauma, displaced students may experience loneliness, racial, cultural, linguistic, or socioeconomic discrimination, or other forms of ostracization (Buckles, 2022).

CHANGES IN MIGRATION TO CALIFORNIA FROM OTHER COUNTRIES

Climate impacts around the globe are driving migration in ways that shape California's student population. Newcomers, or students who have spent less than three years in the country, have long represented a growing segment of California's schools. In the 2024–2025 school year, California had a record high of 236,958 newcomers, equivalent to 1 in 25 public school students (Stavely, 2025). Although student migration due to climate change is not formally tracked, teachers of newcomers report an increase in students from rural, agricultural areas in Mexico and Central America. These areas are part of the "Central American Dry Corridor," a region heavily affected by climate change (Huber et al., 2023). Students from these areas often speak Indigenous languages, have limited or interrupted formal education, and have traveled to California as unaccompanied minors. Many have experienced trauma due to economic insecurity or violence in their home countries, which may then be compounded by trauma from the immigration process and unstable conditions in their lives in the US (Bay Area teacher interview, 2025). Some schools and programs are specifically designed to support newcomer students. However, recent political threats to immigrant communities have reduced border crossings and pushed many students out of school. Lower enrollment numbers have resulted in cuts to these much-needed newcomer programs (Stavely, 2025).

2.2.2 Current Responses

The Eaton Fire illustrates a current response to acute climate disasters in schools, highlighting the short-term responses of local and state emergency services and the legislative and executive branches of state government.

Case Study: *2025 Eaton Fire (Altadena, CA)*

When the 2025 Eaton Fire struck Altadena, California, many residents were unprepared. One resident recounted there being "no evacuation notice" and received an alert as she was fleeing early in the morning with her neighbor's roof already ablaze (Associated Press, 2025a; Los Angeles County, 2025a). Many Altadena schools closed for weeks due to smoke damage and unsafe air quality, forcing students into emergency remote instruction or relocation to neighboring districts.

Local and State Emergency Services: Schools coordinated with local and state agencies to address material needs. Pasadena Unified School District (PUSD) directed affected families to register with the Pasadena Educational Foundation's Fire Relief hub, which provided cash aid, supplies, and service connections and shared updates related to school reopenings (Pasadena Unified School District [PUSD], 2025a, 2025b). For more information on emergency management, please see Section 1.2 Emergency Management in this report. For mental health, the California Office of Emergency Services connected residents with the federally funded Crisis Counseling Assistance and Training Program (CCP), which offers free short-term counseling and outreach after federally declared disasters (California Office of Emergency Services [Cal OES], 2025; Substance Abuse and Mental Health Services Administration [SAMHSA], 2024).

Los Angeles County oversaw a two-phase debris removal process: the US Environmental Protection Agency (EPA) managed hazardous materials in Phase 1, while the US Army Corps led Phase 2 of the debris removal (Los Angeles County, 2025b; US Army Corps of Engineers, 2025). Beyond official channels, businesses and other private groups created stopgap schooling solutions, such as offering office space for classrooms (Pasadena Star-News, 2025).

Legislative and Executive Responses: A later county-commissioned assessment confirmed the gaps in emergency alerts, which cited outdated software and staffing shortages as contributors to the delays (Associated Press, 2025b). At the state level, Governor Newsom's Executive Order N-6-25 (2025) waived Education Code requirements in order to stabilize school operations in wildfire-affected districts, by suspending class size limits, easing residency requirements for displaced students, and preventing attendance-based funding losses through expedited J-13A forms (California Department of Education [CDE], 2025a). Notably, state actions did not waive Occupational Safety and Health Administration (OSHA) workplace standards; instead, flexibility came from Education Code provisions to support temporary facilities and larger class sizes (CDE, 2025a).

Schooling and District Planning: For most schools, the immediate priority was community continuity. Many residents emphasized that relocating students and staff to the same area preserved stability, echoing findings from prior disasters that whole-community transfers can reduce additional disruption after trauma (Pasadena Now, 2025a, 2025b). Families shared that they valued the continuity of staff and peers, noting that "after a few days, it just sort of became the new normal." Meanwhile, PUSD and county officials provided environmental clearance updates before reopening, confirming elevated metals in some soils but no widespread chemical contamination (City of Pasadena Public Health Department, 2025; PUSD, 2025b). Residents also sought soil and air testing, but uneven access to expertise and inconsistent insurance coverage left many with lingering doubts about safety.

Mental Health and Long-Term Recovery: While initial needs focused on water, shelter, and cleanup, residents later recognized the delayed mental health toll. This mirrors findings from prior wildfires, where mental health effects persist long after visible recovery (SAMHSA, 2024). Residents emphasized that mental health support should not end with displacement but be embedded in schools and neighborhoods for at least a year after their return, to acknowledge the slow arc of psychological recovery (Cal OES, 2025). For more information on health, please see *Section 2.1 Health*.

This case study illustrates the strengths and limitations of response mechanisms when climate-amplified wildfires disrupt educational continuity and community well-being. For example, a continuity-with-compassion approach, including co-locating full school communities and allowing flexibility in class size, staffing, and residency, offers a model for sustaining learning amid displacement (CDE, 2025a). Additionally, state tools like J-13A "emergency packets" can stabilize school funding within days, ensuring that ADA-based allocations do not worsen inequities (CDE, 2025b). The McKinney-Vento Act protects the right to education for students who lose their housing, including those temporarily or permanently displaced due to climate-related disasters. It guarantees immediate enrollment in a new school without proof of residency and allows students to stay in their school of origin even if they move. The protections also support access to

special education by waiving paperwork requirements for students with special education needs. Resident testimony and policy responses reveal several factors that shape students' displacement trajectories: clear alerts, trauma-informed school planning, stable funding for school districts, and transparent environmental safety guidance. These levers, when coordinated, can mitigate not only immediate disruption but also the long recovery shadow cast by climate-driven wildfires.

2.2.3 Adaptation Opportunities

Education systems operate as both affected institutions and resilience anchors in climate-disrupted communities. A key adaptation opportunity lies in leveraging schools as continuity platforms that support not only learning but also household stability during and after climate shocks.

Student participation in education is closely tied to housing stability, income continuity, and healthcare access, placing schools at the intersection of multiple climate-sensitive systems. This creates an opportunity to integrate education planning with broader social protection systems in displacement contexts.

Schools also function as community coordination hubs during emergencies, providing physical space, trusted communication channels, and institutional continuity. This role presents an opportunity to expand their function as resilience infrastructure, particularly in supporting displaced students through enrollment portability, transportation access, and wraparound services.

2.4 Community Identity

Community identity is a shared sense of what characterizes a community based on common history and teachings, cultural practices and arts, language, beliefs, values, place-based memories, and social networks. Community identity is reflected in public symbols such as flags and slogans, and anchored by ties to specific landscapes, sacred sites, and local institutions. This shared identity supports a sense of belonging, mutual recognition, and community cohesion, all of which are fundamental to resilience. Displacement or relocation due to climate change impacts and disasters severs place-based relationships and disperses social networks, eroding community identity, cohesion, and collective agency. Preserving community identity is critical for building resilience and creating a path forward in the wake of climate change–induced displacement or relocation (Bronen, 2011; Farny & Dentoni, 2025).

Communities and populations subjected to discrimination, exploitation, and social and economic inequities throughout history are disproportionately impacted by climate change (US Environmental Protection Agency, n.d.). These same communities have made and continue making contributions to the environmental stewardship, innovation, and economic growth that characterize California's collective identity. Nonetheless, many of these communities are under-resourced and therefore lack the adaptive capacity needed to confront and recover from climate change impacts.

Currently in California, federal, state, county, local, and Tribal governments share responsibility for emergency planning, preparedness, response, and recovery. Over the last 15 years a "whole community" approach has been incorporated into emergency management guidelines and

plans (California Governor's Office of Emergency Services [Cal OES], 2024; Federal Emergency Management Agency [FEMA], 2011). Experiences in the last decade suggest that expanding the whole community approach to be inclusive of self-organizing local action and cross-sector networks capable of rapid mobilization can increase resilience in communities and produce better response and recovery outcomes. This requires strategies to be co-created with the communities they serve (Sobelson et al., 2015; Nyahunda et al., 2025; Munenzon, 2024). The Environmental Justice community describes this as "Nothing About Us Without Us" (Progress & Poverty Institute, n.d.). For more information on emergency management, please see *Section 1.2 Emergency Management*.

Climate change induced displacement and relocation impacts community identity. It is important to uplift identity to increase resilience; reinforce identity, sense of belonging, and community cohesion to ease transitions for those displaced or relocated and for sending and receiving communities as a whole; and co-create resilience and recovery strategies with and within Tribes and other communities, incorporating lived experience, skills, and cultural traditions in the process.

2.4.1 Historical and Current Context

California's diverse geography, natural resources, ecosystems, and cultures are at the core of the state's identity. Indigenous peoples have lived on the lands now known as California for over 12,000 years (Moralto, 1984). Beginning in the 1500s, waves of Spanish, Mexican, and American colonization brought violence, enslavement, genocide, and forced removal from traditional homelands to missions, boarding schools, and, in some cases, reservations. This legacy has left many California Native Americans and reservations under-resourced and underserved. Today, California has put multiple policies and programs in place to rebuild its relationship with Tribal Communities and to be considerate and inclusive of the needs and input of Tribal Communities throughout the state (California Natural Resources Agency, n.d.; HCD, n.d.; California Interagency Council on Homelessness [Cal ICH], 2025).

California is now home to 109 federally recognized Tribes, each of which is a sovereign government under US law, and approximately 100 reservations and Rancherias over which Tribal governments exercise primary territorial jurisdiction (California Native American Heritage Commission [NAHC], 2023). In addition, there are at least 81 non-federally recognized Tribes in the state (California Interagency Council on Homelessness [Cal ICH], 2025), many of which maintain continuous Indigenous identity, governance structures, and cultural traditions despite the absence of federal recognition (HCD, n.d.; UCLA American Indian Studies Center,1996). The majority of Native Americans in California do not reside on reservations and instead live in urban and non-reservation communities (California Consortium for Urban Indian Health, n.d.).

California is also home to approximately 10.9 million immigrants (Cuellar Mejia & Johnson, 2025), 22% of the national total. 28% of Californians are foreign-born. No racial or ethnic group constitutes a majority of the state's population. Many communities within California cities have names that reflect a predominant ethnic presence, such as San Francisco's Chinatown, Los Angeles' Koreatown, and San Diego's Little Italy. Other Los Angeles ethnic enclaves include Little Ethiopia, Chinatown, Little Tokyo, Thai Town, Historic Filipino Town, and Little Armenia. Their identity is expressed in local architecture, marketplaces, signage, cuisine, art, historical sites, and traditional celebrations. These communities provide and welcome opportunities for inter-cultural exchange with visitors (Kim, 2024).

Renaming, displacement, and forced separation were used throughout history as tools of erasure to sever peoples' legal, cultural, and territorial ties and consolidate US, state, and territorial government political and economic control. Native American Tribes experienced systematic replacement of Indigenous placenames, forced removal from ancestral lands, and separation from their children who were sent to federal boarding schools for "assimilation" (Fixico, 2010; Lomawaima & McCarty, 2006). Following US annexation, Mexican settlers experienced the invalidation of Mexican land grants, renaming of their towns and regions, and forced displacement (Gonzales, 2001; Johnson, 2003). Enslaved Africans and their descendants were stripped of their African names and identities, displaced through the domestic slave trade, and routinely separated from their families (Thornton, 1998; Baptist, 2014; Stevenson, 1997). These practices functioned to remove people from land or kin, and dismantle collective identity, continuity, and self-determination.

The prevalence of vulnerable communities in California today is attributable to the mistreatment and discrimination Indigenous and immigrant populations have endured. Many under-resourced and underserved communities are populated by immigrants, migrant workers, and people whose families and forebears came or were originally brought to America and enslaved or forced to work grueling jobs with very low pay and limited accommodations. Many were physically and mentally abused, denied civil rights, and barred from land ownership (Daniels & Olin,1972). This shared history can be a key characteristic of community identity (Cornejo et al., 2025; Hassans, 2024; Li et al., 2022).

2.4.2 Climate Change Impacts, Displacement, and Relocation

Communities impacted by sudden onset disasters experience loss of life, livelihoods, loved ones, homes, pets, property, treasured possessions, cultural arts and landmarks, memorial monuments, and gathering places. Not only are jobs, businesses, and incomes lost, but also, generational wealth (Mahoney, 2025). These impacts affect individuals, families, neighborhoods, and the community as a whole. As the community and displaced individuals, families, and neighborhoods struggle to recover, they face shortages in affordable housing and contractors, lengthy rebuilding timelines, and inflated prices (Sadasivam, 2025). They also endure the physical and emotional tolls of demolition, clean-up, and debris removal accompanied by the frustration of dealing with complex and disparate bureaucratic processes, slow or inadequate insurance adjustment, and transportation and mobility limitations. With this trauma comes the loss of identity, sense of place and belonging, and social cohesion. Addressing these losses is important to recovery and wellbeing (Leviston et al., 2023; Kondo et al., 2024; Quinn et al., 2020).

GRADUAL ONSET CLIMATE IMPACTS, RELOCATION, AND STRATEGIC RELOCATION

The need for an entire community to relocate in California due to gradual onset climate impacts has the potential to arise in coastal and inland communities. The Quinault Indian Nation, located on the coast of Washington State, has been moving its villages to escape from the rising Pacific Ocean and tsunamis and building a new, resilient village for over a decade (Ryan, 2024; Rodriguez-Delgado, 2024). Two other examples of managed retreat responding to gradual onset climate change in the US are the Isle de Jean Charles Tribal community in Louisiana whose members relocated due to coastal erosion and sea-level rise (Isle de Jean Charles Band of Biloxi-Chitimacha-

Choctaw Tribe, n.d.) and the Yupik Eskimos Tribe of Newtok, Alaska whose members relocated due to riverbank erosion and frequent flooding (Adaptation Clearinghouse, n.d.). Documentation and reporting on these Tribal communities' experiences can provide information on lessons learned for other communities (Schwing, 2025; Jones & Simon, 2025).

By 2100, statewide averaged sea levels are most likely to rise between 1.6 ft (0.48 m) (Intermediate-Low Scenario) and 3.1 ft (0.94 m) (Intermediate Scenario), although higher amounts are possible, depending on factors such as the rate of greenhouse gas emission, the pace of glacier and ice sheet melt, and temperature increase (California Ocean Protection Council [OPC], 2024; California Coastal Commission [CCC], 2024). Coastal Tribal communities often have limited opportunities to relocate due to their minimal financial resources, reliance on marine resources, economic and land constraints, and deep cultural ties to place (CCC, 2024; Intergovernmental Panel on Climate Change [IPCC], 2022; National Academies of Sciences, Engineering, and Medicine [NASEM], 2024).

Inland climate change impacts such as hotter temperatures, chronic drought, groundwater depletion, land subsidence, water system failures, and related economic considerations may influence individuals, families, and occupational groups, such as farmworkers and small-scale farmers, to relocate voluntarily (Huang, 2023). However, quantitative research has not yet documented this trend or correlated it with specific or compounded climate-related impacts (Miller, 2025; Vesely, 2022). Inland communities often face economic (Lopez, 2025) and water scarcity challenges (Claproth & Smanpongse, 2024).

A statewide framework for community relocation decision-making, planning, and support does not currently exist. The OPC published an updated Sea Level Rise Guidance in 2024 (California Sea Level Rise Guidance, 2024). The CCC followed with its 2024 Sea Level Rise Policy Guidance (California Coastal Commission, 2024) and is developing a companion Environmental Justice Update that will include vulnerability assessments, adaptation plans, and draft LCP policies on sea level rise. Both guides describe sea level rise adaptation measures that include nature-based solutions such as restoring wetlands to absorb flooding, constructing sea walls, raising buildings on stilts, and replacing damaged or unstable infrastructure such as roads and sewer systems (CCC, 2024; OPC, 2024). Economic analyses show substantial return on investments in adaptation to climate change (US Chamber of Commerce Foundation, 2024; Weerasinghe, Amaratunga, & Haigh, R., 2025). At some point, however, the cost of adaptation and the increased risk of impacts associated with sea level rise, especially during extreme weather events, may make it more prudent for a community to assess and plan for strategic retreat. The CCC and OPC guides do not address either in detail. Given the risks posed by accelerating sea level rise (Hamlington et al., 2024; Lindsey, 2023), hotter temperatures, and extended drought, planning in advance for the possibility of needing to relocate could help communities avoid needing to make last minute decisions in the face of a crisis (Mach & Siders, 2021). Toolkits available from The Georgetown Climate Center and the American Meteorological Society (White, 2022, AMS) point out the iterative nature of relocation and strategic retreat decision making and planning and the importance of continued community engagement in the process.

The National Academies of Sciences, Engineering, and Medicine (2024) recently issued a report calling for proactive, community-driven relocation planning at federal, state, and local levels well before crises force last-minute decisions. The report emphasizes that equitable relocation requires not only financial support for those displaced but also careful management of the spaces

left behind and adequate infrastructure investment in receiving communities. Mach and Siders (2021) similarly argue that managed retreat, when pursued strategically and transformatively rather than reactively, can reduce long-term climate losses while advancing equity—but only when planning processes center affected communities, address land tenure rights, and are coordinated across governance levels. This scholarship underscores a consistent finding: the absence of a statewide framework for relocation decision-making in California, documented throughout this report, is itself a significant equity risk. Without such a framework, retreat will continue to occur ad hoc, favoring those with resources to self-relocate while leaving the most vulnerable populations to absorb disproportionate loss.

Even before a decision to relocate is made, people and communities can experience "solastalgia," the sense of loss and distress over the ways in which climate change is impacting their home and surroundings and their powerlessness to control it (Albrecht et al., 2007). Relocation can amplify loss of identity, sense of place, and sense of belonging. This can be exacerbated by a lack of community engagement in the relocation planning process and in the implementation of the plan, which can also lead to poorly constructed housing and infrastructure in the new location (Jones et al., 2025; Birch et al., 2024; Feng & Zhu, 2022).

RECEIVING COMMUNITIES

Receiving communities can be significantly disrupted by a sudden influx of new population (Coffey, 2024; Farney & Dentoni, 2025). Whether temporary or permanent, rapid increases in demand can strain already at-capacity public services and infrastructure. Competition for jobs, social conflicts, and public safety concerns may arise. Housing pressures such as gentrification, shortages, and price spikes can displace legacy residents and contribute to homelessness (Lewis, 2024). Local governance can also be stressed as coalitions realign and elected representation is contested.

Across both sending and receiving communities, these disruptions also extend into civic and political life, including reduced access to voting, weakened representation in local governance, and diminished ability to participate consistently in community decision-making. In wildfire-affected rural communities, repeated displacement and uneven recovery processes can fragment local governance capacity and reduce sustained civic engagement.

Conversely, population increase can also benefit a receiving community by increasing revenue and making the jurisdiction eligible for grants and other government funding (Parfrey et al., 2021). Tools offered by organizations such as Communities of Opportunity can help recraft narratives to overcome "us versus them" mentalities that may arise and assist in facilitating cross-cultural relations (Institute for Local Government, 2015). Storytelling can be an effective means of finding common ground in the process of facilitating social integration and co-creating a more harmonious path forward (Helajzen, 2024).

2.4.3 The Community Identity and Resilience Connection

Identity is integral to and interactive with resilience. "Identity and resilience are two intertwined concepts that shape the essence of human existence...The interplay between identity and resilience is profound, as one's identity serves as a source of strength and motivation in the face of adversity (Sevilla-Vallejo, 2023).

Addressing the loss of identity, sense of place and belonging, and social cohesion can help a community to navigate a crisis (Orazani et al., 2023). Community member participation in co-creating a path forward can not only restore but also transform identity as new strengths are realized and relationships renegotiated (Riedy et al., 2025). However, there is no "one size fits all" approach and engagement strategies can be customized to align with community culture, geography, demographics, and experience. Engagement and co-creation processes are typically most effective when facilitated by trusted leaders (Beckham et al., 2023; Okunola, 2025). In 2023, the California Governor's Office of Land Use and Climate Innovation (formerly Office of Planning and Research) issued $8 million in grants supporting local governments, community-based organizations, and Tribes to assess local hazards, conduct robust engagement, and create equitable and community-driven strategies to minimize climate impacts (Governor's Office of Land Use and Climate Innovation, 2023). Outcomes monitoring and reporting from these projects, which center California's climate-vulnerable communities, will shed light on best practices and lessons learned to inform future community engagement efforts.

2.4.4 Current Responses

Centering communities—their history, culture, lived experience, needs, strengths, and capacities—is key to establishing an inclusive and sustainable partnership to combat social inequities compounded by climate change. In the face of climate disasters, communities and communities collaborating with governments, corporations, and non-government organizations are leading certain planning, response, recovery, and resilience efforts. Lessons learned from these efforts can inform the state's whole community approach to emergency preparation, response, and recovery as well as its approach to climate change mitigation and adaptation.

INDIGENOUS KNOWLEDGE AND PRACTICES

Developed in consultation with California Native American Tribes, the California Natural Resources Agency's (CNRA) Tribal Nature-Based Solutions (TNBS) Program provides grants for Native American Tribe projects that weave Traditional Ecological Knowledge (TEK) with modern science to address climate change and regain ownership of ancestral lands. By uplifting TEK, the projects enhance climate resilience for Indigenous communities, biodiversity, and community well-being. In 2025 one such project involved returning 17,030 acres of ancestral lands to the Tule River Indian Tribe. The Tribe is re-introducing Tule elk and beavers to the area and preventing wildfires through cultural burning (California Natural Resources Agency [CNRA], n.d.; The Conservation Fund, 2025).

ANTI-DISPLACEMENT AND ANTI-GENTRIFICATION EFFORTS

As more frequent and intense wildfires spread to more urban areas, Latinx, Asian, and Black communities are impacted more than ever before, and their risk of permanent displacement is often high (Lin & Castleman, 2025). The "disaster recovery gentrification" of Paradise after the 2018 Camp Fire prevented numerous socially vulnerable, long-term residents from returning (Lambrou et al., 2025). In Altadena, where the 2025 LA Fires decimated some historically Black neighborhoods, the community organized "Altadena Is Not For Sale" to advocate for fair treatment, staging demonstrations and hosting gatherings to provide information on recovery resources (Beckett, 2025).

ARTS AND CULTURE

The 2025 LA Fires also destroyed community art, art studios, and the homes and collections of artists throughout Los Angeles and adjacent communities. Painting community murals is now part of the recovery process. Pasadena residents who lost their homes joined local artists to create murals with paint made from cinders the fire left behind. In addition to healing, the murals are intended to raise public awareness about climate change (Soto, 2025). In Altadena, a crowd gathered to see renowned artist Robert Vargas unveil a mural he painted on the side of a favorite gathering spot. According to Vargas, the young Black girl wearing a shirt adorned with local scenes and faces, holding a teddy bear, and picking a California Poppy, represents the community "rising from the ashes" (Martinez, 2025). Another cross-cultural effort, The Black Trustee Alliance's Land Memories: Voices of Altadena, explores memories of Altadena, the impact of the fires, and art's role in healing (Shaw, 2025). Community engagement in and through cultural arts can create and recreate a sense of belonging, empower communities, and enhance cross-cultural relations (Bissell, 2019).

COMMUNITY VOICES

California's shoreline communities already experience the effects of sea-level rise (Grenier & Sencan, 2024). Impacts on shoreline communities like West Oakland are amplified by a history of toxic waste contamination and a legacy of racial and housing discrimination (Romero, 2022). There are 5,282 contaminated sites in the San Francisco Bay Area region. The people living near them are disproportionately low income and people of color (Hill et al., 2023). Community leaders are ensuring their communities' voices are heard. Yosemite Slough and Bayview residents are involved in the City of San Francisco flood protection plan development process (Menconi, 2025), and the Bayview Hunters Point community is working with the San Francisco Recreation and Parks Department on a $5.1 million project supported by California Climate Investment Funds to transform a former industrial site into a shoreline park built to withstand sea level rise (California Climate Investment, 2025).

UPLIFTING IDENTITY WITH RECOGNITION, HONOR, AND SOLIDARITY

Overcoming social exclusion, discrimination, and systemic racism (Sauberli, 2022; Araiza, 2018) begins with recognizing the contributions California Native Americans and immigrants have made to the state's economy and culture, remediating past injustices, and uplifting multicultural acts of solidarity. In Executive Order N-15-19, Governor Newsom apologized for California's past transgressions and established the Truth and Healing Council to accurately document the history of the relationship between California and Native Americans. Now, through the Tribal Nature-Based Solutions Grant Program, California is restoring about 50,000 acres of ancestral lands to Tribal ownership and stewardship (Office of Governor Gavin Newsom, 2024).

Whole community support for California Native Americans and immigrant populations includes state, county, and city proclamations and events recognizing Native American Heritage Month, Black History Month, Latino Heritage Month, and Lunar New Year. Events organized during these times include cultural and traditional performances, arts and crafts displays and offerings, and booths providing information on community support and services. For instance, Yolo County held a resource fair in Esparta to provide information on home energy efficiency resilience programs

and opportunities to save money on energy bills. The event tagline of "*¡Juntos construimos un futuro más fuerte!*", translates to "Together we build a stronger future!" (Heedan, 2025).

Reframing the narrative is also a critical tool for uplifting communities in climate disaster recovery. Shifting from a victim narrative to one of empowerment can mobilize a community to reclaim its identity and rebuild a more resilient future. Public Works Partners offers a narrative reframing tool that specifically addresses recovery from climate change disasters.

2.4.5 Adaptation Opportunities

Community identity represents a core but often underleveraged dimension of climate adaptation. A key opportunity lies in recognizing identity, culture, and governance systems as resilience assets that shape recovery trajectories after displacement or disaster.

Communities that experience intersecting forms of structural inequity are often the most exposed to climate risk yet also hold deep local knowledge of survival and adaptation strategies. Engaging these knowledge systems through co-designed recovery processes creates an opportunity to align adaptation planning with lived experience.

Customization of recovery and communication strategies based on cultural, demographic, and governance contexts supports adaptation as planning as well and guards against applying generic resilience strategies that are not locally grounded.

The preservation and restoration of community identity during recovery or relocation processes emerges as a stabilizing factor in long-term resilience, reducing fragmentation and supporting continuity across displacement events and beyond.

2.5 Labor and Employment

California's economy is the largest in the US and the fourth largest in the world. The state's main economic sectors are agriculture, professional services, and technology, with agriculture as a leading economic activity in the Central Valley, Inland Empire, and Imperial Valley and professional services and technology concentrated in the large population centers of San Francisco, Los Angeles, and San Diego (Bohn & Duan, 2025). The economy and labor sector in California is significantly impacted by floods, heat waves, and a rise in the number and intensity of droughts and wildfires over time (Bohn & Duan, 2025; Centre, 2023). For example, the socio-economic impact of heat waves can be measured by reductions in crop and labor productivity in agricultural areas and by increases in health costs for households and the number of health care providers needed in heavily populated urban areas (Gould et al., 2025).

Migration may not occur immediately after a climate-related extreme event. Research shows that up to one third of California residents exposed to wildfires and related smoke indicated an intention to migrate in the following five-year period after the event (Coulombe & Rao, 2025). In 2018 alone, 22 wildfires resulted in 350,000 displaced individuals in California (see discussion on the Camp Fire later in this section). The 2016 drought in California resulted in 1,815 direct jobs lost with a spillover effect that led to an additional 4,700 jobs lost in related industries and local economies. Additional impacts on labor include decreased productivity and reduced hours worked (Castillo et al, 2021a; Sanchez et

al., 2025). Severe flooding can also cause large involuntary displacement of people and disruptions to job availability, with disadvantaged communities being the most impacted (Sanders et al., 2022). When flooding in the agricultural sector results in crop failure as well as damage to housing, farms, and public infrastructure such as bridges and roads, farmworkers lose income and may need to travel for longer periods of time to find alternative job sites.

2.5.1 Climate Impacts and Push and Pull Factors

The scale of the impacts of climate change migration and displacement on labor and employment in California is not uniform and varies by socio-economic status as well as by geography and sector.

SOCIO-ECONOMIC CHARACTERISTICS AND IMPACTED GROUPS

Incarcerated individuals are sometimes called upon to fight wildfires, thus requiring their temporary displacement. In California, 1,800 to 2,000 incarcerated individuals are part of California's conservation fire camps. At any point in time, and depending on the severity of wildfire occurrence, 800 to 1,000 incarcerated individuals are employed in wildfire control and suppression (Acey et al., 2026). Despite their important role, incarcerated firefighters have historically received substantially lower compensation than non-incarcerated firefighters. Under AB 247, enacted in 2025, incarcerated hand-crew members are paid $7.25 per hour while assigned to an active fire incident. Post-release pathways into firefighting also exist. Since 2018, 231 graduates of California's Ventura Training Center have obtained employment with local, state, or federal fire agencies (CDCR, 2026; Cal. Penal Code § 2714; Hao, 2023).

Climate change drivers also cause displacement into homelessness (Chimowitz, 2024). For more information on housing, please see *Section 1.1 Housing*. Individuals who find themself unhoused often rely on the informal labor market. Climate change's association with homelessness depends, among other factors, on the type of climate driver (slow onset or acute, fast occurring), existing public and private infrastructure, the type of migration (planned or unplanned), and pre-existing health inequities (Kidd et al., 2023). Individuals who are already living in marginal shelter conditions could become homeless due to climate change impacts and be forced to move or seek shelter in a different location. This displacement can lead to their loss of existing jobs. Individuals who are vulnerable prior to the occurrence of an extreme event and whose dwellings are damaged during an extreme event are more likely to have a difficult time recovering after the event and may migrate as a response (Peacock et al., 2014). Unhoused individuals often participate in the informal labor market, for instance in temporary jobs or as day laborers (Weisberg, 2025; Huffman et al. 2021). Thus, as more people are displaced into homelessness by climate change drivers, this may lead to an increase in individuals on the informal labor market. This segment of the population is often left outside of official responses to climate disasters.

Outdoor Laborers

San Joaquin Valley is a region with large agricultural activity and outdoor labor is an important component of the regional economy. During periods of heat waves, individuals working outdoors in farming, landscaping, and construction can experience negative health outcomes including dizziness, heat stroke, and death (Castillo et al., 2021a). For more information on health, please see *Section 2.1 Health*.

In addition, outdoor workers are disproportionately impacted by heat waves and wildfires because their work hours are reduced and they often must seek employment in different geographical areas, thus increasing their travel distances and therefore the costs of employment. A reduction in hours worked results in income lost. Studies show that increases in the heat index result in decreases in outdoor labor productivity, thus impacting outdoor workers' earnings in significant ways (Castillo et al., 2021b; Sanchez et al. 2025; Gibb et al., 2024).

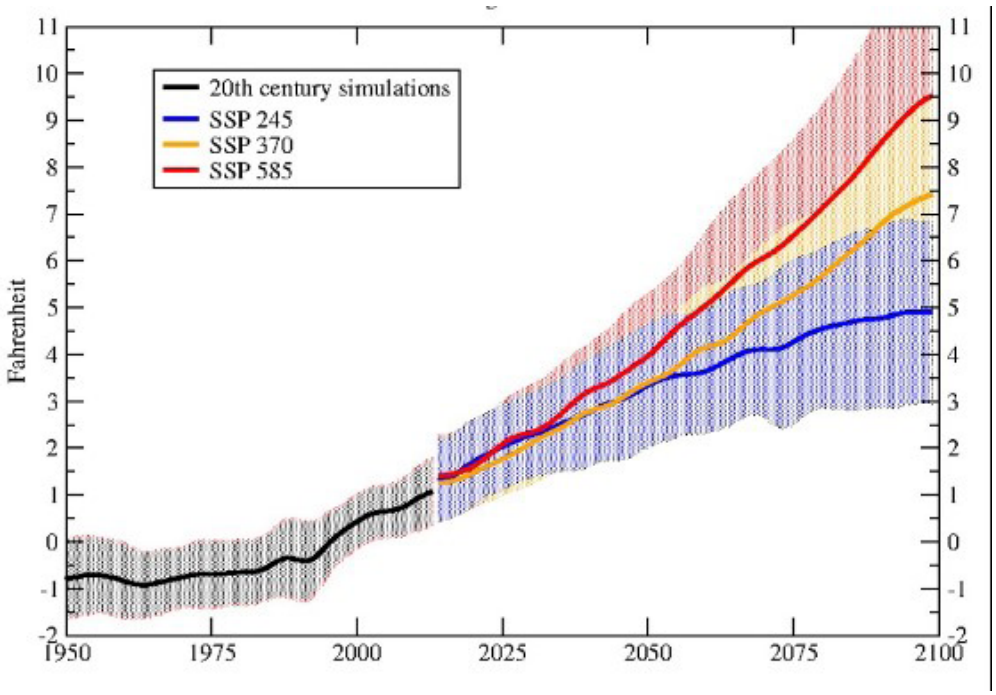

Figure 5: *Projected mean temperature increase from the LOCA 2 statistically downscaled climate model datasets relative to the 1950–2014 base period for the San Joaquin Valley region under high, medium and low emissions scenarios. Source: Wehner, 2025 https://portal.nersc.gov/cfs/m3318/5thCCA/loca2_hybrid/loca2_hybrid_tas.html*

Figure 5 shows that the under a "medium" emissions scenario (SSP 3–7.0) the annual mean temperature in central California (San Joaquin Valley) is projected by the LOCA2-Hybrid statistically downscaled ensemble of CMIP6 climate models to be approximately 3°F (1.67°C) warmer by 2050 than the late 20th/early 21st century reference period. The figure further shows that at the end of the century (2100), projected mean temperatures will warm an additional 1.5°F (0.83°C) under this emissions scenario. Given that agricultural activity is the dominant component of the region's economy, the health and livelihood of agricultural workers, and the industry as a whole, is at risk due to an increase in extreme heat in the region.

Droughts also disrupt labor markets due to crop losses and a resulting decrease in working opportunities for farm workers and individuals working in the landscaping sector. For example, the 2021 and 2022 droughts resulted in 14,740 and 19,420 job losses respectively in crop related activities alone (Medellín-Azuara et al., 2022). Farmworkers are often undocumented and sometimes subject to discriminatory practices in their work, securing housing, obtaining education, and accessing banking services. These institutional-occupational barriers also determine whether an individual can secure alternative employment, housing, and educational services.

Heat impacts outdoor workers' health and well-being (Issa et al., 2023). Individuals can adapt to heat occurrences and hence delay a decision to migrate, but adaptation to heat is in part dependent on pre-existing socioeconomic and health factors. Studies have found a significant association between heat exposure and migration, where exposure to heat increases the likelihood of observed migration (Issa et al., 2023; Nawrotzki et al., 2017; Poston et al., 2009).

IMPACTED SECTORS

Emergency Workforce Planning

Emergency management (EM) plays an important role in the response to extreme events. In traditional EM planning, the needs of workers are often overlooked during climate-induced disasters (Raval et al., 2019). Differences in the levels of emergency government aid received in climate-induced disaster areas can contribute to a rise in inequality, leading to less resilient communities (Emrich et al., 2022). One solution to counter inequality is the development of a disaster resilience workforce, or "resilience corps," that prioritizes jobs for communities facing disproportionate climate and health risks (Lavelle et al., 2024). By prioritizing employment for vulnerable communities experiencing the impacts of climate-induced disasters, a "resilience corps" can also help address any preexisting economic and racial inequalities derived from underinvestment in disenfranchised communities. For more information on emergency management, please see *Section 1.2 Emergency Management*.

Case Study: *The LEAP Institute*

The Latino Equity Advocacy & Policy (LEAP) Institute was created to fill a critical gap in leadership and representation for low-income Latino and farmworker communities in California's San Joaquin Valley. During the early 2000s, the founder led extensive grassroots outreach to raise awareness about environmental health and air quality issues impacting Valley families. These efforts involved listening deeply to community concerns and sharing data on the public health harms caused by industrial emissions and poor air quality. LEAP was formally founded in 2008 to build leadership, equity, and policy capacity from the ground up. The early years were challenging due to limited financial resources and the need to build organizational infrastructure from scratch.

Operating in a rural community presents unique challenges. One major barrier is the limited local talent pool, as many young residents leave the region after completing higher education. Additionally, existing state policies and regulatory systems have not yet caught up with the innovative technologies and community-driven models that LEAP has pioneered through Green Raiteros, which provides clean (low to zero emissions) transportation for community members. Huron, a city in the San Joaquin Valley, experiences severe institutional services isolation. The program fills a need as it facilitates transportation to medical appointments, social security services, and other basic needs of the community. By providing access to these services via electric vehicles, LEAP improves community experience for its residents, reducing the likelihood of Huron residents considering moving to other communities in order to have access to services.

Green Raiteros has catalyzed the growth of The LEAP Institute into a statewide organization serving farmworkers and their families across California's major agricultural regions. Through this platform, LEAP has developed workforce training programs, begun to revamp the Promotoras Verdes leadership initiative, and grown employment opportunities in transportation coordination, dispatch, electric vehicle maintenance, and community engagement. Huron experiences severe heat waves and the LEAP institute has developed portable renewable energy operated rest stations for farmworkers, reducing heat exposure and ensuring farmworkers do not experience reductions in hours worked, and hence income, and thus reducing the need to move to different locations to earn a living. LEAP's vehicle fleet has also supported students attending college by transporting them to and from school and farmworker families to participate in the "farmworker to camp initiative," a program designed to increase participation in outdoor activities, with an emphasis on mental health wellness. These activities are creating pathways for residents, especially current and former farmworkers, and their children, to access stable, well-paying green jobs while strengthening local economies via job training.

Job losses and job gains after extreme climate event occurrence vary by the type of extreme event and by the initial labor profile at a particular location. In the case of wildfires at the regional level, the impact can be significant and follow a pattern of initial employment reduction that is relatively brief, followed by a rebound. Research shows that for wildfires, the intensity of the event can result in an initial period of employment reduction of approximately 3 years, with employment impacts driven by migration (Coulombe & Rao, 2025). Once the economy rebounds, the composition of employment is different from that prior to the wildfire occurrence. For example, the 2017 North Bay complex of wildfires resulted in an increase in unemployment claims from estimated job losses in the range of 5,500 to 6,500. The initial impact was felt mostly in the retail, services, transportation, and construction sectors. By 2019, retail and similar sectors had not recovered to pre-fire levels, but employment overall had recuperated, led by the construction sector (Bellisario et al., 2021). Communities of color are disproportionately impacted by the employment impacts of climate-induced events. For example, a significant number of workers in the construction, agricultural, landscaping, and other service sectors are undocumented and not eligible for unemployment benefits. Studies using unemployment claims alone are likely to underestimate employment impacts on communities of color, particularly Latinx and Indigenous communities (Méndez et al., 2020).

California is highly exposed to the impacts of flooding events and this will increase in the future. The impact of floods on displacement and migration varies by economic region and the socio-economic profile of the residents in those regions. Studies show that more than 7 million Californians—one in five residents—live in areas at risk of flooding. It is estimated that a major

statewide flooding event could displace more than 1.5 million residents (Mount et al., 2024; Porter et al., 2017). Flooding in urban areas forces displacement when residents' dwellings are damaged, regardless of whether they own or rent. If residents' jobs are impacted by the flood, this contributes to their risk of displacement. Under the so-called "ARkStorm scenario" (analogous to the massive storms that devastated California in the winter of 1861–1862), the impact of a major flooding event in California's agricultural and rural sector has been estimated to cost $3.7 to $7.1 billion dollars, accounting only for economic damage to crops, livestock, and some infrastructure, and depending on the duration (Wein et al., 2016). The direct financial impact on farmworkers and their families includes lost wages due to crop damage and an inability to get to work due to damaged roads, bridges, and other transportation infrastructure (e.g. Planada, Cutler, Alpaugh, and Allensworth, among others). Following the 2023 floods, 41% of surveyed households in Planada reported that at least one household member missed work because of the flooding, with a median of 21 days of lost work (HCD, 2024). For more information on transportation, please see *Section 1.3 Transportation*.

2.5.2 Current Responses

Current responses to the climate change challenges facing California include state, county, and city level policies. Policies can address zoning codes, which can affect what kinds of jobs exist in a community, worker access and commuting, and potentially local hiring and living wages; workplace regulations at the county and state levels; and just transition policies at the state level.

JUST TRANSITIONS

Just transition policies refer to strategies and laws designed to ensure that the shift to a low-carbon, environmentally sustainable economy is fair and inclusive, particularly for workers and communities historically dependent on high-emission industries such as oil, gas, coal, and energy-intensive manufacturing. These policies seek to reduce displacement risk by stabilizing employment, supporting skills transfer, and maintaining community economic viability during periods of structural change. Public procurement strategies at the state and county levels represent one mechanism for advancing equity and inclusion, including through job quality standards, workforce training requirements, and incentives for hiring disadvantaged, underrepresented, and displaced workers. For example, the California High-Speed Rail Authority and the Los Angeles County Metropolitan Transportation Authority adopted the US Employment Plan (USEP), establishing standards for wages, workplace safety, and inclusive hiring. Similar standards have been adopted by the City of Los Angeles Department of Transportation (Cha, 2020).

At the same time, the political and economic context in which energy transitions occur plays a critical role in shaping displacement outcomes. In regions such as Central California, where fossil fuel extraction remains a primary economic driver, residents and workers may be skeptical of clean energy transitions due to concerns about job loss and regional economic decline (Nieves, 2023). Just transition frameworks that prioritize job retention, skills transfer, and fiscal stability can help address these uncertainties and reduce resistance to change. California's approach to the planned closure of the Diablo Canyon nuclear power plant illustrates this potential. The proposal included a replacement portfolio of clean energy resources, worker retraining and retention programs, and financial mitigation measures for local governments facing tax revenue losses

(Cha, 2020; County of San Luis Obispo, 2016). Such place-based transition planning can protect livelihoods while positioning regions to attract new clean energy investment, thereby reducing the likelihood that economic disruption translates into long-term displacement or out-migration. For more on energy, please see *Section 1.4 Water and Energy*.

2.5.3 Adaptation Opportunities

Labor and employment systems function as a key transmission channel through which climate change translates into both economic vulnerability and adaptive capacity. A central adaptation opportunity lies in aligning workforce systems with ongoing structural transitions driven by decarbonization, climate disruption, and infrastructure transformation.

California's evolving policy landscape (including emissions reduction programs, electrification initiatives, and clean energy investment pathways) creates an opportunity space where job creation, emissions reduction, and regional economic restructuring intersect. However, uneven distributional outcomes across income and racial groups highlight the need to better connect climate investment flows with geographically targeted workforce stabilization.

Just transition frameworks provide an additional adaptation pathway by structuring how fossil fuel–dependent regions and workers navigate economic restructuring. Because these transitions are place-based as well as sectoral, they represent an opportunity to reduce geographically concentrated displacement pressures through coordinated retraining, income support, and regional diversification strategies.

Climate impacts are also reshaping labor demand in real time—expanding workforces in wildfire response, infrastructure repair, healthcare delivery, water management, and clean energy deployment. This creates an opportunity to proactively align workforce development pipelines with emerging climate-driven labor needs.

Finally, integrating labor market planning with climate risk and displacement mapping creates a systems-level opportunity to anticipate where employment instability, migration pressure, and infrastructure stress are likely to converge.

Findings and Gaps

Summary of Statewide Findings

Climate change is reshaping California's landscapes, economies, and communities in ways that reverberate across every sector and cut across traditional policy boundaries. The evidence synthesized in this report demonstrates that climate-induced displacement and migration rarely result from a single hazard or discrete event. Rather, human mobility emerges through interacting climatic stressors and systemic vulnerabilities across housing, emergency management, transportation, energy and water, health, education, labor, and community-based systems that were not designed for compounding, long-duration climate risk.

Cascading Systemic Vulnerabilities

Climate hazards—floods, wildfires, drought, heat, and sea level rise—disrupt multiple systems simultaneously. The breakdown of one sector can quickly cascade into others: a flood damages homes and roadways, isolating workers and patients from jobs and health care; a wildfire disables the electrical grid, halting refrigeration, water pumping, and communication; a drought deepens energy costs and job losses while reducing community water supplies; impacts to transportation routes (roads, seaports, airports) hinder evacuation, access to essential services, and economic stability.

Climate stressors and their subsequent impacts (e.g., groundwater depletion, chronic heat exposure, flooding, and rising insurance costs) also contribute to displacement by steadily eroding habitability and affordability. These pressures frequently interact with labor market forces, land-use patterns, and regulatory constraints, resulting in gradual but durable migration decisions that are difficult to detect or address through existing disaster-oriented frameworks.

Inequities as Structural Determinants of Displacement

Displacement risk is shaped both by exposure and by structural inequities embedded across systems. Low-income communities, renters, undocumented immigrants, Tribal communities, farmworkers, mobile-home residents, unhoused people, and people with disabilities are more likely to live in hazard-prone areas, depend on fragile infrastructure, have limited mobility options (e.g., reliance upon public transportation or limited affordable housing options near jobs), and face barriers to financial and institutional support including recovery and resettlement assistance. Language barriers can prevent residents from receiving emergency alerts or aid.

These inequities persist across both "sending" and "receiving" communities. Regions that receive displaced populations, such as inland, rural, or lower-cost areas, may lack sufficient housing, transit capacity, health services, or school resources to absorb population influxes. Without anticipatory planning, displacement risks are transferred rather than reduced. Ultimately, across all systems, existing inequities shape who is displaced, how quickly they can recover, where they can safely resettle, and how well the receiving community as a whole fares.

Community-Based Organizations as Critical System Anchors

Across sectors and case studies, community-based organizations (CBOs), Tribes, and mutual aid networks consistently emerge as first responders, service integrators, and trusted intermediaries, particularly for populations excluded from or marginalized within formal systems. These

organizations play critical roles in multilingual emergency communication, emergency financial assistance, tenant protection, health outreach, education continuity, and community recovery. However, their contributions remain under-resourced, episodic, and insufficiently institutionalized within state and regional planning and funding structures. Pre-disaster relationships and trusted intermediaries are particularly critical in emergency response, where fear, language barriers, or exclusion from federal assistance can prevent residents from accessing evacuation centers, alerts, and aid without CBO mediation.

Push and Pull Dynamics and Two-Way Integration

California functions simultaneously as a producer of climate-related out-migration and a destination for displaced populations from within and beyond the state. Adaptation investments (e.g., resilient housing, reliable water systems and access, distributed clean energy, accessible transportation, and strong social infrastructure) can act as "pull" factors that stabilize communities, retain residents and attract new residents.

Conversely, failure to integrate displacement considerations into adaptation planning risks reinforcing patterns in which wealthier communities recover and adapt, while vulnerable populations are displaced repeatedly. These dynamics highlight the importance of reducing displacement pressures in high-risk areas while strengthening two-way integration (i.e., the resilience, capacity, and cohesion of receiving communities).

Fragmented Governance and Reactive Planning

Despite California's leadership in climate adaptation planning, migration and displacement remain peripheral to most adaptation and sectoral frameworks. Agencies responsible for housing, emergency response, energy, water, and transportation each operate within siloed mandates. Coordination between the California Office of Emergency Services (Cal OES), the California State Transportation Agency (CalSTA), the California Department of Transportation (Caltrans), housing agencies, and local governments can be inconsistent, particularly in linking evacuation logistics with housing and social recovery.

Without integrated governance and accountability, responses risk being reactive, inequitable, and short-lived, with a greater likelihood of entrenching existing disparities: wealthier communities will recover quickly, while vulnerable populations will face cascading displacement and vulnerable peoples within receiving communities will face added pressure. Additionally, for undocumented and mixed-status households, the perceived risk of immigration enforcement can actively deter evacuation and assistance-seeking. Without clear non-enforcement protocols, data protections, and formal roles for trusted community-based organizations, emergency response can unintentionally amplify displacement rather than prevent it.

Summary of Regional Findings

Across California, climate-induced displacement unfolds through regionally distinct pathways shaped by local hazards, settlement patterns, and institutional capacity. The regional evidence synthesized in this report shows that wildfire, flooding, extreme heat, drought, and sea level rise

generate uneven displacement pressures across rural, urban, coastal, and inland communities, affecting both places of origin and destination. Together, these findings underscore that climate migration in California is fundamentally place-based, mediated by local housing markets, infrastructure systems, and governance conditions, and cannot be addressed through uniform or hazard-specific responses alone.

North Coast

Catastrophic wildfires in Northern California have produced large-scale displacement with particularly severe impacts in rural, forested, and mountain-adjacent communities where limited evacuation routes, housing loss, and infrastructure constraints intensify vulnerability. At the same time, low-lying coastal communities face increasing exposure to sea level rise, coastal erosion, and flooding, which may generate additional long-term displacement pressures. Displacement in these contexts is often compounded by geographic isolation and limited recovery capacity.

Sacramento Valley

Wildfire events such as the Camp Fire have resulted in large-scale displacement, especially in rural and foothill communities where evacuation constraints and infrastructure limitations amplify impacts. Rebuilding has often favored higher-value, owner-occupied housing, excluding many renters and low-income households from returning, while nearby cities such as Chico have absorbed displaced residents and experienced pressure on housing, water, and transportation systems.

San Francisco Bay Area

Sea level rise poses long-term displacement risks for low-lying shoreline communities and critical infrastructure in the Bay Area and Sacramento-San Joaquin Delta regions. Adaptation planning efforts indicate that future displacement may occur not only through acute disasters, but through planned infrastructure decisions, land-use change, and housing market pressures linked to climate adaptation.

San Joaquin Valley

Communities in the San Joaquin Valley face intersecting risks from extreme heat, drought, and flooding that disrupt housing stability, agricultural labor markets, and health. These stressors often produce constrained mobility, where residents experience high exposure to climate impacts but lack sufficient resources or institutional support to relocate safely or permanently.

Central Coast

Recurrent flooding in the Pajaro River watershed has produced repeated displacement, particularly among farmworker and immigrant communities. Chronic infrastructure failures in Pajaro Valley and Monterey County, combined with limited access to disaster assistance and affordable housing, have transformed flooding from an episodic hazard into a persistent driver of housing instability. Wildfire and mudslide events in Ventura and Santa Barbara counties have also displaced undocumented and low-income households, where community-based disaster relief

funds have played a key role in immediate recovery. Sea level rise and coastal erosion pose additional long-term risks for low-lying coastal communities and infrastructure throughout the region.

Sierra Nevada

Tourism-dependent communities in the Sierra Nevada face displacement pressures driven by wildfire risk, smoke-related closures, and declining snowpack that undermines tourism-based employment and local revenues. Even when housing is not directly destroyed, repeated disruptions contribute to worker out-migration through income instability, seasonal job loss, and severe workforce housing constraints.

Los Angeles

Wildfires in and around Los Angeles County highlight how transportation systems shape short-term displacement and evacuation capacity, particularly for residents without access to private vehicles. Transit shutdowns, temporary fare relief programs, and emergency transportation adaptations directly influence residents' ability to evacuate, relocate temporarily, and maintain access to employment and services during disasters.

San Diego

San Diego faces increasing exposure to wildfire risk and extreme heat that can destabilize housing security and public health. These hazards disproportionately affect renters and lower-income households, who face greater barriers to evacuation, recovery, and long-term relocation when disruptions occur. The region's coastal communities and infrastructure also face growing exposure to sea level rise and coastal flooding, creating additional long-term displacement risks.

Inland Deserts

Inland Desert communities face intensifying risks from extreme heat, drought, and infrastructure stress that affect housing stability, health outcomes, and economic security. These conditions can produce gradual displacement pressures, where long-term environmental stress and resource constraints limit residents' ability to remain in place.

Summary of Gaps and Risks of Inactions

This section synthesizes gaps identified across the report's sectoral analyses, drawing out both cross-cutting and sector-specific deficiencies that shape California's capacity to anticipate, manage, and respond to climate-induced displacement and migration. Each entry identifies the nature of the gap, possible actions that could be taken, and the risks of inaction, while distinguishing between research and data gaps, and resource and policy gaps.

Understanding, Measuring, and Anticipating Climate-Induced Mobility

RESEARCH AND DATA GAP

Gap: California lacks a comprehensive framework for identifying, tracking, and analyzing climate-induced displacement and migration across time, geography, and demographic groups. Existing datasets are fragmented across housing, education, health, labor, and transportation systems and are rarely linked to climate hazard exposure or recovery trajectories. Secondary and tertiary displacement, non-return, and slow-onset migration remain largely invisible.

Possible actions: Integrate mobility indicators into existing administrative datasets (e.g., school enrollment, Medi-Cal, workforce data); support longitudinal studies following households displaced by wildfires, floods, drought, and heat; develop shared definitions and typologies distinguishing temporary displacement, long-term relocation, and permanent migration.

Risk if unaddressed: Displacement and secondary impacts of displacement remain underestimated and poorly understood, limiting anticipatory planning and obscuring inequitable outcomes, particularly for renters, undocumented residents, and rural populations.

RESEARCH AND DATA GAP

Gap: Current displacement frameworks insufficiently account for political economy drivers, including energy policy decisions, labor market transitions, and regulatory rollbacks, that shape long-term migration pressures alongside physical climate hazards.

Possible actions: Incorporate economic transition scenarios into displacement modeling; Analyze how governance decisions influence migration risk over time.

Risk if unaddressed: Climate-induced migration is treated as an external shock rather than a partially policy-mediated outcome.

Community Identity, Governance, and Social Cohesion

RESEARCH AND DATA GAP

Gap: There is limited research on how displacement affects community identity, belonging, and social cohesion, or on how community-led recovery strategies mitigate social fragmentation.

Possible actions: Develop indicators of social recovery and belonging; document Indigenous and community-based recovery practices; collect qualitative data, such as stories, testimonials, interview feedback, and personal experiences.

Risk if unaddressed: Displacement erodes trust in receiving communities and public institutions and undermines long-term resilience.

POLICY AND RESOURCE GAP

Gap: Community-based organizations and Tribes lack sustained, flexible funding and formal roles in climate adaptation and displacement governance.

Possible actions: Provide multi-year funding for community-led resilience efforts; embed community partners, including recognized and unrecognized Tribes, CBOs, and community health workers (CHWs) in planning and implementation structures.

Risk if unaddressed: Effective local solutions remain isolated and unsustainable, tribal sovereignty eroded when excluded from decision-making, and existing disparities remain.

Housing Systems, Rental Markets, and Post-Disaster Displacement

POLICY AND RESOURCE GAP

Gap: Housing recovery and disaster assistance frameworks, primarily at the federal level, remain oriented toward homeowners and physical housing loss, leaving renters—particularly low-income, undocumented, and informal tenants—without adequate protection or recovery support. Recent California actions have increasingly addressed post-disaster renter needs, including rental protections and support for affordable rental housing recovery (HCD, 2025b; Office of Governor Gavin Newsom, 2026). Tenant displacement can nevertheless occur through indirect pathways, including rent increases, lease non-renewals, habitability failures, and informal eviction, even when rental units remain standing.

Possible actions: Expand disaster-related tenant protections, including just-cause eviction standards and rent stabilization during recovery periods; ensure emergency financial assistance and recovery programs explicitly include renters and informal tenants; strengthen access to legal assistance and tenant advocacy during post-disaster recovery.

Risk if unaddressed: Disasters disproportionately accelerate renter displacement, converting short-term disruption into permanent out-migration and exacerbating housing insecurity statewide.

RESEARCH AND DATA GAP

Gap: California lacks a systematic framework for anticipatory planned relocation and managed retreat that integrates equity considerations. Existing research on managed retreat documents that ad hoc, reactive buyouts and relocation programs routinely produce inequitable outcomes—overcompensating property owners while failing renters, exacerbating displacement in receiving communities, and accelerating climate gentrification (Hino et al., 2017; Siders & Ajibade, 2021). California's absence of proactive relocation planning means these failure modes are likely to repeat as climate hazards intensify.

Possible actions: Develop a statewide framework for anticipatory, community-driven relocation planning that explicitly addresses renter rights, cultural continuity, and receiving community capacity; integrate managed retreat into resiliency planning, including for sea level rise and wildfire; fund research on how voluntary buyout and relocation programs in other US contexts can be adapted to California's tenure, demographic, and housing market conditions.

Risk if unaddressed: Retreat will continue to occur reactively and inequitably, concentrating loss among the most vulnerable while allowing development to persist in high-risk areas—compounding future displacement and long-term state fiscal and housing instability.

POLICY AND RESOURCE GAP

Gap: Post-disaster housing markets are weakly regulated, allowing speculative acquisition, rent escalation, and conversion of rental housing to higher-income or short-term uses. Price gouging and habitability protections exist but are unevenly enforced, particularly in rural and unincorporated areas.

Possible actions: Improve monitoring and enforcement of post-disaster rent increases and housing code violations; track post-disaster property transactions and tenure changes; support mechanisms that stabilize housing stock and prevent displacement-driven market churn.

Risk if unaddressed: Climate disasters become catalysts for market-driven displacement, reshaping communities in ways that permanently exclude lower-income residents.

Emergency Management Systems and Access to Assistance

POLICY AND RESOURCE GAP

Gap: Emergency management systems remain heavily reliant on FEMA-centered models that privilege homeowners, documented status, and reimbursement-based recovery. State and local agencies have developed programs and guidance to address these gaps, including support for undocumented residents, renters, unhoused people, and others with access and functional needs, but challenges remain in ensuring equitable access to emergency and recovery resources (Cal OES, 2024; Office of Governor Gavin Newsom, 2023).

Possible actions: Expand and strengthen state-level emergency financial assistance mechanisms that are not contingent on FEMA eligibility; expand flexible funding streams that can be deployed through trusted community-based organizations; clarify roles and responsibilities across state agencies for serving populations facing barriers to federal assistance during emergencies.

Risk if unaddressed: Disasters disproportionately accelerate displacement among marginalized populations, deepen mistrust in institutions, and prolong recovery timelines.

RESEARCH AND DATA GAP

Gap: Limited systematic evaluation exists regarding the effectiveness of emergency communication systems, evacuation assistance, and post-disaster aid delivery across linguistically diverse and rural communities.

Possible actions: Evaluate emergency alert reach and comprehension across language groups; document outcomes of community-led emergency response models; assess disparities in aid receipt and recovery outcomes.

Risk if unaddressed: Emergency response failures persist across events, repeating known inequities without institutional learning.

Transportation Systems, Evacuation, and Mobility After Displacement

POLICY AND RESOURCE GAP

Gap: Transportation planning and emergency evacuation frameworks often prioritize infrastructure protection and immediate life safety, without addressing longer-term mobility needs of displaced populations or transit capacity in receiving communities.

Possible actions: Integrate displacement scenarios into emergency transportation planning; improve coordination between transportation agencies and housing, health, and social services; ensure continuity of transit access for displaced residents.

Risk if unaddressed: Transportation barriers isolate displaced populations, constrain access to employment and services, and slow recovery.

RESEARCH AND DATA GAP

Gap: Limited research examines evacuation behavior among transit-dependent households, people with disabilities, and rural residents, or evaluates transportation system performance during compound climate events.

Possible actions: Study evacuation decision-making and constraints across demographic groups; assess infrastructure failure patterns and recovery timelines; create indicators within planning documents that specifically focus on access to infrastructure and community resilience.

Risk if unaddressed: Future evacuation and recovery efforts repeat known shortcomings, increasing displacement risk.

Energy and Water Systems as Drivers of Habitability

RESEARCH AND DATA GAP

Gap: Insufficient research links energy insecurity and power shutoffs to individual and household migration decisions. Similarly, there is insufficient research linking individual and household migration decisions with hydrological climate related stressors, such as groundwater depletion and water contamination.

Possible actions: Study migration responses to chronic utility failures and contamination; evaluate the stabilizing effects of microgrids, distributed energy, and water system consolidation.

Risk if unaddressed: Gradual degradation of basic services drives unplanned migration without policy recognition.

POLICY AND RESOURCE GAP

Gap: Regulatory and investment frameworks do not consistently prioritize frontline, rural, and Tribal communities for energy and water resilience.

Possible actions: Align infrastructure investment with displacement risk; support Tribal-led and community-governed resilience projects.

Risk if unaddressed: Infrastructure inequities persist, reinforcing environmental injustice and displacement.

RESEARCH AND DATA GAP

Gap: Insufficient research examines how chronic water insecurity—including groundwater depletion, drinking water contamination, drought-related supply reductions, well failures, and rising water costs—influences household mobility, displacement, and decisions to remain in place.

Possible actions: Study migration responses to chronic water shortages, domestic well failures, and drinking water contamination; evaluate the effects of water system consolidation, groundwater sustainability measures, and drought adaptation investments on household stability; develop longitudinal datasets linking water insecurity indicators to migration and displacement outcomes.

Risk if unaddressed: Water insecurity may become a significant but poorly measured driver of climate-related displacement, particularly in rural, agricultural, marginalized, and Tribal communities.

POLICY AND RESOURCE GAP

Gap: Water governance, funding, and adaptation programs do not consistently incorporate displacement risk into decisions regarding groundwater management, drinking water access, drought response, and long-term water system investments.

Possible actions: Integrate displacement and housing vulnerability metrics into groundwater sustainability and drought planning processes; prioritize investments in safe drinking water, domestic well protection, and climate-resilient water infrastructure for disadvantaged and Tribal communities; support community-led water resilience planning in areas experiencing chronic water stress.

Risk if unaddressed: Declining water reliability and affordability may undermine community habitability, exacerbating environmental injustice and contributing to involuntary displacement.

RESEARCH AND DATA GAP

Gap: Insufficient research examines how fossil fuel and renewable energy infrastructure interact with climate stressors to shape displacement risk, particularly in Tribal, rural, and resource-dependent communities.

Possible actions: Evaluate displacement risks associated with energy infrastructure siting and operation across fossil fuel, solar, wind, hydroelectric, and transmission projects; examine how energy development affects water availability, subsistence resources, land tenure, and cultural continuity in frontline and Tribal communities; assess cumulative environmental and social impacts of energy projects under different regulatory and climate scenarios.

Risk if unaddressed: Energy transitions—both legacy fossil fuel systems and rapidly expanding renewable infrastructure—may unintentionally reproduce displacement dynamics, erode trust, and compromise long-term settlement stability in already vulnerable communities.

Health and Education Continuity Amid Displacement

POLICY AND RESOURCE GAP

Gap: Health, education, and labor systems lack durable funding and planning mechanisms to support displaced populations over extended recovery periods.

Possible actions: Stabilize funding for schools and clinics serving displaced populations, especially during post-disaster enrollment fluctuations; integrate schools and healthcare facilities into recovery planning; expand mobile and telehealth services.

Risk if unaddressed: Health and educational systems exacerbate displacement-related inequities, including avoidable morbidity and mortality.

Just Transition Planning and Workforce Stability

POLICY AND RESOURCE GAP

Gap: California has advanced ambitious climate and energy goals, yet just transition planning is uneven across regions and sectors. Workforce retraining, job retention, and local fiscal stabilization measures are not consistently integrated into climate adaptation or displacement planning.

Possible actions: Integrate workforce transition planning into climate adaptation and regional resilience strategies; support skills transfer, job retention, and fiscal mitigation in communities facing energy sector transition.

Risk if unaddressed: Communities reliant on fossil fuel economies and not involved in energy transition planning face compounded risks of economic decline and displacement.

Conclusion

California is entering an era where climate change will simultaneously push residents out of high-risk areas and draw new migrants into the state. The findings across this assessment demonstrate that climate-induced displacement is not only about the hazards themselves but also about how those hazards reverberate through the social and institutional systems that people depend on. Wildfire becomes a housing crisis when affordable stock is lost and rents surge. A flood becomes a labor crisis when workers lose jobs and income. A heat wave becomes a health crisis when the grid fails and cooling is inaccessible. Each system's fragility compounds the others, and without intervention, these failures will accelerate dynamics of inequitable displacement and migration.

At the same time, California has the opportunity to lead in reframing climate mobility not as an inevitable harm but as a chance to build resilience and equity, which can be actively designed across diverse systems. Communities that invest in resilient affordable housing, distributed energy and water systems, equitable health care, strong tenant protections, and culturally competent emergency management become safer not only for those who live there now, but also for those who may arrive in the future. In this way, the state is both a site of "climate push" and "climate pull," and its policy choices will determine whether displacement becomes a source of deepened inequity or a driver of inclusive renewal and growth.

This report shows that frontline communities and community-based organizations are already pioneering solutions, largely out of necessity: multilingual emergency alerts, mutual aid funds for undocumented immigrants, rapid rehousing, Tribal microgrids, and resilience hubs. These models prove that displacement can be mitigated, and that recovery can be just and equitable. But scaling these efforts requires structural commitment, including robust funding, integrated governance and stronger leadership by state and local government, and long-term planning that centers equity.

The path forward demands a holistic, anticipatory approach: weaving migration management into climate adaptation, bridging silos across infrastructure and social systems, and democratizing decision-making to include those most impacted. California's challenge is immense, but so too is its capacity to lead. By embracing "two-way integration"—reducing risks for those displaced while strengthening receiving communities—the state can transform climate-induced mobility into an opportunity to create stronger, safer, more inclusive and vibrant communities.

In short, climate-induced displacement and migration is not a peripheral issue. It is one of the defining challenges of California's future. If approached with foresight and equity, based on the findings of this report and the larger Fifth Assessment, it can also be a foundation for resilience–ensuring that all Californians, whether they stay, move, or arrive, have the resources to not only survive but to thrive.

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