

FINAL DRAFT



NOVEMBER 2022



TUOLUMNE COUNTY

Climate Action Plan

KEARNS  WEST

ASCENT
ENVIRONMENTAL



**DANIEL ANAIAH KIRK
DISTRICT 3 SUPERVISOR**

2 South Green Street
Sonora, CA 95370
(209) 533-5521

email: akirk@co.tuolumne.ca.us

Dear Neighbors,

The Board of Supervisors is pleased to present the County of Tuolumne's first-ever state mandated Climate Action Plan. We envision Tuolumne County as a place where all citizens enjoy opportunities to thrive in a safe, healthy, and productive community, and the development of this plan is a critical step in ensuring this vision is a reality for future generations. The Board is proud to continue making progress on the County's policy priorities by taking action to address our current climate and its impacts on our region.

Recent conditions make it clear that the climate is changing in Tuolumne County and underscore the importance of this effort. Our summers are consistently getting hotter, with temperatures in June 2021 reaching over 110°F and nearly breaking all-time records, and recent data show the county experienced the driest January on record (over 128 years) in 2022. Severe and persistent drought conditions have contributed to a dramatic rise in intense wildfires, which have burned hundreds of thousands of forested acres in our county, and our communities have come to accept blanketing smoke and hazardous air quality as an unfortunate summertime norm. Scorched hillsides have resulted in dangerous flooding, causing damage to roads and buildings and resulting in tens of millions of dollars-worth of repairs. In addition to directly threatening the safety and well-being of all who live, work, and recreate in the county, these events also pose serious risks to the resources upon which our communities and economies depend. From reduced winter snowpack to beetle-infested timber and dry soils, the effects will increasingly burden our cornerstone industries.

This Climate Action Plan serves to address these threats and provides the County with a roadmap to guide future decision-making toward sustainability while meeting residents' needs and providing a high quality of life for all. Consistent with Policy 18.A.1 of the 2018 General Plan, the County has developed this plan to improve resilience and reduce local greenhouse gas emissions. Not only will this plan prepare our community for future changes in the climate and reduce our contributions to it, but it will also provide other benefits to our people and our resources. The measures included in the Climate Action Plan will improve local energy independence and reduce energy costs, protect forest resources and ecosystems services, and strengthen the long-term resilience of local businesses while helping to create new jobs. Developed through robust collaboration with the public, stakeholders, and County staff—along with leading science and examples from similar communities across the state—this plan reflects the values and needs of our citizens and provides a realistic pathway forward. Implementing the measures outlined in this plan will be difficult and require an all-hands-on-deck approach. Success of the plan depends on bold leadership, meaningful participation, and collaboration across the community—but this is nothing new for us. We have a history of rising to the occasion before, and we will do it again. We will act with urgency to address the risks that threaten our home, because the future depends on it.

We look forward to working with you as we build a resilient, prosperous, and healthy future.

Sincerely,

A handwritten signature in black ink, appearing to read "Anaiah Kirk", is written over a large, stylized, light-colored circular mark.

Anaiah Kirk, Chair
Tuolumne County Board of Supervisors

No. _____



Filed _____

By _____

Board Clerk of the Board of Supervisors

RESOLUTION
OF THE BOARD OF SUPERVISORS OF THE COUNTY OF TUOLUMNE

- WHEREAS,** Tuolumne County Climate Action plan meets the requirements of the 2019 General Plan and SB 379; and
- WHEREAS,** the Climate Action Plan establishes a GHG reduction target consistent with the Senate Bill 32 goal to reduce statewide GHG emissions to 40 percent below 1990 levels by 2030; identifies specific measures to reduce countywide emissions consistent with the established target; and includes adaptation strategies for the County to appropriately adjust to the environmental effects of climate change;
- WHEREAS,** the Climate Action Plan provides the County with a comprehensive guiding document to address the challenges of climate change while supporting future development, all while promoting solutions to better manage natural resources within the county; and
- WHEREAS,** the Climate Action Plan is consistent with and complementary to statewide legislation and regulatory mandates, and establishes locally based action items that will not only reduce GHG emissions and enhance climate resilience, but will also improve the livability and quality of life for residents, workers, and visitors of the county; and
- WHEREAS,** the Board of Supervisors recognizes that climate related events such as extreme heat and catastrophic wildfire significantly impact the residents and visitors of Tuolumne County; and
- WHEREAS,** a GHG emissions inventory from catastrophic wildfire has been drafted by the California Air Resources Control Board, who estimated that GHG emissions from wildfires in 2020, (which was the worst fire year on record (by acres burned) for the State of California), were approximately 112 million metric tons of CO₂ (MMTCO₂), which is equivalent to the amount of carbon contained in the structural lumber of 6.3 million average California homes, or over 75 percent of the emissions from all homes in California; and
- WHEREAS,** a new analysis led by researchers with the University of California (*Env. Pollution*, Vol 310, 1 October 2022, 119888) has found the 2020 wildfires in the state put twice as much greenhouse gas emissions into the Earth's atmosphere as the total reduction in such pollutants in California between 2003-2019; and
- WHEREAS,** the Climate Action Plan contains a Workplan in Chapter 5 of action items that shall serve as a workplan, and any new action items proposed by County staff in the future to be included in the workplan shall require approval from the Board of Supervisors; and
- WHEREAS,** the Board of Supervisors recognizes that many residents in the County rely on woodstoves as a primary heat source and the County shall ensure that any future action items that are County-initiated do not require the removal of existing new stoves; and
- WHEREAS,** the Board of Supervisors recognizes that many residents utilize backyard burning as a method to manage vegetation on their property which assists in maintaining required fire clearances and that any future action County-initiated items do not limit the ability for residents to clear their property; and
- WHEREAS,** the Board of Supervisors recognizes that reliance on the electrical grid can be challenging for local residents and that any future action items will consider the concerns of relying on an unpredictable electrical grid; and

WHEREAS, the Board of Supervisors recognizes that the County should consider the potential environmental impacts and challenges associated with implementing action items identified in the Climate Action Plan (e.g., increased use of lithium for battery production, battery recycling and disposal, technology availability).

NOW THEREFORE BE IT RESOLVED that the Tuolumne County Board of Supervisors hereby approves the Tuolumne County Climate Action Plan.

ADOPTED BY THE BOARD OF SUPERVISORS OF THE COUNTY OF TUOLUMNE ON _____.

AYES:	1st Dist. _____	NOES:	_____ Dist.
	2nd Dist. _____		_____ Dist.
	3rd Dist. _____	ABSENT:	_____ Dist.
	4th Dist. _____		_____ Dist.
	5th Dist. _____	ABSTAIN:	_____ Dist.

CHAIR OF THE BOARD OF SUPERVISORS

ATTEST: _____	No. _____
Board Clerk of the Board of Supervisors	

Acknowledgements

Tuolumne County Board of Supervisors
District 1, David Goldemberg

District 2, Ryan Campbell

District 3, Daniel Anaiah Kirk

District 4, Kathleen Haff

District 5, Jaron Brandon

Tuolumne County Planning Commission

Tuolumne County Board of Supervisors
Planning Committee

Tuolumne County Board of Supervisors
Natural Resources Committee

Tuolumne County Community
Development Department
Quincy Yaley, AICP, Director

Taryn Vanderpan, Administrative
Technician

Tuolumne County Administration Office
Cody Nesper, Deputy County Counsel

Cole Przybyla, Innovation and Business
Assistance

Liz Peterson, Senior Administrative
Analyst

Jason Terry, Senior Administrative
Analyst

Tuolumne County Public Works
Department

Kim MacFarlane, P.E., Director

Mike Young, Fleet Manager

Jim McHargue, REHS, Solid Waste
Director

Tuolumne County Agricultural
Commissioner's Office
Kelle Schroeder, Agricultural
Commissioner

Tuolumne County Transportation
Council

Darin Grossi, Executive Director

Shannon Thaggard, Transportation
Planner

Ascent Environmental

Honey Walters, Principal

Hannah Kornfeld, AICP, Project
Manager

Sam Ruderman, Climate Change
Analyst

Kai Lord-Farmer, Climate Change
Analyst

Angie Xiong, AICP, Climate Change
Analyst

Brenda Hom, Senior Climate Change
Specialist

Phi Ngo, GIS

Gayiety Lane, Publishing

Corey Alling, Graphics

Tracy Prybyla, Technical Support

Kearns & West

Nora De Cuir, Senior Director

Kelsey Rugani, Senior Director

Katy Kennedy, Project Coordinator

Table of Contents

EXECUTIVE SUMMARY	ES-1
Plan-at-a-Glance.....	ES-2
INTRODUCTION.....	1-1
Climate Action Planning Overview	1-2
Climate Change Science.....	1-2
Climate Change Mitigation and Adaptation	1-4
Regulatory Background.....	1-6
California Climate Legislation.....	1-6
Regional Climate Planning Efforts	1-7
Purpose and Objectives	1-7
Co-Benefits	1-9
Development Process	1-10
Community Engagement and Public Outreach.....	1-10
Community Workshops.....	1-11
Public Meetings.....	1-11
Project Websites and Press Releases	1-11
How to Read This Plan	1-12
Organization.....	1-12
Structure of Focus Areas	1-12
GHG Reduction Potential and Climate Resilience Benefit.....	1-12
GREENHOUSE GAS EMISSIONS INVENTORY, FORECASTS, AND TARGETS.....	2-1
Why Prepare a Greenhouse Gas Emissions Inventory?	2-1
Baseline Inventory.....	2-1
Emissions Forecasts	2-6
County Scaling Factors	2-6
Business-As-Usual Forecasts.....	2-6
Legislative-Adjusted Business-As-Usual Forecasts	2-7
Reduction Targets.....	2-9
Local Emissions Gap	2-9
CLIMATE CHANGE ADAPTATION AND RESILIENCE	3-1
Climate Change Adaptation and Resilience Overview	3-1
Adaptation Planning Process.....	3-2
Vulnerability Assessment Overview.....	3-3
Vulnerability Assessment Summary	3-4
Exposure, Sensitivity, and Impacts.....	3-4
Summary of Sensitivity and Potential Impacts	3-12
Adaptive Capacity	3-13
Summary of Adaptive Capacity	3-16
Vulnerability Scoring	3-16

Tuolumne County Climate Action Plan

Next Steps for Adaptation and Resilience	3-17
CLIMATE ACTION STRATEGIES AND MEASURES.....	4-1
Overview	4-1
Health & Safety	4-2
Strategies and Measures.....	4-3
Conservation & Recreation	4-9
Strategies and Measures.....	4-10
Buildings.....	4-15
Strategies and Measures.....	4-16
Infrastructure	4-20
Strategies and Measures.....	4-21
Agriculture & Forestry	4-30
Strategies and Measures.....	4-32
IMPLEMENTATION AND MONITORING	5-1
Implementation Strategy	5-1
Prioritization Evaluation Factors	5-2
Prioritization Matrix	5-4
California Environmental Quality Act	5-10
Monitoring and Updates.....	5-10
Ongoing Engagement.....	5-11
Funding Sources.....	5-12
WORKS CITED	6-1
Introduction.....	6-1
Greenhouse Gas Emissions Inventory, Forecasts, and Targets	6-2
Climate Change Adaptation and Resilience	6-2
Climate Action Strategies and Measures	6-4
Implementation and Monitoring.....	6-4
Photograph Log.....	6-5

Appendices

- A GHG Inventory, Forecasts, and Targets: Data and Calculations
- B Adaptation and Resilience Report
- C Prioritization Matrix
- D Regional Climate Planning Efforts
- E Community Engagement Summary

Figures

Figure 1-1 The Greenhouse Effect.....	1-3
Figure 1-2 Relationship between Climate Mitigation and Adaptation.....	1-4

Tuolumne County Climate Action Plan

Figure 1-3	Example of Mitigation and Adaptation Initiative Co-Benefits	1-5
Figure 1-4	Climate Mitigation and Adaptation Planning Processes.....	1-8
Figure 1-5	Co-Benefits	1-9
Figure 1-6	Project Timeline	1-10
Figure 2-1	Tuolumne County 2019 Greenhouse Gas Emissions Inventory by Sector	2-4
Figure 2-2	Tuolumne County 2019 Greenhouse Gas Emissions Equivalencies	2-5
Figure 2-3	Tuolumne County Business-as-Usual Greenhouse Gas Emissions Forecasts.....	2-7
Figure 2-4	Tuolumne County Legislative-Adjusted Business-as-Usual Forecast Greenhouse Gas Emissions	2-8
Figure 2-5	Tuolumne County Local Emissions Gap.....	2-10
Figure 3-1	Adaptation Planning Process	3-3
Figure 3-2	Projected Extended Drought Conditions in Tuolumne County.....	3-11

Tables

Table 2-1	Tuolumne County Greenhouse Gas Emissions Sectors	2-3
Table 2-2	Tuolumne County 2019 Greenhouse Gas Emissions Inventory by Sector	2-5
Table 2-3	Tuolumne County Legislative-Adjusted Business-as-Usual Forecast Greenhouse Gas Emissions (MTCO ₂ e)	2-8
Table 2-4	Tuolumne County Greenhouse Gas Local Emissions Gap (MTCO ₂ e)	2-10
Table 3-1	Changes in Average Annual Temperatures and Extreme Heat in Tuolumne County.....	3-5
Table 3-2	Changes in Average Annual Area Burned in Tuolumne County.....	3-7
Table 3-3	Changes in Average Annual Precipitation and Increased Extreme Precipitation and Flooding in Tuolumne County	3-9
Table 3-4	Changes in Average April Snow Water Equivalence in Tuolumne County	3-11
Table 3-5	Potential Impacts Rating.....	3-13
Table 3-6	Potential Impacts Summary for Tuolumne County.....	3-13
Table 3-7	Summary of Existing Plans and Reports	3-14
Table 3-8	Adaptive Capacity Rating	3-16
Table 3-9	Adaptive Capacity Summary for Tuolumne County	3-16
Table 3-10	Vulnerability Scoring Rubric	3-17

Tuolumne County Climate Action Plan

Table 3-11	Summary of Vulnerability Scoring in Tuolumne County	3-17
Table 5-1	Funding Opportunities for Implementation.....	5-13

Glossary and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
2008 Scoping Plan	<i>Climate Change Scoping Plan: A Framework for Change</i>
2017 Scoping Plan	<i>California's 2017 Climate Change Scoping Plan Update</i>
AB	Assembly Bill
adaptive capacity	The ability of institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences of climate change.
APG	Adaptation Planning Guide
BAU	business-as-usual
CAL FIRE	California Department of Forestry and Fire Protection
CalOES	California Office of Emergency Services
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CARB	California Air Resources Board
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH ₄	methane
climate change adaptation	The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, and which moderates harm or exploits beneficial opportunities. Climate change adaptation is focused on long-term threats to human life, property, economic continuity, ecological integrity, and community function.
climate change mitigation	Reducing emissions and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere through actions to limit climate change and its related effects.
CNRA	California Natural Resource Agency
CO ₂	carbon dioxide

Tuolumne County Climate Action Plan

CO ₂ e	carbon dioxide equivalent
Community Protocol	<i>U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions</i>
county	unincorporated Tuolumne County
County	County of Tuolumne
CPUC	California Public Utilities Commission
EO	Executive Order
EOP	Emergency Operations Plan
extreme heat day	A day in a year when the daily maximum/minimum temperature exceeds the 98th historical percentile of daily maximum/minimum temperatures based on observed historical data from 1961–1990 between April and October.
extreme weather event	As defined in the MJHMP, weather events that occur less than 5 percent of the time (although this definition may vary depending on the type of event).
FEMA	Federal Emergency Management Agency
General Plan	<i>2018 Tuolumne County General Plan</i>
GHG Study	<i>Tuolumne County Regional Blueprint Greenhouse Gas Study</i>
GHG	greenhouse gas
GWP	global warming potential
heat wave	A period of 4 consecutive extreme heat days or warm nights when the daily maximum/minimum temperature is above the extreme heat day threshold.
impact analysis	Evaluation of how climate change effects will occur and how severe they may be.
ICLEI	ICLEI – Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change
MJHMP	<i>Multi-Jurisdictional Hazard Mitigation Plan</i> . A multi-jurisdictional (e.g., countywide) plan that identifies risks and ways to minimize damage by natural and manmade disasters.
MTCO ₂ e	metric tons of carbon dioxide equivalent
N ₂ O	nitrous oxide

Tuolumne County Climate Action Plan

NOAA	National Oceanic and Atmospheric Administration
OES	County Office of Emergency Services
OPR	Governor's Office of Planning and Research
PG&E	Pacific Gas and Electric
PSPS	Public Safety Power Shutoff
RCP	Representative Concentration Pathways
RCP 4.5 Scenario	A lower GHG emissions scenario where emissions peak around 2040 and then decline.
RCP 8.5 Scenario	A business-as-usual GHG emissions scenario where emissions continue to rise strongly through 2050 and plateau around 2100.
resilience	The “capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience.
report	Adaptation and Resilience Report
RTP	<i>2016 Final Regional Transportation Plan</i>
SB	Senate Bill
sensitivity analysis	The identification of populations, functions, and structures that may be affected by projected exposures to climate change effects, and an assessment of their degree of sensitivity.
TCFD	Tuolumne County Fire Department
TCTC	Tuolumne County Transportation Council
TUD	Tuolumne Utilities District
USFS	United States Forest Service
WUI	wildland-urban interface



Executive Summary

Fall Mountain Scenery

Tuolumne County has an inextricable connection to the natural environment. The surrounding mountains, waters, and lands of the Sierra Nevada offer countless opportunities for outdoor recreation and are pivotal to the county's economy and the well-being of its residents. Tuolumne County has a long history of successfully addressing difficult challenges that are unique to the county, but climate change presents a new set of risks that threaten the community's people, resources, and way of life. Impacts from wildfires and smoke, extreme storms and flooding, and persistent drought in recent years highlight the importance of continuing to tackle the challenges associated with climate change in the county.

Tuolumne County has prepared this Climate Action Plan (CAP) to face the issue of climate change head-on. The main objectives of the CAP are three-fold: to build resilience to climate-related hazards that threaten the community; to reduce (or "mitigate") local greenhouse gas (GHG) emissions; and to preserve and improve the county's natural resources and quality of life. The CAP includes strategies that will help the community prepare for and adapt to the anticipated impacts of climate change while also mitigating GHG emissions. Simultaneously, implementation of CAP strategies will result in additional benefits to the environment, economy, and residents, workers, and visitors of the county, such as energy costs savings and improved local air quality. Ultimately, the CAP serves to ensure the sustainability, prosperity, and resiliency of the county for generations to come.

The CAP development process was driven by Policy 18.A.1 of the Tuolumne County General Plan. This policy requires the preparation of a CAP that establishes GHG reduction targets and includes strategies to mitigate local GHG emissions and build resilience to climate change impacts. In addition to this policy, public outreach and community engagement were key to informing the scope, vision, and objectives of the project. A series of public workshops and meetings helped to guide the overall development process and gain a better understanding of community values and priorities for the CAP.

Tuolumne County Climate Action Plan

Climate change mitigation and adaptation strategies are organized into five focus areas: Health and Safety, Conservation and Recreation, Buildings, Infrastructure, and Agriculture and Forestry. CAP strategies are outlined in the Plan-at-a-Glance section below.

Plan-at-a-Glance

The following tables provide a summary of the strategies and measures developed for each of the five focus areas, along with associated co-benefits. Additional details regarding the strategies and measures are provided in **Chapter 4**, and specific implementation actions in **Chapter 5**.

STRATEGY		MEASURES	GHG REDUCTION POTENTIAL	CLIMATE RESILIENCE BENEFIT
HEALTH AND SAFETY				
Active Transportation		Measure 1.1: Encourage residents and visitors to walk, bike, or use other modes of active transportation.		
		Measure 1.2: Encourage students to walk and bike to school through a Safe Routes to School Program.		
Improved Air Quality		Measure 2.1: Reduce vehicle idling.		
		Measure 2.2: Reduce vehicle congestion.		
		Measure 2.3: Reduce air pollution from off-road vehicles and equipment.		
		Measure 2.4: Improve indoor air quality by replacing wood-burning fireplaces and other wood-burning appliances with more efficient heating units, including wood-burning appliances that meet current emissions standards.		

Tuolumne County Climate Action Plan

STRATEGY		MEASURES	GHG REDUCTION POTENTIAL	CLIMATE RESILIENCE BENEFIT
Healthcare Services		Measure 3.1: Improve the accessibility and climate resiliency of the county's healthcare services and facilities.		
		Measure 4.1: Build community resilience to wildfire through disaster preparedness education, outreach, and collaboration.		
Fire-Adapted Community		Measure 4.2: Increase the use of defensible space strategies to reduce wildfire property damage for properties located in high-wildfire risk zones in the county using guidance and requirements pursuant to AB 3074 of 2020 (Fire Prevention).		
CONSERVATION AND RECREATION				
Ecosystem Preservation and Conservation		Measure 1.1: Enhance the protection of the county's natural assets and ecosystems and expand natural capital throughout the county, while building climate resilience in the environment.		
		Measure 1.2: Educate the community about the unique value of the ecosystems in the county and what they can do to protect them.		
		Measure 1.3: Conserve areas, such as wildlife habitat and corridors, wetlands, watersheds, and groundwater		

Tuolumne County Climate Action Plan

STRATEGY		MEASURES	GHG REDUCTION POTENTIAL	CLIMATE RESILIENCE BENEFIT
		recharge areas, that provide carbon sequestration benefits.		
Economic Resilience		Measure 2.1: Support residents and businesses in preparing for impacts on industries that may be affected by climate change including the tourism and recreation industries.		
		Measure 2.2: Establish new recreation and tourism options that are adaptive to climate change.		
Waste Reduction		Measure 3.1: Increase construction and demolition diversion rates.		
		Measure 3.2: Reduce landfilled waste.		
Waste Management		Measure 4.1: Promote responsible consumption of products and materials.		
BUILDINGS				
Energy-Efficient and Resilient New Buildings		Measure 1.1: Increase energy efficiency and climate resiliency in all new buildings.		
		Measure 1.2: Require all new County-owned buildings and facilities to be energy efficient and climate resilient.		

Tuolumne County Climate Action Plan

STRATEGY		MEASURES	GHG REDUCTION POTENTIAL	CLIMATE RESILIENCE BENEFIT
Energy-Efficient and Resilient Existing Buildings		Measure 2.1: Increase energy efficiency and climate resiliency in existing residential and nonresidential buildings.		
		Measure 2.2: Require all existing County-owned buildings and facilities to be energy efficient and climate resilient.		
Energy Reliability and Security		Measure 3.1: Increase energy reliability and security to buildings and assets that deliver critical services throughout the county.		
INFRASTRUCTURE				
Resilient Roadway Network		Measure 1.1: Incorporate climate projections and considerations into future County infrastructure projects as part of the capital improvement projects process and update infrastructure design standards to incorporate future climate variables including extreme heat thresholds and changes in rainfall and large storm events (e.g., 100-year and 500-year storm events).		
Resilient Transit System		Measure 2.1: Improve transit facilities to increase transit ridership.		
		Measure 2.2: Work with TCTC and TCTA to convert its transit fleet to electric		

Tuolumne County Climate Action Plan

STRATEGY		MEASURES	GHG REDUCTION POTENTIAL	CLIMATE RESILIENCE BENEFIT
		vehicles and/or alternatively fueled vehicles, <u>as they become more available in the region.</u>		
		Measure 2.3: Increase the use of on-demand and vehicle-sharing services.		
Low-Emission and Electric Vehicle Support		Measure 3.1: Support and encourage the adoption of low-emission vehicles and EVs.		
Resilient and Clean Electrical Grid		Measure 4.1: Transition to 100 percent clean electricity. <u>Incorporate the development and use of clean electricity into the electrical grid.</u>		
		Measure 4.2: Reduce electricity grid demand through load reduction strategies.		
Water Efficiency and Conservation		Measure 5.1: Reduce water consumption.		
		Measure 5.2: Increase <u>Promote</u> the capture and use of recycled water and <u>greywater.</u>		
		Measure 5.3: Increase operational efficiency and resilience of water and wastewater systems in response to climate change.		

Tuolumne County Climate Action Plan

STRATEGY		MEASURES	GHG REDUCTION POTENTIAL	CLIMATE RESILIENCE BENEFIT
Green Infrastructure		Measure 6.1: Increase the use of green infrastructure in County projects.		
		Measure 6.2: Update stormwater design requirements and the Stormwater Management Plan to expand the use of green infrastructure for stormwater management and reduce flood risk.		
Reliable Broadband Connections		Measure 7.1: Strengthen <u>Maximize</u> broadband grant opportunities to build infrastructure connections and access throughout the county, <u>via middle-mile and last-mile projects.</u>		
		Measure 7.2: Maximize opportunities for broadband infrastructure installations through construction projects.		
AGRICULTURE AND FORESTRY				
Livestock Management		Measure 1.1: Implement best practices for livestock management.		
Energy-Efficient Agriculture		Measure 2.1: Transition to electric or alternatively fueled agricultural equipment, <u>once it is practical and affordable to do so.</u>		

Tuolumne County Climate Action Plan

STRATEGY		MEASURES	GHG REDUCTION POTENTIAL	CLIMATE RESILIENCE BENEFIT
		Measure 2.2: Implement agricultural best practices that improve energy efficiency.		
Climate-Resilient Agriculture		Measure 3.1: Implement agricultural best practices that improve resilience to climate impacts <u>and increase the amount of locally produced food.</u>		
		Measure 3.2: Increase soil organic matter and carbon content.		
		Measure 4.1: Reduce open burning (e.g., agricultural burning, backyard burning). Utilize alternatives to <u>open burning on agricultural and residential areas.</u>		
Biomass Conservation				
Water Conservation and Efficiency		Measure 5.1: Reduce water consumption for irrigation and agriculture.		
		Measure 6.1: Improve long-term forest resilience.		
Forest Resilience		Measure 6.2: Increase forest resilience to wildfire and drought while protecting dense forest species.		
		Measure 6.3: Manage vegetation and reduce wildfire risk to promote sequestration.		

Tuolumne County Climate Action Plan

STRATEGY		MEASURES	GHG REDUCTION POTENTIAL	CLIMATE RESILIENCE BENEFIT
Economic Resilience		Measure 7.1: Support workers and businesses in preparing for climate change-related economic impacts on agriculture and forestry operations.		



Introduction

Spanning from the alpine terrain of the Sierra Nevada and Yosemite National Park to the rolling plains and pasturelands of the foothills or the Central Valley, Tuolumne County (hereafter referred to as “county”) has always had a unique and important connection to its surroundings. With a multitude of world-class outdoor recreation opportunities and access to vast natural resources, the community is linked to and dependent on the natural environment. As global climate change intensifies, it presents significant risks to the quality of life and prosperity in the county.

This Climate Action Plan (CAP) provides the County of Tuolumne government (hereafter referred to as “County”) with a comprehensive guiding document to address the challenges of climate change. The CAP serves to reduce greenhouse gas (GHG) emissions from local sources, strengthen resilience to prepare for and adapt to climate change impacts, and implement solutions to better manage natural resources within the county. The CAP is consistent with and complementary to statewide legislation and regulatory mandates. It establishes locally based strategies, measures, and actions that will not only reduce GHG emissions and enhance climate resilience, but will also improve the livability and quality of life for residents, workers, and visitors of the county.

Climate Action Planning Overview

As California continues to experience rising average temperatures, more severe storms, and intense drought, it has become evident that the effects of global climate change are already occurring. The impacts of climate change in California vary across the state due to its diverse biophysical setting, climate, and community characteristics. While projections do not show a consensus in the overall trend for annual precipitation in California, they do show increasing variability in precipitation, and even modest changes could have significant effects on the state's ecosystems (OPR, CEC, and CNRA 2018a). At a regional level, average annual temperature in the county is projected to continue to increase steadily over time, and precipitation patterns and events are expected to become increasingly volatile (OPR, CEC, and CNRA 2018b). These changes are anticipated to result in increased frequency and duration of heat waves, heightened wildfire risk, and more frequent and intense flooding and drought, resulting in adverse effects on human health and safety, economic prosperity, infrastructure, and provision of public services in the county.

Climate change is a global issue, but local governments play an important role in reducing GHG emissions and preparing for the impacts of climate change in their communities. To help achieve these objectives, public agencies develop CAPs, which serve as long-term strategic planning frameworks that outline specific strategies, measures, and actions an agency can take to mitigate GHG emissions and strengthen resilience to climate change impacts. CAPs also contain specific guidance for governments to effectively implement emissions reduction measures and monitor progress over time.

Climate change threatens the natural resources, economy, and community character that make the county such a unique place. Regional and local impacts, such as increased wildfires and wildfire smoke, extreme storms, and more frequent and prolonged drought have been observed already and are projected to worsen if action is not taken to reduce GHG emissions (OPR, CEC, and CNRA 2018b). The County is joining hundreds of other communities across the nation through the development and implementation of a CAP to address the challenges associated with climate change.

Community Economic Resilience Fund

The purpose of the Community Economic Resilience Fund (CERF) is to build an equitable and sustainable economy across California's diverse regions and foster long-term economic resilience in the overall transition to a carbon-neutral economy. The goal for the Eastern Sierra CERF Region is to develop a regional economic recovery plan and prioritized investment schedule that will generate sustainable high-road jobs. A high-road economy favors businesses that invest in their workforces, pay living wages, and engage in environmentally sustainable business practices. The Eastern Sierra CERF Region, of which Tuolumne County is located in, was awarded \$5 million to develop roadmaps. A first step is to identify other ongoing planning

processes or projects across the region to ensure the alignment between these processes and CERF, and to ensure a joint and coordinated response to reaching the State's goals. Examples of such efforts include: comprehensive economic development strategies, climate plans, high road training partnerships, general plans, and regional transportation plans. By having a CAP, Tuolumne County is well-prepared for the first phase of the CERF funding.

Climate Change Science

The greenhouse effect, illustrated in **Figure 1-1** below, is a natural process that insulates the Earth and helps regulate its temperature. After absorbing sunlight, the Earth emits heat in the form of infrared radiation. This radiation is then absorbed by a collection of naturally occurring atmospheric gases called GHGs. These gases, which consist mainly of water vapor, carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), all act as effective global insulators by absorbing some of the infrared radiation that is emitted by Earth and re-emitting it back down towards the planet. This process, where some heat is prevented from escaping out of the atmosphere, is what keeps temperatures on Earth conducive to life. Without the greenhouse effect, Earth would not be able to support life as we know it.

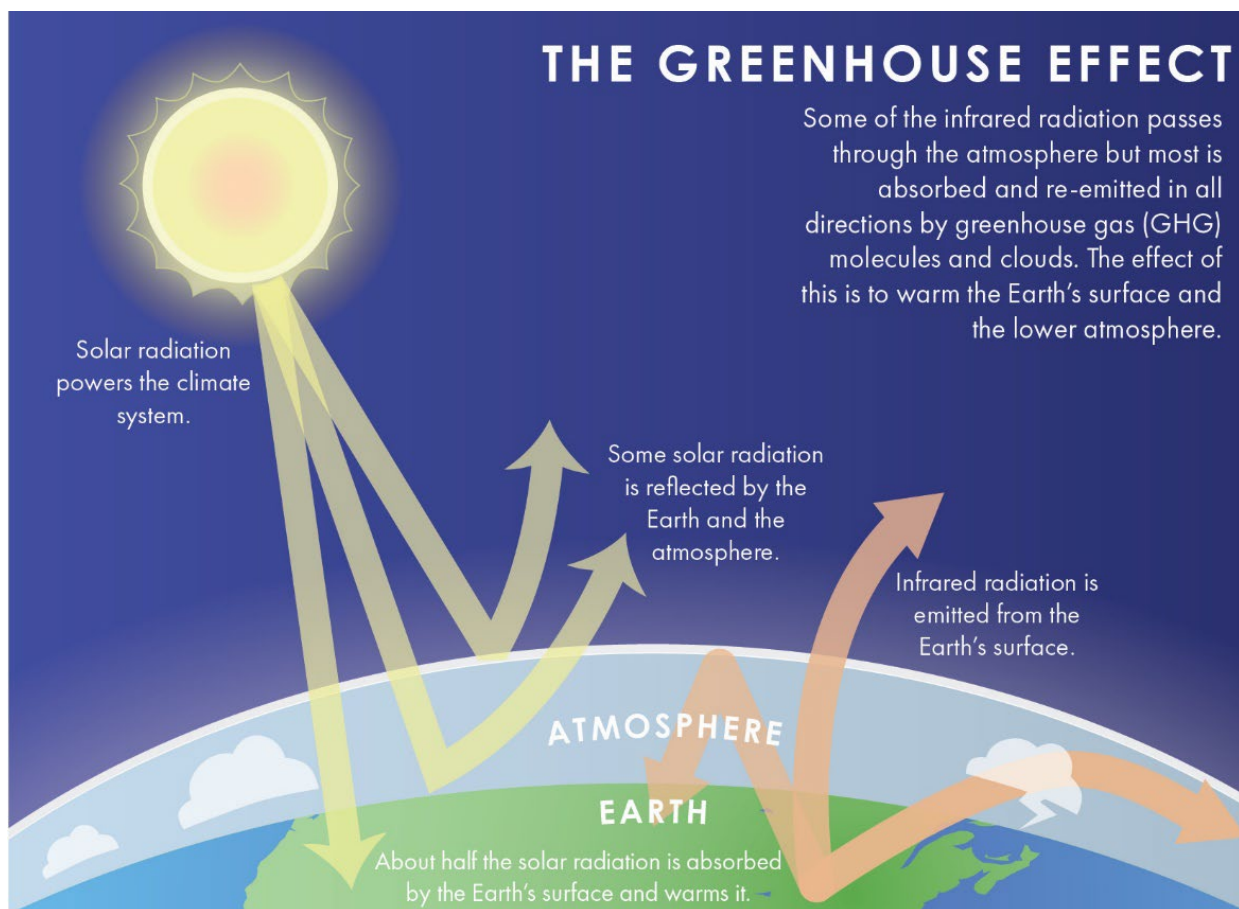


Figure 1-1 The Greenhouse Effect

Source: Ascent Environmental 2022.

The combustion of fossil fuels and other anthropogenic (i.e., human-caused) activities since the Industrial Revolution in the 19th century have introduced GHGs into the atmosphere at an increasingly accelerated rate. These significantly elevated levels of GHGs above natural ambient concentrations have intensified the greenhouse effect, causing the Earth to warm at an unprecedented rate and leading to a trend of unnatural warming of the Earth's climate. This effect, known as global climate change, is the driver behind changes in more extreme weather patterns, rapid melting of the polar ice caps, an increase in sea level, and other impacts on biological resources and humans.

There is scientific ~~consensus~~ evidence that observed increases in atmospheric GHG concentrations and the consequential warming of Earth's atmosphere, oceans, and land ~~have "unequivocally" been caused by~~ are linked to human activities and influence. Human activities are estimated to have caused approximately 2 degrees Fahrenheit (°F) of warming across the globe compared to pre-industrial era levels (i.e., prior to the year 1900), and global average temperature is expected to increase by up to approximately 8 °F by the end of the century unless additional efforts to reduce GHG emissions are made (IPCC 2021). The GHG emissions that have created this warming—those released between the pre-industrial era and the present—will persist for hundreds to thousands of years and create further long-term impacts to the climate system (IPCC 2018).

Climate Change Mitigation and Adaptation

Addressing climate change requires an integrated approach that targets both its sources and impacts.

- Efforts that focus on reducing the sources of climate change are commonly known as climate change mitigation, GHG mitigation, or climate action. The focus of climate change mitigation planning is to reduce communities' generation of GHG emissions and minimize contributions to climate change.
- Climate change adaptation or climate change resilience efforts are those that serve to prepare for and reduce harm from future effects of a changing climate. Climate change adaptation planning aims to enhance the resilience of communities to climate change impacts through analyzing the climate-related vulnerabilities specific to a jurisdiction and developing strategies to respond to and prepare for impacts.

The CAP's inclusion of adaptation and resiliency efforts are especially important when looking through the lens of GHG emissions and wildfires. Without resiliency efforts such as forest management practices to reduce fuel loads within Tuolumne County, GHG emissions reductions can be lost in one mega fire. An emissions inventory from

catastrophic wildfire has been drafted by the California Air Resources Board (CARB), which estimated that GHG emissions from wildfires in 2020, (which was the worst fire year on record (by acres burned) for California), was approximately 112 million metric tons of CO₂ (MMTCO₂), which is equivalent to the amount of carbon contained in the structural lumber of 6.3 million average California homes, or over 75 percent of the emissions from all homes in California. Further, a new analysis led by researchers with the University of California (*Env. Pollution*, Vol 310, 1 October 2022, 119888) found the 2020 wildfires in the state put twice as much GHG emissions into the Earth's atmosphere as the total reduction in such pollutants in California between 2003-2019.

Figure 1-2 illustrates the relationship between these two facets of climate change planning. State law requires communities to address climate change mitigation in local planning and environmental review processes and climate adaptation in local long-range planning processes, such as general plans (CalOES 2020).

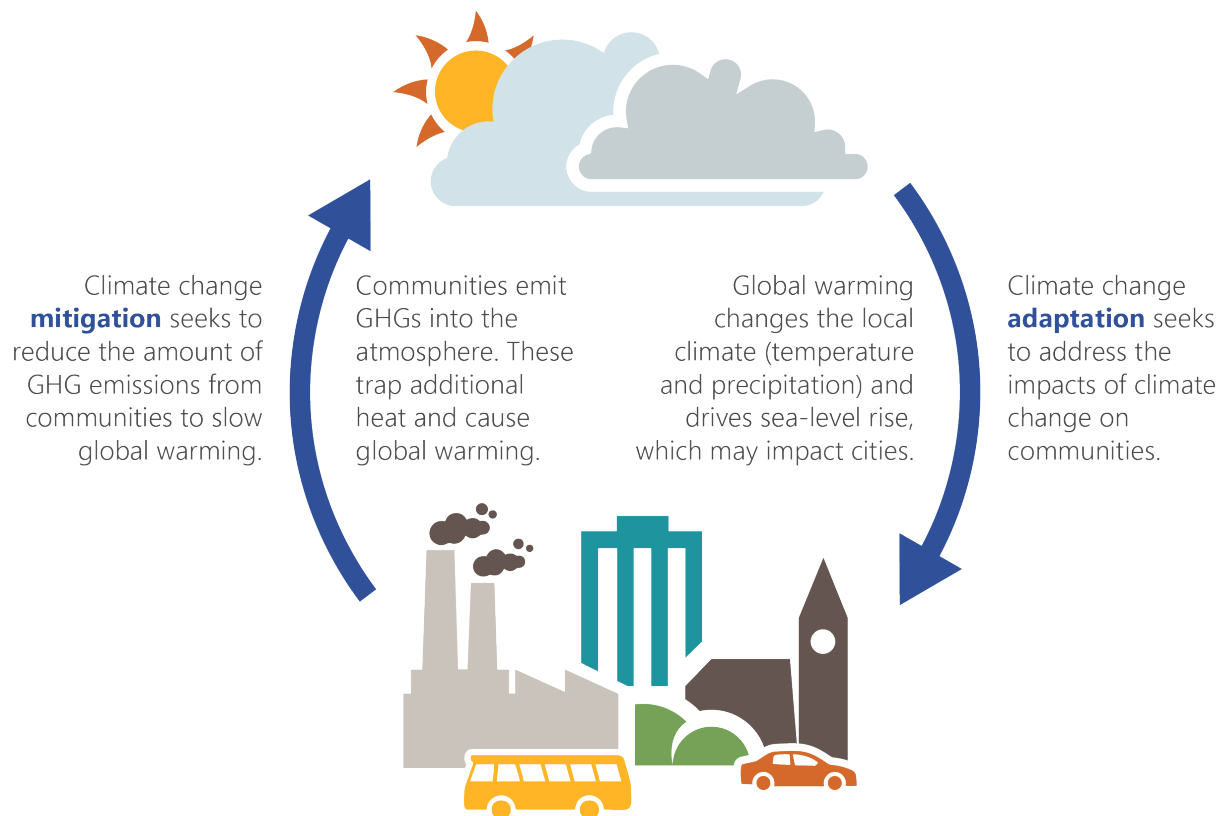


Figure 1-2 Relationship between Climate Mitigation and Adaptation

Source: CalOES 2020; adapted by Ascent Environmental in 2022.

Climate change mitigation and adaptation are both crucial components of comprehensive climate change planning. While mitigation and adaptation are often separate planning efforts, it is important to consider both components within the overall climate action planning process. Many initiatives that focus on climate

mitigation and reducing GHG emissions include co-benefits for adaptation, and vice versa. For example, renewable energy installations combined with battery storage systems will reduce reliance on fossil fuel-generated grid electricity and thus reduce GHG emissions, but will also improve energy independence and resilience in the face of climate hazards that threaten energy infrastructure. Consequently, this initiative would yield adaptation benefits as well as GHG emissions reductions. On the flip side, building energy efficiency improvements, such as increasing insulation in a home or structure, will help to combat extreme heat events and decrease risks to humans of heat-related illnesses, but will also reduce cooling demands and thus save energy, reducing GHG emissions associated with energy consumption (see **Figure 1-3** below). This dynamic has contributed to the increasingly common approach of combining climate change mitigation and adaptation in the climate action planning process. Recognizing the importance and benefits of this relationship, the County's CAP focuses on both climate change mitigation and adaptation to address climate change.

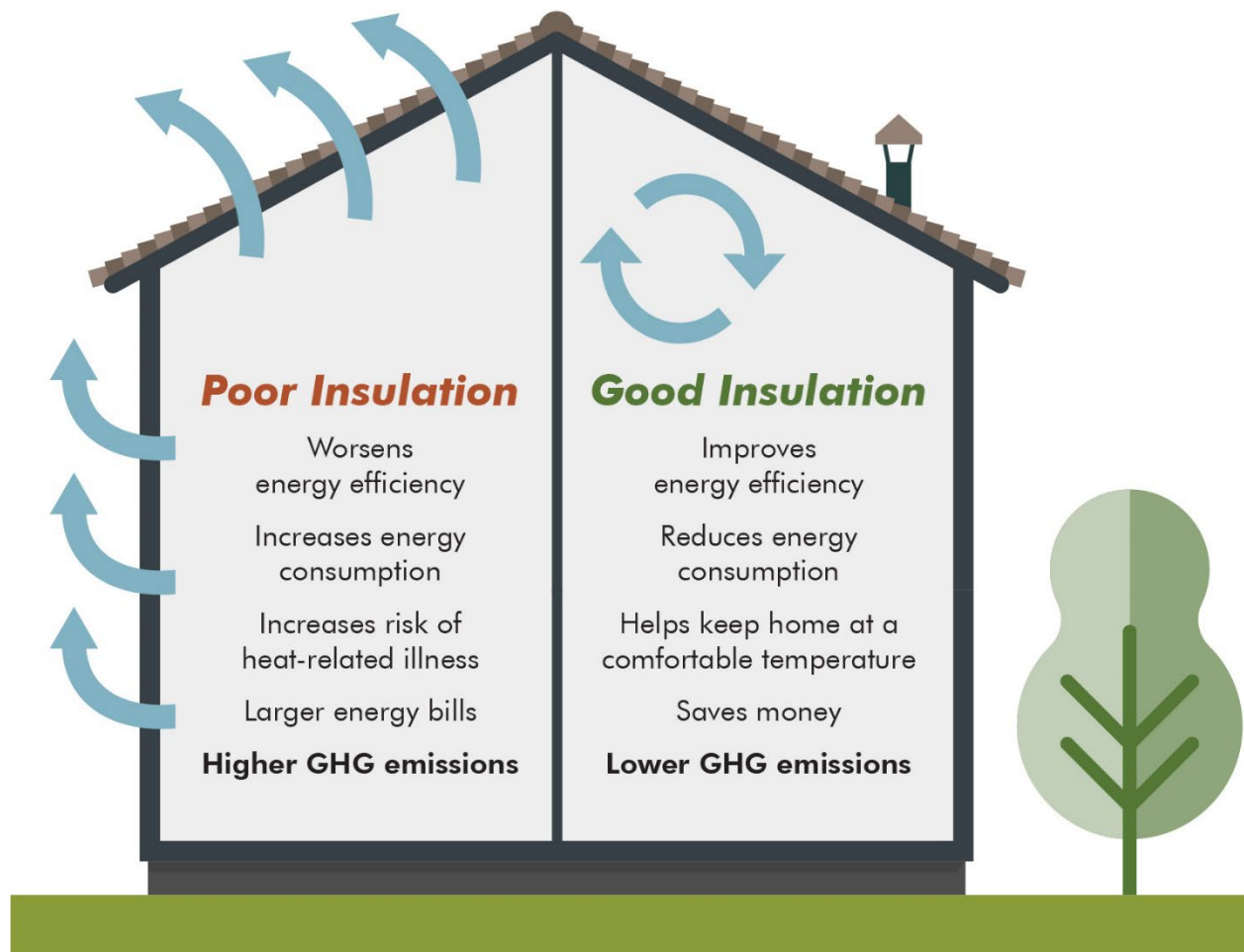


Figure 1-3 Example of Mitigation and Adaptation Initiative Co-Benefits

Source: Ascent Environmental 2022.

Regulatory Background

In response to the increase in anthropogenic GHG emissions and the threat of global climate change, federal and State governments have already taken several steps to reduce GHG emissions and build resilience to climate change impacts. These efforts, and the legislative background summarized in the following sections, provide important policy direction and context for this CAP.

CALIFORNIA CLIMATE LEGISLATION

Mitigation Legislation

Executive Order (EO) S-3-05 was signed in 2005, which directed California to reduce statewide GHG emissions to 1990 levels by 2020 and 80 percent below 1990 levels by 2050. A year later, the Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32) was passed, establishing regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions. AB 32 put a cap on GHGs and set a target of reducing statewide emissions to 1990 levels by 2020. In 2008, ~~the California Air Resources Board~~ (CARB) developed the *Climate Change Scoping Plan: A Framework for Change* (2008 Scoping Plan) as part of its role in implementing AB 32 and EO S-3-05 (CARB 2008). The 2008 Scoping Plan, along with its update in 2014, describes the approach California will take to reduce GHG emissions to achieve reduction targets and goals. In 2016, California achieved the AB 32 target of reducing GHG emissions to 1990 levels, 4 years ahead of schedule, based on its reported statewide 2016 inventory (CARB 2020).

In September 2016, Senate Bill (SB) 32 codified into statute the midterm 2030 target of 40 percent below 1990 levels by 2030. The 2030 GHG emissions reduction target places California on a trajectory toward meeting the goal of reducing statewide emissions to 80 percent below 1990 levels by 2050.

In November 2017, CARB published *California's 2017 Climate Change Scoping Plan Update* (2017 Scoping Plan) (CARB 2017), which lays out the framework for achieving the 2030 target as established in SB 32. The 2017 Scoping Plan identifies GHG reductions by emissions sector to achieve a statewide emissions level that is 40 percent below 1990 levels by 2030.

EO B-55-18, signed in September 2018, furthers California's efforts to reduce GHG emissions by setting a goal to achieve carbon neutrality no later than 2045 and to achieve net negative GHG emissions thereafter.

Adaptation Legislation

In 2009, the State released its first climate adaptation strategy, *Safeguarding California*. The passing of AB 1482 in 2015 required the California Natural Resources Agency (CNRA) to update the State's climate adaptation strategy by July 1, 2017, and every 3 years thereafter. The most recent update of the strategy, now called the *Safeguarding California Plan*, contains implementation measures and specific actions

and responsibilities for State agencies to carry out those policies. AB 1482 also required CNRA, in collaboration with the Strategic Growth Council, to oversee and coordinate these State agency adaptation actions. It also mandated that State agencies maximize specified objectives, including promoting the use of *Safeguarding California* to inform planning decisions and ensure that State investments consider climate change impacts.

SB 246, signed in 2015, directed the California Governor's Office of Planning and Research (OPR) to establish the Integrated Climate Adaptation and Resilience Program. The program has two components: the State Adaptation Clearinghouse and the Technical Advisory Council. The goal of these initiatives is to coordinate regional and local efforts with State climate adaptation strategies to improve resilience to the impacts of climate change across California. This bill also required OPR to review and update, as needed, the *California Adaptation Planning Guide*.

Also adopted in 2015, SB 379 required cities and counties within California to integrate climate change vulnerability, adaptation strategies, and emergency response strategies into the safety element of their general plans. The bill required the preparation of a vulnerability assessment, which must identify the risks that climate change poses to the local jurisdiction and the geographic areas at risk from climate change impacts, using federal, state, regional, and local climate vulnerability documentation. Adaptation policies, goals, and objectives are to be developed based on findings from the vulnerability assessment, and jurisdictions are required to create a set of feasible implementation measures to reduce climate change impacts on new or proposed land uses. Lastly, SB 379 states that jurisdictions that have adopted a CAP or climate adaptation plan separate from the general plan may reference that document to comply with SB 379 requirements.

REGIONAL CLIMATE PLANNING EFFORTS

The County is actively engaged in climate planning at the local level through the development, implementation, and periodic updating of planning documents, partnerships with other agencies and stakeholders, and outreach and educational efforts. These activities provide the foundation for sustainability activities occurring at the municipal and community levels and are complementary to the CAP. Some of the major efforts that provide context for and support this CAP are described in Appendix D.

Purpose and Objectives

Through the development of this CAP, the County aims to reduce GHG emissions from local activities and minimize contributions to climate change while building resilience to prepare for and adapt to climate change impacts. The planning processes are shown in **Figure 1-4**. For climate change mitigation, this involves:

- establishing an updated baseline inventory of GHG emissions in the county,
- projecting future GHG emissions,
- setting GHG emissions reduction targets, and
- identifying strategies, measures, and actions to reduce GHG emissions.

For climate change adaptation, this involves preparing a vulnerability assessment and adaptation strategies, which consists of:

- evaluating the county's exposure to climate change-related hazards,
- analyzing sensitivity to these hazards and identifying vulnerabilities and potential impacts,
- determining the county's existing adaptive capacity to prepare for and adapt to these impacts, and
- developing adaptation strategies to improve community resilience.



Figure 1-4 Climate Mitigation and Adaptation Planning Processes

Source: Ascent Environmental 2022.

This CAP also includes an implementation strategy, which will be key to achieving the County's goals. As part of CAP implementation, GHG reduction and adaptation efforts will be tracked and monitored over time to ensure the County is making progress toward achieving its objectives.

This CAP will serve as a living document that will require periodic updates, including reporting on the status of implementation and conducting updates to the GHG emissions inventory, vulnerability assessment, and climate change mitigation and adaptation measures. These updates will help ensure that this CAP is being effectively implemented and support the County in addressing climate change. Ultimately, the overarching goals of this CAP will remain the same: to reduce GHG emissions and build resilience to the effects of climate change.

Co-Benefits

While the CAP is primarily geared towards reducing GHG emissions and addressing climate change-related vulnerabilities within the county, it will also result in numerous environmental, economic, and social “co-benefits” to residents, workers, and visitors. Co-benefits result from the implementation of CAP actions and are additional valuable outcomes that are not the primary intent of climate change mitigation or adaptation actions. For example, implementation of an action to weatherize older buildings to improve energy efficiency will reduce GHG emissions and strengthen resilience to extreme weather conditions, but it will also provide the co-benefit of financial savings to building owners money through reduced energy costs.

Co-benefits identified in the CAP, as shown in **Figure 1-5**, include local air quality, water security, forest resilience, cost savings, social and cultural well-being¹, resilience to wildfire, carbon sequestration, economic diversity, and biodiversity conservation.

¹ The social and cultural well-being co-benefit includes improvements to natural resources and landscapes that would strengthen the community's ability to connect with the natural environment through experiences such as outdoor recreation, as well general quality of life improvements such as reduced traffic.



Figure 1-5 Co-Benefits
Source: Ascent Environmental 2022.

Development Process

The development of this CAP was driven by Policy 18.A.1 for Goal 18A of the County's *2018 Tuolumne County General Plan* (General Plan). This policy requires the preparation of a CAP that establishes GHG reduction targets consistent with State mandates and provides specific measures to reduce countywide GHG emissions. It also requires the inclusion of adaptation strategies that the County can implement to build resilience to climate change impacts. These details were used to inform the scope, vision, and objectives of the project and guided the CAP development process.

As shown in **Figure 1-6** below, the County initiated a scoping phase for the project in early 2020. For the second phase of the project, which began in October 2020, the County prepared GHG emissions inventories and forecasts, set GHG reduction targets, and conducted a climate change vulnerability assessment. After completing these tasks in June 2021, the County developed GHG emissions reduction and adaptation strategies, measures, and actions to be included in the CAP. These efforts created the foundation for developing the CAP document, which occurred between September 2021 and March 2022. Details regarding CAP implementation are provided in **Chapter 5**.

Engagement with County staff, members of the public, government officials, and other stakeholders was conducted throughout the entirety of the project. Outreach and engagement efforts are described in the following section.



Figure 1-6 Project Timeline
Source: Ascent Environmental 2022.

Community Engagement and Public Outreach

While climate change is a global challenge, community engagement and participation with climate action and adaptation efforts at the local level is a critical component of the solution. Local action on climate change cannot be achieved solely by one agency; it requires active and ongoing partnerships between residents, businesses, local government, and other organizations and stakeholders. By meaningfully engaging a cross-section of the community, the County strengthened its ability to effectively implement local climate change solutions. The following sections summarize the engagement efforts for the CAP.

COMMUNITY WORKSHOPS

The County hosted a series of online public workshops to engage residents, stakeholders, and other interested organizations and individuals and provide an opportunity to participate in the CAP planning process. The workshops, which engaged approximately 150 individuals, informed attendees about the project scope and goals and solicited input to gain a better understanding of the community's climate change concerns and priorities. The kick-off workshop, held on February 25, 2021, provided an overview of the purpose and objectives of the CAP and outlined GHG emissions- and adaptation-related background information for the county. The second workshop was held on April 8, 2021, and focused on the findings of the county's climate change vulnerability assessment. Attendees provided feedback that was used to refine the County's adaptation and resilience strategies. The final workshop, which was held on May 25, 2021, included a presentation on countywide GHG emissions levels and GHG reduction targets, as well as a discussion regarding GHG reduction measures suitable for the county. These events played a key role in determining the County's approach to climate change mitigation and adaptation through ground-truthing the technical analyses conducted for the CAP.

PUBLIC MEETINGS

County staff provided updates on an ongoing basis and shared project milestones with elected officials and committee members at public meetings, both online and in person, throughout the project. In addition to presenting to the County Board of Supervisors, County staff also met with the Board of Supervisors Planning Committee and the Board of Supervisors Natural Resources Committee to help guide the development of the CAP. Members of the public were encouraged to attend all public meetings.

PROJECT WEBSITES AND PRESS RELEASES

To provide project information and resources to the community and stakeholders, the County developed a webpage dedicated to the CAP (located at <https://www.tuolumnecounty.ca.gov/1332/Climate-Action-Plan>). The site includes an overview of the project, news and updates, and supporting documents and information. This webpage was kept up-to-date and supported public participation throughout the project. Public engagement was also facilitated by a series of press releases, which were used to disseminate information regarding CAP progress and engagement events, such as the public workshops.

County staff also developed an interactive website using the virtual platform Konveio to ensure that community values and input were integrated into the CAP. This site was used to host information on the CAP and gather specific feedback on proposed GHG reduction and adaptation strategies and measures. The Konveio site also included a CAP Survey inquiring about the public's priorities related to the CAP.

How to Read This Plan

ORGANIZATION

This CAP is divided into five main chapters. This chapter, **Chapter 1**, introduces the county, outlines the objectives and organization of the CAP, and describes existing legislation and efforts aimed at addressing climate change.

Chapter 2 summarizes the county's baseline GHG emissions, presents a forecast of future emissions, and identifies the County's emissions reduction targets. An overview of the climate adaptation planning process and a summary of the county's climate change vulnerability assessment are included in **Chapter 3**. The core of the CAP – the GHG reduction and adaptation strategies and measures – are included in **Chapter 4**, organized into five focus areas: Health and Safety, Conservation and Recreation, Buildings, Infrastructure, and Agriculture and Forestry. Each focus area contains strategies and measures that the County will implement to reduce GHG emissions and strengthen community resilience to climate change impacts. **Chapter 5** provides a framework for implementing, monitoring, and updating the CAP in the future.



STRUCTURE OF FOCUS AREAS

Each focus area in **Chapter 4** presents strategies that serve as the foundation to help the County achieve its climate change goals. Within each strategy are one or more measures that represent specific expressions of the broad strategies. Climate change mitigation and adaptation objectives are intertwined throughout the strategies and measures. **Chapter 5** includes actions associated with each measure that define the activities, projects, programs, or policies that the County will implement or support to advance its GHG reduction and adaptation goals. These actions have been identified as priorities and are intended to be implemented within the first 3 to 5 years after CAP adoption.

GHG REDUCTION POTENTIAL AND CLIMATE RESILIENCE BENEFIT

Each CAP action was evaluated qualitatively for its GHG reduction potential and climate resilience benefit. Actions were assigned a score of 1, 2, or 3 for each metric, which correspond to a low, medium, or high GHG reduction potential and low, medium, or high climate resilience benefit. Some actions suggested during final hearings were not scored but are included in the workplan. The icons shown below are used throughout the CAP to indicate the score for GHG reduction potential and climate resilience benefit. Additional information regarding the scoring can be found in **Chapter 5**.

Greenhouse Gas Emissions Inventory, Forecasts, and Targets

Living Wall

This chapter summarizes the accounting of greenhouse gas (GHG) emissions generated by activities within the county. It describes the county's baseline GHG emissions levels in 2019 and presents the anticipated increase in emissions if no local actions are taken through the year 2050. Finally, this chapter establishes targets for reducing emissions consistent with statewide GHG reduction targets and goals for the years 2030, 2040, and 2050.

Why Prepare a Greenhouse Gas Emissions Inventory?

The first step in the climate action planning process is to prepare a GHG emissions inventory. A GHG inventory estimates emissions generated within a defined geographic boundary during a single year. It identifies the sources, activities, and sectors that are producing these emissions and the relative contribution of each, while also providing a baseline for future forecasts. This information is used to set reduction targets that are consistent with State objectives and then to create solutions for reducing GHG emissions locally through the creation of a climate action plan (CAP). To develop and implement a CAP that will effectively reduce GHG emissions, local governments must first have a comprehensive understanding of the emissions that are generated by activities within their jurisdictions that the local agency has the ability to impact by passing and/or enforcing new policies or regulations. GHG emissions inventories not only serve to provide this knowledge, but they also act as the basis for measuring progress. CAPs provide a framework for agencies to track emissions over time and assess the effectiveness of CAP implementation. GHG emissions inventorying is a critical step in the overall climate action planning process.

Baseline Inventory

In 2012, the Tuolumne County Transportation Council developed the *Tuolumne County Regional Blueprint Greenhouse Gas Study* (GHG Study) to help identify a preferred growth alternative that would meet the County's 2020 GHG emissions reduction, consistent with Assembly Bill 32

(described further in Appendix D). The GHG Study includes a countywide emissions inventory using 2010 as the baseline year (TCTC 2012).

Since the 2010 GHG inventory was prepared, new protocols have been developed for calculating communitywide GHG emissions in various sectors (see Appendix A for additional details). These changes reflect refinements in the planning process that have resulted from research in the field and shared knowledge from local governments engaged in climate action planning. ICLEI – Local Governments for Sustainability (ICLEI) develops protocols for local-scale accounting of emissions that have become the industry standard for local governments developing GHG emissions inventories. The most recent guidance for community-scale emissions inventories is ICLEI’s July 2019 publication *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (Community Protocol), Version 1.2 (ICLEI 2019). State agencies, including California Air Resources Board (CARB) and Governor’s Office of Planning and Research, recommend that jurisdictions prepare GHG emissions inventories consistent with the guidelines included in the Community Protocol.



Firefighter at the Antelope Fire

Policy 18.A.1 of the General Plan specifies an update to the County’s baseline GHG emissions inventory to be included in this CAP. Consistent with the policy, this CAP presents a 2019 GHG emissions inventory, which will serve as the County’s updated baseline for forecasting GHG emissions, setting emissions reduction targets, developing GHG reduction measures, and monitoring implementation success in the future.

The 2019 GHG emissions inventory provides a detailed accounting of the sources and quantities of GHG emissions generated from activities within the county. Importantly, this only includes activities occurring on unincorporated county lands; the inventory does not account for GHG emissions generated from activities occurring outside of the County’s jurisdiction, as the County does not have operational control of or authority over these emissions sources. Therefore, GHG emissions generated from activities within incorporated places (i.e., City of Sonora) or lands owned and/or managed by State and federal agencies (e.g., Federal Responsibility Areas) are excluded from the inventory.

Three primary GHGs are quantified: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Emissions of these gases are converted to a comparable unit by multiplying each non- CO_2 gas by their global warming potential (GWP), enabling the reporting of emissions in terms of carbon dioxide equivalent (CO_2e). This conversion allows consideration of all gases in comparable terms and makes it easier to communicate how various sources and types of GHG emissions contribute to climate change. Emissions are reported in metric tons of CO_2e (MTCO_2e), the standard measurement for the amounts of GHG emissions produced and released into the atmosphere. GWP values for CH_4 and N_2O included in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report were used for calculating emissions estimates (IPCC

2013). In August 2021, IPCC released its Sixth Assessment Report, which includes updated GWP values. Because these values were not available at the time the GHG inventory and forecasts were prepared, the GWP values from the Fifth Assessment Report were used.

The 2019 inventory estimates countywide emissions in eight sectors: residential building energy, nonresidential building energy, on-road transportation, off-road vehicles and equipment, solid waste, water supply, wastewater treatment, and agriculture and forestry. Consistent with the Community Protocol and CARB guidance, GHG emissions from wildfire are not accounted for in the 2019 GHG emissions inventory. The Community Protocol currently does not include methodologies for wildfire-related GHG emissions and the State does not include wildfire emissions in the statewide inventory at this time.

Wildfire Emissions: Climate Drivers and Emissions Inventory

The State is taking action to protect public health, promote resiliency, and support economies to address the risks, impacts, and inequities caused by wildfire. Effects such as increasing temperature, shifting wind patterns, changes in precipitation, and shifting insect habitat are drivers of climate change that influence the risk of wildfire in Tuolumne County (OPR 2022). When evaluating the year-over-year inventory data, there are trends of carbon losses in our natural and working lands, with most losses attributed to wildfires. The year 2020 was the worst fire year on record (by acres burned) in California. CARB estimated 112 million MTCO₂e was emitted, which is equivalent to the amount of carbon contained in the structural lumber of 6.3 million average California homes, or over 75 percent of all homes in California (CARB 2022).

The Community Protocol currently does not include methodologies for wildfire-related GHG emissions, and the State does not currently include wildfire-related GHG emission in the statewide inventory. Quantifying emissions from fires and forest management is an evolving area of science and it is possible that future State inventories will include these sources of emissions. For the first time, CARB and the California Department of Forestry and Fire Protection developed a draft report (released in December 2020) that presents statewide estimates of GHG emissions associated with wildfires and prescribed burning activities for 2000–2019 but these estimates are not yet available for the local level. Estimating how much wildfire emissions alter GHG contributions to climate change is challenging because wildfire emissions are part of the terrestrial carbon cycle.

The terrestrial carbon cycle transfers carbon between the land, ocean, and atmosphere. The cycle is balanced over decades or centuries by fire, plant respiration and decomposition, plant growth, and other factors. If the cycle is balanced, biogenic CO₂ emissions from fires and other sources are offset by biogenic CO₂ sequestration, resulting in relatively minimal changes in the total concentration of atmospheric CO₂. However, with the combustion of fossil fuels at the rates recently experienced, this cycle has been in a state of imbalance. Fossil fuels also contribute to a negative feedback loop for California's forests and lands – as CO₂ emissions accumulate in the atmosphere and results in increased warming, extreme heat events, droughts, invasive species, the risk and intensity of fires also increases. This in turn pushes the terrestrial carbon cycle further out of balance (CARB 2022). Because of this effect, CARB is working to understand and track both the total GHG emissions from anthropogenic sources, such as the combustion of

fossil fuels, and the total carbon flux (i.e., the net change in carbon held in landscapes) from terrestrial carbon.

Therefore, because of a lack of available methods to quantify locally and predict future wildfire occurrences in an accurate manner, these emissions are not included in the County's inventory. However, a discussion of the anticipated increase in wildfires is included in **Chapter 3** and strategies and measures to address wildfire risk are included in **Chapter 4**. **Table 2-1** describes each GHG emissions sector. The County, in part through this CAP, is addressing the impacts and inequities that result from wildfire. Further, Tuolumne County encourages the State Legislature to take additional actions to account for emissions from wildfire in future GHG inventories.

Table 2-1 Tuolumne County Greenhouse Gas Emissions Sectors

Emissions Sectors	Description
Residential Building Energy	Residential building energy emissions are associated with the consumption of electricity, propane, fuel wood, and heating oil in homes within the county.
Nonresidential Building Energy	Nonresidential building energy emissions are associated with the consumption of electricity, propane, and diesel in nonresidential buildings within the county.
On-Road Transportation	On-road transportation emissions are associated with gasoline and diesel fuel consumption from motor vehicles on local and regional roadways.
Off-Road Vehicles and Equipment	Off-road emissions are associated with gasoline and diesel fuel use from construction and mining, entertainment, industrial, lawn and garden, commercial, and recreational equipment, as well as pleasure craft, railyard operations, transportation refrigeration units, and boating enforcement units.
Solid Waste	Solid waste emissions are associated with the decomposition of community-generated mixed and organic waste in landfills generated.
Water Supply	Water emissions are associated with the electricity used to supply, convey, treat, and distribute water in the county.
Wastewater Treatment	Wastewater treatment emissions are associated with the combustion of digester gas and include process and fugitive emissions from septic tanks and centralized wastewater treatment plants.
Agriculture and Forestry	Agriculture and forestry emissions are associated with enteric fermentation and manure management from livestock, fertilizer and pesticide application, open burning, and agricultural equipment.

Source: Ascent Environmental 2021.

The updated baseline GHG emissions inventory estimated that countywide emissions were approximately 664,604 MTCO₂e in 2019. Emissions from on-road transportation accounted for the majority of countywide emissions in 2019. This sector, which includes emissions from fossil fuel (i.e., gasoline and diesel) consumption in vehicles, generated approximately 62 percent of the emissions in 2019. Residential building energy and agriculture and forestry were the next largest emissions-generating sectors, each contributing approximately 14 percent of countywide GHG emissions. The nonresidential building energy sector was the fourth largest contributor and generated approximately 5 percent of countywide GHG emissions in 2019. Emissions associated with the off-road vehicles and equipment, solid waste, water, and wastewater sectors each accounted for no greater than 3 percent of countywide GHG emissions. The county's GHG emissions in 2019 by sector are displayed in **Figure 2-1** and summarized in **Table 2-2** below.

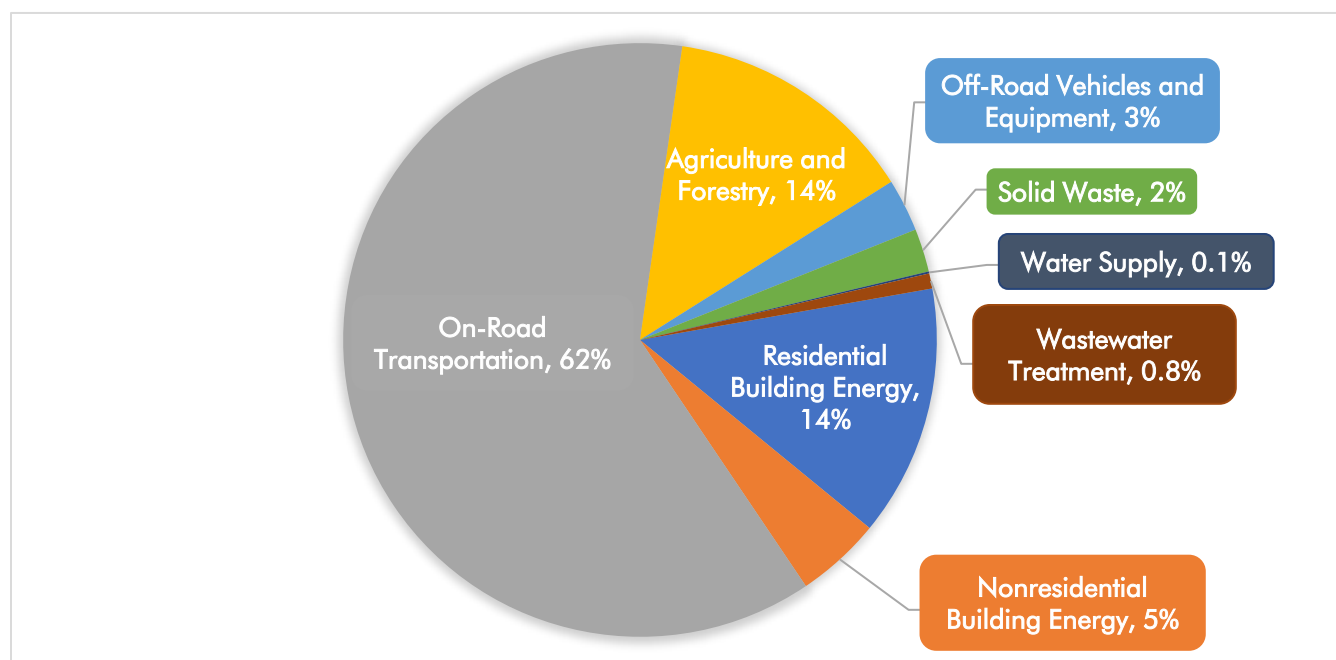


Figure 2-1 Tuolumne County 2019 Greenhouse Gas Emissions Inventory by Sector
Source: Ascent Environmental 2021

Table 2-2 Tuolumne County 2019 Greenhouse Gas Emissions Inventory by Sector

Sectors	MTCO ₂ e	Percent of Total
On-Road Transportation	410,195	62%
Residential Building Energy	91,063	14%
Agriculture and Forestry	91,591	14%
Nonresidential Building Energy	30,814	5%
Off-Road Vehicles and Equipment	19,111	3%
Solid Waste	15,650	2%
Wastewater Treatment	5,451	1%
Water Supply	730	<1%
Total	664,604	100%

Note: Columns may not sum exactly due to independent rounding.

MTCO₂e = metric tons of carbon dioxide equivalent.

Source: Ascent Environmental 2021.

As shown in **Figure 2-2**, countywide emissions in 2019 of approximately 664,604 MTCO₂e are equivalent to combusting 75 million gallons of gasoline, or the total combustion from 145,000 passenger vehicles driving continuously for one year (EPA 2021).

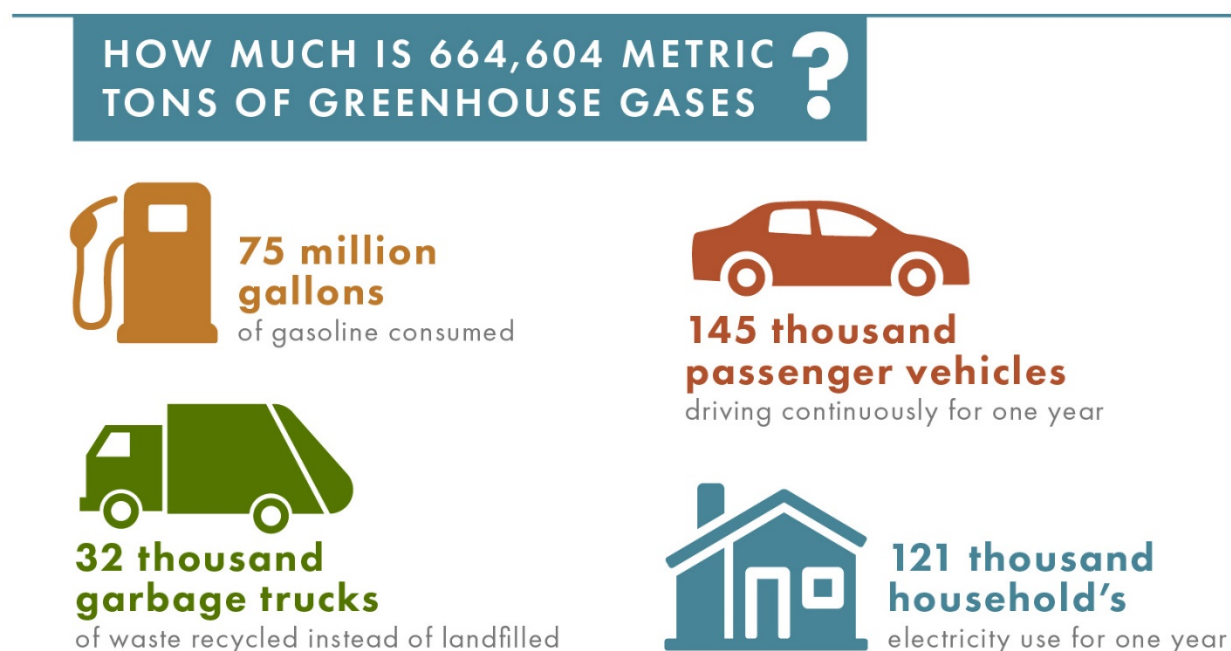


Figure 2-2 Tuolumne County 2019 Greenhouse Gas Emissions Equivalencies

Source: EPA 2021; adapted by Ascent Environmental in 2021.

Emissions Forecasts

GHG emissions forecasts provide a modeled estimate of future levels based on a continuation of current trends in activity, population, and job growth, while also accounting for known regulatory actions by State and federal agencies (i.e., “legislative” actions) that are expected to reduce emissions in the future. Emissions forecasts provide insights into the scale of local reductions needed to achieve GHG emissions reduction targets after applying anticipated reductions from regulatory actions.

This CAP includes two forecast scenarios: a “business-as-usual” (BAU) scenario, and a legislative-adjusted BAU scenario. The BAU scenario is based on a variety of scaling factors for each sector (or activities that occur within the sector[s]) in the county and assumes no additional State or federal actions will occur after 2019 (the inventory year). In the legislative-adjusted BAU scenario, the BAU forecast is “adjusted” to account for the effects of State and federal laws and regulatory requirements on the county’s forecasted emissions. The forecasts estimate emissions for the years 2030, 2040, and 2050, which are generally based on the State’s GHG reduction target years established in key State legislation and policies, including Senate Bill (SB) 32 and Executive Order (EO) S-3-05, as well as the County’s General Plan horizon year.

Details on how the forecasts were developed, and the activity data used to forecast emissions in each sector can be found in Appendix A.

COUNTY SCALING FACTORS

GHG emissions forecasts were estimated for 2030, 2040, and 2050 using county-specific demographic (i.e., population and employment) and vehicle activity growth projections. The county’s population is expected to increase annually by 0.78 percent, while employment is expected to increase annually by 0.75 percent. These scaling factors were used to forecast GHG emissions for most sectors in the inventory. An annual vehicle miles traveled growth projection of 0.54 percent per year was used to scale emissions from the on-road transportation sector, and emissions from agricultural activities in the county were scaled based on anticipated changes in future agricultural land. County scaling factors used for the forecasts can be found in Appendix A.

BUSINESS-AS-USUAL FORECASTS

The BAU forecast estimates GHG emissions assuming the continuation of current behaviors and activities within the county, with the exception of emissions from wildfire, and that no additional efforts or legislative actions beyond what have already been implemented will be made to reduce GHG emissions in the future. Based on 2019 GHG emissions levels, the BAU forecast estimates annual GHG emissions in the county to increase steadily and rise by approximately 16 percent in 2050. This projected increase in BAU emissions is due to anticipated growth in demographics and vehicle activity within the county. Countywide BAU emissions are shown in **Figure 2-3**.

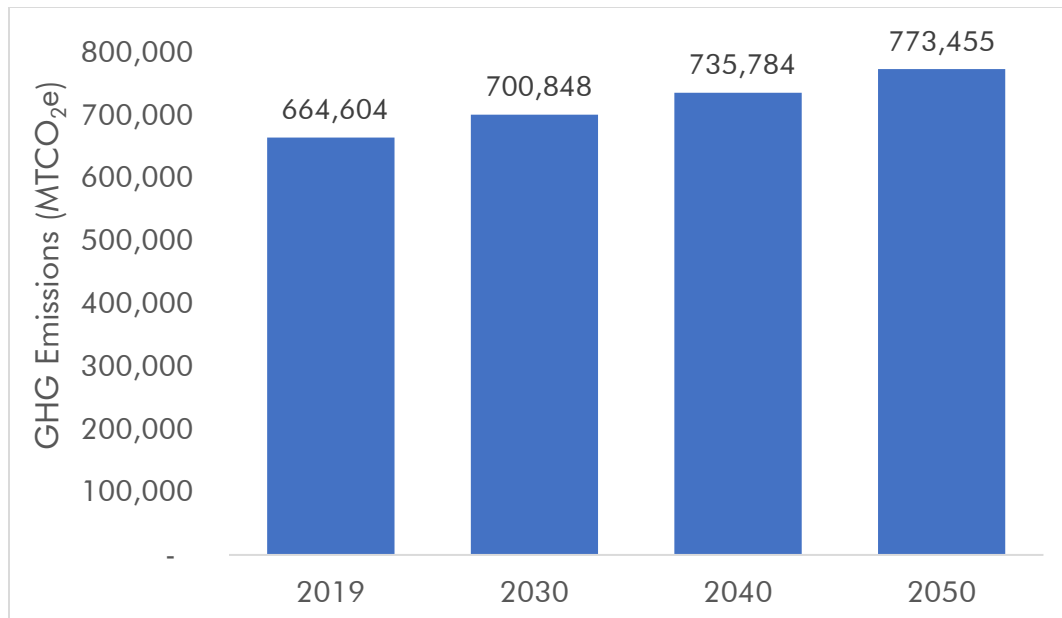


Figure 2-3 Tuolumne County Business-as-Usual Greenhouse Gas Emissions Forecasts

Source: Ascent Environmental 2021.

LEGISLATIVE-ADJUSTED BUSINESS-AS-USUAL FORECASTS

Legislative-adjusted BAU emissions forecasts evaluate how countywide GHG emissions would change over time accounting for legislative actions at the State and federal levels, such as regulatory requirements to increase vehicle fuel efficiency. This forecast provides the County with the information needed to focus efforts on certain emissions sectors and sources that have the most GHG reduction opportunities. The legislative actions applied to estimate emissions under this scenario include:

- California Renewables Portfolio Standard (SB 100)
- California Building Energy Efficiency Standards (Title 24, Part 6)
- California Advanced Clean Car Standards
- California Truck and Bus Regulation
- Federal Fuel Efficiency Standards
- EPA Fuel Efficiency Standards for Off-Road Compression-Ignition Engine Standards

A detailed description of the specific legislative reductions applied in the legislative-adjusted BAU forecasts can be found in Appendix A.

With the application of these legislative actions, forecasted emissions are expected to decrease through 2040 and then stay relatively steady, with a slight increase above 2040 levels in 2050. Compared to 2019 levels, legislative-adjusted BAU emissions are anticipated to decrease by approximately 14 percent in 2030 and 19 percent in 2050. Legislative-adjusted BAU emissions are presented in **Figure 2-4** and **Table 2-3** below. **Figure 2-4** also shows the projected BAU emissions trend.

Tuolumne County Climate Action Plan

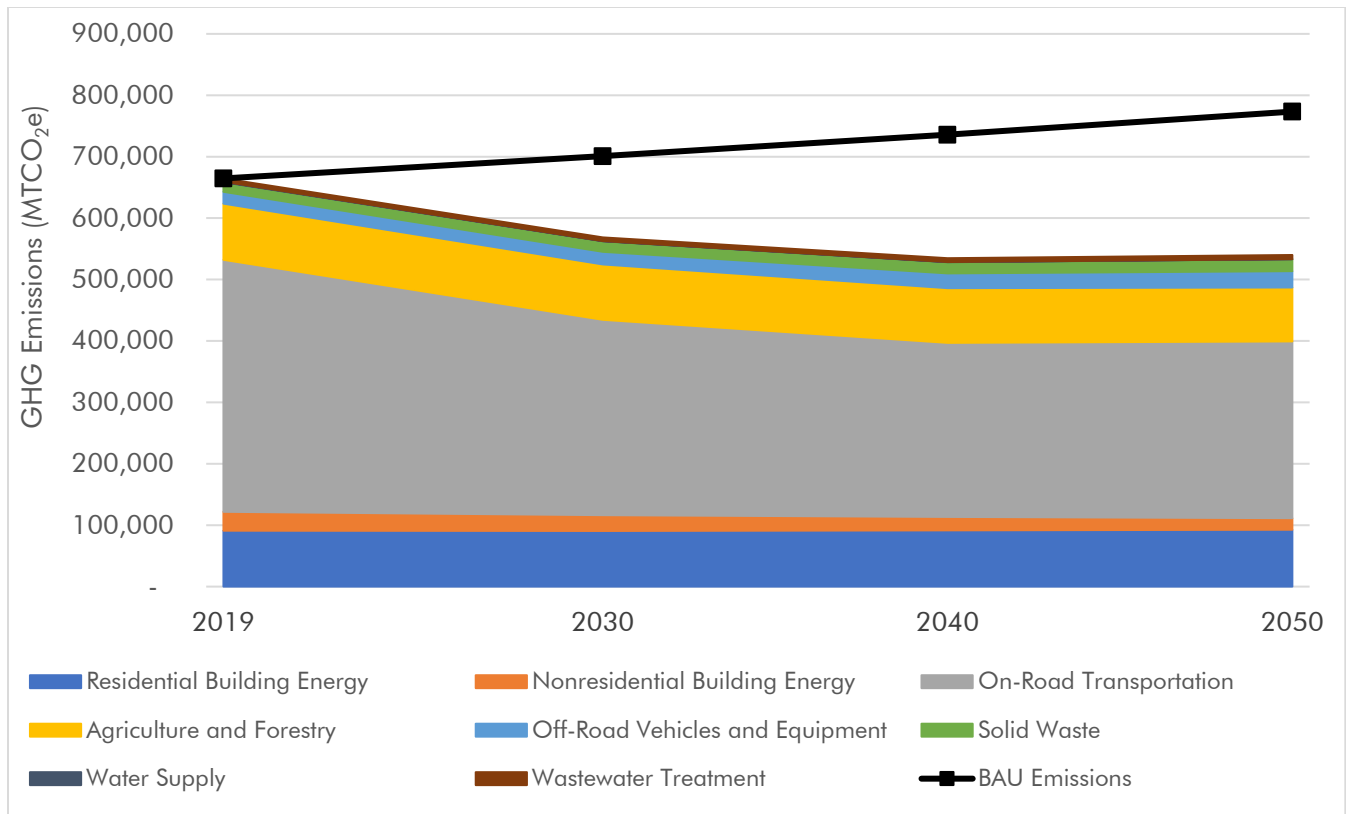


Figure 2-4 Tuolumne County Legislative-Adjusted Business-as-Usual Forecast Greenhouse Gas Emissions

Source: Ascent Environmental 2021.

Table 2-3 Tuolumne County Legislative-Adjusted Business-as-Usual Forecast Greenhouse Gas Emissions (MTCO₂e)

Emissions Sector	2019	2030	2040	2050
Residential Building Energy	91,063	90,573	91,583	92,544
Nonresidential Building Energy	30,814	25,692	21,845	18,877
On-Road Transportation	410,195	318,050	283,466	287,766
Off-Road Vehicles and Equipment	19,111	20,715	24,058	26,622
Solid Waste	15,650	17,001	18,231	19,460
Water Supply	730	453	243	0
Wastewater Treatment	5,451	5,922	6,350	6,827
Agriculture and Forestry	91,591	90,204	89,043	87,879
Total	664,604	568,611	534,818	539,975
Percent change from 2019	—	-14%	-20%	-19%

Notes: Columns may not sum exactly due to independent rounding.

MTCO₂e = metric tons of carbon dioxide equivalent.

Source: Ascent Environmental 2021.

Reduction Targets

The emissions reduction targets in this CAP have been established to be consistent with statewide GHG emissions targets. As directed in SB 32 and EO S-3-05, the State aims to reduce annual statewide GHG emissions to:

- 40 percent below 1990 levels by 2030, and
- 80 percent below 1990 levels by 2050.

The State's 2030 and 2050 targets are in line with the scientifically established levels needed to limit the rise in global temperature to no more than 2 degrees Celsius (°C), the warming threshold at which major climate disruptions, such as super droughts and rising sea levels, are projected. These targets also pursue efforts to limit the global temperature increase even further to no more than 1.5 °C (United Nations 2015:3).



In addition to these targets, California set a new statewide GHG reduction/carbon neutrality goal for in 2018 through EO B-55-18. The order directs the State to achieve carbon neutrality no later than 2045, and to achieve net negative emissions thereafter. This order was codified by AB 1279, passed in September 2022.

The County aims to reduce GHG emissions in proportion with the State's targets. Countywide 1990 emissions levels are not available, which is the case for most local jurisdictions in California. Therefore, the County's reduction targets were developed relative to countywide emissions in 2019 and established in proportion with statewide reductions for all emissions sectors relevant to the County's jurisdiction, consistent with CARB guidance. Estimating equivalent reductions needed from the 2019 baseline, the County aims to reduce emissions to:

- 38 percent below 2019 levels by 2030,
- 59 percent below 2019 levels by 2040, and
- 79 percent below 2019 levels by 2050.

The County's 2030 target requires identifies the GHG reduction goal for the County to work towards by 2030, which is to reduce GHG emissions to be reduced to 413,443 MTCO₂e in 2030. The 2040 target, which the County has set based upon the trajectory necessary to meet be consistent with the State's 2050 goal, requires countywide emissions to be reduced to identifies that a reduction target of 274,542 MTCO₂e in by 2040 would be consistent with the State's target. In 2050, a GHG emissions reduction target of will need to be reduced to 137,271 MTCO₂e would be consistent with the State. **Table 2-4** presents the County's emissions reductions targets, and details regarding the methodology used to develop these reduction targets are provided in Appendix A.

Local Emissions Gap

The local emissions gap is the difference between the State and local emissions reduction targets. While legislative actions will account for close to 50 percent of the reductions needed to achieve local emissions target, the County can take local steps to implement additional actions to close the remaining “local emissions gap.” State and federal regulations alone will not be sufficient to achieve the County’s GHG emissions reduction targets, therefore, this CAP proposes a workplan to further the County’s GHG emissions reduction goals. While legislative actions will account for close to 50 percent of the reductions needed to achieve the emissions targets, the County would need to implement additional actions to close the remaining “local emissions gap” and meet its reduction targets. Table 2-4 and Figure 2-5 display the County’s forecasted emissions, targets, and the local emissions gap. A detailed description of the calculations and estimates is provided in Appendix A.

Table 2-4 Tuolumne County Greenhouse Gas Local Emissions Gap (MTCO₂e)

Emissions Sector	2019	2030	2040	2050
Business-as-Usual Emissions	664,604	700,848	735,784	773,455
Legislative-Adjusted Business-as-Usual Emissions	664,604	568,611	534,818	539,975
Target Percent Reduction below 2019	—	38	59	79
Emissions Reduction Targets	—	413,443	274,542	137,271
Local Emissions Gap	—	155,168	260,276	402,704

Notes: MTCO₂e = metric tons of carbon dioxide equivalent.

Source: Ascent Environmental 2021.

This CAP is primarily focused on achieving the 2030 target and making substantial progress in achieving the longer-term post-2030 targets. At the local level, by adopting the proposed CAP workplan of implementing identified high-impact actions, the County will be working towards achieving Achievement of the 2030 target and the longer-term 2040 and 2050 targets. Local actions will be supplemented by will require the implementation of locally enacted GHG reduction measures, along with updates to CARB’s Scoping Plan and future State and federal actions.

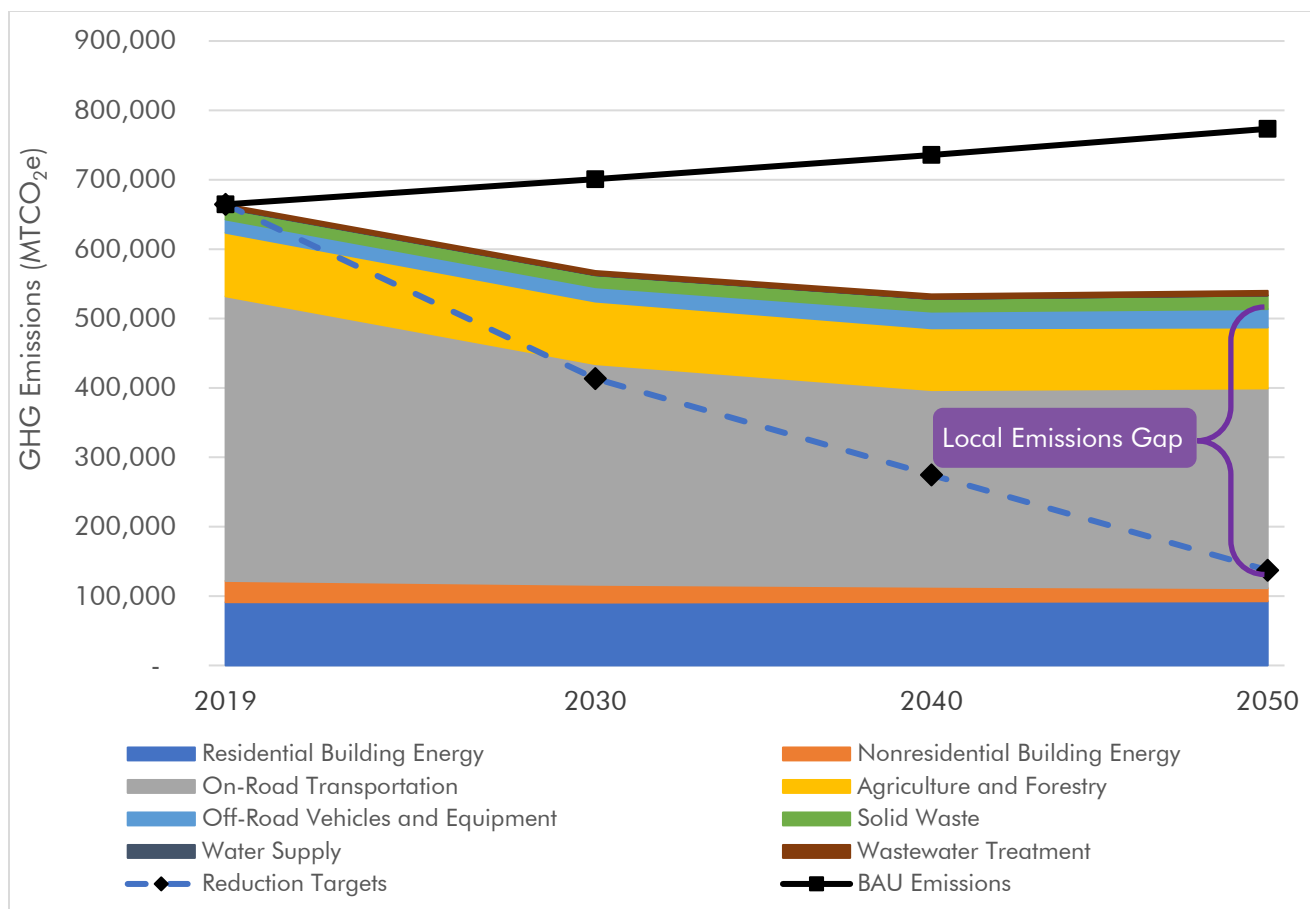


Figure 2-5 Tuolumne County Local Emissions Gap

Source: Ascent Environmental 2021.



Climate Change Adaptation and Resilience

Creature from the Black Lagoon in Tuolumne Meadows

This chapter describes the context of climate change adaptation and resilience for the county. It outlines the climate change adaptation planning process; summarizes the county's exposure to existing hazards, sensitivity to these hazards and potential climate-related impacts, and existing adaptive capacity to address these impacts; and introduces the next steps to strengthen local climate change resilience. This chapter serves as a summary of the County's Adaptation and Resilience Report, which was developed in preparation of the climate action plan (CAP). Additional information, data, and methodologies can be found in the report included in Appendix B.

Climate Change Adaptation and Resilience Overview

The effects of climate change are already occurring at global and regional scales and will continue to worsen existing hazards in the county. The primary effects of climate change include increased temperatures and changes in precipitation patterns. Alterations to these climate variables are expected to heighten and exacerbate risks posed by secondary climate effects, including extreme heat events, wildfire, drought, flooding, large storms, and reduced snowpack. While many of these hazards have existed historically in the county, the frequency and intensity of many of these hazards are projected to increase as a result of global climate change. The level of impact from these climate-related hazards will vary across the county due to variations in physical, social, and economic characteristics.

While it remains imperative that global greenhouse gas (GHG) emissions be reduced to combat climate change, it is equally important for communities to prepare for the impacts of climate change and improve resilience through adaptation planning. Regional and local efforts are critical in building climate resilience—the capacity of a community to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience related to climate change—and can lead to a greater understanding of climate risks and strategies to reduce their impacts.

There are many plans, policies, and programs in place already at the local and regional levels that address existing hazards. In some cases, these may be sufficient to address the potential for climate change to worsen existing hazards. In other cases, significant gaps exist, and new policies are needed. This CAP aims to identify and address those gaps.

Adaptation Planning Process

The goal of the adaptation planning process is to improve community resilience in the face of a changing climate. A resilient community is one that is prepared for current and future hazardous conditions and experiences less harm when a disaster happens. Resilient communities can recover from hazards more quickly and rebuild in a manner that accounts for continued capacity for adapting to climate change. Under SB 379, the State requires local governments to proactively plan for adapting to climate change (described further in **Chapter 1**).

To assist local governments with SB 379 compliance, the California Office of Emergency Services (CalOES) and CNRA prepared the Adaptation Planning Guide (APG), which provides communities with vulnerability assessment and adaptation planning guidance. Most recently updated in June 2020, the APG includes a step-by-step process that communities may use to help plan for the impacts of climate change. The APG provides a framework for communities to identify potential climate change effects and important physical, social, and natural assets; create adaptation strategies to address climate change impacts; and develop a monitoring and implementation framework for climate change adaptation. The APG served as the formal guidance document for preparing the adaptation components of this CAP (CalOES 2020).

The guide includes a four-phase process, illustrated in **Figure 3-1**, which allows communities to assess their specific climate vulnerabilities, and it provides a menu of strategies for communities to reduce climate-related risks and prepare for current and future impacts of climate change.

- **Phase 1, “Explore, Define, and Initiate,”** includes scoping and defining the adaptation planning effort, which involves identifying key stakeholders, potential climate change effects, and important populations and assets in the community.
- **Phase 2, “Assess Vulnerability,”** includes an analysis of the impacts and adaptive capacity associated with potential climate change hazards to determine the vulnerability of populations and community assets. The vulnerability assessment is composed of four steps: exposure, sensitivity and potential impacts, adaptive capacity, and vulnerability scoring.
- **Phase 3, “Define Adaptation Framework and Strategies,”** focuses on developing adaptation strategies to address the risks posed by climate-related hazards based on the results of the vulnerability assessment.
- In **Phase 4, “Implement, Monitor, Evaluate, and Adjust,”** the adaptation framework is implemented, consistently monitored and evaluated, and adjusted based on continual learning, feedback, or triggers.

The following sections provide an overview and summary of the county’s climate change vulnerability assessment, which was used to develop adaptation and resilience strategies for the CAP, as discussed in **Chapter 4**.

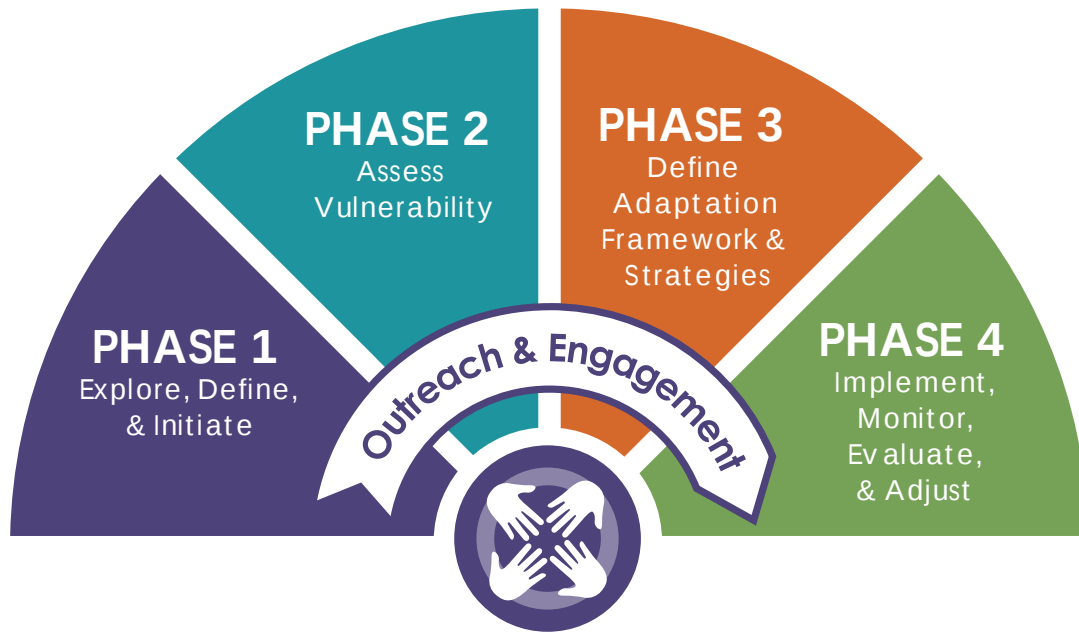


Figure 3-1 Adaptation Planning Process

Source: CalOES 2020; adapted by Ascent Environmental in 2021.

Vulnerability Assessment Overview

The county's vulnerability assessment provides a comprehensive analysis of community vulnerabilities to climate change. It identifies and characterizes projected climate change effects and associated hazards that are anticipated to impact the community. The vulnerability assessment follows the steps in Phase 2 of the APG and aims to answer the following questions:

- **Exposure:** what climate change effects will the county experience?
- **Sensitivity and Potential Impacts:** what aspects of the community (i.e., populations, built environment, and community functions) will be affected? How will climate change affect the points of sensitivity?
- **Adaptive Capacity:** what is currently being done and what ability does the County have to address the impacts?
- **Vulnerability Scoring:** how vulnerable is the county to each climate change effect?

The vulnerability assessment was conducted consistent with APG guidance using the steps described above. For the exposure analysis, Cal-Adapt, a tool developed by the California Energy Commission and the University of California, Berkeley that uses downscaled global climate model data, was used to assess potential climate change effects that may impact the county over time. The severity of future climate impacts on the county's populations, built environment, and community functions will depend on future global emissions. Two future emissions scenarios, known as Representative Concentration Pathways (RCP), were used in the vulnerability assessment: the RCP 8.5 scenario, which represents the high GHG emissions

scenario; and the RCP 4.5 scenario, which represents a lower GHG emissions scenario. The geographic boundary of the county was used as the study area for this analysis.

In the exposure analysis, primary climate change effects identified and evaluated include changes to average annual temperature and average annual precipitation. The secondary effects, which can occur because of individual changes or a combination of changes in the primary effects, include changes to wildfire, extreme heat, extreme precipitation and flooding, and drought regimes, as well as reduced snowpack. Climate change effects were evaluated for changes to occur by near-term (2021–2050), midterm (2035–2064), and long-term (2070–2099) timescales.

In addition to Cal-Adapt, several existing resources were reviewed to obtain information about climate-related hazard risks that may threaten the county due to climate change. Information from *California's Fourth Climate Change Assessment* (OPR, CEC, and CNRA 2018a) and the *Sierra Nevada Region Report* (OPR, CEC, and CNRA 2018b), along with a variety of additional resources (see Appendix B), were reviewed to assess the various potential effects climate change could have within the county. The effects identified were consistent with the climate model projections included in the Cal-Adapt tool.

Vulnerability Assessment Summary

The vulnerability assessment was prepared to help the County understand which climate vulnerabilities in the community are most urgent and needed to be prioritized during the adaptation strategy development process. The results were also used to prioritize strategy implementation. The full climate change vulnerability assessment, including detailed data, additional information, and references, can be found in the Adaptation and Resilience Report in Appendix B.

EXPOSURE, SENSITIVITY, AND IMPACTS

The following sections summarize the projected exposures and associated sensitivities of and impacts to the county's populations, built environment, and community functions. Populations include residents, visitors, and segments of the population that are particularly vulnerable to climate change impacts, such as individuals experiencing homelessness or those with disabilities, senior citizens, children, geographically and culturally isolated communities, and outdoor workers. The built environment consists of a set of assets that are essential to the health and welfare of residents and visitors and are especially important during and proceeding climate-related hazard events. This includes residential and commercial buildings; critical facilities (i.e., hospitals and medical facilities, fire departments, emergency shelters, schools, senior centers); transportation infrastructure (i.e., roadways, bridges, railroads, and airports); and utility infrastructure (i.e., energy, communications, and water and wastewater). Community functions are the resources and assets, operations, economic sectors, and services that are created or influenced by the interaction between populations and the built environment, are essential to public health and welfare, and allow day-to-day activities to continue in the county. The priority community functions that have been identified include agriculture, livestock, and forestry; tourism and recreation; transportation and mobility; essential services (e.g., grocery stores); ecological functions; emergency services; and energy delivery and other utility (e.g., communications) operations.

Increased Temperatures and Extreme Heat

Annual average temperature in the county is projected to rise approximately 6.0 to 9.5 °F by 2100 depending on future global emissions (CEC 2021a). Increased temperatures will lead to secondary climate change impacts including increases in the frequency, intensity, and duration of extreme heat events and wildfires in the county. An extreme heat day in the study area is defined as a day when the maximum temperature is above the extreme heat threshold of 88.6 °F, and a heat wave consists of a period of four or more consecutive extreme heat days (CEC 2021b). The average number of extreme heat days, heat waves, and days in the longest heat wave are all projected to increase substantially by 2100. The projected average annual area burned by wildfire is also expected to increase in the near-term and continue to rise through the end of the century (CEC 2021c). **Table 3-1** outlines projections for increased temperature and frequency of extreme heat in the county.

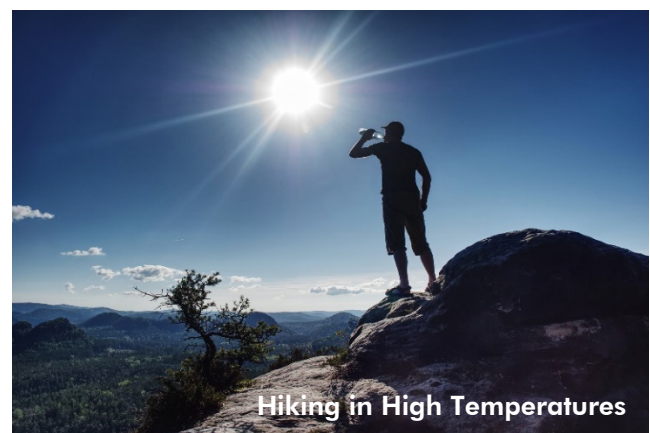
Table 3-1 Changes in Average Annual Temperatures and Extreme Heat in Tuolumne County

Average Annual	Historic Average Annual (1961-1990)	Near-Term (2021-2050)	Midterm (2035-2064)	Long-Term (2070-2099)		Potential Change
				Low Emissions	High Emissions	
Maximum Temperature (°F)	60.6	64.4	66.1	66.6	69.7	+6.0 to 9.5
Minimum Temperature (°F)	32.6	36.8	38.2	38.5	42.1	+5.9 to 9.5
Number of Extreme Heat Days (88.6 °F)	4	23	35	39	61	+35 to 57
Number of Heat Waves	0.5	4	6	7	12	+6 to 11
Number of Days in the Longest Heat Wave	2.6	10	14	14	25	+11 to 25

Notes: °F = degrees Fahrenheit.

Source: CEC 2021a; CEC 2021b.

These climate change effects are expected to impact all populations and can result in serious public health consequences. Higher frequency of extreme heat conditions can cause serious public health impacts, such as heat stroke and dehydration, as well as indirect effects such as worsened air quality from increased ozone formation and particulate matter generation (CalEMA and CNRA 2012:3). Seniors and children, who make up approximately 32 percent and 17 percent of the county's residents,



respectively, as well as individuals with disabilities and outdoor workers and recreationists, are especially vulnerable to health impacts caused by significantly elevated temperatures and prolonged heat waves.

The county's built environment (i.e., physical assets such as homes, hospitals, and roads) is relatively resilient to rising temperatures and extreme heat conditions. However, prolonged conditions of high and extreme heat may lead to increased risk of regional power outages, brownouts, and blackouts resulting from increased electricity demand, reduced power transmission line efficiency, and/or Public Power Safety Shutoff (PSPS) events implemented by Pacific Gas and Electric (PG&E). One major effect of climate change on the county's transportation system from extreme heat is the reduction in the overall lifespan of transportation infrastructure such as roads and bridges (OPR, CEC, and CNRA 2018b). Increased average temperatures and extreme heat on roadways and bridges can result in the degradation of pavement and increase roadway hazards, such as potholes and roadway cracks. This climate change effect will contribute to the continued degradation of local and regional roadways, which is already a significant issue. Recently, the county was identified as a low-ranking county in the state in terms of its pavement condition index.

Several of the county's community functions are vulnerable to increased temperatures and more frequent and intense heatwaves. Agriculture and livestock operations are significantly threatened due to warmer nighttime temperatures and reduced chill hours, as well as increased demand for irrigation due to increased evapotranspiration from plants and soils. Additionally, changes in temperatures will alter the range of crop-damaging pests and microbial diseases, which could increase the vulnerability of certain crops. Impacts associated with heat stress on cattle may also threaten livestock operations. Lastly, as temperatures continue to rise, winter snowpack will be reduced considerably. Tourism and recreation businesses and industries that depend on winter snowpack will be particularly vulnerable and at risk of significant economic losses as the winter season shortens (Halofsky et al. [in press]).

Increased Wildfire Risk

Increased temperatures and changes in precipitation patterns will lead to reduced moisture content in vegetation and soils during dry years. These conditions are expected to increase the amount of area burned by wildfires both within and beyond the boundaries of the county. Higher temperatures lasting even only one day will affect moisture levels of grass and other small-diameter fuels (e.g., twigs, brush, pine needles). Additionally, as higher temperatures last for longer periods of time, dead fuels of wider diameter will also become drier and contribute to increased wildfire intensity. These conditions are expected to result in up to a near tripling of average annual area burned in the county by 2100. Importantly, anticipated changes in wildfire impacts are not homogenous across the county; for instance, the central and eastern portions of the county are projected to be more severely impacted by wildfire. **Table 3-2** illustrates projected changes in annual average area burned by wildfire.

Table 3-2 Changes in Average Annual Area Burned in Tuolumne County

Average Annual Area Burned	Historic Modeled ¹ Average Annual Area Burned (1961-1990)	Near-Term (2021-2050)	Midterm (2035-2064)	Long-Term (2070-2099)	
				Low Emissions	High Emissions
Average Annual Area Burned (hectares)	4,764	6,442	8,224	8,434	13,319

¹Observed historical average annual area burned data were not available from Cal-Adapt; the modeled historical average annual area burned data under the low emissions scenario was available and used as proxy data. Source: CEC 2021c.

Increased frequency and intensity of wildfires will directly affect the safety of all residents and visitors of the county, with the potential to result in physical injury or death. Most of the county's residents live in the wildland-urban interface (WUI) on or near State Routes 108, 120, or 49, which on an average day can handle traffic adequately. However, during a mass evacuation, transportation on smaller roads, which are often narrow and wind through rugged topography, may be difficult due to high levels of congestion. Traffic could be made worse by additional hazards, such as fallen trees and power lines or abandoned vehicles, and impacts would be significantly amplified during holiday weekends or other large events (CAL FIRE 2020). Risk would also rise if an evacuation occurred before Sonora and Tioga mountain passes open in the summer, which would force traffic through the City of Sonora and Jamestown or Columbia, causing more congestion (County of Tuolumne 2020). Residents living in isolated and rural communities are particularly vulnerable to catastrophic wildfire, as these settings will encounter

In 2021, historic wildfires in northern California resulted in heavy smoke drifting to Tuolumne County and creating unhealthy air quality that lasted for weeks.

longer response times for firefighters and other emergency response personnel. Evacuation from these areas in the case of wildfire may also be difficult (OPR, CEC, and CNRA 2018a), especially as traffic on major roadways increases as surrounding areas evacuate. Additionally, wildfire smoke—from fires within the county, or from fires in distant areas—

can cause considerable adverse health impacts, especially in vulnerable populations, such as the children, outdoor workers and recreationists, and those suffering from preexisting cardiovascular or respiratory conditions. Recent smoke impacts have forced schools to cancel outside recess and put youth sports seasons on hold. Secondary impacts of wildfire including post-fire flooding and debris flow also pose risks to public health and safety, both from immediate harm and through the potential increase of contaminants in drinking water supplies. Additionally, these secondary impacts can lead to culvert blockages resulting in drainage impacts to roads and private property.

Increased frequency and intensity of wildfires pose a serious threat to buildings, critical facilities, community health, transportation infrastructure, and utility infrastructure throughout the county. Many of the more densely populated and developed areas within the county are located within or along the edge of the WUI, and nearly all of these areas are characterized as Very High Fire Hazard Severity Zones by the California Department of Forestry and Fire Protection (CAL FIRE) (see Figure VA-4 in Appendix B). Energy



Smoke from the Rim Fire

infrastructure faces direct risk of damage, but wildfire also threatens electricity supply to the community due to increasingly frequent PSPSs by PG&E during periods of increased wildfire risk such as windy and dry conditions. Energy resources that rural communities rely on, such as onsite propane, heating oil, and fuelwood, could be lost or damaged from wildfires (County of Tuolumne 2018a). Other utility infrastructure (e.g., water, communications), may experience similar impacts. Roadways are likely to be closed, and transportation infrastructure may also be damaged. Additionally, secondary impacts from wildfire, such as post-fire flooding and debris flow, may cause further direct damage to the county's built environment.

Severe wildfires often burn tens of thousands of acres, disrupting the county's ecological functions by destroying fragile habitat, disturbing native animal populations, threatening rare and endangered plant and animal species, and altering scenic and aesthetic qualities of recreation opportunities. Hiking, camping, biking, fishing, wine tasting, fairs, music festivals, and other popular tourism and recreation activities are also easily disrupted by wildfire (CAL FIRE 2020). Agriculture and livestock operations and timber production within the county are also significantly vulnerable to wildfire. The financial impacts caused by wildfires on these industries and the economy at large can be devastating. Energy, water, transportation, and

In recent years, the U.S. Forest Service has issued unprecedented forest closure orders to reduce the risk of wildfire due to high temperatures and drought conditions. Stanislaus National Forest was closed for two weeks surrounding the Labor Day holiday in 2021.

communications infrastructure are also at risk. Impacts to this infrastructure further threaten individuals' abilities to avoid harm and obtain essential resources such as food and water. Lastly, increased frequency and intensity of wildfires place greater pressure on the Tuolumne County Fire Department (TCFD) and regional emergency response services. Recent efforts to evaluate the capacity of TCFD and other emergency response

operations, such as the "Matrix Study," highlight existing challenges and emphasize the importance of building capacity for these services in the face of rising threats due to wildfire.

Increased Extreme Precipitation and Flooding

The historic average annual precipitation in the county is 42 inches. As shown in **Table 3-3**, the average annual precipitation in the county is projected to increase 3.5 to 8.2 inches by the end of the century (CEC 2021a). The average number of annual extreme precipitation events in the county is projected to increase from two events per year to up to four events per year by the end of the century (CEC 2021d).

Table 3-3 Changes in Average Annual Precipitation and Increased Extreme Precipitation and Flooding in Tuolumne County

Average Annual Precipitation	Historic Average Annual Precipitation (1961-1990)	Near-Term (2021-2050)	Midterm (2035-2064)	Long-Term (2070-2099)	
				Low Emissions	High Emissions
Average Annual Precipitation (inches)	42	NA ¹	46.5	45.5	50.2
Annual Average Extreme Precipitation Events	2	2	3	2	4

Notes: °F = degrees Fahrenheit; NA = not applicable.

¹ The specific data set used for future precipitation increases in the county for this analysis does not include projections for the near-term period.

Source: CEC 2021a; CEC 2021d.

While average annual precipitation in the county is projected to trend upward in future years, the key finding for this climate effect is that variability and volatility in severe storms are expected to increase as a result of primary climate change effects (i.e., changes in temperature and precipitation regimes). Precipitation events may be less frequent but may shift to more intense storms dropping above-average amounts of precipitation. Precipitation patterns in California also oscillate between extremely dry and wet periods, and in the next several decades dry years are likely to become even drier, while wet years will become even wetter. Importantly, future wet seasons will have more precipitation in the form of rain rather than snow due to higher temperatures, disrupting the normal timing of groundwater and surface water recharge (OPR, CEC, and CNRA 2018b). In addition to extreme storms and flooding events, changes in precipitation patterns will affect other secondary climate effects including drought, reduced snowpack, and wildfire.

In early 2017, a Local State of Emergency was declared after severe and rapid storms brought large amounts of rain, snow, and high winds to the county, causing flooding to roads, bridge washouts, and pavement failures on roads. Total infrastructure damages sustained were estimated at approximately \$8 million.

Increases in the magnitudes and frequency of extreme precipitation and flood events will adversely affect populations in the county through both direct threats to public health and safety as well as several secondary hazards. Particularly vulnerable populations include those that live within or directly adjacent to the 100-year floodplain (especially those located near State Route 108), individuals experiencing homelessness, senior citizens, individuals with disabilities, and geographically and culturally isolated communities (e.g., tribal communities). Transportation

networks are susceptible to flood impacts and may be impassable during flood events, which may disrupt evacuation routes or emergency response routes. Additionally, flooding may result in adverse impacts to drinking water supplies through contamination of waterways.

Increases in the magnitude and frequency of flood events pose significant risk to the county's buildings, critical facilities, transportation infrastructure, utility infrastructure, and essential services. Many of the communities in the State Route 108 corridor are located within or directly adjacent to 100-year floodplain and face heightened risk of property damage; the communities of Chinese Camp and Groveland may face similar threats. Severe storms and flooding threaten a considerable number of critical facilities, including fire departments, police stations, and schools, as well as vulnerable electricity delivery and propane gas line infrastructure (County of Tuolumne 2012; County of Tuolumne 2017). These events are also likely to damage transportation infrastructure, including roads, bridges, and culverts due to increased runoff,

Flooding in Groveland in 2018 forced business closures and strained the County's abilities to provide basic services and emergency access to residents and visitors.

especially following a wildfire. Transportation infrastructure near streams and floodplains will be especially vulnerable. Lastly, these climate change effects can also cause damage to energy, water, and communications infrastructure, disrupting service to residences and critical facilities as well as further challenging public safety infrastructure such as traffic signals (County of Tuolumne 2017). Severe winter

storms in the county routinely cause power outages that persist for more than a week.

Increased flooding may impact the economy through losses in agricultural products. The consequences of these events, such as unwanted submergence and/or excessive soil saturation of cropland, can destroy crops and may be detrimental to livestock (CDFA 2013). Flooding may have economic impacts on businesses and public agency budgets through increased direct and indirect costs associated with flood mitigation services, clean-up operations, and maintenance and replacement of damaged infrastructure. If floods cause sustained closures of major roadways, access to major tourism and recreation destinations and activities could be limited, interrupting business cycles and causing revenue loss for businesses and the County. Impacts of extreme precipitation and flooding events, such as damage to roads, may also limit residents' and visitors' access to essential resources and emergency services and affect the County's ability to provide these services (County of Tuolumne 2017).

Drought, Water Supply, and Reduced Snowpack

Increased average temperatures and a compressed rate of snowmelt in the county's watersheds, along with inadequate precipitation during the typically rainy season, have previously affected surface water supplies in the region and will continue to occur in the future. The county's water supply relies on surface water runoff originating from high-elevation snowpack in the Sierra Nevada, which is stored in large storage reservoirs at lower elevations. With high volatility in annual precipitation, April snow-water equivalence, a common measurement of snowpack that is defined as the amount of water contained within the snowpack and used estimate changes in snowpack, in the county is projected to decline over 50 percent by the end of the century, as shown in **Table 3-4** (CEC 2021e). These conditions could result in the county being subject to water shortages in the future.

Table 3-4 Changes in Average April Snow Water Equivalence in Tuolumne County

Average April Snow Water Equivalence	Historic Average Snow Water Equivalence (1961-1990)	Near-Term (2021-2050)	Midterm (2035-2064)	Long-Term (2070-2099)	
				Low Emissions	High Emissions
Average April Snow Water Equivalence	12.1	10.7	9.3	8.8	5.8

Source: CEC 2021e.

County lands are currently experiencing the two highest drought rankings provided by the National Oceanic and Atmospheric Administration’s National Integrated Drought Information System, classified as Extreme Drought and Exceptional Drought (NOAA 2021). According to the California Department of Water Resources, precipitation in the central Sierra Nevada for this water year (i.e., September 2020 to June 2021) is 53 percent below the average from 1966 through 2015. Recent research suggests that extended drought occurrence (a “mega-drought”) could become more pervasive in future decades. As shown in **Table 3-3**, the county’s average annual rainfall accumulation is 42 inches. **Figure 3-2** illustrates a potential “extended drought” scenario between 2051 and 2070, where the county’s average annual rainfall accumulation would decrease to 34.9 inches (CEC 2021f).

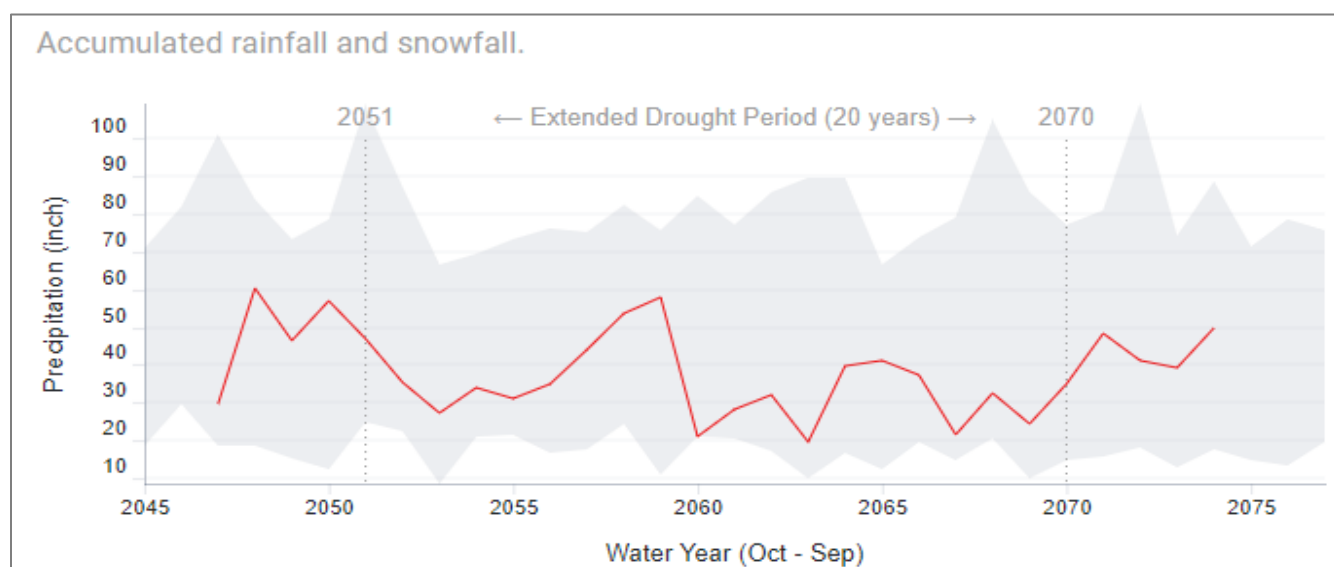


Figure 3-2 Projected Extended Drought Conditions in Tuolumne County

Source: CEC 2021f.

In the event of a severe and sustained drought lasting multiple years, the county’s water supply reservoirs are not of adequate size to provide potable water to all residents of the county, without adding to the supply or rationing water (County of Tuolumne 2018a). For this reason, all populations and communities are sensitive to drought and related water supply issues. However, water shortages are more likely to impact particularly vulnerable populations, such as individuals experiencing homelessness, individuals with disabilities, and senior citizens, that may have limited or no access to financial or other resources that would enable them to cope with

associated hazards. For example, individuals with higher incomes and personal vehicles may be able to purchase more bottled water supplies, travel to areas that are not experiencing water availability issues, or deepen water wells.

While increasingly frequent and prolonged droughts directly threaten residents of the county, the built environment will not experience substantial direct impacts associated with this climate-related hazard. However, these conditions have the potential to cause secondary impacts. Heavy rainfall or snowfall during drought conditions can cause intense flooding, debris flows, landslides, and mudslides, which pose risks to the county's built environment, such as culverts and bridges (described further above).



Drought conditions and other changing climatic variables cause considerable impacts to natural resources and ecological function in the county. These conditions in recent decades have caused pine bark beetles to propagate rapidly, resulting in severe tree mortality in the county. Portions of forests along the central parts of the county are estimated to have lost over 75 percent of tree biomass (OPR, CEC, and CNRA 2018b). This has resulted in adverse economic impacts on timber harvesting, reduction in native habitat and overall ecological function, increased forest fuels for wildfire, and economic consequences associated with decreases in tourism and recreation. More intense droughts could also affect agricultural operations due to more variable and limited water supply. Most of the county's grazing lands for livestock are not irrigated, so drought conditions make these operations particularly vulnerable to economic losses, which can be catastrophic for businesses if they persist and ultimately force farmers and ranchers to sell their land (County of Tuolumne 2018). Additionally, shorter winter seasons resulting from warmer temperatures causing earlier snowmelt and spring runoff are already impacting businesses reliant on the snowpack (Halofsky et al. [in press]), which in the county primarily include ski mountains as well as summer recreation businesses that are dependent on water resources. Loss of skier-days from drought conditions and the diminished snowpack could lead to job losses in other industries, primarily service and hospitality (OPR, CEC, and CNRA 2018b).

SUMMARY OF SENSITIVITY AND POTENTIAL IMPACTS

Based on guidance from the APG, potential impacts from each climate change effect are rated on a qualitative scale of Low, Medium, and High. A description of each qualitative rating for potential impacts is provided in **Table 3-5**.

Table 3-5 Potential Impacts Rating

Rating	Potential Impacts Rating Description
Low	Impact is unlikely based on projected exposure; would result in minor consequences to public health, safety, and/or other metrics of concern.
Medium	Impact is somewhat likely based on projected exposure; would result in some consequences to public health, safety, and/or other metrics of concern.
High	Impact is highly likely based on projected exposure; would result in substantial consequences to public health, safety, and/or other metrics of concern.

Source: CalOES 2020.

The climate change effects anticipated to impact the county are ranked for a potential impacts rating in **Table 3-6**. This evaluation is based on the exposure analysis and analysis of sensitivities and impacts.

Table 3-6 Potential Impacts Summary for Tuolumne County

Climate Change Effect	Potential Impacts Rating
Increased Temperatures and Extreme Heat	High
Increased Wildfire Risk	High
Increased Extreme Precipitation and Flooding	Medium
Drought, Water Supply, and Reduced Snowpack	High

Source: Ascent Environmental 2021.

ADAPTIVE CAPACITY

The third step in the vulnerability assessment process is to evaluate the adaptive capacity of the county's populations, built environment, and community functions to address the impacts of climate change. Adaptive capacity refers to a community's current and future ability to address climate-related impacts.

A review of the County's existing policies, plans, programs, and resources, as well as those from relevant regional and State agencies and organizations, provides an assessment of the county's current ability to reduce vulnerability to hazards and adapt to climate change over the long-term. **Table 3-7** shows a summary of existing plans and reports that contribute to the County's adaptive capacity to address the anticipated impacts of climate change effects.

The County has already taken a number of actions to address climate change impacts on the community. To address impacts from increased temperatures and extreme heat, the County has prepared its *Tuolumne County Multi-Jurisdictional Hazard Mitigation Plan* and *Extreme Temperature Contingency Plan*, operates temporary cooling centers under extreme temperature conditions, and enforces compliance with the latest California Building Standards Code for development projects. The Tuolumne County Transportation Council has also developed the *2016 Final Regional Transportation Plan* with climate change in mind to prepare for associated impacts on the transportation system. While most of the county's residents and visitors will likely be able to sufficiently prepare for and respond to increased temperatures and extreme heat, the County may have difficulty adequately protecting vulnerable populations from the impacts that

caused by a drastic increase in the number of extreme heat events. Additionally, the County may need to strengthen adaptive capacity for agricultural and livestock operations within the county.

Table 3-7 Summary of Existing Plans and Reports

Plan or Report	Climate Change Effect			
	Increased Temperatures and Extreme Heat	Increased Wildfire Risk	Increased Extreme Precipitation and Flooding	Drought, Water Supply, and Reduced Snowpack
California's Fourth Climate Change Assessment, Sierra Nevada Regional Report	✓	✓	✓	✓
County Multi-Jurisdictional Hazard Mitigation Plan	✓	✓	✓	✓
County General Plan	✓	✓	✓	✓
County Emergency Operations Plan		✓	✓	✓
Sierra Nevada Recreation and Infrastructure Adaptation Partnership	✓	✓	✓	✓
CAL FIRE Tuolumne-Calaveras Unit 2020 Strategic Fire Plan	✓	✓		
TUD 2020 Urban Water Management Plan				✓
TCTC 2016 Final Regional Transportation Plan		✓	✓	
County OES Extreme Temperature Contingency Plan	✓			

Notes: CAL FIRE = California Department of Forestry and Fire Protection; OES = Office of Emergency Services; TCTC = Tuolumne County Transportation Council; TUD = Tuolumne Utilities District.

Source: Table compiled by Ascent Environmental in 2021.

The County and partner agencies and organizations have implemented a variety of actions to reduce the risk and impacts of wildfire. The County adheres to and enforces the California Building Standards Code as well as numerous other relevant regulations and ordinances that specify building and equipment design features, emergency access, defensible space requirements, and hazardous vegetation and fuel management procedures. The County maintains its Wildfire Preparedness webpage and operates a Citizen Alert Emergency Notification System. The County's cooperative fire department, TCFD, contracts with CAL FIRE to provide fire suppression, emergency medical services, public education, and other related services, and it collaborates with U.S. Forest Service and the National Park Service to provide wildfire response. TCFD also participates in mutual aid agreements to receive support from the State and other departments, and it supports businesses in meeting code requirements through the Fire Safety Inspection Program. The County is currently coordinating with other agencies to address dead and dying trees that threaten powerlines, structures, county roads, highways, and water system infrastructure, and it is in the process of constructing two Community Resilience Centers that will act as emergency response centers during wildfires. Lastly, the County

collaborates with and supports several agencies and organizations, such as Yosemite Stanislaus Solutions, the Master Stewardship Agreement projects, numerous Fire Wise Communities, and local FireSafe Councils, to advance wildfire planning efforts and implementation actions. While the County, regional and State agencies, and other partners are implementing a diverse array of policies and programs that address the threat of increased wildfire risk, the county is still considerably vulnerable to this climate change effect. The extensive amount of lands at very high risk of wildfire within the county, challenges with securing adequate funding for TCFD, impacts associated with wildfire smoke, and the anticipated increase in risk of wildfire as conditions change necessitate an increase in the pace and scale of implementation projects to address wildfire in the county.

The County has worked to better prepare residents from extreme precipitation and flooding events using advisories and notifications, including the County's Citizen Alert Emergency Management Notification system, and has partnered with the local American Red Cross to provide shelter for those who need it during these events. The County has adopted planning and land use ordinances and regulations that outline development standards for areas within the 100-year floodplain that are potentially vulnerable to flood events. The County has adopted a Flood Damage Prevention Ordinance and a Storm Drainage Master Plan, which serve to improve flood control efforts. The County strictly enforces flood hazard regulations, including the Federal Emergency Management Agency (FEMA) regulations that determine the location of structures in floodplains. The County also maintains development standards in areas with poor drainage that are susceptible to flooding and will continue to improve these areas while maintaining its ability to respond to flood-related hazards. While the county's populations and assets are not severely threatened by floods, the County and other regional and local agencies can continue to implement policies and programs that reduce the risks associated with significant flooding events, particularly those that improve transportation accessibility and reliability.

The County is currently in the process of developing a Drought Contingency Plan, which will demonstrate comprehensive planning to prepare for and respond to potential water shortages in the county. During drought conditions in recent years, the Tuolumne Utilities District (TUD) and its customers have been able to implement critically dry-year planning and significantly reduce water demand. This has been accomplished through a variety of public outreach and engagement initiatives, providing customers with water conservation kits that included items such as low-flow showerheads, and school education programs. TUD has also modified water conservation ordinances in situations where water supply availability is limited and has developed strategic partnerships to improve the efficacy of outreach efforts. Groveland Community Services District has undertaken similar efforts and, like TUD, has developed a 2020 Urban Water Management Plan that states the agency will be able to meet future water demand. The County convened a Tree Mortality Task Force to address the issue of hazards associated with ongoing and increasing tree mortality in the county that has occurred due to sustained dry conditions in recent years. The Task Force was made up of a group of partner agencies that mobilized and were able to remove over 13,000 hazardous trees.

SUMMARY OF ADAPTIVE CAPACITY

Based on a combination of the adaptation initiatives outlined in existing documents and resources and additional adaptive efforts that have been pursued (see Appendix B for details), the County's adaptive capacity for each climate change effect can be rated Low, Medium, or High. High adaptive capacity indicates that sufficient measures are already in place to address the points of sensitivity and impacts associated with climate change, while a low rating indicates a community unprepared and requires major changes to address hazards (CalEMA and CNRA 2012:26). Adaptive capacity ratings are described in **Table 3-8**.

Table 3-8 Adaptive Capacity Rating

Rating	Adaptive Capacity Rating Description
Low	The community lacks capacity to manage climate impact; major changes would be required.
Medium	The community has some capacity to manage climate impact; some changes would be required.
High	The community has high capacity to manage climate impact; minimal to no changes are required.

Source: CalOES 2020.

Table 3-9 summarizes the County's adaptive capacity regarding each climate change effect. Like the potential impacts rating evaluation, the scoring of adaptive capacity allows the County to understand priority areas where there are gaps in preparing for and adapting to climate change.

Table 3-9 Adaptive Capacity Summary for Tuolumne County

Climate Change Effect	Adaptive Capacity Rating
Increased Temperatures and Extreme Heat	Medium
Increased Wildfire Risk	Low/Medium
Increased Extreme Precipitation and Flooding	Medium
Drought, Water Supply, and Reduced Snowpack	Medium

Source: Ascent Environmental 2021.

VULNERABILITY SCORING

The final step in the vulnerability assessment is to characterize the vulnerability to each climate change effect. The county's vulnerability to each identified impact is assessed based on the magnitude of risk to and potential impacts on populations, the built environment, and community functions while considering the current adaptive capacity in place to mitigate these impacts. Based on the ratings of potential impacts and adaptive capacity, an overall vulnerability score can be determined for each climate change effect. This scoring can help the County understand which effects pose the greatest threats and should be prioritized in future planning efforts. **Table 3-10** presents the rubric used to determine overall vulnerability scores based on the ratings for potential impacts and adaptive capacity.

Table 3-10 Vulnerability Scoring Rubric

Vulnerability Score				
Adaptive Capacity	Low	3	4	5
	Medium	2	3	4
	High	1	2	3
		Low	Medium	High
Potential Impacts				

Source: CalOES 2020; adapted by Ascent Environmental in 2021.

Vulnerability scoring for each climate change effect is included in **Table 3-11** below. The table shows that increased wildfire risk is assigned a vulnerability rating of 4–5 and therefore should be a very high priority for the County. Drought, water supply, and reduced snowpack is assigned a vulnerability score of 4, which means it should also be prioritized in the County’s adaptation and related planning efforts. Increased temperatures and extreme heat are also assigned a vulnerability score of 4. These climate change effects are likely to have significant impacts on the county’s populations, built environment, and community functions in the near-term to midterm, and although a variety of adaptive efforts related to both climate change effects are in place and underway, the magnitude of the risks posed by these hazards contributes to high vulnerability in the county. Increased extreme precipitation and flooding is characterized as having a vulnerability rating of 3. This climate change effect is currently being addressed adequately based on existing conditions, but additional adaptation and resilience planning will be required in the future to mitigate impacts and protect the county.

Table 3-11 Summary of Vulnerability Scoring in Tuolumne County

Climate Change Effect	Vulnerability Score		
	Adaptive Capacity	Potential Impact	Vulnerability
Increased Temperatures and Extreme Heat	Medium	High	4
Increased Wildfire Risk	Low/Medium	High	4–5
Increased Extreme Precipitation and Flooding	Medium	Medium	3
Drought, Water Supply, and Reduced Snowpack	Medium	High	4

Source: Ascent Environmental 2021.

Next Steps for Adaptation and Resilience

The County, regional and State agencies, and other stakeholder groups have already implemented a variety of initiatives to address climate change in the county through existing policies, programs, and actions. As climate change continues to exacerbate risks and impacts from wildfires, heat waves, flooding, drought, and reduced snowpack, the County must continue to develop and implement adaptation strategies to plan for and mitigate these risks. **Chapter 4** of this CAP includes adaptation and resilience strategies and measures that were developed based on the findings of the vulnerability assessment. These initiatives serve to address the climate-related hazards identified throughout the adaptation planning process and prioritize strategies that will be effective, feasible, cost-appropriate, and include co-benefits.



Climate Action Strategies and Measures

Sunset at Tuolumne Meadows

This chapter presents the strategies and measures that the County will implement to reduce greenhouse gas (GHG) emissions and improve resilience to the impacts of climate change. These locally based initiatives are organized under five focus areas and include details regarding GHG reduction potential, climate resilience benefit, and co-benefits.

Overview

This climate action plan (CAP) includes 25 strategies and 47 measures that would reduce GHG emissions and build resilience to climate change in the community. The strategies are organized into five focus areas: agriculture and forestry, buildings, conservation and recreation, health and safety, and infrastructure. Each focus area presents strategies that serve as the foundation for addressing GHG emissions reductions and adaptation improvements throughout the county. Within each strategy are one or more measures that represent specific expressions of the broad strategies. Measures are further evaluated in **Chapter 5** with specific actions that define the activities, programs, policies, or projects that the County will implement or support to achieve the CAP's goals. While the initiatives included are primarily intended to reduce emissions and improve resilience, they also provide co-benefits, such as improved air quality, cultural and social well-being, and economic diversity.

The strategies and measures discussed in this chapter were developed based on a combination of factors, including the results of the County's GHG emissions inventory and vulnerability assessment, robust engagement with the public and stakeholders, feedback from County staff and elected officials, and the best available climate action and adaptation planning guidance. The following sections provide background information and context for each focus area and present the strategies and measures. Each measure includes a score for GHG Reduction Potential and Climate Resilience Benefit and identifies associated co-benefits. Further explanation of these metrics and full descriptions of each action are included in **Chapter 5**.

HEALTH & SAFETY



STRATEGY 1 Active Transportation



STRATEGY 2 Improved Air Quality



STRATEGY 3 Healthcare Services



STRATEGY 4 Fire-Adapted Community



Burn Scar on Mountain Trail

To ensure the health and safety of its communities, it is vital that the County develop strategies to address climate change-related hazards that pose considerable direct threats to human life and property such as wildfire, as well as indirect effects such as poor air quality. Developing and implementing actions that create fire-resilient communities are necessary to reduce the county's vulnerabilities to catastrophic wildfire. In addition, increasing the capacity of local and regional healthcare systems and services will serve to build

resilience to climate change impacts that threaten the county.

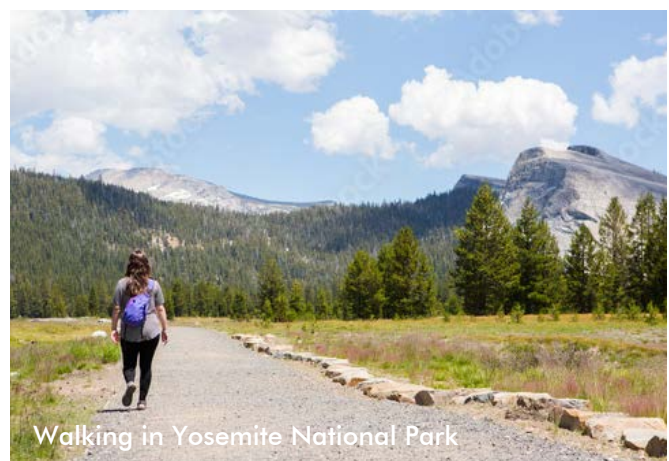
While all individuals in the county will experience the effects of climate change, some populations will be more vulnerable to impacts than others. Vulnerable populations are those that are more likely to be affected or impacted more severely by climate change effects due to a variety of factors, such as health challenges or disabilities, living and working location or conditions, income level, historical and/or current marginalization, and limited access to resources. These variables, which are often the result of historic inequitable planning processes, can lead to increased susceptibility to and disproportionate harm from climate impacts. It is important for the County to plan for all groups that, for one reason or another, lack available resources or capacity to react or adapt to climate change impacts themselves.

In implementing these strategies, the county's residents and visitors will also benefit through improvements to public health and safety. Residents and visitors that choose to increase active transportation trips in place of using fossil fuel vehicles will experience positive health benefits associated with exercise and decreased air pollutants. Similarly, efforts to facilitate the transition to cleaner fuel and power sources will reduce emissions and improve local air quality.

Strategies and Measures

Efforts aimed at improving public health and safety in the county provide opportunities to both mitigate GHG emissions and reduce vulnerabilities to climate change. This section outlines strategies and measures the County could implement to reduce GHG emissions, improve the health of residents and visitors, and prepare for anticipated hazards associated with climate change. Health and safety measures are classified into four

strategies that would serve to enhance and increase active transportation options, improve local air quality, prepare the county for the heightened risk of wildfire, and create a more resilient healthcare system. Each measure includes a score for GHG Reduction Potential and Climate Resilience Benefit and identifies associated co-benefits (explained further in **Chapter 5**).



Walking in Yosemite National Park



Strategy 1. Active Transportation

The transportation sector represents the county's largest source of GHG emissions, accounting for almost two-thirds of total emissions in 2018. Reducing reliance on fossil fuel-powered vehicles by increasing access to biking, walking, and other active forms of transportation improves the health of residents and visitors while reducing emissions.

Measure 1.1: Encourage residents and visitors to walk, bike, or use other modes of active transportation.

Actions that could be taken under this measure include enhancing active transportation accessibility, safety, and options through infrastructure improvements, rideshare services, and educational outreach to promote active transportation opportunities.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Social and Cultural Well-Being



Measure 1.2: Encourage students to walk and bike to school through a Safe Routes to School Program.

Actions that could be taken under this measure include implementing a Safe Routes to School Program and developing education and outreach initiatives to increase the number of students that use active transportation.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Social and Cultural Well-Being



Strategy 2. Improved Air Quality

In addition to generating GHG emissions, the combustion of fossil fuels in vehicles and equipment also produces particulate matter, which degrades local air quality and has negative health consequences. Wood burned in homes and businesses for heating creates the same effects. Reducing traffic and vehicle idling, transitioning to cleaner fuels for equipment, and replacing wood-burning appliances positively impacts local air quality, improves quality of life, and reduces emissions.

Measure 2.1: Reduce vehicle idling.

Actions that could be taken under this measure include restricting vehicle idling in sensitive areas and installing electrical power supply for delivery trucks and associated equipment in nonresidential development.

GHG Reduction Potential: 

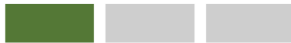
Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Social and Cultural Well-Being



Measure 2.2: Reduce vehicle congestion.

Actions that could be taken under this measure include implementing vehicle congestion relief projects, adopting and implementing relevant transportation plans, and including traffic calming measures in development projects.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Social and Cultural Well-Being

Measure 2.3: Reduce air pollution from off-road vehicles and equipment.

Actions that could be taken under this measure include enforcing existing regulations, encouraging the use of electric- or alternatively fueled off-road vehicles and equipment, creating incentives for fuel switching, and installing sufficient outdoor electrical outlets in new development.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Social and Cultural Well-Being

Measure 2.4: Improve indoor air quality by replacing wood-burning fireplaces and other wood-burning appliances with more efficient heating units, including wood-burning appliances that meet current emissions standards.

Tuolumne County residents rely on wood-burning appliances for heat; however, older model appliances contribute to harmful indoor air quality. Actions that could be taken under this measure include seeking grant funding to developing and implementing a wood-burning stove and fireplace change-out program and continuing to enforce emissions standards for wood-burning appliance installations.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Economic Diversity, Social and Cultural Well-Being



Strategy 3. Healthcare Services

As climate change causes increased hazards to human health and safety, resilient healthcare services will be crucial for the county. Building the resilience of community healthcare systems ensures protection for county residents and visitors.



Measure 3.1: Improve the accessibility and climate resiliency of the county's healthcare services and facilities.

Actions that could be taken under this measure include increasing access to broadband to improve healthcare accessibility and communicating with healthcare facilities to determine energy security.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Social and Cultural Well-Being



Strategy 4. Fire-Adapted Community

Due to overstocked forests and abnormally dry conditions, wildfire is already a major threat in the county, and climate change effects are expected to exacerbate the risk of wildfire in the future. Preparing for wildfire through education and outreach and increasing the use of defensible space contributes to fire-adapted communities resilient to wildfire.

Measure 4.1: Build community resilience to wildfire through disaster preparedness education, outreach, and collaboration.

Actions that could be taken under this measure include raising awareness for wildfire preparedness, ensuring vulnerable populations are prepared for wildfire, collaborating with regional organizations and schools to share information and leverage grant funding, working with businesses to prepare for economic impacts, and assessing emergency services and resources to identify vulnerabilities and ensure adequate preparedness.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Cost Savings, Social and Cultural Well-Being

Measure 4.2: Increase the use of defensible space strategies to reduce wildfire property damage for properties located in high-wildfire risk zones in the county using guidance and requirements pursuant to Assembly Bill (AB) 3074 of 2020 (Fire Prevention).

Actions that could be taken under this measure include continuing to support fuel break projects and defensible space education initiatives, developing a Wildland-Urban Interface Risk Reduction Program, adopting an ordinance to improve fuel reduction around structures, updating local codes to reduce wildfire risks to development, and updating landscaping standards to be fire-adapted.

GHG Reduction Potential:



Climate Resilience Benefit:



Co-Benefits: Air Quality, Forest Resilience, Cost Savings, Biodiversity Conservation, Social and Cultural Well-Being, Carbon Sequestration



CONSERVATION & RECREATION



STRATEGY 1 Ecosystem Preservation and Conservation



STRATEGY 2 Economic Resilience



STRATEGY 3 Waste Reduction



STRATEGY 4 Waste Management

As a rural community, conserving and preserving open space and the natural environment is a key priority for the County. In addition to providing a multitude of valuable ecosystem services, such as water filtration, erosion control, and temperature regulation, the county's vast natural lands also act as an extensive carbon sink, pulling carbon dioxide out of the air and sequestering it into vegetation and soils.

The county's natural resources and assets also offer significant economic opportunities and benefits. Tourism and recreation are all major economic industries within the county. These sectors and their enterprises provide jobs to local workers and attract visitors year-round.



Managing waste generated by residents and visitors is another important element of protecting the value of the county's natural environment. Implementing local actions to reduce waste generation, consume locally, and increase the reuse of products will ultimately serve to protect natural resources and support local businesses.

Strategies and Measures

While many conservation and economic sustainability efforts will not result in quantifiable GHG emissions reductions, considering and planning for climate change impacts is crucial to protecting the county's natural resources and the strengthening the resilience of the industries on which those assets depend. This section outlines the strategies and measures the County could implement to support these goals. Conservation- and economic resilience-related measures are organized within four strategies that focus on safeguarding the county's natural resources and ecosystems, enhancing resilience of the local economy to climate change, and reducing the adverse impacts of waste generation. Each measure includes a score for GHG Reduction Potential and Climate Resilience Benefit and identifies associated co-benefits (explained further in **Chapter 5**).



Strategy 1. Ecosystem Preservation and Conservation

The county's natural environment is central to community values and priorities, and it provides key ecosystem services such as supplying drinking water and fuels. Protecting local lands, forests, and water benefits community character and builds resilience to the impacts of climate change.

Measure 1.1: Enhance the protection of the county's natural assets and ecosystems and expand natural capital throughout the county, while building climate resilience in the environment.

Actions that could be taken under this measure include supporting local and regional restoration and preservation organizations that aim to safeguard watersheds and forests.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Forest Resilience, Biodiversity Conservation, Economic Diversity, Carbon Sequestration

Measure 1.2: Educate the community about the unique value of the ecosystems in the county and what they can do to protect them.

Actions that could be taken under this measure include educating community members about environmental protection, the benefits of open and defensible space, and existing outdoor education opportunities.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Forest Resilience, Biodiversity Conservation, Social and Cultural Well-Being, Carbon Sequestration



Measure 1.3: Conserve areas, such as wildlife habitat and corridors, wetlands, watersheds, and groundwater recharge areas, that provide carbon sequestration benefits.

Actions that could be taken under this measure include encouraging the protection of agricultural lands and retaining oak woodland habitat that enhance carbon sequestration benefits.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Forest Resilience, Biodiversity Conservation, Carbon Sequestration



Strategy 2. Economic Resilience

The county's local and regional economy may be impacted by climate change through disruptions to business operations, damage from natural hazards, and changes in climatic conditions. Improving economic resilience reduces negative consequences of climate change to the community.

Measure 2.1: Support residents and businesses in preparing for impacts on industries that may be affected by climate change including the tourism and recreation industries.

Actions that could be taken under this measure include assessing the effects of increased tourism and visitation, preparing for shorter winters and reduced snowpack, and making transit system improvements to support tourism and recreation.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Economic Diversity, Social and Cultural Well-Being



Measure 2.2: Establish new recreation and tourism options that are adaptive to climate change.

Actions that could be taken under this measure include partnering with organizations such as Sierra Business Council to help businesses proactively plan for climate change through diversification and resilience strategies as well as providing job skills training to create new opportunities for local workers.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Economic Diversity, Social and Cultural Well-Being



Strategy 3. Waste Reduction

The community's waste-related GHG emissions are associated with the decomposition of organic material disposed in landfills. Although the waste sector only accounts for a small percentage of emissions in the county, minimizing waste generation reduces the community's contribution to climate change.

Measure 3.1: Increase construction and demolition diversion rates.

An action that could be taken under this measure includes adopting a construction and demolition waste recycling ordinance.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: N/A

Measure 3.2: Reduce landfilled waste.

Actions that could be taken under this measure to support Senate Bill 1383 (i.e., the State's organic waste diversion regulation) include improving waste management infrastructure, implementing organic waste diversion programs, increasing recycling and green waste processing rates, and exploring the feasibility of expanding anaerobic digestion facilities.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Social and Cultural Well-Being



Composting Plant



Strategy 4. Waste Management

In addition to generating emissions, waste can be damaging to aesthetic and cultural resources in the county. Waste management best practices reduce emissions while benefiting local businesses and protecting the unique characteristics of the county.

Measure 4.1: Promote responsible consumption of products and materials.

Actions that could be taken under this measure include discouraging single-use and disposable products, encouraging local consumption, updating environmentally preferable procurement policies and implementing onsite composting, and supporting recycling and food recovery businesses.



GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Water Security, Cost Savings, Economic Diversity, Social and Cultural Well-Being

BUILDINGS



STRATEGY 1 Energy-Efficient and Resilient New Buildings



STRATEGY 2 Energy-Efficient and Resilient Existing Buildings



STRATEGY 3 Energy Reliability and Security



The energy used in buildings and facilities throughout the county, including residences, businesses, and County government operations, is a significant contributor to countywide GHG emissions. Building-related GHG emissions accounted for 19 percent of total GHG emissions in the county in 2019. Although legislative reductions from adopted State actions will help to reduce building energy emissions 5 percent by 2030, additional reductions through local action can help the County reduce GHG emissions.

Strategies and Measures

The building energy sector offers one of the greatest opportunities to achieve emissions reductions. This section outlines strategies and measures the County could implement to reduce energy-related GHG emissions. Building measures are classified into three strategies, focused on the various sources of building energy emissions that will remain in the county without further action taken at the local level. Each measure includes a score for GHG Reduction Potential and Climate Resilience Benefit and identifies associated co-benefits (explained further in **Chapter 5**).



Strategy 1. Energy-Efficient and Resilient New Buildings

The energy used in homes and businesses in the county generate GHG emissions and contribute to climate change. Buildings also play an important role in creating community resilience to climate change. New buildings that are efficient and suitable for future environmental conditions improve community climate change resilience and increase quality of life.

Measure 1.1: Increase energy efficiency and climate resiliency in all new buildings.

Actions that could be taken under this measure include developing building “reach” codes¹ for new construction, encouraging new developments to install high water-efficient appliances, exploring wastewater reduction opportunities in new construction, using efficient and resilient building materials, and adopting heat island reduction guidelines for new construction.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Cost Savings, Energy Reliability, Social and Cultural Well-Being

Measure 1.2: Require all new County-owned buildings and facilities to be energy efficient and climate resilient.

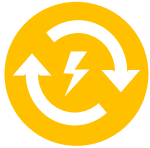
Actions that could be taken under this measure include meeting high energy efficiency standards in new buildings and implementing energy monitoring systems.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Cost Savings, Energy Reliability

¹ California’s Building Energy Efficiency Standards (Title 24, Part 6 of the California Code of Regulations) set the minimum building code requirements statewide. However, local governments can adopt more stringent requirements that “reach” beyond the minimum State requirements for energy use in buildings.



Strategy 2. Energy-Efficient and Resilient Existing Buildings

The county's future building stock will consist primarily of existing building (i.e., those that are already built today), and new development will only account for a small proportion of all buildings in the county in the future. Similarly, the majority of future GHG emissions from the building energy sector will be associated with the county's existing building stock. Increasing the energy efficiency and climate resiliency of existing buildings in the county significantly reduces GHG emissions and prepares the community for the impacts of climate change.

Measure 2.1: Increase energy efficiency and climate resiliency in existing residential and nonresidential buildings.

Actions that could be taken under this measure include implementing an energy efficiency and resiliency retrofitting program, encouraging energy benchmarking for nonresidential buildings, increasing awareness about the benefits of building energy efficiency and resiliency, incentivizing applicable improvement projects, prioritizing low-income owners and renters, and encouraging cool and/or green roofs.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Cost Savings, Energy Reliability, Economic Diversity, Social and Cultural Well-Being, Carbon Sequestration

Measure 2.2: Require all existing County-owned buildings and facilities to be energy efficient and climate resilient.

Actions that could be taken under this measure include developing retrofit plans for and installing energy monitoring systems in buildings, retrofitting public lighting, and upgrading existing water appliances and infrastructure.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Cost Savings, Energy Reliability



Tuolumne County Superior Court



Strategy 3. Energy Reliability and Security

Energy delivery is one of the most critical services in the county. Energy generation, transmission, and distribution are threatened by a variety of climate change impacts, such as wildfires and intense storm events. The rise in Public Safety Power Shutoffs by utility providers, which are associated with climate-related hazards, also pose risks to the community. Improving energy reliability and security ensures critical services are available for residents and visitors of the county.

Measure 3.1: Increase energy reliability and security to buildings and assets that delivery critical services throughout the county.

Actions that could be included under this measure include installing backup power sources at critical facilities, diversifying backup energy generation and installing battery storage systems, improving blackout preparedness, establishing onsite backup power at County buildings, and promoting outreach materials and incentives for battery storage and clean backup power systems.

GHG Reduction Potential:



Climate Resilience Benefit:



o-Benefits: Cost Savings, Energy Reliability, Social and Cultural Well-Being



INFRASTRUCTURE



STRATEGY 1 Resilient Roadway Network



STRATEGY 2 Resilient Transit System



STRATEGY 3 Low-Emission and Electric Vehicle Support



STRATEGY 4 Resilient and Clean Electrical Grid



STRATEGY 5 Water Efficiency and Conservation



STRATEGY 6 Green Infrastructure



STRATEGY 7 Reliable Broadband Connections

The majority of GHG emissions generated countywide are associated with infrastructure within the county. On-road transportation-related GHG emissions accounted for 62 percent of total GHG emissions in the county in 2019. Additionally, the supply of water and treatment of wastewater accounted for 1 percent of the county's 2019 GHG emissions.

Adopted State and federal regulatory actions will help to reduce these infrastructure-related GHG emissions 22 percent by 2030. However, additional local actions can help to further reduce emissions from this sector to align with State targets more closely.



Tuolumne County Transit Bus

Strategies and Measures

Because the majority of GHG emissions generated by activities throughout the county are associated with infrastructure, these sectors present the most significant opportunities to achieve emissions reductions. Implementing climate-smart initiatives focused on the county's transportation systems and utility (i.e., energy, water, and communications) services would result not only in substantial emissions reductions, but also improved climate resiliency. This section



Highway 49 in Tuolumne County

outlines infrastructure-related strategies and measures the County could implement to help achieve its climate change-related goals. Infrastructure measures are organized under seven strategies that aim to enhance the resilience of transportation and utility systems throughout the county and encourage climate-smart choices by residents and visitors. Each measure includes a score for GHG Reduction Potential and Climate Resilience Benefit and identifies associated co-benefits (explained further in **Chapter 5**).



Strategy 1. Resilient Roadway Network

Climate change is expected to increase the frequency and intensity of flood events in the county. Flooding threatens transportation infrastructure, which, if damaged, can pose risks to public health and safety. Building a resilient roadway network reduces impacts of flooding and protects the community from associated hazards.

Measure 1.1: Incorporate climate projections and considerations into future County infrastructure projects as part of the capital improvement projects process and update infrastructure design standards to incorporate future climate variables including extreme heat thresholds and changes in rainfall and large storm events (e.g., 100-year and 500-year storm events).

Actions that could be taken under this measure include modeling the intensity of large storm events in the future, identifying priority roadway improvement projects, assessing evacuation route capacity, prioritizing the protection of high-risk assets, and considering climate resilience in infrastructure procurement processes.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Cost Savings, Social and Cultural Well-Being



Strategy 2. Resilient Transit System



Nearly all of the GHG emissions associated with transportation in the county are generated from single-occupancy vehicles. Increasing the use of transit services as well as on-demand and vehicle-sharing services, instead of personal vehicles, reduces the community's transportation emissions, improves local air quality, and enhances quality of life.

Measure 2.1: Improve transit facilities to increase transit ridership.

Actions that could be taken under this measure include encouraging transit operators to update planning documents, enhancing transit shelters, supporting additional fixed route services, improving transit networks, and expanding the capacity of seasonal transit services.

GHG Reduction Potential:   

Climate Resilience Benefit:   

Co-Benefits: Air Quality, Cost Savings, Social and Cultural Well-Being

Measure 2.2: Work with Tuolumne County Transit Council and Tuolumne County Transportation Authority to convert its transit fleet to electric vehicles (EVs) and/or alternatively fueled vehicles, as they become available in the region.

Actions that could be taken under this measure include supporting TCT in transitioning its fleet to zero- and low-carbon vehicles and installing associated charging and fueling infrastructure.

GHG Reduction Potential:   

Climate Resilience Benefit:   

Co-Benefits: Air Quality, Cost Savings, Social and Cultural Well-Being

Measure 2.3: Increase the use of on-demand and vehicle-sharing services.

Actions that could be taken under this measure include expanding on-demand and vehicle-sharing services and increasing awareness of transportation alternatives through outreach.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Social and Cultural Well-Being



Strategy 3. Low-Emission and Electric Vehicle Support

The combustion of fossil fuels (i.e., gasoline, diesel) in vehicles produces GHG emissions. In the county, on-road vehicles driven by residents and visitors contribute 62 percent of all community emissions. Transitioning to EVs and other alternative low-emission fuels significantly reduces GHG emissions and improves local air quality.

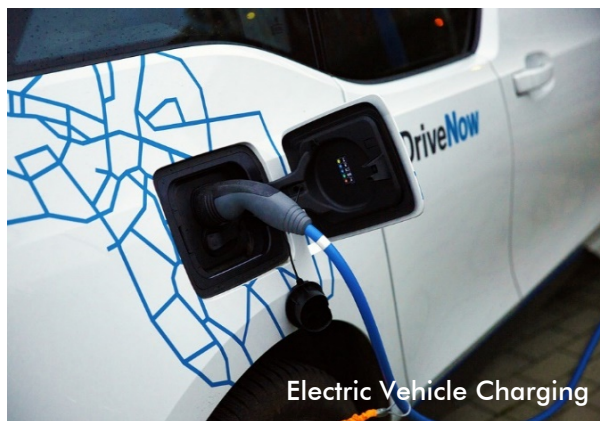
Measure 3.1: Support and encourage the adoption of low-emission vehicles and EVs.

Actions that could be taken under this measure include installing EV charging and alternative fuel stations, adopting an EV charging station ordinance, encouraging building owners and utility companies to install EV chargers, offering preferred parking for EVs, and promoting EVs through public outreach campaigns.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Social and Cultural Well-Being





Strategy 4. Resilient and Clean Electrical Grid

Electricity is a critical resource for the community, but electricity consumption is responsible for over one quarter of GHG emissions within the county. The electricity grid is vulnerable to climate change hazards such as wildfires and intense storm events, and electricity distribution is also threatened by increasingly common Public Safety Power Shutoffs (PSPSs). Increasing the use of clean electricity, improving grid reliability, and building energy independence reduces GHG emissions while strengthening community resilience to the effects of climate change.

Measure 4.1: ~~Transition to 100 percent clean electricity.~~ Incorporate the development and use of clean electricity into the electrical grid.

The State of California is transitioning to 100 percent clean energy, and therefore this CAP proposes the County take steps towards that goal. Actions that could be taken under this measure include increasing the development of renewable energy systems suitable for the county, incentivizing local clean energy production and infrastructure projects, and prioritizing climate resilience in energy and transmission systems planning.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Energy Reliability, Economic Diversity, Social and Cultural Well-Being

Measure 4.2: Reduce electricity grid demand through load reduction strategies.

Actions that could be taken under this measure include installing battery storage installations, utilizing smart grid and other peak load reduction technologies, developing microgrids, and working with utilities to improve electricity grid reliability.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Cost Savings, Energy Reliability, Economic Diversity, Social and Cultural Well-Being



Wind and Solar Energy



Strategy 5. Water Efficiency and Conservation

Water is a critical resource in the community, both for potable consumption and irrigation for agriculture. Climate change expected to increase the occurrence and duration of droughts in the county, which may threaten water supplies in the future. Conserving water and improving water efficiency benefits water users and builds the county's resilience to climate change.

Measure 5.1: Reduce water consumption.

Actions that could be taken under this measure include implementing water-smart landscaping, establishing and promoting conservation practices and standards, and implementing and enforcing existing management plans and programs aimed at reducing water consumptions.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Water Security, Cost Savings

Measure 5.2: ~~Increase~~ Promote the capture and use of recycled water and greywater.

Actions that could be taken under this measure include working with water providers to develop incentives for water recycling and encouraging agricultural operators to increase the use of recycled water for irrigation.

GHG Reduction Potential: 

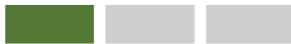
Climate Resilience Benefit: 

Co-Benefits: Water Security, Cost Savings

Measure 5.3: Increase operational efficiency and resilience of water and wastewater systems in response to climate change.



Actions that could be taken under this measure include supporting water agencies in preparing for long-term drought conditions, working with water utilities to develop renewable energy and backup battery storage systems, and encouraging water utilities to evaluate the feasibility of biogas generation at wastewater treatment plants.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Water Security, Energy Reliability, Social and Cultural Well-Being



Strategy 6. Green Infrastructure

Green infrastructure is an effective and economical approach to water management that protects, restores, or mimics the natural water cycle while enhancing community safety. Green infrastructure is an alternative to “gray infrastructure” (i.e., systems of gutters, pipes, and tunnels) that filters and absorbs stormwater where it falls through assets such as rain barrels, green roofs, protected open space, and greening steep hillsides. Implementing green infrastructure improves the community’s resilience to extreme storm impacts associated with climate change.

Measure 6.1: Increase the use of green infrastructure.

Actions that could be taken under this measure include adding green infrastructure to new buildings, identifying opportunities for green infrastructure in improvement projects, and developing guidelines for the inclusion of green infrastructure in transportation improvements.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Water Security, Cost Savings, Social and Cultural Well-Being, Carbon Sequestration

Measure 6.2: Update stormwater design requirements and the Stormwater Management Plan to expand the use of green infrastructure for stormwater management and reduce flood risk.

Actions that could be taken under this measure include assessing the feasibility of developing a Biochar and Soil Health Program, streamlining development review for green infrastructure-related projects, and educating residents about residential green infrastructure opportunities.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Water Security, Forest Resilience, Cost Savings, Biodiversity Conservation, Economic Diversity, Social and Cultural Well-Being, Carbon Sequestration

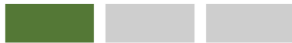


Strategy 7. Reliable Broadband Connections

Many of the more rural areas within the county lack access to adequate broadband internet. Today, internet access has evolved into a basic need and impacts nearly all facets of everyday life, including transportation, healthcare and emergency services, and education. Improving broadband reliability and accessibility improves quality of life and enhances community resilience.

Measure 7.1: ~~Strengthen~~ Maximize broadband grant opportunities to build infrastructure connections and access throughout the county, via middle-mile and last-mile projects.

Actions that could be taken under this measure include participating in and engaging with existing regional efforts and organizations to increase broadband deployment, supporting relevant State legislation, and encouraging residents to report broadband accessibility issues.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Social and Cultural Well-Being

Measure 7.2: Maximize opportunities for broadband infrastructure installations through construction projects.

Actions that could be taken under this measure include adopting policy to install underground broadband conduit in applicable construction projects as well as encouraging the inclusion of broadband infrastructure in new development proposals throughout the county.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Cost Savings, Social and Cultural Well-Being

AGRICULTURE & FORESTRY



STRATEGY 1 Livestock Management



STRATEGY 2 Energy-Efficient Agriculture



STRATEGY 3 Climate-Resilient Agriculture



STRATEGY 4 Biomass Conservation



STRATEGY 5 Water Conservation and Efficiency



STRATEGY 6 Forest Resiliency



STRATEGY 7 Economic Resilience

Tuolumne County Climate Action Plan

Livestock management, open burning, fertilizer application, pesticide use, and operation of agricultural equipment contribute to the agriculture and forestry sector of the county's GHG emissions. Most of this sector's emissions (88 percent) are generated by enteric fermentation and manure management. Livestock produce methane and nitrous oxide emissions through their digestion and the decomposition of manure. Open burning refers to agricultural and non-agricultural burning of vegetative matter, hazard reduction and ditch/road maintenance burning, and other burn activities that are permitted by the Tuolumne County Air Pollution Control District.



In 2019, the agriculture and forestry sector accounted for 14 percent of countywide GHG emissions. Emissions associated with this sector are projected to gradually decrease over the next several decades, as it is anticipated that more land will be converted to other uses in accordance with the County's General Plan. While land use changes will contribute to modest GHG emissions reductions, further local actions can help the County achieve additional emissions reductions. In addition, local efforts can be implemented to enhance the resilience of the county's agriculture and forestry operations to climate change.



Strategies and Measures

The agriculture and forestry sector offers opportunities for the County to achieve emissions reductions. This section outlines the strategies and measures the County could implement to reduce agriculture- and forestry-related GHG emissions. Many of these initiatives would result in both GHG emissions reductions as well as resilience benefits to agriculture and forestry operations within the county, and others focus solely on strengthening resilience in this sector. Measures are classified into seven strategies that focus on the various sources of emissions that will remain in the county without further local action and planning for long-term resilience to climate change impacts on agriculture and forestry operations. Each measure includes a score for GHG Reduction Potential and Climate Resilience Benefit and identifies associated co-benefits (explained further in **Chapter 5**).



Strategy 1. Livestock Management

Emissions from livestock, which are produced from digestion and manure decomposition, contribute nearly 13 percent of the county's GHG emissions and impact local ecosystems and natural resources. Implementing best practices reduces livestock-related emissions and improves the resilience of the agriculture sector to climate change impacts.

Measure 1.1: Implement best practices for livestock management.

Actions that could be taken under this measure include providing training and education to build capacity for local farmers, increasing the use of range management to restore meadows, and upholding traditional livestock grazing rights to manage vegetation and protect soil and water.

GHG Reduction Potential:

Climate Resilience Benefit:

Co-Benefits: Water Security, Cost Savings, Biodiversity Conservation, Social and Cultural Well-Being, Carbon Sequestration



Grazing Cattle



Strategy 2. Energy-Efficient Agriculture

The operation of fossil fuel-powered agricultural equipment generates GHG emissions in the county. Transitioning to low-carbon equipment increasing energy efficiency, and installing renewable energy systems improves energy independence and saves farmers money, bolstering the resilience of agricultural operations.

Measure 2.1: Transition to electric or alternatively fueled agricultural equipment, once it is practical and affordable to do so.

Actions that could be taken under this measure include converting all stationary fossil fuel-powered agricultural equipment to electric alternatives and using renewable diesel in diesel-powered equipment where electrification is infeasible.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Social and Cultural Well-Being

Measure 2.2: Implement agricultural best practices that improve energy efficiency.

Actions that could be taken under this measure include improving energy efficiency throughout agricultural operations, promoting energy and water efficiency, and installing onsite renewable energy systems.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Cost Savings, Energy Reliability



Strategy 3. Climate-Resilient Agriculture

Climate change is already impacting agricultural operations in the county, and future changes such as increasingly hot and dry growing seasons are expected to pose even greater threats to the agriculture industry. Farmers and ranchers can implement a variety of methods and practices to minimize the impacts of climate change on agricultural operations.

Measure 3.1: Implement agricultural best practices that improve resilience to climate impacts and increase the amount of locally produced food.

Actions that could be taken under this measure include reducing the use of synthetic fertilizers, adjusting planting plans and crop varieties, implementing cover crops and no-till methods, reducing water consumption from irrigation, and encouraging networking and educational resource sharing among agriculture producers.

GHG Reduction Potential:



Climate Resilience Benefit:



Co-Benefits: Air Quality, Cost Savings, Biodiversity Conservation, Economic Diversity, Social and Cultural Well-Being, Carbon Sequestration



Measure 3.2: Increase soil organic matter and carbon content.

Actions that could be taken under this measure include encouraging compost application, supporting regenerative farming systems, and pursuing innovative practices that increase carbon sequestration.

GHG Reduction Potential:



Climate Resilience Benefit:



Co-Benefits: Water Security, Cost Savings, Biodiversity Conservation, Economic Diversity, Carbon Sequestration



Strategy 4. Biomass Conservation

Trees, brush, agricultural biomass wastes, and other vegetative matter are burned in the county for several reasons, such as waste management from land conversion projects and creating defensible space. Conserving this biomass reduces GHG emissions, improves local air quality, and adds economic value.

Measure 4.1: ~~Reduce open burning (e.g., agricultural burning, backyard burning)~~ Utilize alternatives to open burning in agricultural and residential areas.

Actions that could be taken under this measure include reducing residential open burning through a local pick-up and delivery program, requiring repurposing of usable lumber removed due to land conversion, and promoting the development of value-added alternatives such as composting and energy generation.



GHG Reduction Potential:

Climate Resilience Benefit:

Co-Benefits: Air Quality, Forest Resilience, Cost Savings, Energy Reliability, Economic Diversity, Social and Cultural Well-Being

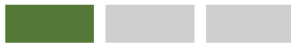


Strategy 5. Water Conservation and Efficiency

Irrigation for agriculture constitutes a significant portion of water consumption in the county. Climate change is expected to impact local and regional water supplies through increased precipitation volatility and increased frequency and duration of droughts. Conserving water and improving the efficiency of irrigation systems benefits agricultural operations and strengthens community resilience to water-related impacts of climate change.

Measure 5.1: Reduce water consumption for irrigation and agriculture.

Actions that could be taken under this measure include promoting water-efficient irrigation systems and technologies and facilitating the continued use of recycled wastewater for agricultural irrigation.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Water Security, Cost Savings, Economic Diversity



Strategy 6. Forest Resilience

Healthy forests provide direct benefits to the community, including wildfire and drought resilience, and they also play a role in mitigating climate change. Building the long-term resilience of forests in the county boosts public safety, improves local air quality, enhances water quality and supply, and increases carbon sequestration.

Measure 6.1: Improve long-term forest resilience.

Actions that could be taken under this measure include supporting existing organizations and projects that focus on forest health, creating a special assessment district to fund and maintain a fuel modification program to reduce wildfire risk, and assessing the feasibility of developing a Transfer of Development Rights program.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Water Security, Forest Resilience, Biodiversity Conservation, Economic Diversity, Carbon Sequestration

Measure 6.2: Increase forest resilience to wildfire and drought while protecting dense forest species.

Actions that could be taken under this measure include implementing sequential and mechanical thinning and prescribed burning, allowing the use of natural ignitions to treat landscapes with fire, designing fuel buffers and removing surface fuels, and restoring post-fire forested lands with climatically favorable species.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Air Quality, Forest Resilience, Biodiversity Conservation, Carbon Sequestration

Measure 6.3: Manage vegetation and reduce wildfire risk to promote sequestration.

Actions that could be taken under this measure include developing and implementing vegetation management programs that reduce wildfire risk, improve forest health, and enhance carbon storage in forests while providing alternative uses for biomass, as well as planting native trees in priority areas throughout the county.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Water Security, Forest Resilience, Energy Reliability, Biodiversity Conservation, Social and Cultural Well-Being, Carbon Sequestration





Strategy 7. Economic Resilience

Climate change impacts such as wildfires, increasing temperatures, and drier conditions will continue to impact businesses within the county, particularly in the agriculture industry. Proactive climate resilience planning benefits the local and regional economy and protects workers and business owners.

Measure 7.1: Support workers and businesses in preparing for climate change-related economic impacts on agriculture and forestry operations.

Actions that could be taken under this measure include developing a job skills training program for agriculture and forestry workers, educating local farmers and ranchers about the projected agriculture-related impacts of climate change, supporting ecotourism and agriculture tourism (agritourism), promoting farmland conservation, and supporting the development of regional biomass facilities.

GHG Reduction Potential: 

Climate Resilience Benefit: 

Co-Benefits: Forest Resilience, Cost Savings, Energy Reliability, Biodiversity Conservation, Economic Diversity, Social and Cultural Well-Being, Carbon Sequestration

Implementation and Monitoring



Cathedral Peak

This chapter outlines how the County will implement the climate action plan (CAP) measures and actions and describes the process for continuously assessing and monitoring progress over time to ensure the CAP is effective in reducing emissions and improving resilience to climate change. This chapter also provides potential funding sources for implementation and discusses greenhouse gas (GHG) emissions thresholds the County can use to guide future development.

Implementation Strategy

Effective implementation of this CAP will require ongoing management and oversight of measure implementation. To gauge progress over time, it will also require consistent updates to the County's GHG emissions inventory and vulnerability assessment. Ensuring that the measures identified in the CAP result in emissions reductions and resilience improvements is central to the success of this CAP. Achieving these goals will require investments and long-term commitments from the County as well as participation from County staff. The success of CAP implementation will also depend on the participation of residents, businesses, and other stakeholders in the county.

To help guide the implementation of CAP measures and actions, the County developed a workplan. This involved evaluating each action considering a variety of factors, including GHG reduction potential, climate resilience benefit, jurisdictional control, timeframe of implementation, technological feasibility, public and private cost-effectiveness, and associated co-benefits, to generate a prioritization score. After CAP adoption, the workplan and scores will help County staff determine which actions should be implemented and when which will contribute to the effectiveness of the CAP. The factors that were evaluated for prioritizing each action are described in further detail below.

PRIORITIZATION EVALUATION FACTORS

The following factors were used to develop a prioritization score for each CAP action.

- ▶ **GHG Reduction Potential** was evaluated qualitatively, and each action was assigned a score of 1, 2, or 3, which correspond to a low, medium, or high GHG reduction potential. This analysis was based on substantiated GHG reduction potential evidence combined with the magnitude of countywide GHG emissions reductions that would occur from implementation. In other words, if an action would be effective at reducing GHG emissions from an emissions source, but that source represents a small proportion of the county's total emissions, that action received a low score. For example, while **Agriculture and Forestry Action 2.1.1** would convert fossil fuel-powered agricultural equipment to electric equipment and significantly reduce GHG emissions associated with this source, the action received a score of 1 because this agricultural equipment accounts for less than 1 percent of countywide emissions. Conversely, because **Buildings Action 2.1.1** would effectively reduce fossil fuel energy use in buildings through an energy efficiency and clean energy retrofit program, it received a score of 3 due to the relatively large contribution of the GHG emissions source (i.e., fossil fuel use in buildings) to countywide emissions and the ability of the action to reduce these emissions.
- ▶ **Climate Resilience Benefit** was evaluated qualitatively, and each action was assigned a score of 1, 2, or 3, which correspond to a low, medium, or high climate resilience benefit. The scoring reflected each action's ability to improve community resilience to climate change impacts based on the county's vulnerability assessment, in conjunction with associated research and established best practices. For example, because increased wildfire due to climate change poses such a considerable threat to the county, **Health and Safety Action 4.1.1** scored a 3 due to its ability to improve wildfire preparedness and significantly reduce the risks associated with wildfire in the community. The threat and impacts of increased flooding in the community are relatively less significant, so **Infrastructure Action 6.2.2**, which would increase the use of green stormwater infrastructure, received a score of 1, even though it would reduce flood risk.
- ▶ **Jurisdictional Control** was rated on a scale of 1 to 3 and represents the County's ability to achieve the overall objective of an action. A score of 1 was assigned to actions where the County would only be able to influence—through encouragement, support, or similar effort—the success of the intended goal. Under **Conservation and Recreation Action 3.1.2**, for example, the County would encourage consumers to buy locally but would not regulate or control consumers' choices, so this action received a score of 1. When the County could require the desired outcome of an action through regulation and/or enforcement, a score of 2 was assigned. For example, **Health and Safety Action 4.2.4** received a score of 2, as it would result in the development of an ordinance requiring property owners to implement fuel reduction efforts. Actions that involved the County developing a program, creating a partnership, or engaging in a similar initiative also received this score, such as **Agriculture and Forestry Action 6.3.2**, which would involve the County developing a vegetation management program. Lastly, a score of 3 was given to actions where the County would have direct authority over implementation and control the success of the action. Most commonly, actions associated with County operations and municipal policies received this score, such as **Buildings Action 2.2.2**, which would install energy monitoring systems in County-owned

facilities. Some actions that involve the County conducting research or assessing feasibility also received a score of 3, such as **Conservation and Recreation Action 2.1.1**, where the County would evaluate the impacts of increased tourism and visitation on the region.

- ▶ **Timeframe of Implementation** was assessed qualitatively, and each action was given a rating of 1, 2, or 3, which represent long-term, mid-term, and near-term timeframes of implementation. The score assigned to each action depended on how much time it would take for an action to be implemented, with the scoring favoring those that could be implemented quickly. Actions that involve the County encouraging or supporting initiatives received a score of 1 because of the ease of implementation, while those that would require the County to develop and implement a program or install infrastructure received a score of 2. Actions that aim to achieve long-term goals, such as restoring meadows and wetlands, received a score of 1.
- ▶ **Technological Feasibility** scoring was determined for each action based on the availability of necessary technology, equipment, or resources for successful implementation and achievement of the action's intended goal. Actions received a score of 1 or 2, which correspond to limited availability and widespread availability of technology needed for implementation. Most actions received a score of 2. A score of 1 was assigned to actions where technological and/or development would be required, such as for **Infrastructure Action 6.2.1**, which would involve developing a biochar program.
- ▶ **Cost-Effectiveness** was evaluated qualitatively, and each action received a score of 0 or 1 for either County cost-effectiveness or private (i.e., residents and businesses) cost-effectiveness, depending on the applicability of the action. Actions that would primarily result in impacts to County budgets were rated for County cost-effectiveness. For example, **Buildings Action 3.1.4** would establish onsite backup power at County facilities and therefore was evaluated for County cost-effectiveness. A score for private cost-effectiveness was assigned to actions that would primarily impact residents and/or businesses. **Health and Safety Action 2.3.4**, for example, would provide incentives for purchasing electric landscaping equipment to residents and business owners, so private cost-effectiveness was evaluated. A score of 0 was assigned where costs may outweigh benefits or balance with benefits, and a score of 1 was assigned where benefits would outweigh costs.
- ▶ **Co-benefits** evaluated include improvements to air quality, water security, forest resilience, cost savings, energy reliability, biodiversity conservation, economic diversity, social and cultural well-being, and carbon sequestration. A score of 1 was given for each co-benefit that would result from action implementation (i.e., maximum score of 9). Co-benefits are described in more detail in **Chapter 1**.

Workplan

Based on the assessment approach described above, the maximum prioritization score for each action was 25. To enable the County to focus on and feasibly implement high-priority actions, a minimum score of 15 was chosen as the threshold for the inclusion of an action in the CAP. The ~~29~~ 30 actions with prioritization scores greater than 15 are included in the summarized workplan below, which presents each action’s overall prioritization score, the agency responsible for implementation, and the recommended timing for implementation (i.e., ongoing – already occurring, near-term – within three to five years, or mid-term – within 10 years), which is based on the two previous factors above as well as additional considerations such as community values and priorities that may not be reflected elsewhere. The full workplan with all factor scores can be found in Appendix C. Details regarding monitoring, ongoing engagement, potential funding sources, and GHG emissions thresholds are included in the sections following the workplan.

Measure	Action	Timing	Implementing Agency	Prioritization Score
HEALTH AND SAFETY				
STRATEGY 4. FIRE-ADAPTED COMMUNITY				
Measure 4.2: Increase the use of defensible space strategies to reduce wildfire property damage for properties located in high-wildfire risk zones in the county using guidance and requirements pursuant to Assembly Bill (AB) 3074 of 2020 (Fire Prevention).	Action 4.2.1. Continue to support the Tuolumne County Fire Department (TCFD) Fire Safety Inspection Program and the Tuolumne FireSafe Council’s fuel break projects and education and outreach efforts regarding defensible space strategies.	Ongoing	Fire Department, Office of Emergency Services	15

Measure	Action	Timing	Implementing Agency	Prioritization Score
CONSERVATION AND RECREATION				
STRATEGY 1. ECOSYSTEM PRESERVATION AND CONSERVATION				
Measure 1.1: Enhance the protection of the county's natural assets and ecosystems and expand natural capital throughout the county, while building climate resilience in the environment.	Action 1.1.1. Support Yosemite Stanislaus Solutions, Tuolumne River Trust, and other stakeholder organizations in their efforts to protect and enhance the county's natural environment and improve climate resilience.	Ongoing	County Administration Office, Office of Emergency Services	17
	Action 1.1.2. Protect and restore river basins, watersheds, and ecosystems.	Ongoing	Community Development Department	15
Measure 1.3: Conserve areas, such as wildlife habitat and corridors, wetlands, and watersheds that provide carbon sequestration benefits.	Action 1.3.1. Within identified communities, retain oak woodland habitat as much as practical. Efforts could include incorporating oak woodland into landscaped or public spaces to enhance project site aesthetics, using oak woodlands as visual buffers between land uses, and using oak woodland habitat to maintain slopes and reduce onsite runoff.	Ongoing	Community Development Department	17
BUILDINGS				
STRATEGY 1. ENERGY-EFFICIENT BUILDINGS AND RESILIENT NEW BUILDINGS				
Measure 1.1: Increase energy efficiency and climate resiliency in all new buildings.	Action 1.1.1. Explore building "reach" codes that include energy efficiency measures that go beyond State requirements for new construction.	Near-term	Community Development Department	15
Measure 1.2: Require all new County-owned buildings and facilities to be energy efficient and climate resilient.	Action 1.2.1. Establish a policy to require new County buildings to be constructed to meet a high energy efficiency standard such as the California Green Building Standards Code (CalGREEN).	Near-term	County Administration Office, Community Development Department	16

Measure	Action	Timing	Implementing Agency	Prioritization Score
STRATEGY 2. ENERGY-EFFICIENT AND RESILIENT EXISTING BUILDINGS				
Measure 2.1: Increase energy efficiency and climate resiliency in existing residential and nonresidential buildings.	Action 2.1.1. Partner with energy utility providers, building contractors, and other stakeholders to implement an Energy-Resilient Buildings Program modeled after a Regional Energy Network program that focuses on energy efficiency retrofits, improving climate-control (cooling), wildfire smoke and ventilation systems, and energy independence in existing buildings.	Near-term	Community Development Department, Innovation and Business Assistance Department	19
	Action 2.1.2. Facilitate conversations with homeowners, landlords, and tenants about energy conservation, energy efficiency best practices, green infrastructure, and anticipated monetary savings associated with retrofitting buildings.	Near-term	Community Development Department	15
	Action 2.1.3. <u>Work with non-profit and community action groups to</u> P prioritize low-income homeowners and renters as part of the Energy-Resilient Buildings Program and provide information and educational materials to residents focused on cost-effective strategies to keep homes cool during extreme heat events (i.e., four or more consecutive days when the maximum temperature is above 88.6 °F).	Near-term	Community Development Department, Office of Emergency Services	15
Measure 2.2: Require all existing County-owned buildings and facilities to be energy efficient and climate resilient.	Action 2.2.1. Conduct detailed assessments and develop retrofit plans specific to each existing County-owned building based on the age, type, energy consumed, and climate-related risks. Prioritize buildings and facilities with the highest energy use per area. Seek grant funding for energy efficiency upgrade projects in order to significantly upgrade the energy efficiency of at least 25 percent of County facilities within 10 years.	Mid-term	Community Development Department, County Administration Office	15

Measure	Action	Timing	Implementing Agency	Prioritization Score
INFRASTRUCTURE				
STRATEGY 4. RESILIENT AND CLEAN ELECTRICAL GRID				
Measure 4.1: Transition to 100 percent clean electricity. Incorporate the development and use of clean electricity into the electrical grid.	Action 4.1.1. Where feasible, develop renewable energy generation capacity at County-owned buildings and facilities.	Mid-term	County Administrative Office, Community Development Department	15
	Action 4.1.2. Encourage development of alternative energy-producing facilities that conserve the county's natural resources such as rooftop solar and wind turbines, <u>as well as emerging battery technologies and the use of green hydrogen.</u>	Near-term	Community Development Department, Public Works Department	16
	Action 4.1.3. Adopt a community solar program to help realize economies of scale and help residents without appropriate rooftop space to participate in green energy generation.	Near-term	Community Development Department, Public Works Department	17
	Action 4.1.4. Encourage energy development and transmission systems planning that prioritizes climate resilience, efficiency, and local benefit.	Mid-term	Community Development Department, County Administration Office	15
	Action 4.1.5. Provide <u>Seek</u> incentives for clean energy infrastructure and community-based energy projects, prioritizing local renewable energy production.	Mid-term	Community Development Department, County Administration Office	17
	Action 4.1.6. The County will coordinate with regional economic partners, such as the Sierra Business Council, to pursue grant funding to analyze and identify a minimum of four potential cost-effective and feasible sites for the establishment of new solar farms, wind farms, or similar clean power energy sites within Tuolumne County <u>on County-owned property.</u>	Mid-term	County Administrative Office, Community Development Department	16
Measure 4.2: Reduce electricity grid demand	Action 4.2.1. Encourage installation of battery storage in conjunction with renewable energy generation projects through engagement campaigns and partner agency incentives.	Near-term	Community Development Department, Office of Emergency Services	16

Tuolumne County Climate Action Plan

Measure	Action	Timing	Implementing Agency	Prioritization Score
through load reduction strategies.	Action 4.2.2. <u>Work with Pacific Gas & Electric Company to assess the feasibility and cost effectiveness of microgrid technologies to increase energy independence for County operations, businesses, and residents during Public Safety Power Shutoff events.</u>	Near-term	County Administration Office, Office of Emergency Services	15
STRATEGY 6. GREEN INFRASTRUCTURE				
Measure 6.1: Increase the use of green infrastructure in County projects.	Action 6.1.1. <u>As feasible, integrate green infrastructure to be integrated</u> into all new County-owned buildings and facilities.	Mid-term	County Administration Office, Public Works Department	15
AGRICULTURE AND FORESTRY				
STRATEGY 1. LIVESTOCK MANAGEMENT				
Measure 1.1: Implement best practices for livestock management.	Action 1.1.1. Work with the County Agricultural Commissioner's office to facilitate forums, training sessions, and capacity-building activities for local farms to continue to implement <u>reasonable</u> manure management best practices.	Near-term	Agricultural Commissioner	15
	Action 1.1.2. Uphold traditional livestock grazing rights to manage vegetation, protect soil and water, and protect the stability of the communities that depend on range resources.	Near-term	Agricultural Commissioner, Farm Advisor	16
STRATEGY 2. ENERGY-EFFICIENT AGRICULTURE				
Measure 2.2: Implement agricultural best practices that improve energy efficiency.	Action 2.2.1. Promote energy conservation; increased energy and water use efficiency; and on-farm solar, wind, and other renewable energy production.	Near-term	Agricultural Commissioner, Community Development Department	16
STRATEGY 3. CLIMATE-RESILIENT AGRICULTURE				
Measure 3.1: Implement agricultural best practices that improve resilience to	Action 3.1.1. Encourage mapping of existing crop varieties against future climate projections such as extreme heat, drought, and flood risk. Adjust varieties to address those future conditions, selecting species	Near-term	Agricultural Commissioner, Farm Advisor	16

Tuolumne County Climate Action Plan

Measure	Action	Timing	Implementing Agency	Prioritization Score
<u>climate impacts and increase the amount of locally produced food.</u>	that are native, drought-tolerant, and adapted to extreme heat.			
	Action 3.1.2. Encourage networking among <u>local</u> agriculture producers to share resources, tools, and knowledge about sustainable, efficient, and resilient agricultural practices.	Near-term	Agricultural Commissioner, Innovation and Business Assistance Department	17
Measure 3.2: Increase soil organic matter and carbon content.	Action 3.2.1. Develop programs to encourage compost application to enhance soil for carbon sequestration and healthy farms. Utilize existing programs and resources from the California Department of Food and Agriculture’s Healthy Soils Program.	Mid-term	Agricultural Commissioner, Farm Advisor	17
	Action 3.2.2. Support regenerative farming systems that use perennial groundcover, rotational grazing systems, and other natural approaches to increase crop diversity and improve soil health and soil organic matter, while ensuring fair incomes for farmers.	Near-term	Agricultural Commissioner, County Administration Office	18
	Action 3.2.3. Encourage farmers and other key stakeholders to pursue innovative agricultural practices that increase the amount of carbon that is removed from the air and stored in soils and working lands.	Near-term	Agricultural Commissioner	16
STRATEGY 6. FOREST RESILIENCE				
Measure 6.1: Improve long-term forest resilience.	Action 6.1.1. Continue to support existing projects and organizations including Yosemite Stanislaus Solutions to ensure the long-term health of forests in areas under the County’s jurisdiction, as well as areas managed by State and federal agencies. Balance and integrate fuel modification efforts with habitat and open space management, vegetative soil cover/erosion management, and urban greening to reduce the potential for conflicts between safety and environmental goals.	Ongoing	Fire Department, Community Development Department	17

Tuolumne County Climate Action Plan

Measure	Action	Timing	Implementing Agency	Prioritization Score
Measure 6.3: Manage vegetation and reduce wildfire risk to promote sequestration.	Action 6.3.1. Implement a vegetation management program to reduce wildfire risk and improve forest health.	Mid-term	Fire Department, Community Development Department	15
	Action 6.3.2. Develop vegetation management programs that support enhanced carbon storage in forests, use of durable wood products, and use of wood biomass for energy, while maintaining healthy forest ecosystems.	Mid-term	Fire Department, Community Development Department	15

California Environmental Quality Act

The Tuolumne County Board of Supervisors recommended the CAP be developed without meeting the California Environmental Quality Act (CEQA) Guidelines Section 15183.5. A CAP that meets this section of the State CEQA Guidelines is considered a “qualified” CAP, which can be used for tiering and streamlining abilities of future discretionary development projects’ GHG analyses. In other words, a “qualified” CAP would allow projects requiring CEQA review to demonstrate that, if they have included all measures from the CAP that apply to new development (e.g., renewable energy installations, electric vehicle charging infrastructure), the associated GHG emissions would be less than significant based on its consistency with the CAP. Although this CAP was not developed with the intention to provide tiering and streamlining of CEQA GHG analyses, the CAP still serves as an important policy document with actions to reduce GHG emissions from local activities.

Rather than developing the CAP to meet the criteria of Section 15183.5 of the State CEQA Guidelines, thresholds of significance have been developed for use by new projects when undergoing environmental review. The following table shows efficiency thresholds that were developed using the County’s GHG inventory, forecasts, and targets that are aligned with State reduction goals. Projects could use these efficiency thresholds to determine significance for GHG analyses in CEQA documents based on the project’s anticipated operational year.

GHG Emissions Efficiency Thresholds

	2030	2040	2050
Target emissions from new development (MTCO ₂ e)	19,617	23,676	17,316
Efficiency threshold for new development (MTCO ₂ e/SP)	3.84	2.43	1.20
Efficiency threshold for new development (MTCO ₂ e/capita)	4.72	2.98	1.48
Efficiency threshold for new development (MTCO ₂ e/employee)	20.70	13.09	6.48

Notes: GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent; SP = service population.

Source: Ascent Environmental 2021.

Monitoring and Updates

The County will begin implementing CAP measures and actions upon adoption, and data tracking will begin in the year following, including new clean energy installations, EV charging infrastructure, resource consumption (e.g., water), among others. As measures are implemented, the effects on emissions trends and climate resilience in the county will ~~necessitate CAP maintenance and updates to ensure relevancy and effectiveness~~ be incorporated into the approved CAP, as this is a “living” document that will be updated as changes in State law occur, as well as in response to any local actions. This ensure that the CAP remains relevant and effective. Therefore, County staff will need to evaluate and monitor CAP performance over time and may alter or amend the plan if it is not achieving the desired outcomes. This will include conducting periodic GHG emissions inventory and vulnerability assessment updates, as well as analyzing individual action performance. Grants will be used as much as possible to fund the

implementation of the CAP, including the emissions inventory updates. A preliminary summary of available funding and financing options is presented in Table 5-1.

For action items that are implemented after adoption of the CAP, County staff will evaluate the performance of each action that has been implemented and success of the measure. This entails monitoring the level of community participation, costs, benefits, effectiveness, and barriers to implementation, as well as actual reductions in activities that result in GHG emissions. Assessing the performance of CAP actions focused on climate adaptation will be informed by resilience-related improvements in the community. By evaluating whether the implementation of a action is on track to achieve its objective, the County can identify successful actions and reevaluate or replace underperforming measures.

County staff will prepare monitoring reports and refine the community GHG emissions inventory and vulnerability assessment in alignment with updates to the County Board of Supervisors' Strategic Plan. The timing of the updates of the inventory would depend on the action items that are implemented. Updating an emissions inventory too frequently may not capture the impact of an action. Frequent emissions inventory updates may not show progress towards the County's GHG targets, as it will take time for GHG reductions to be reflected in future inventories.

Additionally, inventories will include wildfire emissions as it is expected that availability of local and regional data will developed over time. These report will provide updates on CAP progress, including the status of actions implemented to achieve GHG reductions and improve resilience as well as other important milestones in the CAP implementation process, and serve to provide policy direction and prioritization to the Board of Supervisors. As technologies and markets change and the County implements the actions in the CAP, these reports will be used to track progress and identify actions that need to be improved, adjusted, or removed. The report will also be used for periodic presentations to the County Board of Supervisors about implementation progress on actions and overall progress towards CAP objectives. The report would also serve to provide transparency and promote engagement with the public for CAP implementation. Resources devoted to ongoing monitoring will be calculated and dedicated in conjunction with the Board of Supervisors Strategic Planning process and priorities.

Finally, the County will aim to prepare a CAP update every five years, beginning in 2027. CAP updates would reflect the findings and recommendations of the monitoring reports and inventory updates. Future CAP updates are necessary to account for any new State or federal legislation that may affect the CAP, and to focus on GHG reduction measures and actions that may have been difficult to implement previously due to a lack of available technologies or high upfront implementation costs.

Ongoing Engagement

Continued engagement with and active participation by the community is critical for successful implementation of the CAP. As the County implements and monitors CAP measures, involvement with residents and businesses, community organizations, developers, property owners, and other local, regional, and State agencies will ultimately guide the County's measure implementation and promote achievement of CAP objectives. While a handful of mitigation

strategies will be led solely by the County, many measures will require partnerships and collaboration.

Effective and long-term climate action and resilience building in the community depends on efforts that continue to change the way individuals interact with the environment. Numerous measures require participation from residents and visitors to fully implement, and the County is committed to continuing its outreach efforts through CAP implementation, monitoring, and future CAP updates. Many of the measures in **Chapter 4** are focused on increasing community awareness and participation in existing programs and connecting the community with new information, tools, funding, or resources.

Vulnerable populations typically experience disproportionate impacts of climate change relative to the rest of the community. Following CAP adoption, addressing some of these climate inequities in the form of more prominent engagement with vulnerable communities will be of utmost priority. The County is committed to overcoming the barriers of engagement with frontline communities, such as lack of access to technology and language barriers, to ensure a more equitable implementation process.

Funding Sources

The County will incur costs to implement some of the measures included in the CAP. These include initial start-up, ongoing administration, staffing, and costs associated with the enforcement of any future ordinances that the Board of Supervisors may adopt~~costs~~. While some measures will only require funding from the County and other public entities, others would result in increased costs for businesses, developers, and residents. However, implementation of CAP measures will result in substantial cost-savings for the County, residents, and business owners in the long term. The County will be proactive in seeking cost-effective implementation and strategic funding opportunities and developing partnerships to lessen the burden of implementation costs.

Capital improvement, investment, and increased operation and maintenance costs will be required for successful CAP implementation. Funding options are available from a variety of sources, including the County funds, local utilities, and regional and State agencies. The County will continuously monitor private and public funding sources for new grant and rebate opportunities. A preliminary summary of available funding and financing options is presented in **Table 5-1**.

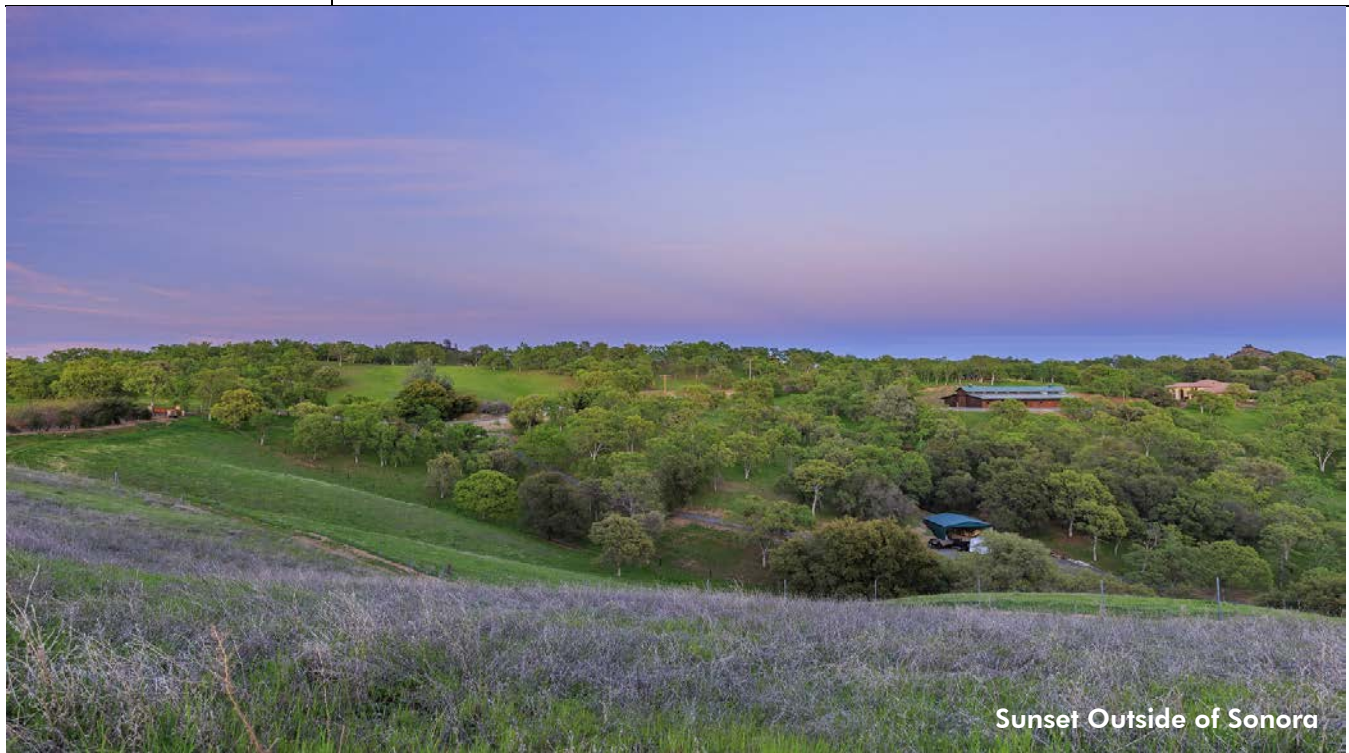
The funding sources and programs listed below are subject to change. Aside from seeking the listed funding sources, the County should continue to search for new funding sources through the State's [Climate Change Funding Wizard](#) website, which provides the most up-to-date information on funding opportunities for projects related to climate change mitigation and adaptation.

Table 5-1 Funding Opportunities for Implementation

Residential and Nonresidential Energy	
PG&E and TPPA Rebates and Incentives Program	PG&E and TPPA, the two main energy providers in the county, offer a variety of energy efficiency programs such as free energy audits designed to help residential and nonresidential customers save energy and money.
California Energy Commission 1 Percent Interest Rate Loans	The California Energy Commission offers 1 percent loans for local jurisdictions to conduct projects with proven energy savings at municipal facilities.
California Lending for Energy and Environmental Needs Center	This funding source, as a program of California Infrastructure and Economic Development Bank, provides direct public financing to municipalities, universities, schools, and hospitals to help meet the state's goals for GHG reductions, water conservation, and environmental preservation.
GRID Alternatives	GRID Alternatives is a nonprofit organization that provides no-cost solar installations to low-income residents and provides assistance for communities in developing multifamily and community-scale solar installations. The organization also provides hands-on job training for volunteers interested in employment in the solar industry.
Low-Income Weatherization Program	Administered by the California Department of Community Services and Development, the Low-Income Weatherization Program provides low-income households with solar photovoltaic (PV) systems and energy efficiency upgrades at no cost to residents. The program is designed with the primary goal of reducing GHG emissions by saving energy and generating clean renewable energy while reducing energy costs for low-income single-family households and multi-family affordable housing.
Transportation and Land Use	
Caltrans Active Transportation Planning Program	This program provides competitive planning grants for jurisdictions working on planning projects to increase the proportion of trips accomplished by biking and walking and reduce community-wide vehicle miles traveled.
Caltrans Transportation Planning Grant Program	The Transportation Planning Grant Program provides competitive planning grants to help local jurisdictions in a variety of transportation planning efforts including development and implementation of regional transportation plans. The program also helps address multimodal transportation deficiencies with a focus on transit and support planning actions that advance climate adaptation efforts for local transportation systems.
California Clean Vehicle Rebate Project	This California Air Resources Board program provides rebates of up to \$7,000 for the purchase or lease of a new, eligible zero-emission or plug-in hybrid light-duty vehicle.
PG&E California Clean Fuel Reward Program and Empower EV Program	Through PG&E's participation in the California Clean Fuel Reward Program, customers can receive an upfront incentive worth up to \$1,500 on new EV purchases or leases. PG&E also offers incentives of up to \$2,500 per income-eligible single-family household to help cover the cost of purchasing and installing EV charging equipment through the Empower EV Program.

Transportation and Land Use	
Affordable Housing and Sustainable Communities Program	This program, administered by the California Department of Housing and Community Development, funds land use, housing, transportation, and land preservation projects that support infill and compact development and reduce GHG emissions. Funds are available in the form of loans and/or grants in two kinds of project areas: Transit-Oriented Development Project Areas and Integrated Connectivity Project Areas.
SB 2 Planning Grant Program	This planning grant program provides financial and technical assistance to local governments to update planning documents and zoning ordinances, including general plans, community plans, specific plans, sustainable communities strategies, and local coastal programs, to streamline housing production. The program does not use a competitive process to award funds. All localities that meet the eligibility requirements outlined in the grant application will be funded.
Strategic Growth Council Affordable Housing and Sustainable Communities Program	This program makes it easier for Californians to drive less by making sure housing, jobs, and key destinations are accessible by walking, biking, and transit. Program funding can be used for affordable housing development, sustainable transportation infrastructure and related amenities that reduce vehicle miles traveled, and programs to encourage an increase in modes of active transportation.
Urban Greening Program	Urban Greening Program will fund projects that reduce greenhouse gases by sequestering carbon, decreasing energy consumption, and reducing vehicle miles traveled, while also transforming the built environment into places that are more sustainable, enjoyable, and effective in creating healthy and vibrant communities. These projects will establish and enhance parks and open space, using natural solutions to improve air and water quality, reduce energy consumption, and create more walkable and bike-able trails.
Volkswagen (VW) Environmental Mitigation Trust	The VW Environmental Mitigation Trust provides about \$423 million for California to mitigate the excess nitrogen oxide emissions caused by VW's use of illegal emissions testing defeat devices in certain VW diesel vehicles. The trust provides funding opportunities for specified eligible actions that are focused mostly on "scrap and replace" projects for the heavy-duty sector, including on-road freight trucks, transit and shuttle buses, school buses, forklifts and port cargo handling equipment, commercial marine vessels, and freight switcher locomotives.
Solid Waste	
CalRecycle Food Waste Prevention and Rescue Grant Program	The purpose of this competitive grant program is to reduce overall GHG emissions by establishing new or expanding existing food waste prevention projects (source reduction or food rescue for people) in California to reduce the amount of food being disposed of in landfills.
CalRecycle Local Enforcement Agency Grant Program	CalRecycle administers a non-competitive grant program to assist local enforcement agencies with their solid waste facilities permit and inspection program.
General Funding and Staff Capacity	
CivicSpark Program	The CivicSpark Program supports sustainability-focused research, planning, and implementation projects throughout California by providing public agencies and other organizations with high-quality capacity-building support. This 11-month AmeriCorps program employs highly motivated emerging sustainability professionals.

General Funding and Staff Capacity	
California Climate Investments	California Climate Investments is a statewide initiative that provides funds from the state's cap-and-trade program for projects and programs that work to reduce GHG emissions in the state. Funds from California Climate Investments can go to support a variety of projects, including affordable housing, renewable energy, public transportation, zero-emission vehicles, environmental restoration, sustainable agriculture, and recycling. Numerous state programs already itemized above are funded by California Climate Investments; however, the program continues to evolve and is updated by the state periodically to include new or modified programs.
Local Early Action Planning (LEAP) Grants	LEAP provides one-time grant funding to cities and counties to update their planning documents and implement process improvements that will facilitate the acceleration of housing production and help local governments prepare for their 6th cycle Regional Housing Needs Assessment, much like the SB 2 Planning Grants.
Regional Early Action Planning (REAP)	REAP allows councils of governments and other regional entities to collaborate on projects that have a broader regional impact on housing. Grant funding is intended to help regional entities and governments facilitate local housing production that will assist local governments in meeting their Regional Housing Need Allocation.
Sustainable Transportation Equity Project (STEP)	STEP is a new transportation equity pilot that aims to address community residents' transportation needs, increase access to key destinations, and reduce greenhouse gas emissions by funding planning, clean transportation, and supporting projects. STEP's overarching purpose is to increase transportation equity in disadvantaged and low-income communities throughout California via two types of grants: Planning and Capacity Building Grants and Implementation Grants. Within these two grant types, CARB currently has up to \$22 million available.
	Source: Compiled by Ascent Environmental in 2021.



Works Cited

Introduction

- California Air Resources Board. 2008 (December). *Climate Change Scoping Plan: A Framework for Change*. Available: https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/document/adopted_scoping_plan.pdf. Accessed May 5, 2021.
- . 2017 (January). *The 2017 Climate Change Scoping Plan Update: The Strategy for Achieving California’s 2030 Greenhouse Gas Target*. Available: https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf. Accessed May 5, 2021.
- . 2020. *California Greenhouse Gas Emissions for 2000 to 2018: Trends of Emissions and Other Indicators*. Available: https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2018/ghg_inventory_trends_00-18.pdf. Accessed May 5, 2021.
- California Governor’s Office of Emergency Services. 2020. *California Adaptation Planning Guide*. Available: <https://www.caloes.ca.gov/HazardMitigationSite/Documents/APG2-FINAL-PR-DRAFTAccessible.pdf>. Accessed May 12, 2021.
- California Governor’s Office of Planning and Research, California Energy Commission, and California Natural Resources Agency. 2018a. *California’s Fourth Climate Change Assessment Report: State Summary Report*. Available: https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf. Accessed May 6, 2021.
- . 2018b. *California’s Fourth Climate Change Assessment Report: Sierra Nevada Region Report*. Available: https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-004_SierraNevada_ADA.pdf. Accessed May 6, 2021.
- CalOES. See California Governor’s Office of Emergency Services.
- Intergovernmental Panel on Climate Change. 2018. *Special Report: Global Warming of 1.5°C: Summary for Policymakers*. Available: <https://www.ipcc.ch/sr15/chapter/spm/>. Accessed May 2, 2021.
- . 2021 (August). *Climate Change 2021: The Physical Science Basis: Summary for Policy Makers*. Available: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf. Accessed September 10, 2021.
- IPCC. See Intergovernmental Panel on Climate Change.

OPR, CEC, and CNRA. See California Governor's Office of Planning and Research, California Energy Commission, and California Natural Resources Agency.

Greenhouse Gas Emissions Inventory, Forecasts, and Targets

California Air Resources Board. 2022. Frequently Asked Questions: Wildfire Emissions.

Available:

<https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/Wildfire%20Emissions%20FAQ%202022.pdf>. Accessed October 21, 2022.

California Governor's Office of Planning and Research. 2022. Fire Hazard Planning Technical Advisory. Available: https://opr.ca.gov/docs/20220817-Fire_Hazard_Planning_TA.pdf.
Accessed October 21, 2022.

CARB. See California Air Resources Board.

EPA. See U.S. Environmental Protection Agency.

ICLEI – Local Governments for Sustainability. 2019. *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*. Version 1.2.

Intergovernmental Panel on Climate Change. 2013. *Fifth Assessment Report. Chapter 8, Anthropogenic and Natural Radiative Forcing*. Available:
http://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf.
Accessed May 20, 2021.

OPR. See California Governor's Office of Planning and Research.

Tuolumne County Transportation Council. 2012. *Tuolumne County Regional Blueprint Greenhouse Gas Study*.

United Nations. 2015. Paris Agreement. Available:
https://unfccc.int/sites/default/files/english_paris_agreement.pdf. Accessed May 23, 2021.

U.S. Environmental Protection Agency. 2021. Greenhouse Gas Equivalencies Calculator. Available: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>. Accessed May 15, 2021.

Climate Change Adaptation and Resilience

CalEMA and CNRA. See California Emergency Management Agency and California Natural Resources Management Agency.

California Department of Food and Agriculture. 2013. Climate Change Consortium for Specialty Crops: Impacts and Strategies for Resilience. Available:
<https://www.cdffa.ca.gov/environmentalstewardship/pdfs/ccr-report.pdf>. Accessed February 19, 2021.

- California Department of Forestry and Fire Protection. 2020. *2020 Strategic Fire Plan*. Accessed February 21, 2021.
- California Emergency Management Agency and California Natural Resources Management Agency. 2012. *California Adaptation Planning Guide: Planning for Adaptive Communities*. Available: https://resources.ca.gov/CNRALegacyFiles/docs/climate/01APG_Planning_for_Adaptive_Communities.pdf. Accessed February 2, 2021.
- California Energy Commission. 2021a. Cal-Adapt Annual Averages Tool. Available: <https://cal-adapt.org/tools/annual-averages>. Accessed February 19, 2021.
- . 2021b. Cal-Adapt Extreme Heat Tool. Available: <https://cal-adapt.org/tools/extreme-heat>. Accessed February 19, 2021.
- . 2021c. Cal-Adapt Wildfire Tool. Available: <https://cal-adapt.org/tools/wildfire>. Accessed February 19, 2021.
- . 2021d. Cal-Adapt Extreme Precipitation Tool. Available: <https://cal-adapt.org/tools/extreme-precipitation>. Accessed February 20, 2021.
- . 2021e. Cal-Adapt Snowpack Tool. Available: <https://cal-adapt.org/tools/snowpack>. Accessed February 19, 2021.
- . 2021f. Cal-Adapt Extended Drought Scenario Tool. Available: <https://cal-adapt.org/tools/extended-drought>. Accessed February 20, 2021.
- California Governor's Office of Emergency Services. 2020. *California Adaptation Planning Guide*. Available: <https://www.caloes.ca.gov/HazardMitigationSite/Documents/APG2-FINAL-PR-DRAFTAccessible.pdf>. Accessed February 12, 2021.
- California Governor's Office of Planning and Research, California Energy Commission, and California Natural Resources Agency. 2018a. *California's Fourth Climate Change Assessment Report: State Summary Report*. Available: https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf. Accessed May 6, 2021.
- . 2018b. *California's Fourth Climate Change Assessment Report: Sierra Nevada Region Report*. Available: https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-004_SierraNevada_ADA.pdf. Accessed May 6, 2021.
- CalOES. See California Governor's Office of Emergency Services.
- County of Tuolumne. 2012 (July). *Emergency Operations Plan from Tuolumne County*. Accessed February 11, 2021.
- . 2017 (December). *Tuolumne County Multi-Jurisdictional Hazard Mitigation Plan*. Available: <https://www.tuolumnecounty.ca.gov/DocumentCenter/View/8045/TuolumneLHMP2018?bidId=>. Accessed January 29, 2021.
- . 2018 (August). *Tuolumne County General Plan. Volume II: Technical Background Report*. Accessed February 1, 2021.

———. 2020 (June). *Tuolumne County Fire Safety Report: Are We Ready?* Available: <https://www.tuolumnecounty.ca.gov/DocumentCenter/View/14793/Tuolumne-County-Fire-Safety-Report>. Accessed February 6, 2021.

CDFA. See California Department of Food and Agriculture.

Halofsky, J.E., Peterson, D.L., Buluc, L., and Ko, J. [in press]. *Climate change vulnerability and adaptation for infrastructure and recreation in the Sierra Nevada: General Technical Report*. PSW-GTR-2xx. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. Accessed February 19, 2021.

National Oceanic and Atmospheric Administration. 2021 (June). Drought Conditions for Tuolumne County. Available: <https://www.drought.gov/states/California/county/Tuolumne>. Accessed June 14, 2021.

OPR, CEC, and CNRA. See California Governor's Office of Planning and Research, California Energy Commission, and California Natural Resources Agency.

Climate Action Strategies and Measures

References were not used in this chapter.

Implementation and Monitoring

References were not used in this chapter.

Photograph Log

EXECUTIVE SUMMARY

Page ES-1, Fall Mountain Scenery.

County of Tuolumne. Available:

<https://www.tuolumnecounty.ca.gov/ImageRepository/Document?documentID=9108>.

INTRODUCTION

Page 1-1, Tuolumne County Courthouse.

County of Tuolumne. Available: <https://www.tuolumne.courts.ca.gov/general-info/directions.shtml>.

Page 1-12, Tuolumne Meadows.

Jon Sullivan. Year not given. Available:

https://commons.wikimedia.org/wiki/File:Tuolumne_meadows_yosemite_streams.jpg.

GREENHOUSE GAS EMISSIONS INVENTORY, FORECASTS, AND TARGETS

Page 2-1, Living Wall.

UCCE Master Gardeners of Tuolumne County. Year not available. Available:

<https://www.mymotherlode.com/wp-content/uploads/2018/08/livingwall3.jpg>.

Page 2-2, Firefighter at the Antelope Fire.

Garrett Pohlman, USFS. 2021 (August 7). Available:

https://commons.wikimedia.org/wiki/File:Antelope_Fire_-_2021_08_08-11.26.12.750-CDT.jpg.

Page 2-9, Burned Mountainsides.

Doug Olson. 2014 (March 5) (original upload date). Resized. Available:

[https://commons.wikimedia.org/wiki/File:Tuolumne_County,_CA,_USA_-_panoramio_\(9\).jpg](https://commons.wikimedia.org/wiki/File:Tuolumne_County,_CA,_USA_-_panoramio_(9).jpg).

CLIMATE CHANGE ADAPTATION AND RESILIENCE

Page 3-1, Creature of the Black Lagoon in Tuolumne Meadows.

Jarek Tuszyński. 2015 (September 20). Resized. Available:

https://commons.wikimedia.org/wiki/File:Tuolumne_Meadows_-_Creature_from_the_Black_Lagoon_-_02.JPG.

Page 3-5, Hiking in High Temperatures.

Rdonar. Date not given. Resized. File #: 308929565. Available:

https://stock.adobe.com/images/traveler-on-rock-drinking-bottled-water-from-plastic-bottle/308929565?prev_url=detail.

Page 3-8, Smoke from the Rim Fire.

Governor's Office of Emergency Services. 2013 (August 23). Available:
<https://wordpress.org/openverse/image/3ca2a150-acc8-42a2-a222-5cf97a82d051/?referrer=creativecommons.org>.

Page 3-12, Don Pedro Lake.

docentjoyce. 2014 (May 21). Resized. Available:
<https://www.flickr.com/photos/docentjoyce/14346409086>.

CLIMATE ACTION STRATEGIES AND MEASURES

Page 4-1, Sunset at Tuolumne Meadows.

Steve Dunleavy. 2011 (July 15). Resized. Available:
https://commons.wikimedia.org/wiki/File:Tuolumne_Meadows_Sunset.jpg.

Page 4-3, Burn Scar on Mountain Trail.

Available: https://farm8.staticflickr.com/7487/15319412794_ee14448e85_b.jpg

Page 4-3, Walking in Yosemite National Park.

Mark. Date not given. Resized. Available: https://stock.adobe.com/images/hiking-in-yosemite-s-back-country-3/181690275?prev_url=detail.

Page 4-4, Biking Sugar Pine Rail Trail to Lyons Reservoir.

Available: <https://www.visittuolumne.com/beat-the-heat-off-the-beaten-path-in-tuolumne-county>.

Page 4-5, Electric Snowmobile.

Asurnipal. 2019 (May 9). Resized. Available:
https://commons.wikimedia.org/wiki/File:Innsbruck-icat_pro_13ZE-Snowmobile-02ASD.jpg.

Page 4-6, Tuolumne County Emergency Response Trailer.

County of Tuolumne. Available: <https://www.tuolumnecounty.ca.gov/272/Emergency-Preparedness>.

Page 4-8, Rim Fire Approaching Groveland Ranger Station.

Dusty Vaughn, USFS. 2013 (August 17). Available:
https://commons.wikimedia.org/wiki/File:Rim_Fire_approaches_the_Groveland_Ranger_Station_in_the_Stanslaus_National_Forest-0003.jpg.

Page 4-10, Rainbow Pools, South Fork Tuolumne River.

Elaine with Grey Cats. 2012 (October 21). Resized. Available:
https://commons.wikimedia.org/wiki/File:Rainbow_Pools_on_the_South_Fork_of_the_Tuolumne_River.jpg.

Page 4-11, High Country Sunrise.

Don Graham. 2017 (October 3). Resized. Available:
<https://www.flickr.com/photos/23155134@N06/42620994951>

Page 4-12, Alpine Slide.

Charles Willgren. 2008 (June 21). Resized. Available:
https://commons.wikimedia.org/wiki/File:Alpine_Slide_in_Golden.jpg.

Page 4-13, Composting Plant.

Robin Stott. 2010 (February 26). Resized. Available:
https://commons.wikimedia.org/wiki/File:Composting_plant,_Heathfield_Farm_-_geograph.org.uk_-_1742361.jpg.

Page 4-14, Recycling Bins.

Available: <https://www.maxpixel.net/Trash-Recycling-Garbage-Waste-Container-Bin-5395333>.

Page 4-16, Downtown Groveland.

daveynin. 2013 (October 11). Resized. Available:
https://commons.wikimedia.org/wiki/File:Groveland_on_California_Route_120_-_Flickr_-_daveynin.jpg.

Page 4-18, Tuolumne County Superior Courthouse.

Kit Leong. No date given. Resized. Available: https://stock.adobe.com/images/exterior-view-of-the-tuolumne-county-superior-court/222550001?prev_url=detail.

Page 4-19, Linemen Inspecting Energy Infrastructure.

Ed Hunt, Western Area Power. 2014 (August 12). Resized. Available:
<https://www.flickr.com/photos/westernareapower/15300808056>.

Page 4-21, Tuolumne County Transit Bus.

County of Tuolumne. Available:
<https://www.tuolumnecounty.ca.gov/DocumentCenter/View/14795/Tuolumne-County-Transit-Program-Report>.

Page 4-21, Highway 49 in Tuolumne County.

Glenn Pillsbury. 2002 (August 13). Resized. Available:
https://commons.wikimedia.org/wiki/File:CA49_Tuolumne_County.JPG.

Page 4-23, Yosemite Area Regional Transportation System Bus.

Ricky Courtney. 2013 (October 1). Resized. Available:
https://commons.wikimedia.org/wiki/File:YARTS_Bus_at_Merced.jpg.

Page 4-24, Electric Vehicle Charging.

Available: <https://www.maxpixel.net/Current-Vehicle-Electric-Auto-Electric-Car-5960863>.

Page 4-25, Wind and Solar Energy.

Kenueone. 2016 (May 5). Resized. Available:
https://commons.wikimedia.org/wiki/File:Renewable_Energy_on_the_Grid.jpg.

Page 4-27, Tuolumne Public Power Agency Dam.

Doug Olson. 2014 (March 5). Resized. Available:
[https://commons.wikimedia.org/wiki/File:Tuolumne_County,_CA,_USA_-_panoramio_\(13\).jpg](https://commons.wikimedia.org/wiki/File:Tuolumne_County,_CA,_USA_-_panoramio_(13).jpg).

Tuolumne County Climate Action Plan

Page 4-28, Green Infrastructure for Stormwater.

DASonnenfeld. 2019 (June 20). Resized. Available:
<https://commons.wikimedia.org/wiki/File:ESF-green-infrastructure-01.jpg>.

Page 4-31, Cattle in Tuolumne County.

County of Tuolumne. Available:
<https://www.tuolumnecounty.ca.gov/ArchiveCenter/ViewFile/Item/502>.

Page 4-31, Stanislaus National Forest.

Zack Frank. No date given. Resized. Available:
https://stock.adobe.com/images/stanislaus-national-forest/390667027?prev_url=detail.

Page 4-32, Grazing Cattle.

Róbert Kóta. No date given. Resized. Available: <https://pixnio.com/fauna-animals/cows-and-calves/cow-grass-grassland-cattle-landscape-livestock-agriculture>.

Page 4-34, Climate Resilient Agriculture.

Available: <https://www.pxfuel.com/en/free-photo-ordhm>.

Page 4-35, Forest Biomass.

Oregon Department of Forestry, courtesy of Oregon State University. 2012 (June 24). Resized. Available: <https://www.flickr.com/photos/oregonstateuniversity/31566765380>.

Page 4-37, Firefighters in Tuolumne Grove.

U.S. Department of Agriculture. 2013 (August 17). Available:
[https://commons.wikimedia.org/wiki/File:National_Park_Service_fire_crew_enters_the_Tuolumne_Grove_of_Giant_Sequoias_\(9599182739\).jpg](https://commons.wikimedia.org/wiki/File:National_Park_Service_fire_crew_enters_the_Tuolumne_Grove_of_Giant_Sequoias_(9599182739).jpg).

IMPLEMENTATION AND MONITORING

Page 5-1, Cathedral Peak.

Doug Olson. 2014 (January 10). Resized. Available:
[https://commons.wikimedia.org/wiki/File:Tuolumne_County,_CA,_USA_-_panoramio_\(5\).jpg](https://commons.wikimedia.org/wiki/File:Tuolumne_County,_CA,_USA_-_panoramio_(5).jpg).

Page 5-15, Sunset Outside of Sonora.

Kit Leong. No date given. Resized. Available: https://stock.adobe.com/images/sunset-view-of-beautiful-country-side-near-sonora/222532485?prev_url=detail.