

City of Carmel-by-the-Sea Climate Adaptation Plan



Final Draft
July 2022



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Acknowledgements

This Climate Adaptation Plan was a coordinated effort among:

- Carmel-by-the-Sea Community Members
- Carmel-by-the-Sea Climate Committee Members
- Carmel-by-the-Sea Planning Commission and Forest & Beach Commission
- Carmel-by-the-Sea City Council
- Carmel-by-the-Sea City Staff
- Agency Partners and Experts who presented at Climate Committee Members
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Thank you for participating. We appreciate your feedback, insight, and passion – the Climate Adaptation Plan is better because of you.

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Table of Contents

Introduction 1

Climate Adaptation Plan Process 4

Stakeholder and Public Input 10

Adaptation Strategy 12

Adaptation Policies and Actions 15

Implementation and Monitoring 29

Appendix A Climate Action Plan
Appendix B Climate Vulnerability Assessment
Appendix C Outreach
Appendix D Implementation Tracking Tool
Appendix E Implementation Case Studies

Introduction

Introduction and Purpose

This Climate Adaptation Plan establishes an adaptation strategy for the City of Carmel-by-the-Sea (the City) to prepare for the anticipated impacts associated with climate change. Climate change is caused by the addition of excess greenhouse gases (GHGs) to the atmosphere, which traps heat near the earth's surface increasing global average temperatures in what is referred to as the greenhouse effect. This rise in average temperatures across the globe affects sea level rise, precipitation patterns, the severity of wildfires, the prevalence of extreme heat events, water supply, and ocean temperatures and chemistry.¹ According to the Intergovernmental Panel on Climate Change (IPCC), GHGs are now higher than they have been in the past 400,000 years, raising carbon dioxide levels from 280 parts per million to 410 parts per million in the last 150 years.² The dramatic increase in GHGs is attributed to human activities³ beginning with the industrial revolution in the 1800s, which represented a shift from an agrarian and handicraft-based economy to one dominated by industry and machine manufacturing.⁴

Carmel-by-the-Sea is a coastal town, located on the Monterey Peninsula, with vegetation consisting mostly of evergreen and deciduous trees as well as coastal chaparral. Carmel-by-the-Sea, like many cities throughout California, is expected to experience increased climate hazards because of climate change. These include stronger storms, increasing wildfire risk, rising sea levels, extended drought conditions, and increasing temperatures. The impacts of climate change are already being felt throughout California and at least some increase in these impacts is expected even under aggressive global GHG reduction scenarios.⁵ However, Carmel-by-the-Sea can adapt by taking

steps to prepare the community and its infrastructure for these expected climate changes. Virtually all people and assets in the city will be affected by climate change in some way. Identifying the expected severity of these impacts and steps to adapt to these changes will be critical to minimizing future costs and community impacts. The purpose of the Climate Adaptation Plan is to identify and prioritize climate adaptation actions the City can implement to improve the resilience of its community members, natural environment, critical infrastructure, and built environment.

City Setting

Carmel-by-the-Sea is located on the Monterey Peninsula in northwest Monterey County, California, along the Pacific Ocean. The renowned scenic environment of Carmel-by-the-Sea stems from its two dominant features, the coastline and the central ridge of wooded hills. Highway 1 is the primary roadway linking Carmel-by-the-Sea to surrounding cities. Carmel-by-the-Sea is an area rich in coastal resources and cultural heritage and is popular for visitors across California and the United States. Approximately one square mile in area, the City's elevation ranges from sea level to 500 feet above sea level, sloping gently from Carmel-by-the-Sea Bay up to Highway 1. Vegetation in the vicinity of Carmel-by-the-Sea generally consists of evergreen trees, most notably the native Monterey Pine, in the City and along the coast, deciduous trees along the Carmel River, and coastal chaparral on the Carmel Valley hills. Various species of wildlife inhabit the area, especially in reserves and in undeveloped gulches. Carmel-by-the-Sea's land is largely forested and contains a substantial amount of open space. There are several areas in and around the City that qualify as wildland fire hazard areas. These areas are located to the north and east of the City boundaries and includes Pescadero Canyon, Forest Hill Park, and Del Monte Forest to the north, and Mission Trails Nature Preserve to the east.⁶

1. <https://climate.nasa.gov/effects/>

2. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf

3. <https://climate.nasa.gov/scientific-consensus/>

4. <https://www.acs.org/content/acs/en/climatescience/greenhousegases/industrialrevolution.html>

5. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report_smaller.pdf

6. https://ci.carmel.ca.us/sites/main/files/file_attachments/environmental_safety_cc_adopted_9-1-09.pdf?1510257865



Adaptation Strategy Lexicon

Several key climate adaptation-related words and phrases are used throughout the plan. The following definitions will be helpful in understanding the overall strategy and the process which led to its development.

- **Mitigation:** An act or sustained actions to reduce, eliminate, or avoid negative impacts or effects.⁷
- **Adaptation:** The process of adjustment to actual or expected climate and its effects. In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate.⁸
- **Vulnerability:** The propensity or predisposition to be adversely affected.⁹
- **Resilience:** The capacity of an 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.¹⁰

- **Climate Hazard:** A dangerous or potentially dangerous condition created by the effects of the local climate.¹¹ Climate hazards of concern for Carmel-by-the-Sea are wildfire, increased temperature, drought, intense precipitation, and sea level rise.
- **Impacts:** Effects on natural and human systems. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate hazards and the vulnerabilities of the system or asset effected.¹²
- **Asset/Population:** Asset refers to a community structure or service that is relied on broadly by the City. Population groups are also identified. The purpose of including this information is to indicate which asset or population group the action would protect.
- **Implementation:** The process of putting a decision or plan into effect; execution.

7. <https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf>

8. https://www.ipcc.ch/site/assets/uploads/2018/03/SREX_FD_SPM_final-2.pdf

9. https://www.ipcc.ch/site/assets/uploads/2018/03/SREX_FD_SPM_final-2.pdf

10. <https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf>

11. <https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf>

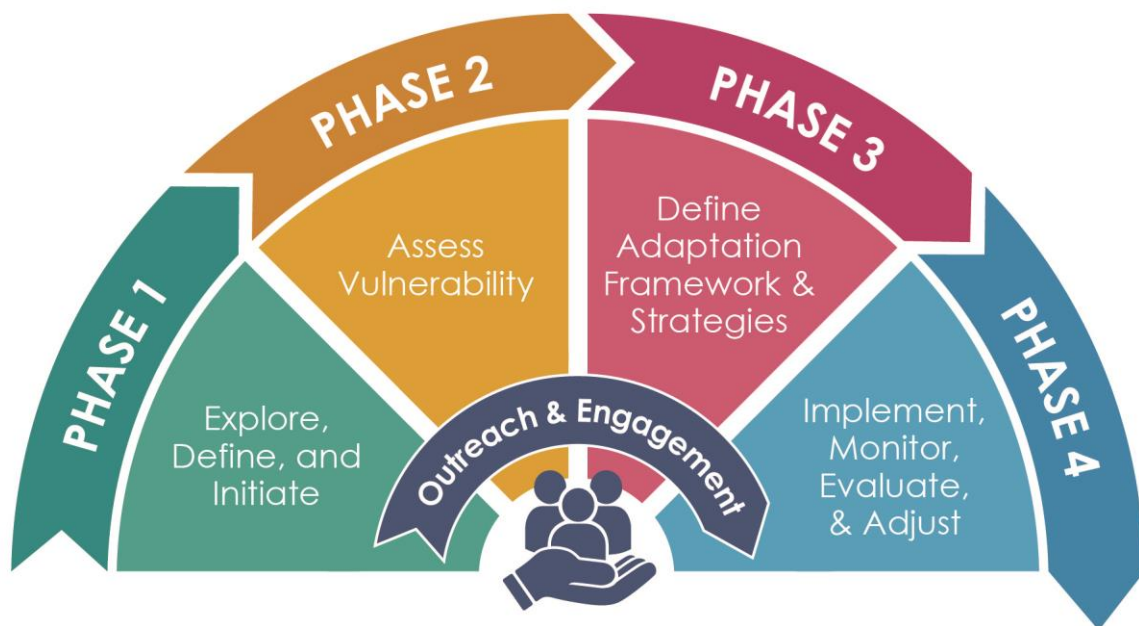
12. https://www.ipcc.ch/site/assets/uploads/2018/03/SREX_FD_SPM_final-2.pdf

Climate Adaptation Plan Process

Background

In September 2019, the City began the process of developing Climate Action and Adaptation Plans that would establish a roadmap to reducing local GHG emissions and identify opportunities to adapt to climate change. The Climate Action Plan is included as Appendix A to the Climate Adaptation Plan. The City followed the climate adaptation planning process recommended by the California Governor’s Office of Emergency Services, as documented in the 2020 California Adaptation Planning Guide (2020 CalOES APG), illustrated in the graphic below, and specifically described below.

- **Phase 1.** The City began by convening a Climate Committee to guide the preparation of the Climate Action and Adaptation Plans. The Climate Committee is composed of members of the Carmel-by-the-Sea community, including residents, business owners, and professional experts. The Climate Committee began monthly meetings in November 2019.
- **Phase 2.** To identify the climate hazards specific to Carmel-by-the-Sea and establish a common understanding of the potential climate change impacts in the Carmel-by-the-Sea community, the City completed a Climate Change Vulnerability Assessment (Vulnerability Assessment) in July 2021 (see Appendix B). The Vulnerability Assessment characterizes hazards associated with climate change that are anticipated to impact the community and City-owned assets, describes the community’s major climate vulnerabilities, and identifies work that has already been done by the City to improve its resilience to climate impacts. Although the City has a variety of policies and programs already in place to address climate change impacts, policy gaps were identified in the Vulnerability Assessment.
- **Phase 3 and Phase 4.** The City prepared this Climate Adaptation Plan to establish adaptation goals, policies, and actions to address gaps identified in the Vulnerability Assessment. The Climate Adaptation Plan also establishes a roadmap to implementation. Implementing, monitoring, evaluating, and adjusting the Climate Adaptation Strategy (Phase 4), will be led by the City as described in the Implementation and Monitoring Plan section of the report.



Graphic: 2020 California Adaptation Planning Guide (Adaptation Planning Process)



Graphic: 2020 California Adaptation Planning Guide (Phase 3)

The Climate Adaptation Plan was developed pursuant to the steps in Phase 3 of the 2020 CalOES APG, shown in the graphic above.

Step 3.1. The City summarized the findings from the Vulnerability Assessment to aid in developing new policies and actions.

Step 3.2. The City confirmed the goals with the Climate Committee and community members.

Step 3.3. and **Step 3.4.** The City prepared and prioritized adaptation actions based on adaptation action selection criteria.

Step 3.5. The City incorporated input from stakeholders and community members.

The sections below detail the methodology used to shape the Climate Adaptation Plan.

Vulnerability Assessment Summary

The purpose of the Vulnerability Assessment is to characterize climate hazards that will impact the community and City assets in Carmel-by-the-Sea, determine the community’s major climate vulnerabilities, and identify work that has already been done to improve community resilience. The Vulnerability Assessment uses information and

modeling projections provided by the State of California to support climate adaptation efforts including the Cal-Adapt modeling tool and the Fourth California Climate Assessment. The City determined that Carmel-by-the-Sea is most vulnerable to the following climate change impacts: stronger storms, wildfires, sea level rise, extended droughts, and increased temperature.

The Vulnerability Assessment also evaluated the impact these climate hazards could have on the following **asset classes** (or types of resources) and *specific assets* present in the city.

- **Natural Assets:** *Mission Trail Nature Preserve, North Dunes, Pescadero Canyon, Urban Forest, Marine Sanctuary, and Carmel Beach*
- **Community:** *Elderly Population and People with Disabilities, Residents, Visitors, Local Businesses, Service Industry Workers, Second Homes*
- **Utilities:** *Water Supply, Sanitary Sewer System, Power Grid, Overhead Communication, Pacific Gas & Electric Company, Underground Lines (Gas, Cable)*
- **Regional Infrastructure:** *Wastewater Treatment Facility, Transportation Infrastructure (Caltrans), Hospital and Emergency Medical Care Facilities, Landfill & Waste Management*
- **Local Infrastructure:** *Shoreline Access Infrastructure, Seawalls and Revetments, Storm Drain System, Emergency Response Facilities*



Stronger storms



Wildfire



Sea Level Rise



Extended Drought



Increased heat





Within each asset class, specific assets were evaluated, as listed in Table 1 below. Each asset was categorized with one of the following climate impacts categories:

- already causing observable impacts or near-term significant risk
- mid- to long-range impacts
- not enough data
- no anticipated impacts

The City reviewed adopted policies and programs for each of the assets and indicated whether the City had already initiated policies or actions to address the climate hazard. This analysis assumes that existing adaptation policies and actions will continue to be implemented. Table 1 presents the results of this analysis, for more details on the vulnerability analysis see Appendix B.

Table 1 Vulnerability Scoring Matrix

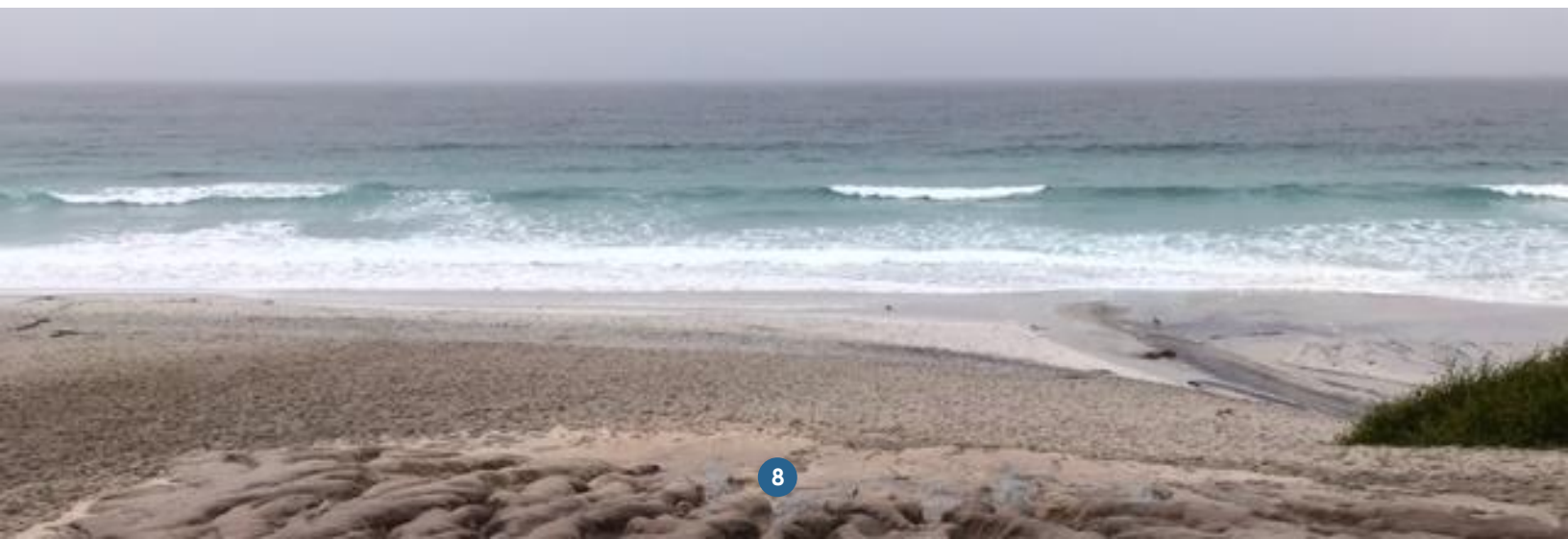
Color coding:

-  Climate change is already causing observable impacts or a near-term significant risk
-  Climate change poses mid- to long-range impacts
-  Not enough data
-  No anticipated impacts
- Yes** Some policy/action initiated
- No** No policy/action initiated

Priority Assets at Risk	Priority Climate-Related Hazards				
	Stronger Storms	Wildfires	Sea Level Rise	More Droughts	Increased Temp
Natural Assets					
Mission Trail Nature Preserve	Yes	Yes		Yes	Yes
North Dunes			No	Yes	Yes
Urban Forest	Yes	No		Yes	No
Marine Sanctuary					
Carmel Beach	Yes		Yes		
Community					
Elderly Population and People with Disabilities	No	No		No	No
Residents	Yes	Yes		Yes	No
Visitors	No	No			
Local Businesses	No	No	No	Yes	No
Service Industry Workers	No	No	No		No
Second Homes	Yes	Yes	No		

Priority Assets at Risk	Priority Climate-Related Hazards				
	Stronger Storms	Wildfires	Sea Level Rise	More Droughts	Increased Temp
Utilities					
Water Supply		Yes	Yes	Yes	Yes
Sanitary Sewer System			Yes		
Power Grid	No	No			No
Overhead Communication	No	No			
PG&E/Communication Underground Lines (gas, cable)		No	No		
Regional Infrastructure					
Wastewater Treatment Facility	Yes		Yes		
Transportation Infrastructure (Caltrans)	Yes	Yes	Yes		
Hospital and Emergency Medical Care Facilities					
Landfill & Waste Management	Yes				
Local Infrastructure					
Shoreline Access Infrastructure	Yes		Yes		
Seawall and Revetments	Yes		Yes		
Storm Drainage System	Yes		Yes		
Emergency Response Facilities (Fire station, EOC, PD, PW, City Hall, etc..)	Yes	Yes			No

Notes: Shoreline Access Infrastructure = Scenic trail, public restrooms, beach stairs, coastal roadways, and parking; EOC = Emergency Operations Center; PD = Police Department; PW = Public Works; PG&E = Pacific Gas & Electric Company
Source: Adapted from the July 2021 City of Carmel-by-the-Sea Climate Change Vulnerability Assessment (Appendix B)



Based on identified policy gaps in the Vulnerability Assessment, the Climate Adaptation Plan identifies new policies and programs for the assets considered to be most vulnerable to climate change. Assets and communities that are considered most vulnerable are those that have no policies/actions for increasing resilience and are either currently experiencing observable or near-term risks or those that are expected to experience mid- to long-range impacts (this corresponds to cells in Table 1 that are highlighted orange or yellow and labeled No). Key findings of the Vulnerability Assessment include:

- Carmel-by-the-Sea’s natural assets are most vulnerable to wildfire, sea level rise, and increased temperature.
- Carmel-by-the-Sea’s communities are vulnerable to all priority climate-related hazards.
- Utilities are most vulnerable to stronger storms, wildfire, sea level rise, and increased temperature.
- Regional infrastructure assets, including the Carmel Area Wastewater Treatment Facility and Highway 1, were determined to be vulnerable to climate change, however, policies and actions have been initiated to address vulnerabilities.
- Policies and actions have been initiated to reduce local infrastructure’s vulnerability to stronger storms, wildfires, and sea level rise. No action has been taken to address vulnerability to increased temperature.
- The Climate Committee determined that a coastal engineering study would be necessary to fully assess the potential impacts of sea level rise on City assets and to identify policies and actions to address those impacts.



Stakeholder and Public Input

Outreach

The Climate Adaptation Plan was developed and refined through a stakeholder engagement process with the Carmel-by-the-Sea Climate Committee and the public. Draft versions of the adaptation strategy (goals, policies, and actions) were presented in September and October 2021 to the Climate Committee. Comments received during and following these meetings were incorporated into an updated set of goals, policies, and actions that were then presented at a virtual public workshop in November 2021. Comments received during and following the public workshop were incorporated into the goals, policies, and actions, and presented at the January 2022 Climate Committee meeting for final input. See Appendix C for meeting slides, interactive activity results, and responses to comments.

The Carmel-by-the-Sea Climate Committee provided input along the following themes:

- Support for additional strategies that would improve emergency evacuation, and relieve traffic and congestion
- Identification of additional actions to support vulnerable populations
- Additions to actions to address tree maintenance and protect native species, particularly the Monterey Pines
- Augment actions to include stormwater runoff reduction and increase resilience of the Carmel Area Water District facility

The community provided input along the following themes:

- Support to include a clear evacuation plan for elderly residents
- Applying updated City Planning Guidelines and Development Standards citywide, not just in the Very High Fire Hazard Severity Zone
- Additional opportunities for partnership in adaptation-related community engagement efforts
- Increasing City staff resources to increase staff time for implementation of the strategy

The Climate Adaptation Plan was presented to the Forest & Beach Commission and the Planning Commission in May, and City Council in June 2022 for input.

The Planning Commission was supportive of the plan and provided input on the following:

- Support for electrification,
- Support for reducing the use of automobiles, including higher development density in the downtown to provide housing for Carmel workforce, and the provision of shuttle services, especially for special events,
- Support for further outreach on food waste composting, including solutions for common implementation issues,
- Support for increasing forest health and wildfire mitigation, including in Pescadero Canyon,
- Support for the use of green roofs as cool roofs,

The Forest & Beach Commission provided input on the following:

- Support for the Grant Writer/Climate Coordinator position and for prioritizing implementation to ensure success,
- Suggestion to add Pescadero Canyon to the list of natural resources and to consider it in the adaptation plan,
- Suggestion to expedite bluff monitoring if feasible.

City Council provided input on the following:

- Support for the Climate Committee's continued oversight of the coastal engineering study.
- Recommendation that the Planning Commission be the overseeing body for the implementation of the Climate Action and Adaptation Plans if the Design Review Board (DRB) is re-established, which would free up the Planning Commission's agenda.
- Recommendation that the Forest and Beach Commission oversee the plans' implementation if a DRB is not re-established.

- Recommendation that all City Departments be involved in the implementation of the plans, and that each Department Director should be involved in the implementation.
 - Recommendation that funds be allocated for implementation as specific projects and measures are ready to be implemented.
 - Support for ongoing implementation of the plans.
 - Suggestion to hold a Community Workshop to generate interest from members of the community to serve on a commission and/or to support the various Adaptation strategies and initiatives.
 - Support of Actions 1.3.3-1.3.5 (improving the resilience of existing buildings and infrastructure)
 - Support for the implementation of a public facility solar project to show leadership in building electrification.
 - A member of the public expressed concern regarding potential impacts to the built and natural environment associated with the increase of wireless and cellular infrastructure.
 - The Monterey Peninsula Water Management District requested being included as a regional partner, and the Carmel Area Wastewater District offered comments regarding the critical nature of the sanitary sewer and impacts of the climate on it.
- Input from the Forest & Beach Commission, the Planning Commission, and City Council were incorporated into the Climate Adaptation Plan, and the Plan was adopted in August 2022.



Adaptation Strategy

Strategy Overview

The Adaptation Strategy presented in this section identifies goals, policies and actions that seek to contribute to increasing resilience to climate change in Carmel.

Goals, policies, and actions are defined as:

- **Goals:** Broad statements describing community desires. The Carmel-by-the-Sea adaptation goals are modeled after the Adaptation Vision and Principles developed by the California Governor’s Office of Planning and Research (OPR) Integrated Climate Adaptation & Resiliency Program (ICARP).¹³ Each goal is focused on increasing the resilience of one of the following broad asset categories: community, natural assets, and infrastructure

(including utilities) and the built environment.

- **Policies:** Specific position statements that support the achievement of goals and serve as guides to City Council, Planning Commission, and City staff, when making decisions.
- **Actions:** Specific methods to incrementally implement and achieve policies and goals.

The intent of the goals, policies, and actions is to address the key vulnerabilities identified in the Vulnerability Assessment, including assets at risk from near-term or mid-term climate change impacts and that lack existing adopted policies or established programs. It is expected that existing adaptation-related policies and actions identified in the City’s Vulnerability Assessment will continue to be implemented and re-assessed in the next update of the Climate Adaptation Plan and Vulnerability Assessment, by 2030 at the latest.

13. <https://opr.ca.gov/planning/icarp/tac/>



Carmel-by-the-Sea's Adaptation Goals

Based on the results of the vulnerability analysis and input from the community and Carmel-by-the-Sea Climate Committee three primary goals were identified. These goals served as a guide for the development of the adaptation actions and policies contained in the Adaptation Strategy.

With these goals in mind, the City, stakeholders, and community provided input on a suite of policies and specific actions that would achieve these goals and result in a more adaptive and resilient Carmel. These specific policies and actions can be found in the Adaptation Policies and Actions section.

Goal 1. A Healthy, Safe, and Resilient Community

Goal 1 is a healthy, safe, and resilient community in the face of climate change. The policies and actions under this goal improve community health, safety, and resilience through equitable and effective emergency preparedness, targeted actions to improve the resilience for vulnerable populations, minimization of negative health impacts from climate change, and economic resilience in the form of support for service industry workers and local businesses. The policies and actions for Goal 1 are provided in Table 2 of the Adaptation Strategy. Goal 1 policies and actions should be prioritized given that community assets are those that have

the greatest vulnerability based on the number of hazards they are exposed to and not having policies or actions currently in place to increase resilience (see Appendix B).

Goal 2. A Natural Environment Resilient to Climate Hazards

Goal 2 of Carmel's adaptation strategy is a resilient natural environment. The City's beaches, urban forestry, and parks are all vulnerable to climate hazards. The policies and actions under this goal aim to improve resilience of the community's habitats and ecosystems using studies, partnerships, funding, and structural actions. The policy and actions for Goal 2 are list in Table 3 of the Adaptation Strategy.

Goal 3. Resilient Infrastructure and Built Environment

Goal 3 in the City's adaptation strategy is a resilient built environment. This goal involves policies that address infrastructure redundancies and incorporation of climate change into built environment planning. The actions under these policies are organized by climate hazard-related improvements with each addressing improvements needed to increase infrastructure resilience to climate change. Actions like green infrastructure and storm drain repairs target intense precipitation while actions like bluff monitoring and the hiring of a coastal engineer help the community adapt to sea level rise. The policies and actions for Goal 3 are provided in Table 4 of the Adaptation Strategy.



Adaptation Policies and Actions

Policy and Action Development

In order to achieve each of the three adaptation goals identified in the Adaptation Strategy section above, a suite of adaptation policies and actions were developed. The policies and actions focus on the most vulnerable assets within Carmel-by-the-Sea which were identified through the vulnerability matrix. To guide the creation of effective adaptation strategies for these assets, the City developed selection criteria to prioritize the selection of goals, policies, and actions. These criteria were established to guide the development of policies and specific actions and help promote implementation, equity, and effectiveness. Every Goal contains at least one action that meets each of the criteria established. The following criteria were used to develop and ultimately select Carmel's adaptation actions:

1. Implement adaptation actions that result in **measurable increase in resilience** and reduction in climate change risks.
2. Implement actions that respond to continual changes in climate, ecology, and economics using **adaptive management** that incorporates regular monitoring.
3. Establish governance policies, **institutional structures**, and monitoring processes to implement adaptation actions.
4. Identify **funding** needs, establish funding mechanisms, and allocate adequate funding to support adaptation policy development and implementation.
5. Focus meaningful and active **engagement** with the most impacted communities.
6. Employ adaptive and flexible governance approaches by maximizing collaborative **partnerships** among sectors to accelerate effective problem solving.
7. Prioritize actions that promote **equity**, foster community resilience, and protect the City's most vulnerable populations, including the elderly. Explicitly prioritize communities that are disproportionately vulnerable to climate impacts.

To facilitate implementation of each action by the City, additional information is included for each specific action, as follows:







- **Metric:** A way to gauge progress of an action through measurable indicators or benchmarks of progress. This involves quantifying increases in resilience. The metric is a key component of *Phase 4: Implement, Monitor, Evaluate, and Adjust* of the 2020 CalOES APG.¹⁴
- **Timeframe:** Sorted into phases of near-term (1-2 years, or by 2024), mid-term (3-5 years, or by 2027), and long-term (5-10 years, or by 2023) this categorization helps plan for timing of implementation.
- **Implementation Lead:** The City department or entity that will lead the implementation of the action.
- **Cost:** Sorted into ranges of \$-Low (<\$25,000), \$\$-Medium (\$25,000 - \$100,000), and \$\$\$-High (>\$100,000) these estimates are used to determine type and extent of funding and financing needed.

Policies and actions are organized by goal in the following tables.

14. <https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf>

Table 1 Goal 1. A Healthy, Safe, and Resilient Community

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Policy 1.1. Provide effective emergency preparedness and response in anticipation of potential climate-related disasters							
Action 1.1.1. Maintain and Update Evacuation Plan. Maintain and update an Evacuation Plan every 8 years at a minimum to account for all types of emergencies. The plan should focus on the most vulnerable groups including the elderly community and persons with disabilities.		Elderly Population and People with Disabilities, Residents, Service Industry Workers	Adaptive Management, Equity	Evacuation Plan updated every 8 years, with the first update by 2023	Near-term (by 2024) and Ongoing	Police and Fire	\$
Action 1.1.2. Update Emergency Preparedness. Incorporate climate change risk and impact considerations into Carmel-by-the-Sea CERT programming and materials to promote emergency preparedness at a neighborhood block-by-block scale. CERT to promote block-by-block scale emergency preparedness by organizing City by blocks and recruiting Block Captains.		Residents, Local Businesses, Second Homes	Adaptive Management, Engagement, Measurable Increase in Resilience	Number of block captains formed, climate change risk incorporated into CERT materials	Near-term (by 2024)	Police and Fire	\$
Action 1.1.3. Collaborate with Monterey Fire. Collaborate with Monterey Fire on its inspection and outreach efforts to reduce fire risks. Continue to coordinate with the CERT program and reach out to new potential outreach partners such as local businesses, community groups, and utilities to help distribute information to increase resident and homeowner awareness and knowledge of how to prepare for emergencies.		Residents, Local Businesses, Second Homes	Engagement, Partnerships	Number of meetings held with Monterey Fire and CERT program; educational materials distributed	Near-term (by 2024)	Police and Fire	\$
Action 1.1.4. Publicize Local Evacuation Routes. Publicize both City and Monterey County evacuation routes for the community on the City's website, and in the newsletter and brochures. Target additional outreach to the most vulnerable such as the elderly and people with disabilities in the event of a wildfire or other disaster.		Elderly Population and People with Disabilities, Residents	Engagement, Equity	Educational materials distributed	Near-term (by 2024)	Police and Fire	\$
Action 1.1.5. Evaluate Evacuation Route Capacity. Evaluate evacuation route capacity, safety, and viability under a range of emergency scenarios and identify and implement mitigating actions in 2022, in accordance with Assembly Bill 747.		Elderly Population and People with Disabilities, Residents, Service Industry Workers	Adaptive Management	Analysis evaluating evacuation route capacity completed	Mid-term (by 2027)	Police and Fire	\$ \$

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Action 1.1.6. Evacuation Alternatives and Access. Identify neighborhoods that have single ingress/egress, pursuant to Senate Bill 99, and develop and employ evacuation alternatives, such as a gathering facility, and/or alternative emergency access routes in those neighborhoods. Evaluate potential congestion issues in the event of an evacuation and develop and maintain a list of residents who may have difficulty evacuating. Evaluate options to provide evacuation, such as a shuttle service, for residents with mobility challenges.		Elderly Population and People with Disabilities, Residents, Service Industry Workers	Adaptive Management, Engagement, Equity	Analysis identifying neighborhoods that have single ingress/egress and evacuation alternatives completed; List of limited-mobility residents developed	Mid-term (by 2027)	Police and Fire	
							
Action 1.1.7. Develop Local Partnerships to Increase Resistance to Wildfire Structural Damage. Work with local community groups to publicize the Firewise Community Certification program (e.g., on the City website and in the newsletter and brochures) and encourage resident involvement.		Residents, Second Homes	Engagement, Partnerships	Number of meetings held to publicize Firewise Community Certification	Mid-term (by 2027)	Police and Fire	

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Policy 1.2. Focus adaptation efforts and engagement on the most vulnerable populations.							
Action 1.2.1. Establish a Resilience Hub. Formally designate a physical resilience hub, such as the Youth Center or Public Library, and make it available during extreme heat events, poor air quality, severe weather events, and other highly hazardous conditions for use by the community. Provide the following essential resources in the resilience hub(s): health programming and resources, food, refrigeration, charging stations, basic medical supplies, and other emergency supplies. Electrified heating and cooling paired with backup power sources like battery storage provides redundancy and continues services in the event of a power outage. Designate a virtual resilience hub on the City website where residents can access information about the physical resilience hub and resilience efforts.		Elderly Population and People with Disabilities, Residents, Service Industry Workers	Adaptive Management, Equity	Physical and virtual Resilience Hubs established; Existing facilities upgraded to provide all essential resources	Near-term (by 2024)	Public Works/Police and Fire/Library	\$ \$
Action 1.2.2. Limit the Impacts of Climate Change on the Most Vulnerable Populations. Develop a framework to define equity in Carmel-by-the-Sea and develop adaptation approaches that are equitably implemented.		Elderly Population and People with Disabilities, Residents, Service Industry Workers	Equity	Carmel-by-the-Sea Equity Framework developed	Mid-term (by 2027)	Community Planning and Building	\$
Action 1.2.3. Engage the Community. Develop educational materials notifying the community about the resilience hub and how to access it by sharing updates across city and community channels. Partner with the CERT program and block captains, and community groups, to prioritize disadvantaged / marginalized communities including the elderly and individuals with disabilities. Identify alternative methods of engagement to reach a wider audience.		Elderly Population and People with Disabilities, Residents, Service Industry Workers	Engagement, Equity	Community engagement plan developed	Near-term (by 2024)	Library/City Hall/Police Department	\$
Action 1.2.4. Social Support Network. Collaborate with the Carmel Foundation and other community-based organizations (e.g., Carmel Residents Association) to develop an inventory of locations with isolated elderly residents and people with disabilities and develop a plan for a social support network to increase resilience to climate change, for example by promoting home electrification.		Elderly Population and People with Disabilities	Partnerships, Equity, Engagement	Social support network created; Inventory of locations created	Mid-term (by 2027)	Police Department/ CERT/ Community Planning and Building	\$
Action 1.2.5. Back-up Power for Vulnerable Populations. Coordinate with 3CE, PG&E, and emergency management services to establish backup power and emergency grid shutdown protocols that protect the most vulnerable populations.		Elderly Population and People with Disabilities	Partnerships, Equity, Measurable Increase in Resilience	Number of households with backup power established	Long-term (by 2032)	Police and Fire/Public Works	\$ \$ \$

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Policy 1.3. Minimize health impacts of climate change.							
Action 1.3.1. Partner with Monterey County Health Department. Coordinate with Monterey County Health Department to develop and enhance disaster and emergency early warning systems to incorporate objective data and information for potential health threats such as heat-illness, and illnesses complicated by low air quality due to climate change hazards. Include information on early warning systems and other resilience efforts on the City's virtual resilience hub (Action 1.2.1.)		Elderly Population and People with Disabilities, Residents, Local Businesses, Service Industry Workers	Partnerships, Measurable Increase in Resilience	Emergency early warning systems updated	Near-term (by 2024)	Police and Fire	\$
Action 1.3.2. Initiate a Heat Pump Retrofit Program. Create a program to help fund property owners to convert HVAC units to heat pumps, which provide water heating and space heating in addition to cooling and can improve indoor air quality and community adaptation to extreme heat. Include a microgrid energy storage component to increase power reliability. Prioritize at-risk populations for retrofit incentives.		Elderly Population and People with Disabilities, Residents, Local Businesses, Service Industry Workers	Measurable Increase in Resilience	Number of heat pumps installed; Number of heat pumps serving at risk residents	Mid-term (by 2027)	Community Planning and Building	\$ \$ \$
Action 1.3.3. Invest in Improving Resilience in Critical Facilities. Invest in sustainable backup power sources to provide redundancy and continued services for critical facilities, including City Hall, Carmel Police Department, Carmel Fire Department, the Libraries, and assisted living facilities, in the event of a power outage triggered by a climate event.		Elderly Population and People with Disabilities, Residents	Measurable Increase in Resilience	Number of critical facilities with sustainable backup power sources.	Mid-term (by 2027)	Public Works	\$ \$ \$
Action 1.3.4. Conduct a Feasibility Study for Existing Building Electrification and Back-up Power. Perform an electrification feasibility study/existing building analysis in order to understand the potential for, and associated costs of, electrification retrofitting, including heat pumps, along with on-site energy generation and battery storage to provide a more resilient back-up power supply. Establish a plan for reducing or eliminating natural gas from existing buildings, potentially through a reach code, and building resilience to potential electrical grid shutoffs.		Elderly Population and People with Disabilities, Residents	Adaptive Management	Feasibility Study for Existing Building Electrification and Back-up Power completed	Mid-term (by 2027)	Public Works	\$ \$
Action 1.3.5. Improve Resilience in Existing Building Stock. Develop a program for identifying funding and incentives to weatherize residential and commercial buildings that addresses severe weather protection, energy efficiency, indoor air quality improvements, and other housing improvements. Include an outreach campaign as part of this program to advertise the benefits of weatherizing and electrifying buildings.		Elderly Population and People with Disabilities, Residents	Funding, Measurable Increase in Resilience, Adaptive Management	Number of retrofitted structures	Long-term (by 2032)	Community Planning and Building	\$ \$
Action 1.3.6. Promote Funding Opportunities. Work with partners like 3CE and PG&E to identify and promote potential resilience opportunities and accessible funding and financing mechanisms to pay for building electrification, weatherization, and battery backups.		Elderly Population and People with Disabilities, Residents, Local Businesses	Funding, Partnerships, Engagement	Funding identified and promoted to community; Number of projects initiated with incentives	Near-term (by 2024)	Community Planning and Building/Police and Fire/Public Works	\$





















Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Policy 1.4. Increase Economic Resilience							
Action 1.4.1. Develop Partnerships to Provide Support to Displaced Workers. Work in partnership with the Monterey County Workforce Development Board and the Carmel Chamber of Commerce to develop a plan to provide support for displaced workers that establishes education and training partnerships for workers displaced or workers negatively impacted by climate change or climate adaptation policies.		Service Industry Workers, Local Businesses	Partnerships, Equity	Commitment from business community to develop a plan to support displaced workers	Near-term (by 2024)	Community Planning and Building/City Hall	 
							
							
Action 1.4.2. Establish Partnerships to Develop a Resilient Economy. Partner with the County of Monterey Economic Development Department, Carmel Chamber of Commerce, and the Monterey County Workforce Development Board, to develop more integrated strategies for protection of jobs, economic sustenance, and for the protection of vulnerable populations more at-risk of temporary or permanent job dislocation due to climate change.		Service Industry Workers, Local Businesses	Partnerships, Equity	Number of meetings held to develop strategies for job protection	Mid-term (by 2027)	Community Planning and Building/City Hall	
							
							
Action 1.4.3. Business Resilience Outreach Program. Collaborate with businesses in the city to better understand shared climate risks and identify opportunities to advance shared climate resilience priorities. Partner with the Carmel Chamber of Commerce and Visit Carmel to pilot and implement a local business resilience initiative to build small business capacity before a time of crisis by increasing the awareness of, and preparedness for, business continuity risks faced by the city's local businesses, providing a toolkit of intervention to help local businesses manage risks and enhance business resilience, and conducting outreach campaigns to engage leaders from the business, government, and community sectors to enhance preparedness for economic resilience.		Service Industry Workers, Local Businesses	Engagement, Partnerships	Toolkit of intervention developed to help support local businesses manage risks and enhance resilience	Near-term (by 2024)	Community Planning and Building/City Hall	 
							
							
Action 1.4.4. Hire a Grant Writer/Climate Coordinator. Hire a grant writer/climate coordinator to pursue available grants to fund climate adaptation implementation and track progress.		All	Funding	Grant writer hired	Near-term (by 2024)	City Hall	  
							
							

Table 2 Goal 2. A Natural Environment Resilient to Climate Hazards

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Policy 2.1. Protect and restore climate-vulnerable habitat and ecosystems.							
Action 2.1.1. Increase Funding for Climate Adaptation. Earmark Capital Improvement Program (CIP) funding for design, permitting, and implementation of adaptation projects and strategies, such as those in the 2021 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) and Integrated Regional Watershed Management Program (IRWMP).		Urban Forest, Mission Trail Nature Preserve, North Dunes, Carmel Beach, Water Supply	Funding	Number of adaptation projects funded through CIP	Near-term (by 2024)	Public Works	\$ \$
		Urban Forest	Engagement, Equity, Measurable Increase in Resilience, Adaptive Management	Forest Management Plan Updated	Near-term (by 2024) and Ongoing	Public Works Forestry Division /Forest and Beach Commission	\$ \$
	<ol style="list-style-type: none"> Review and consider modifications to the preferred urbanized tree species that would result in improved resilience in the context of the expected climate of the second half of the century, reduce wildfire hazard, and that takes into account aesthetics and the ecological benefits of natives or near-native (e.g., native species from the Southwestern US or Mexico would likely be preferred to European species). Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way Incorporate tree species that have greater drought and wildfire resistance In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. Enhance carbon sequestration potential Update of the Plan should include collaboration and engagement with stakeholders, such as the Monterey Pine Forest Watch, California State University, Monterey Bay, and vulnerable communities.						
Action 2.1.3. Increase Resilience of the Mission Trail Nature Preserve and Pescadero Canyon. Update and implement the Mission Trail Nature Preserve Master Plan to consider the potential impacts of climate change and to reduce wildfire risk for neighboring private properties. Coordinate with CalFire and the Monterey Fire Departments to incorporate Best Practices into an annual maintenance plan, including cost estimates for implementation and revenue sources for implementation. Continue to coordinate with CalFire and the Pebble Beach Community Services District on wildfire mitigation in Pescadero Canyon.		Mission Trail Nature Preserve	Adaptive Management, Partnerships, Funding	Mission Trail Nature Preserve Master Plan updated	Mid-term (by 2027) and Ongoing	Community Planning and Building and Public Works	\$ \$
Action 2.1.4. Increase Resilience of the North Dunes. Continue to fund maintenance and monitoring at the North Dunes to determine how the changing climate will affect dune habitats. Implement enhancement efforts to improve resilience of the North Dunes.		North Dunes	Funding, Adaptive Management, Measurable Increase in Resilience	Regular maintenance and monitoring occurring at North Dunes	Ongoing	Community Planning and Building and Public Works	\$ \$

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Action 2.1.5. Increase Resilience to Stronger Storms. When designing projects in the city, including those recommended in the Mission Trail Stream Stability Study, size improvements to handle larger storms consistent with best available climate change projections.		Mission Trail Nature Preserve	Institutional Structures, Adaptive Management, Measurable Increase in Resilience	Number of projects sizing improvements to handle larger storms.	Near-term (by 2024)	Public Works	\$ \$
Action 2.1.6. Beach Sand Monitoring Program. Reinstate beach sand monitoring program described in the Shoreline Management Plan.		Carmel Beach	Adaptive Management	Active beach sand monitoring program in place	Near-term (by 2024)	Public Works	\$ \$
Action 2.1.7. Carmel Cove Sand Supply. Partner with local researchers (e.g., California State University Monterey Bay) or other sources to conduct Carmel Cove sand supply dynamics analysis.		Carmel Beach	Partnerships	Carmel Cove sand supply dynamics analysis completed	Long-term (by 2032)	Community Planning and Building and Public Works	\$ \$

Table 3 Goal 3. Resilient Infrastructure and Built Environment

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Policy 3.1. Support greater resilience, redundancy, and reliability of local and regional infrastructure and the built environment.							
Action 3.1.1. Underground Utilities in Fire Hazard Zones. Determine the feasibility of, and community support for, undergrounding power lines in the Mission Trail Nature Preserve, designated evacuation routes, and in other high priority areas in the Very High Fire Hazard Severity Zone. Develop a plan for undergrounding utilities based on results from the feasibility study and begin implementation in the most vulnerable communities.		Water Supply, Sanitary Sewer System, Power Grid, Overhead Communication, PG&E/Communication on Underground Lines- gas, cable	Measurable Increase in Resilience, Equity	Feasibility Study completed; Plan developed based on Feasibility Study; Number of utilities moved underground	Near-term (by 2024)	Community Planning and Building and Public Works	\$ \$ \$
Action 3.1.2. Increase Green Infrastructure. Modify Capital Improvement Program (CIP) project design to consistently evaluate the potential for green infrastructure to be incorporated in CIP projects in the public right-of-way and on public lands. Identify and develop a green infrastructure pilot project that will reduce runoff volume and capture and infiltrate stormwater, based on projected changes in precipitation amounts due to climate change, and incorporates tree and shrub planting to increase carbon sequestration in the city.	 	Urban Forest, Storm Drain System	Institutional Structures, Measurable Increase in Resilience	Change in impervious surface coverage.	Near-term (by 2024)	Public Works	\$ \$
Action 3.1.3. Public Building Electrification. Identify opportunities to incorporate electrification of City facilities and buildings, including solar photovoltaic power system and battery backup installation, into the Capital Improvement Program (CIP). As an initial step, identify and develop a pilot project to electrify a city building or facility, including the installation of a photovoltaic power system.	 	Power Grid, City Facilities	Institutional Structures, Measurable Increase in Resilience	Public building electrification pilot project completed.	Near-term (by 2024)	Public Works	\$ \$ \$
Action 3.1.4. Reduce Stormwater Runoff. Reduce stormwater runoff through implementation of stormwater diversion and infiltration projects that reduce pollution problems caused by more frequent and intense storms and more extreme flooding events.		Storm Drain System, Carmel Beach	Measurable Increase in Resilience	Stormwater diversion project implemented	Long-term (by 2032)	Public Works	\$ \$ \$
Action 3.1.5. Storm Drain Repair Funding and Improvements. Earmark Capital Improvement Program (CIP) funding for design, permitting and implementation of storm drain repairs. Include strategies in the 2021 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) for potential regional funding. Upsize Storm Drain Master Plan (SDMP) improvements, especially when making repairs in the lower reaches of watersheds, to handle larger storms.		Storm Drain System	Funding	Number of adaptation projects funded through CIP	Near-term (by 2024)	Public Works	\$ \$ \$

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
<p>Action 3.1.6. Retrofit Existing Critical Buildings and Related Infrastructure. Conduct an evaluation of all first-responder and municipal facilities to determine retrofits that may be needed for long-term resilience to climate change hazards including sea-level rise related flooding and erosion, increased wind/storm events, an increase in high heat days, and/or wildfire depending upon location and risk factors. Develop a budget and schedule for retrofits based on the findings of the municipal facilities. Retrofit existing critical buildings as detailed in the program schedule.</p>		Emergency Response Facilities – Fire station, EOC, PD, PW, City Hall, etc., Hospital and Emergency Medical Care Facilities	Measurable Increase in Resilience, Funding	List of critical buildings and related infrastructure requiring retrofits	Near-term (by 2024)	Public Works	
<p>Action 3.1.7. Water Conservation. Partner with the Monterey Peninsula Water Management District to reduce water demand and increase water recycling, such as stormwater capture and grey water reuse, through education and outreach. Provide information and incentives for residential water use reduction, focusing engagement on vulnerable communities first.</p>		Water Supply	Partnerships, Equity, Engagement	Water demand reduced, incentives for grey water reuse developed and shared	Near-term (by 2024)	Community Planning and Building and Public Works	
<p>Action 3.1.8. Bluff Structural Monitoring Program. Implement bluff structural monitoring program and do follow-up monitoring post-storm to identify additional footing stability issues.</p>		Carmel Beach	Measurable Increase in Resilience	Bluff structural monitoring program implemented	Mid-term (by 2027)	Public Works	
<p>Action 3.1.9. Sea Level Rise Coastal Vulnerability Study. Hire coastal engineer with experience in planning for climate change to:</p> <p>(1) Conduct research and prepare a Sea-Level Rise Vulnerability Study to further assess the risks to the city’s coastal assets, including the beach, sea walls, revetments, bluffs, stairs and access, public bathrooms, parking areas, drainage infrastructure, and utilities.</p> <p>(2) Determine adaptation measures and Local Coastal Program policy options, including but not limited to: a) Mostly natural, unarmored North Dunes area; b) mostly armored bluffs along Scenic Roach south of 8th Avenue; c) Unarmored dunes along private property between 8th Avenue and Del Mar Parking Lot; d) Armored private properties on the bluffs at the north end of the City (Pescadero Canyon area).</p> <p>(3) Evaluate the use of thresholds for phasing adaptation projects based on changing coastal conditions. Consider applying an adaptive pathways approach which establishes trigger thresholds for different adaptive measures based on the severity of the impact from flooding and erosion associated with sea-level rise.</p>		Carmel Beach, Shoreline Access Infrastructure, Seawall and Revetments	Adaptive Management	Sea-level rise vulnerability study completed	Near-term (by 2024)	Public Works	
<p>Action 3.1.10. Wastewater Treatment. Collaborate with the Carmel Area Wastewater District (CAWD) to increase the facilities and associated infrastructure (ex. sewer lines) resilience to sea level rise and stronger storms. Maintain staff/council personnel as liaisons to CAWD.</p>		Water Supply, Storm Drain System	Partnerships	Number of collaboration meetings with CAWD regarding facility’s resilience	Near-term (by 2024) and Ongoing	Community Planning and Building and Public Works	

Action	Climate Hazard	Asset/Population	Criteria	Metric	Timeframe	Implementation Lead	Cost
Policy 3.2. Incorporate climate change adaptation into relevant plans and standards.							
Action 3.2.1. Development Standards. Evaluate City's development standards for consistency with best practices for reducing climate change risk (e.g., wildfire risk) for both new and existing development, including but not limited to incorporating defensible space design in landscaping guidelines and permitting the use of fire-resistant building materials that may conflict with current Design Guidelines. Develop a project checklist for building and site adaptation measures. The checklist, included with permit applications, should serve to provide education to permit applicants on modifications to site plans and structures that can improve a project's resilience to existing and potential future climate change hazards.		Residents, Local Businesses, Second Homes	Institutional Structures, Adaptive Management	Number of projects implementing adaptation measures, City development standards consistent with best practices for reducing wildfire risk	Mid-term (by 2027)	Community Planning and Building	\$ \$
Action 3.2.2. Update City Planning Guidelines. Update the City's municipal code to maintain consistency with current California codes (California Building Code Chapter 7 and California Residential Code R337) throughout the City.		Residents, Local Businesses, Second Homes	Institutional Structures, Adaptive Management	City municipal code consistent with current California codes	Near-term (by 2024)	Community Planning and Building	\$ \$
Action 3.2.3. Incorporate Climate Change Adaptation into Local Plans. Prioritize the update of local plans, including the Climate Change Vulnerability Assessment, Local Coastal Program, General Plan, Mission Trails Nature Reserve Master Plan, Del Mar Master Plan, Shoreline Management Plan, and drought planning to promote climate change resilience as new information is available.		All	Adaptive Management	Number plans updated to incorporate adaptation	Mid-term (by 2027)	Community Planning and Building/Public Works	\$ \$
Action 3.2.4. Update Shoreline Management Plan. Update Shoreline Management Plan and Local Coastal Program based on results of Sea-level Rise Vulnerability Study.		Carmel Beach	Adaptive Management	Shoreline Management Plan and Local Coastal Program updated	Long-term (by 2032)	Community Planning and Building and Public Works	\$ \$
Action 3.2.5. Multi-Jurisdictional Hazard Mitigation Plan. Maintain a comprehensive list of projects, based on existing plans and gaps identified in the Vulnerability Assessment, to provide to Monterey County during updates to the Monterey County Multi-Jurisdictional Hazard Mitigation Plan in 2022 and beyond.		All	Adaptive Management	Number of adaptation projects included in the Multi-Jurisdictional Hazard Mitigation Plan	Near-term (by 2024)	Community Planning and Building, Police, and Public Works	\$

Implementation and Monitoring



Implementation

Implementation of the Climate Adaptation Plan will require City staff time and resources, along with strategic collaboration and leadership among key partners and regular and meaningful community engagement. Implementation of actions will require regular tracking and reporting to measure progress against established goals. This section describes the guidance, tools, responsibilities, and analysis required to effectively implement and monitor progress with the adaptation strategy. An implementation guide, which provides each adaptation action sorted by timeframe for implementation and organized by goal and policy, can be found in Appendix D. The appendix includes relevant case study examples to illustrate how policies and actions are being transformed into specific projects and programs.

Implementation Roles and Responsibilities

Effective implementation of the Climate Adaptation Plan will not only require coordination and leadership from the City and its partners, but also the active engagement and development of partnerships with community stakeholders, local businesses, and residents to achieve steady progress towards the City's climate resilience goals.

City's Role

The City will serve as the direct lead in the implementation and monitoring of the Climate Adaptation Plan. The City should incorporate the actions of the Climate Adaptation Plan into the operations, financial decision-making, community engagement, and overall planning processes. In alignment with the climate adaptation goals and policies, the City should update city services,

building codes, and related programs, and pursue revenue and funding sources for implementing adaptation actions and projects. The City will be responsible for ensuring that the plan remains a relevant document informed by the best available science and is reviewed, evaluated, and updated on a consistent basis. Through the implementation, review, and updating process, the City should continue to actively engage vulnerable populations, such as the elderly and individuals with disabilities, through public workshops and other engagement opportunities to develop adaptation strategies that are inclusive, equitable, and effectively addressing community needs. City departments and entities tasked with leading implementation of adaptation actions include Public Works, Police & Fire, Community Planning & Building, the Library, City Hall, and the Community Emergency Response Team (CERT). See Appendix D, which shows which department is responsible for leading each action. The Adaptation Strategy identifies a Grant Writer/Climate Coordinator (action 1.4.4.) as a key position to ensure that each City department lead is making progress on their adaptation actions. Appendix D provides a detailed implementation guide indicating the appropriate City lead for each action with actions sorted by timeframe for implementation. The City Council should also consider establishing and appointing a new Sustainability Commission to support the implementation of the Climate Adaptation Plan by providing feedback on progress reports as described below in the Reporting on Progress section.

The Role of Partners

Partnerships will allow for efficient problem solving, regional collaboration for feasibility studies and other adaptation-related work, and the ability to widely communicate resources. To facilitate implementation of some of the actions, the City should coordinate with several key partners, as identified below.

Table 5 Partner Role

Organization	Partner Description and Opportunities
Fire Protection	
Firewise USA	Firewise USA provides as framework of communities and neighbors to organize and participate in wildfire risk mitigation efforts. Once a local fire safe council/neighborhood has been certified, the City should partner with the group to increase community resilience to wildfire.
California Department of Forestry and Fire Protection (CAL FIRE)	CAL FIRE protects and stewards over 31 million acres of California’s privately owned wildlands. The Department also provides emergency services in 36 of the State’s 58 counties through contracts with local governments and prevents wildfires in the State Responsibility Area (SRA). The City should apply for grant funding from CAL FIRE to better prepared for wildfires.
Monterey Fire	Monterey Fire serves an area of about 400 square miles and provides fire and emergency services as well as community education programs to Carmel and other jurisdictions in Monterey County. The City should regularly partner with Monterey Fire on defensible space code enforcement, education and outreach, and emergency preparedness.
National and Statewide Partners	
The U.S. Army Corps of Engineers	The U.S. Army Corps of Engineers provides engineering solutions to reduce disaster risk and energize the economy. They also have a regulatory program to protect the nation’s aquatic resources and navigable capacity. The City should coordinate with the U.S. Army Corps of Engineers to implement projects related to coastal flood hazard reduction and/or habitat restoration that would serve as adaptation strategies.
California Department of Transportation (Caltrans)	Caltrans is responsible for designing, building, and maintaining the State’s transportation system, including Highway 1. The City should partner with them to discuss feasible sea-level-rise adaptation strategies.
The California Coastal Commission	The California Coastal Commission plans and regulates the use of land and water in the coastal zone. The City should continue to collaborate with the California Coastal Commission regarding planning for sea level rise and climate change through Local Coastal Program updates.
Utilities	Electric, gas, cable, telephone, and other utility companies contain assets that will be affected by climate hazards. The City should coordinate with these utilities to discuss feasible adaptation strategies.
Regional Partners	
Association of Monterey Bay Area Governments (AMBAG)	AMBAG leads regional collaboration and services to analyze, plan and implement regional policies for Counties and Cities of Monterey, Santa Cruz, and San Benito. The City should collaborate with AMBAG to plan and implement regional-scale adaptation strategies.
Central Coast Community Energy (3CE)	3CE is a Community Choice Energy agency that sources clean and renewable electricity for Monterey, San Benito, and Santa Cruz and parts of San Luis Obispo and Santa Barbara counties. The City should collaborate with 3CE to plan and implement adaptation strategies that increase electricity reliability in the face of climate hazards.

Organization	Partner Description and Opportunities
The Central Coast Climate Collaborative	The Central Coast Climate Collaborative is a membership organization cultivating a network of local and regional community leaders throughout six Central Coast counties to address climate change mitigation and adaptation. The City could consider participating in the Central Coast Climate Collaborative to share best practices and information with other local and regional agencies.
Monterey Peninsula Water Management District (MPWMD)	MPWMD serves approximately 112,000 people within the cities of Carmel-by-the-Sea, Del Rey Oaks, Monterey, Pacific Grove, Seaside, Sand City, Monterey Peninsula Airport District and portions of unincorporated Monterey County. Climate change and water are inextricably linked, and the city should maintain staff and council liaisons to help frame and integrate immediate and long term water planning into climate change adaptation.
County-based Partners	
The Monterey County Health Department	The Monterey County Health Department is a membership organization cultivating a network of local and regional community leaders throughout six Central Coast counties to address climate change mitigation and adaptation. The City could consider participating in the Central Coast Climate Collaborative to share best practices and information with other local and regional agencies.
The Monterey County Workforce Development Board (WDB)	The Monterey County Workforce Development Board coordinates with public and private partners to train and place individuals with the skills that employers need. WDB provides job seekers with connections, services, and resources needed to successfully join the workforce. The City should partner with WDB to establish education and training partnerships for workers displaced or negatively impacted by climate change.
The County of Monterey Economic Development Department	The County of Monterey Economic Development Department coordinates and facilitates the County's efforts to attract, return, and grow businesses and jobs and provide affordable housing throughout the County. The City should work with the County of Monterey Economic Development Department to develop more integrated strategies for job protection, economic sustenance, and the protection of vulnerable populations more at risk of temporary or permanent job dislocation due to climate change.
California State University (CSU) Monterey Bay	CSU Monterey Bay, founded in 1994, is a public, coeducational institution that provides undergraduate degrees, graduate degrees, and teacher certifications. The City should partner with CSU Monterey Bay to conduct local adaptation-related studies.
City-based Partners	
Carmel Area Wastewater District (CAWD)	CAWD provides wastewater treatment services Carmel-by-the-Sea and is owned, operated, and managed by the community via an elected Board of Directors. The City should maintain staff or council personnel as liaisons to CAWD to increase the facility's resilience to sea level rise and stronger storms.
Neighboring Cities	Neighboring cities include Monterey, Pacific Grove, Salinas, Del Rey Oakes, Marina, Sand City, and Seaside. The City should stay in regular communication with neighboring jurisdictions to share best practices and information on adaption planning, to jointly conduct needed monitoring, and to coordinate on issues that cross jurisdictional boundaries.

Organization	Partner Description and Opportunities
The Carmel Foundation	The Carmel Foundation is a Carmel-based membership organization with over 3,000 members 55 years of age and older that facilitates interactive programs, activities, and classes for its members. The City should partner with the Carmel Foundation to develop and plan for a social support network to increase resilience to climate change.
Local community and volunteer groups	Local community and volunteer groups can help disseminate adaptation-related information and workshops to all residents and communicate information back to the City.
The Carmel Chamber of Commerce	The Carmel Chamber of Commerce provides programs, workshops, and networking to promote the businesses in the City of Carmel. The City should partner with the Carmel Chamber of Commerce to increase economic resilience by developing strategies for job protection in the face of climate change.
Visit Carmel-by-the-Sea	Visit Carmel-by-the-Sea provides exclusive offers, itineraries, and resources for visitors to utilize when planning a visit to the City. The City could coordinate with Visit Carmel-by-the-Sea to distribute evacuation information to visitors, in the event of a climate change-induced disaster.
Carmel Unified School District	Carmel Unified School District serves communities in Carmel-by-the-Sea, Carmel Valley, and Big Sur, and has three elementary school, one middle school, one high school, one continuation high school, adult programs, preschool, and before/after school programs. The City could coordinate with the school district to provide resilience hubs in the community.



These partners are well positioned to support implementation of adaptation actions from the Plan that align with the respective expertise or jurisdictional mandate of each partner organization. For example, the Monterey County Health Department is best positioned to provide City emergency providers with information and data regarding potential health threats associated with climate change hazards for incorporation into disaster and emergency early warning systems. Similarly, the Carmel Foundation and Carmel Residents Association have the connections and expertise to support the development of a plan for a social support network that improves communication among vulnerable populations regarding climate change. Climate Adaptation Plan partners can utilize their expertise, relationships, and resources to work with the City on implementing adaptation-related engagement efforts, planning, and other related projects.

The Role of Business

A large portion of local businesses in the City is in the hospitality industry. Businesses, such as restaurants, hotels, and art galleries, can serve as key Climate Adaptation Plan partners by promoting outreach events and campaigns that center the engagement of the community in conversations around climate risks and concerns. The City should partner with the Carmel Chamber of Commerce, the Monterey County Workforce Development Board, and the County of Monterey Economic Development Department to support businesses in developing continuity plans and guidelines that support economic resilience, protect vulnerable workers, and prepare for emergency and disaster events. Businesses should explore opportunities to build resilience to climate hazards through improving emergency preparedness, electrifying equipment and procuring battery storage to prepare for potential electrical grid shutoffs.

The Role of Residents

Residents of the City should focus on utilizing the resources and programs developed as a result of the Climate Adaptation Plan to become better informed on ways to prepare for climate change hazards events. Residents can participate in outreach campaigns and local programs to build personal and community resilience.

Residents can create a buffer, or defensible space, between their properties and grass, trees, shrubs, or any wildland area that surround them to help slow or stop the spread of wildfire and help protect their homes. They can also become involved in Carmel-by-the-Sea CERT programming to become better informed on emergency preparedness and promote community scale awareness and disaster mitigation. Another possible avenue for resident participation in the Adaptation Strategy is to convert HVAC units to heat pumps for water heating and space heating in addition to cooling, which can improve indoor air quality and community adaptation to extreme heat.

Funding and Financing Mechanisms

Effective implementation of the Climate Adaptation Plan will require capital investment, funding, and staff time to update and create plans, develop standards and best practices, design programs, conduct studies, maintain projects, and upgrade and institute infrastructure improvements. While some actions have significant costs, some costs can be reduced through the utilization of grants, incentive programs, subsidies, and low interest financing, lessening the financial burden on the City and community.

The City should develop a funding and financing plan to fund the more costly actions in the adaptation strategy. In this plan, the City should consider the following revenue sources.

- **Assessment and Abatement Districts**, often financed through the collection of supplemental tax assessments, allow for the better assessment of hazards and increased funding for maintenance, repairs, and improvements. An example of an Abatement District is provided in Appendix E.
- **Infrastructure Financing Districts**, allow for incremental property tax revenues to be devoted to a specific purpose. Once an infrastructure financing district is established and priority projects have been identified as part of the business plan, funds can be drawn from changes in local tax revenues occurring as part of redevelopment or rezone, or can be used to apply for grant funds.

- **A Shoreline Account** can serve as the primary account where funds generated for future adaptation programs and maintenance would be kept in reserve.
- **Development Impact Mitigation Fees or In-Lieu Fees** can generate funds for implementing adaptation strategies. The City could consider establishing a fee program, similar to those established by the California Coastal Commission, to administer fees for habitat damages. These fees could be used to implement habitat restoration projects and maintenance.
- **Bonds** allow municipalities to borrow money from investors, which is then repaid to the investor over an established period at a certain rate. Green bonds are a new market that has emerged to specifically fund adaptation infrastructure.
- **Taxes** can be imposed to fund adaptation strategies. The City can impose a special tax with two-thirds majority voter approval. The taxing agency must publish an annual report including the tax rate, the amounts of revenues collected and expended, and the status of any project funded by the special tax.
- **Grants.** The City should also explore state and federal funding sources such as FEMA’s Hazard Mitigation Grant Program and Pre-Disaster Mitigation Program, Caltrans Adaptation Planning Grant Program, CAL FIRE’s Fire Prevention Grants Program, and the California Coastal Commission and California Coastal Conservancy – Local Coastal Program Local Assistant Grant Program and Climate Ready Grants.

The appropriate revenue source option should consider applicability to climate adaptation, revenue potential, and ease of authorization.

Monitoring and Evaluation

The City will lead the monitoring of the Climate Adaptation Plan to assess the effectiveness of the adaptation and resilience strategies and to confirm alignment with changing climate conditions and associated risks. To maintain consistency with the 2020 CalOES APG, the City should designate one department as the responsible agency for carrying out monitoring activities for adaptation action. As noted in the Adaptation Strategy (action 1.4.4), a Grant Writer/Climate Coordinator should be hired within the Public Works Department to lead monitoring and evaluation of the Climate Adaptation Plan. While some adaptation actions can be implemented using existing staff time, full Climate Adaptation Plan implementation will require additional staff and consultant time to coordinate implementation of the Climate Adaptation Plan and monitor progress. Responsibilities will include collecting and compiling all monitoring data and conducting an overall assessment of effectiveness annually. The City should follow monitoring with annual evaluation of the adaptation actions to be able to adjust in line with community needs. Re-evaluation of adaptation strategies should occur when an adaptation strategy is identified as losing effectiveness. When an adaptation action loses effectiveness, the vulnerability and susceptibility of the populations, assets, resources, and/or operations it affects should be reassessed.

The Climate Adaptation Plan should be monitored through tracking quantitative metrics to assess progress towards achieving the adaptation goals. For example, for Action 1.3.2, the City would track the number of heat pumps installed and for Action 3.1.2, the City would track the change in impervious surface coverage.



Annually, policy performance should be monitored and reported to determine the extent to which the City is achieving the adaptation policies and goals. The City should also track quantitative metrics that gauge compliance with the policies. For example, for Policy 3.2, the City would track the number of relevant plans and standards that were updated to incorporate climate change adaptation. To evaluate how adaptation strategies are considering and addressing the concerns of vulnerable populations, the City should consider defining and annually measuring a series of equity-related metrics and communicating findings through an online reporting system. The Climate Adaptation Plan should be monitored and evaluated simultaneously with the City's greenhouse gas reduction actions to measure the City's overall progress towards acting on climate change and increasing community resilience.

Reporting on Progress

The City should produce an annual report describing achievement towards the Climate Adaptation goals, policies, and actions. The report could be posted on the City website and disseminated into the community, with support from engagement partners. The report should contain quantitative information regarding metric tracking as well as lessons learned and future plans to address challenges. It is recommended that the City establish a new Sustainability Commission to be responsible for reviewing the report, providing feedback on progress, and sharing any concerns around the strategies for increasing community resilience. Alternatively, this responsibility could be assigned to the Planning Commission or the Forest and Beach Commission. With guidance from the assigned Commission, City and partner staff, and the community, the City should update to the Climate Adaptation Plan on or before 2030.

Updating the Climate Adaptation Plan and Vulnerability Assessment

The Vulnerability Assessment and Climate Adaptation Plan should be updated to incorporate new climate science data, shifting community

priorities, implementation hurdles, changes in best practice, and technological advances. The Climate Committee determined that a coastal engineering study will be necessary to fully assess the impacts of sea level rise on City assets and to determine policies and actions to address those impacts. The Climate Adaptation Plan should be updated once this study has been completed. The City Council was supportive of the Climate Committee continuing with oversight of the coastal engineering study. It is important that through each iteration of the Vulnerability Assessment and Climate Adaptation Plan, the City continue to engage key stakeholders, the community, and vulnerable populations.

Data Gaps

In the next update of the Vulnerability Assessment, the City should reassess impacts for which not enough data was available during the July 2021 update (see Appendix B). These include:

- Impacts of stronger storms on
 - Marine sanctuary, sanitary sewer system, hospital and emergency medical care facilities
- Impacts of wildfires on
 - Hospital and emergency medical care facilities
- Impacts of sea level rise on
 - Mission Trail Nature Preserve, landfill and waste management, coastal natural assets, coastal infrastructure assets
- Impacts of more drought on
 - Marine sanctuary
- Impacts of increased temperature on
 - Marine sanctuary, overhead communication, hospital and emergency medical care facilities
- Impacts of fog on
 - Mission Trail Nature Preserve, North Dunes, urban forest, marine sanctuary
- Impacts of ocean warming on
 - Marine sanctuary, visitors, local businesses

