City of Carmel-by-the-Sea

Climate Adaptation Plan

rincon

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August 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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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 activities[3] 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.

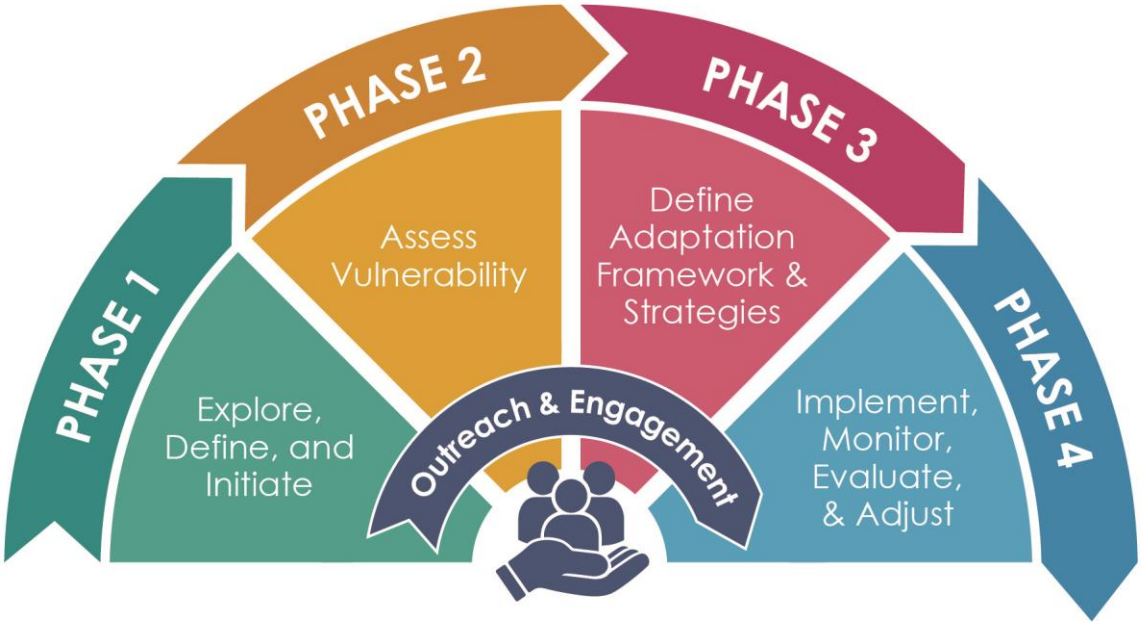
7. https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-June-2020-Accessible.pdf
8. https://www.ipcc.ch/site/assets/uploads/2018/03/SREX_FD_SPM_final-2.pdf
9. https://www.ipcc.ch/site/assets/uploads/2018/03/SREX_FD_SPM_final-2.pdf
10. https://www.caloes.ca.gov/HazardMitigationSite/Documents/CA-Adaptation-Planning-Guide-FINAL-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*

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

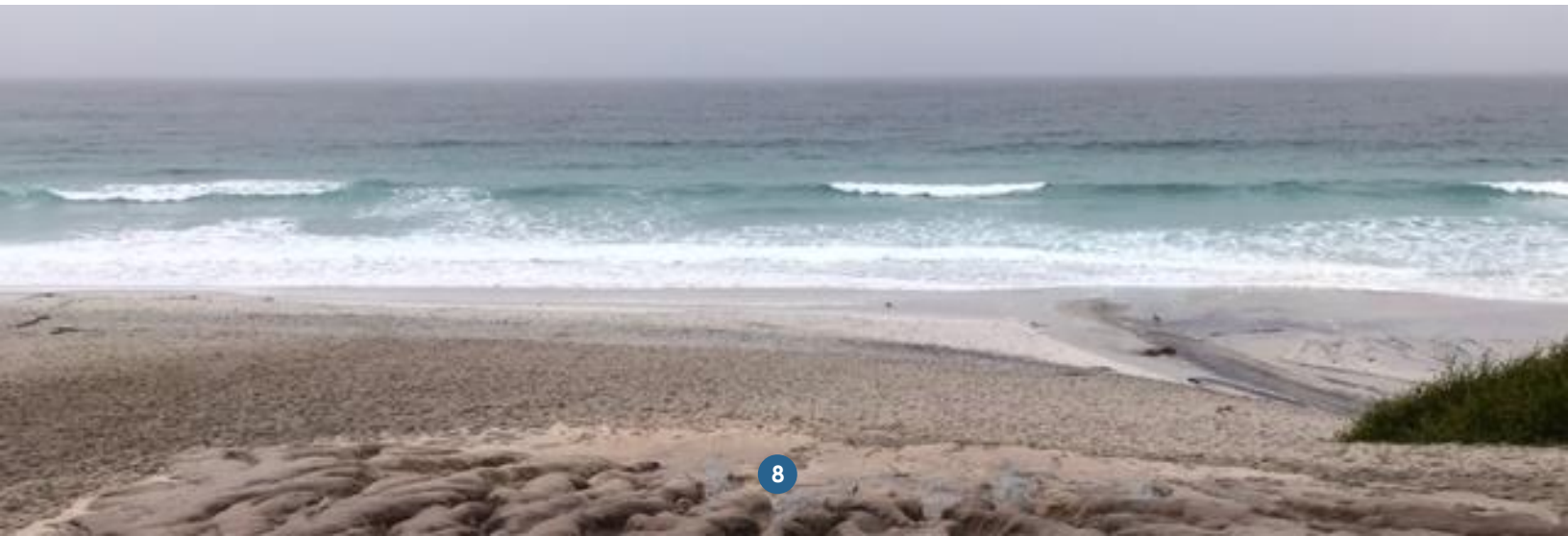
Color coding:

- 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 Climate-Related Hazards				
Priority Assets at Risk	**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 (by2027)	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	$ $
Action 2.1.2. Increase Urban Forest Resilience. Update and implement the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. 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.		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	$ $
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 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
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.		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	$ $ $
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.		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	$
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.		Carmel Beach	Measurable Increase in Resilience	Bluff structural monitoring program implemented	Mid-term (by 2027)	Public Works	$ $
Action 3.1.9. Sea Level Rise Coastal Vulnerability Study. Hire coastal engineer with experience in planning for climate change to: (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. (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). (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.		Carmel Beach, Shoreline Access Infrastructure, Seawall and Revetments	Adaptive Management	Sea-level rise vulnerability study completed	Near-term (by 2024)	Public Works	$ $ $
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.		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 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

Appendix A
Climate Action Plan

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

The Path Forward

Adopted by the Carmel-by-the-Sea City Council on August 2nd, 2022

Final
August 2022

Credits and Acknowledgments

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Many thanks to the members of the public who have attended the Climate Committee meetings starting in November 2019 and provided valuable input throughout the plan development process.

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Appendix A – Greenhouse Gas Inventory and Forecasting Technical Memo

INTRODUCTION

Rising concentrations of carbon dioxide and other greenhouse gases are altering temperature and rainfall patterns and contributing to rising sea levels globally. In California, recent historic wildfires, droughts, floods, mudslides, and public safety power shutoffs represent the types of climate change impacts that will continue to be experienced with increasing frequency and severity. Although climate change is a global issue, regional and local governments are uniquely positioned to identify the specific risks and most effective solutions for their communities.

Recognizing the importance of local action, the City of Carmel-by-the-Sea (City) Climate Action Plan (CAP) presents measures that will serve as a road map to meeting Carmel-by-the-Sea's greenhouse gas (GHG) emission reduction targets. It addresses government operations emissions under the City's control, as well as community-wide emissions. The emissions reduction measures build on existing plans, policies and practices already adopted by the City and other regulators, and are consistent with statewide climate legislation. This plan is a companion document to the City's Climate Adaptation Plan and includes several measures that not only reduce the community's GHG emissions but also improve public health and community resilience.

Scope of the Climate Action Plan

This Climate Action Plan consists of the following elements:

(1) a greenhouse gas emissions inventory (summarized in this chapter and provided in full as Appendix A),

(2) a 2030 greenhouse gas emissions target and forecast, and a 2045 carbon neutrality goal, in line with Statewide goals,

(3) an action plan to meet these targets, and

(4) implementation and monitoring recommendations to ensure continued success towards reaching GHG reduction goals.

The CAP identifies strategies to guide the development and implementation of GHG reduction measures in the City of Carmel-by-the-Sea, and quantifies the emissions reductions that result from these strategies. The overall benefits of the CAP are much greater than reducing GHG emissions; it includes quality of life and resilience improvements for the community, potential energy cost savings for residents and businesses, and protection of environmental and community assets for future generations.

The CAP proposes strategies to reduce GHG emissions from community-wide activities and government operations. Strategies are broken down into six goals:
Goal 1: Energy Efficiency and Electrification of Residential and Commercial Buildings
Goal 2: Improved Transportation Choices
Goal 3: Renewable Energy Sources
Goal 4: Water Efficiency
Goal 5: Waste Reduction
Goal 6: Urban Forest Protection and Heat Island Effect Reduction

GREENHOUSE GAS EMISSIONS INVENTORY AND FORECAST

GHG emissions inventories are the foundation of planning for future reductions. Establishing an inventory of emissions helps to identify and categorize the major sources of emissions produced over a single calendar year. A community inventory includes GHG emissions that result from the activities of city residents and businesses. The inventory identifies the major sources of GHG emissions resulting from activities in sectors that are specific to community activities.

Community GHG Inventory Scope

The Association of Monterey Bay Area Governments (AMBAG) has prepared community inventories for its member jurisdictions, including the City, for the years 2005, 2010, 2015, 2018, and 2019. The 2019 inventory is the most recent year for which data is available. Table A provides the sectors evaluated in the GHG inventories.

Table A: Community Sectors Evaluated

Community Sectors
Residential Energy (Electricity and Natural Gas)
Commercial Energy (Electricity and Natural Gas)
On-Road Transportation
Solid Waste
Wastewater

AMBAG calculated GHG emissions using the available activity data (e.g., kilowatt-hours of electricity) in the State Energy Efficiency Collaborative (SEEC) ClearPath tools to convert activity data to emissions output using relevant emission factors.

Transportation GHG Analysis

LSA Associates (LSA) was retained by the City to develop an updated GHG emissions inventory to address specific concerns associated with the City's unique tourist-based economy that attracts visitors from around the State and the world (Appendix A). The City wanted to better understand the relationship between its tourist economy and GHG emissions resulting from tourism. The City had two specific goals: (1) understanding GHG emissions from on-road transportation based upon the origins and destinations of vehicle trips attributable to the City; and (2) developing GHG reduction strategies that will be effective for different types of vehicle trips including vehicle trips resulting from tourism, vacation homes, employee commutes, delivery services, and other local trips.

The analysis determined the following vehicle trip information:

- Local trips made up approximately 7 percent (%) of all vehicle trips in the City and averaged 6.5 miles.
- Commute trips represented 38% of all vehicle trips in the City and averaged 27 miles per trip.
- Delivery services providing supplies to local businesses and construction sites in the City made up approximately 10% of all vehicle trips and averaged 27 miles.

- 20% of vehicle trips result from the occupants of second homes in Carmel with an average trip length of 120 miles from their origin to the second home.
- Domestic tourists (primarily from the Bay Area and Salinas) make up 22.5% of vehicle trips. Their mileage varies depending on their origin from 27 miles for visitors from Salinas to 322 miles for those from Los Angeles and Orange Counties.
- International tourists make up approximately 2.5% of vehicle trips. Many of these visitors took a tour bus to arrive in Carmel from San Francisco International Airport.

There are three types of GHG emissions that the United States Environmental Protection Agency (EPA) defines in their guidance protocols: Scope 1 GHG emissions are "direct" emissions from sources that are controlled by the jurisdiction; Scope 2 emissions are "indirect" emissions from sources controlled by the jurisdictions, such as emissions from the generation of electricity; Scope 3 emissions are from sources not controlled by the jurisdiction.

According to the EPA protocols, GHG emissions associated with vehicle miles traveled within Monterey County boundaries are considered "Scope 1" emissions and are counted in the City's GHG inventory and target setting. The GHG emissions associated with vehicle miles traveled outside of the Monterey County boundaries are considered Scope 3 emissions. Although these emissions are not included in the target setting, the City has developed strategies focused on reducing these emissions as well.

GHG Inventory Results

The City's total emissions in 2019 were 30,962 metric tons of carbon dioxide equivalent (MT CO_2e). As shown in Figure 1 and Table B, the on-road transportation sector was the largest contributor to emissions in the 2019 inventory, with 45.8% of the City's total GHG emissions. Natural gas from residential and commercial buildings made up 43.2% of the City's GHG emissions.

The third most significant category of emissions was solid waste at 10.3% of total emissions. Solid waste emissions are associated with the decomposition of organic waste material in landfills, which generates methane gas, a greenhouse gas 84 times more potent than carbon dioxide.

Electricity (0.5%), and wastewater (0.2%) comprised the remainder of the emissions. As shown in Figure 2, electricity accounts for a low percentage of total emissions due to the power supply mix provided by Central Coast Community Energy (3CE), which relies largely on low-carbon energy sources.

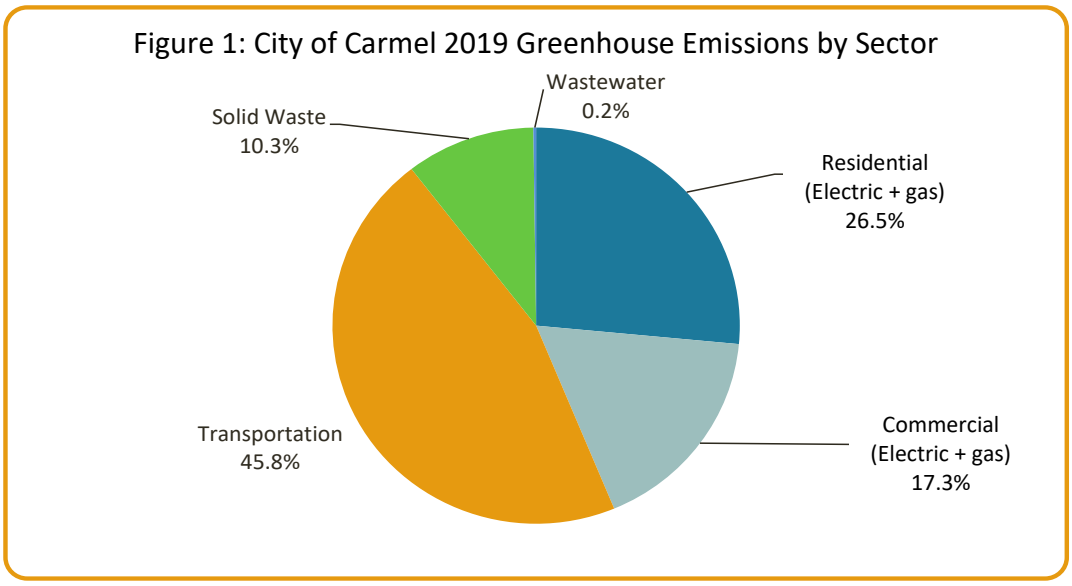
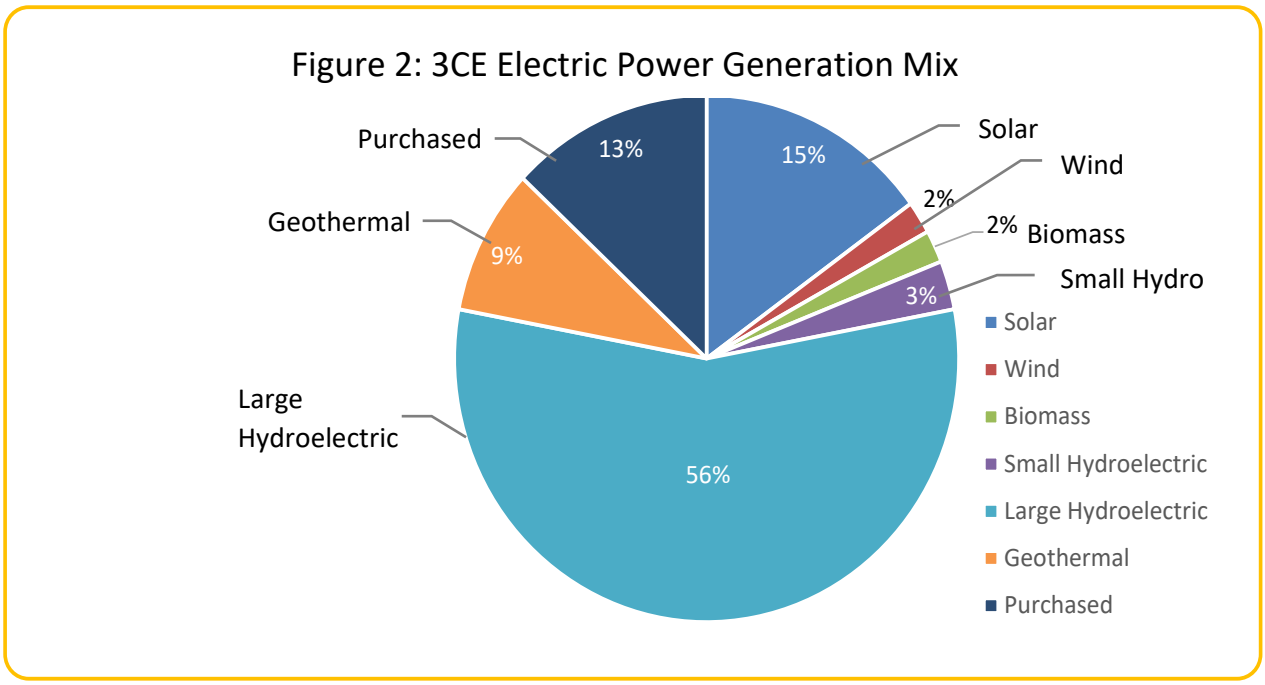


Table B: Communitywide GHG Emissions by Sector for 2019

Sector	2019 (MT CO_2e)	Percent of Total
On-road Transportation		
Scope 1	14,173	45.8
Scope 3	15,115	
Electricity		
Residential	63	0.5
Commercial	92	
Natural Gas		
Residential	8,138	43.2
Commercial	5,250	
Solid Waste	3,178	10.3
Wastewater	68	0.2
Total Scope 1 Emissions	**30,962**	100
Total with Scope 3 Emissions	**46,076**	

Source: AMBAG and LSA 2021.
MT CO_2e = metric tons of carbon dioxide equivalent



GHG Emissions Forecast

Forecasting future GHG emissions allows the City to understand how emissions are expected to increase or decrease in the future. Major changes in growth or land uses may affect how to best plan to reduce emissions in the future. GHG emissions are forecast using two scenarios: a Business-as-Usual (BAU) scenario and an Adjusted BAU (ABAU) scenario. The BAU scenario describes emissions based on projected growth in population and employment and does not consider policies that would reduce emissions in the future (that is, the policies and related efficiency levels in place in 2019 are assumed to remain constant through 2045). The City's projected growth is estimated using data from AMBAG's adopted growth forecasts for Carmel by-the-Sea, which provides the City's demographic growth indicators for the years 2030 and 2045. The growth rates for households, population, and employment were estimated based on the available data and used to estimate the growth in households, population, and employment into the year 2045. Table C shows the growth projections used to develop the emissions forecasts. As shown in this table, population, jobs, and energy consumption will experience very low growth rates in the City through 2045.

The ABAU scenario describes emissions based on projected growth *and* considers policies that will achieve GHG reductions in the future. By evaluating the two scenarios, the City can evaluate the effect that existing policies may have on future emissions and determine which local measures would provide additional reductions.

Two future years are forecast for each scenario: 2030 and 2045. The 2030 forecast year is consistent with the goals identified in the Senate Bill (SB) 32, and the corresponding Statewide Scoping Plan, which identifies Statewide GHG reduction targets for 2030.

As shown in Table D, the 2030 BAU emissions are estimated to be 29,445 $MTCO_2e$. By 2045, emissions are estimated to decrease to 27,471MT CO_2e. This modest reduction in GHG

emissions is due to changes over time as people purchase newer and more energy efficient automobiles and appliances.

As shown in Table E, the City's ABAU emissions are estimated to be 23,013 MT CO_2e in 2030, and 19,013 MT CO_2e in 2045. The ABAU takes into account stringent State regulations related to transportation (vehicle efficiency and low carbon fuel standards) and energy sectors (renewable energy portfolio standards and requirements for a portion of the natural gas supply to be renewable natural gas).

Table C: Growth Indicators for 2020, 2030, and 2045

Sector	Demographic Indicator	2020	2030	2020–2030 CAGR[1] Percent	2045	2020–2045 CAGR Percent
Residential Energy	Households	3,437	3,442	0.0002	3,459	0.0064
Commercial/Industrial Energy	Jobs	3,556	3,674	0.0033	3,915	0.0040
N/A[2]	Population	3,949	3,954	0.0001	3,984	0.0035
VMT, Solid Waste and Wastewater	Service Population (Population + Jobs)	7,505	7,628	0.0015	7,899	0.0020

Source: AMBAG, 2022 Regional Growth Forecast
[1] CAGR = Compound annual growth rate.
[2] Not applicable. Population data are shown for informational purposes but are not used for forecasting any sector.

Table D: Business As Usual (BAU) Forecast Emissions

Sector	2019 (MT CO_2e)	2030 (MT CO_2e)	Percent Change 2019–2030	2045 (MT CO_2e)	Percent Change 2019–2045
On-road Transportation Scope 1: Scope 3:	 14,173 15,115	 13,316 14,201	-5%	 12,582 13,418	-11%
Electricity Residential Commercial	 63 92	 60 87	-5%	 56 82	-11%
Natural Gas Residential Commercial	 8,138 5,250	 7,759 4,961	-4%	 7,239 4,628	-11%
Solid Waste	3,178	3,033	4%	2,830	-11%
Wastewater	68	59	-5%	55	-12%
Total (Scope 1) **Total (Scope 3)**	**30,962** **46,076**	**29,445** **43,646**	-5%	**27,471** **40,889**	-11%

Source: LSA forecasts for the City of Carmel by-the-Sea, 2021.
MT CO_2e = metric tons carbon dioxide equivalent

Table E: Adjusted Business As Usual (ABAU) Forecast Emissions

Sector	2019 (MT CO_2e)	2030 (MT CO_2e)	Percent Change (2019–2030)	2045 (MT CO_2e)	Percent Change (2019–2045)
On-road Transportation			-26.6%		-38.6%
Scope 1:	14,173	10,407		8,708	
Scope 3:	15,115	11,105		9,285	
Electricity					
Residential	63	47	-25.4%	39	-38.1%
Commercial	92	68		57	
Natural Gas					
Residential	8,138	6,138	-24.6%	5,010	-38.4%
Commercial	5,250	3,935		3,203	
Solid Waste	3,178	2,372	-25.4%	1,958	-38.3%
Wastewater	68	46	-32.4%	38	-44.1%
Total (Scope 1)	**30,962**	**23,013**	**-25.7%**	**19,013**	**-38.6%**
Total (Scope 3)	**46,076**	**34,118**		**28,298**	

Source: LSA forecasts for the City of Carmel by-the-Sea, 2021.
MT CO_2e = metric tons carbon dioxide equivalent

GREENHOUSE GAS EMISSIONS TARGETS

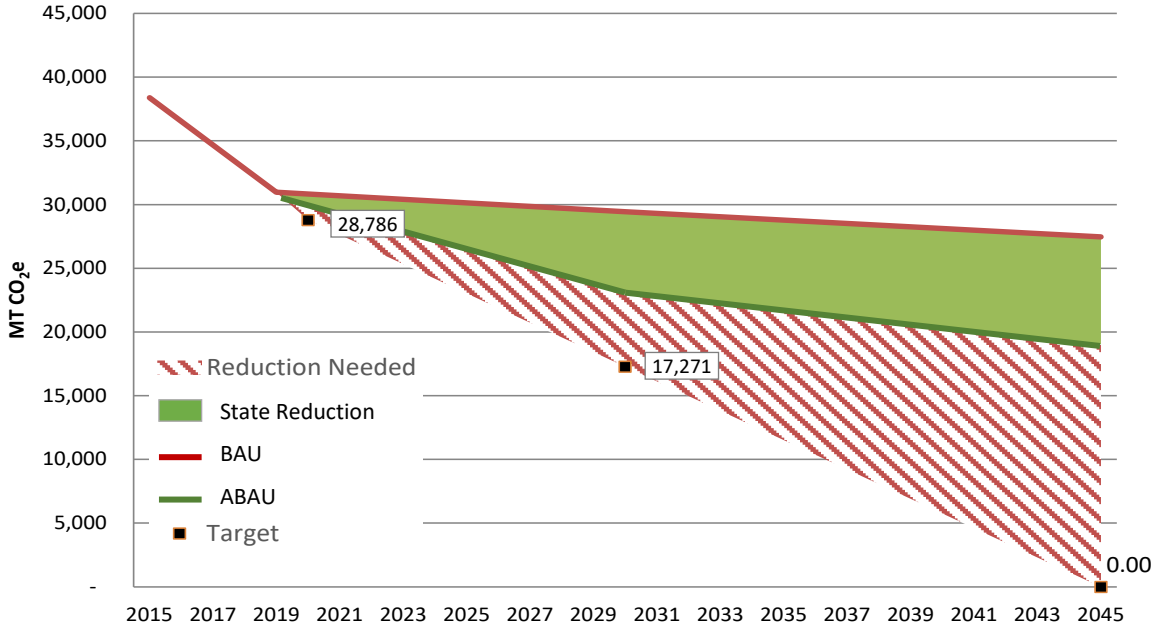
The State has set goals for reducing statewide GHG emissions by 2030 and 2045 through Assembly Bill (AB) 32, Senate Bill (SB) 32, SB 100, and Executive Order (EO)-B-55-18. The State has also provided guidance to local jurisdictions as "essential partners" in achieving the State's goals by identifying a 2030 GHG emissions target 40 percent below 1990 levels. Additionally, continued reduction goals should be implemented beyond the 2030 target to keep the State on a path toward Statewide climate neutrality by 2045.

In the City of Carmel-by-the-Sea, the State's target of 40 percent below 1990 levels by 2030 amounts to a reduction of 12,174 MT of CO_2 equivalent in annual emissions by 2030 compared to the BAU forecast and a reduction of 5,742 MT CO_2e by 2030 compared to the ABAU forecast to meet the State target. The City needs to implement strategies and measures to meet the State's 2030 GHG reduction target.

Additionally, the City's long-term goal is to also meet the State's 2045 carbon neutrality goal. As the City begins to implement the Climate Action Plan, additional measures will need to be identified and developed over time to meet this long-term goal.

Figure 3 depicts the BAU and ABAU forecasts, reduction targets, and additional GHG emission reductions required to meet the reduction targets.

Figure 3: BAU, ABAU forecasts, and Reduction Targets



GREENHOUSE GAS EMISSION REDUCTION STRATEGIES

Based on the City's GHG emissions forecasts and identified targets, the City developed a strategy table (Table F) of community-wide goals, measures, and actions to meet its 2030 reduction target and work towards its 2045 carbon neutrality goal.

In the strategy table, goals describe overarching objectives in a particular sector of GHG emission reductions. There are six goal areas listed in the table:

Goal 1: Energy Efficiency and Electrification of Residential and Commercial Buildings
Goal 2: Improved Transportation Choices
Goal 3: Renewable Energy Sources
Goal 4: Water Efficiency
Goal 5: Waste Reduction
Goal 6: Urban Forest Protection and Heat Island Effect Reduction

Within each goal, one or more measures are presented. Each measure includes a GHG reduction potential by 2030 and one or more actions that indicate the steps the City plans to take in achieving the measure. Certain actions are noted as "supporting actions" that will enhance the effectiveness of program implementation and GHG reductions.

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

- **Metric:** A performance indicator to gauge progress on implementation of actions. Metrics are a key component of implementing, monitoring, and evaluating the Climate Action Plan.
- **Timeframe**: The timeframe lays out a preliminary timeline for action implementation.
- **Implementation Lead**: The City department(s) that will lead the implementation of each action.
- **Cost**: Sorted into ranges of $-Low (<$25,000), $$-Medium ($25,000 - $100,000), and $$$-High (>$100,000), these estimates are used to determine the extent of funding and financing needed to implement these measures.

TABLE F: GHG Emissions Reduction Strategy Table
Goal 1. Energy Efficiency and Electrification of Residential and Commercial Buildings

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 1.1 Energy Efficiency Training, Education, Incentives and Recognition for Residential and Commercial							
Action 1.1.1: Energy Efficiency Outreach Post links on website and social media and provide materials at public events re: energy efficiency and electrification resources for residential and commercial, and green building programs such as Leadership in Energy and Environmental Design (LEED), Passive House, Active House, and Energy Upgrade California Promote an annual energy efficiency fair. Promote PG&E energy center and online resources. Hold trainings on energy efficiency and Title 24 requirements.	Supporting Action	Supporting Action	- Energy efficiency resources on website, Friday Letter, social media - Energy efficiency fair held (Earth Day) - Title 24 training held	2022-2024	Building, Planning, Public Works, Community Activities	$	1.3.6
Action 1.1.2: Energy Efficiency and Electrification Incentives Partner with AMBAG, PG&E and 3CE to promote incentive programs for residential and commercial efficiency and electrification, including heat pump retrofits and gas appliance and fireplace retrofits.	71.1	71.1	- Incentive programs posted on website, Friday Letter, social media - Incentive programs promoted at energy fair - Incentive program promoted thru Green Business and Green Citizen programs	2023-2025	Building, Planning, Public Works	$	1.3.2, 1.3.6
Action 1.1.3: Energy Efficiency Audits Promote PG&E energy audits and tools for residential and commercial	Supporting Action	Supporting Action	- Audit Information on website, Friday Letter, social media - Information shared at annual fair	2022-2024	Planning, Public Works	$	

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 1.2 Energy Efficiency in Renovation Projects							
Action 1.2.1: 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, battery storage, and electric car readiness to provide a more resilient back-up power supply. Establish a plan for reducing or eliminating natural gas from existing buildings, through a reach code, and building resilience to potential electrical grid shutoffs.	Supporting Action	Supporting Action	- Feasibility Study for Existing Building Electrification and Back-up Power completed	2022-2024	Building, Planning, Public Works	$ $	1.3.4
Action 1.2.2: Residential Home Energy Renovations. Enhance enforcement of Title 24 compliance and promote participation in green building programs. Develop a Reach Code based on the results of the Feasibility Study (Action 1.2.1). If feasible, the Reach Code should require electrification retrofits, including electric car readiness, in major home renovations/additions. Evaluate feasibility of streamlining online permitting to facilitate electrification retrofits	1,217.5	1,294.6	- 100% of regulated projects are Title 24 compliant - Reach Code Adopted by City Council - Online permitting streamlined for electrification-only retrofits - Passive House, LEED, Build It Green, Energy Star information on City website and at energy fair	2023-2025	Building, Planning	$ $	
Action 1.2.3: Residential Home Energy Renovation Incentives. Develop a program to promote home energy efficiency and electrification benefits, advertise incentives, and recognize residents that implement retrofits, such as a Green Citizen Program. Promote financing programs for home upgrades, such as Home Energy Renovation Opportunity (HERO) and Property Assessed Clean Energy (PACE) Promote incentives available to homeowners to convert to all-electric homes and install EV chargers. Evaluate the feasibility of providing additional incentives.	Supporting Action	Supporting Action	- Green Citizen Program developed - Financing information on website, at energy fair - Incentive information on website, at energy fair	2022-2024	Building, Planning, Public Works	$	1.3.6

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Action 1.2.4: Commercial Energy Renovations. Enhance enforcement of Title 24 compliance Develop a Reach Code based on the results of the Feasibility Study (Action 1.2.1). If feasible, the Reach Code should require electrification retrofits in major commercial renovations/expansions, unless the business can show a need for natural gas (restaurants, pottery kilns etc.) Promote participation in green building programs such as Leadership in Energy and Environmental Design (LEED), Passive House, and Energy Upgrade California. Evaluate the feasibility of streamlining online permitting to facilitate electrification retrofits	1,206.2	1,666	- 100% of regulated projects are Title 24 compliant - Reach Code Adopted by City Council - Online permitting streamlined for electrification-only retrofits - Passive House, LEED, Build It Green, Energy Star information on City website and at energy fair	2023-2025	Building, Planning	$ $	
Action 1.2.5: Commercial Energy Renovation Incentives. Partner with AMBAG and 3CE incentive programs to increase business participation in commercial energy efficiency programs Promote financing programs for home upgrades, such as Property Assessed Clean Energy (PACE) Initiate a Green Business Certification Program for businesses that follow the California Green Business Program standards (www.greenbusinessca.org). Promote existing incentives for businesses to convert to all-electric buildings. Evaluate the feasibility of providing additional incentives.	69.4	69.4	- Green Business Program initiated - Financing information on website, at energy fair - Incentive information on website, at energy fair, and shared via GBP	2022-2024	Building, Planning, Public Works	$	1.3.6

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 1.3 Energy Efficiency in New Construction Projects							
Action 1.3.1: Energy Efficiency in New Residential Construction Educate City staff and developers on future Title 24 updates. Promote CalGreenTier 1 and Tier 2 green building ratings such as Passive House, LEED, Build it Green or Energy Star certified buildings. Evaluate feasibility of streamlining online permitting. Develop a Reach Code based on the results of the Feasibility Study (Action 1.2.1). If feasible, the Reach Code should require new residential buildings to be all-electric homes.	0.01	0.01	- 100% of projects are Title 24 compliant - Reach Code Adopted by City Council - Online permitting streamlined for electrification-only retrofits - Passive House, LEED, Build It Green, Energy Star information on City website and at energy fair	2023-2025	Building, Planning	$	
Action 1.3.2: Energy Efficiency in New Commercial Construction Educate City staff and developers on future Title 24 updates. Promote CalGreen Tier 1 and Tier 2 green building ratings such as Passive House, LEED, Build it Green or Energy Star certified buildings. Evaluate feasibility of streamlining online permitting. Develop a Reach Code based on the results of the Feasibility Study (Action 1.2.1). If feasible, the Reach Code should require new commercial buildings to be all-electric with exemptions for business that can show a need for natural gas (restaurants, pottery kilns etc.)	0.0	0.0	- 100% of projects are Title 24 compliant - Reach Code Adopted by City Council - Online permitting streamlined for electrification-only retrofits - Passive House, LEED, Build It Green, Energy Star information on City website and at energy fair	2023-2025	Building, Planning	$	

Goal 2. Improved Transportation Choices

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 2.1. Alternative Transportation Options							
Action 2.1.1: Reduce Reliance on Automobiles. Work with AMBAG, TAMC and Caltrans to remove barriers to alternative transportation such as safe pedestrian and bicycle access to the City across Highway 1. Promote and provide incentives for bus ridership Explore the feasibility of increasing land use density in downtown during the next General Plan Land Use Element update. Identify and promote within the hotels and visitors center existing shuttle services between Carmel and the airports. Work with Monterey Airport and AMBAG to explore the feasibility of an electric shuttle service between Monterey Airport and destinations in the City.	Scope 1 563 Scope 3 89	Scope 1 563 Scope 3 89	- Outreach on shuttle services created and provided in Carmel hotels - Incentives developed and promoted to encourage bus use - Coordination meetings held with AMBAG, Monterey Airport on shuttle options - Coordination meetings held re: alternative transportation to Carmel - General Plan Land Use Element updated	2023-2030	Planning, Public Works	$ $ $	
Action 2.1.2: Develop Bicycle Master Plan to Create Safe Bike Routes around the City Develop customized bike routes to improve bike transit. Provide signage, reduce speed limits as necessary, and develop safety education programs on “sharing the road” with bikes.	10	10	- Bicycle master plan created - Signage installed - Outreach materials created and shared via City website, newsletters, local newspapers, and other outlets.	2024-2026	Planning, Public Works	$	
Action 2.1.3: Ride-Sharing and Bike to Work Programs within City Operations and Businesses Promote ride-sharing and facilitate air district incentives for ride-sharing Provide reserved preferential parking spaces for ride-sharing, carpooling, and ultra-low or zero emission vehicles in City parking lots. Encourage the same at private businesses that have employee parking. Require businesses of a certain size to provide facilities such as bike racks and showers.	Supporting Action	Supporting Action	- Incentives for ride-sharing created and advertised - Incentives for bike riding created and advertised - Reserved parking spaces created for ride-sharing, and low/zero emission vehicles - Bike racks included in design guidelines for commercial remodels	2022-2024	Planning, Public Works	$	

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 2.2. Electrify the Fleet							
Action 2.2.1: Prioritize Electric Vehicles (EVs) Promote electric vehicle incentive programs at outreach events. Apply for grants to install e-chargers at public facilities. Work with community groups and businesses to install additional e-chargers. Encourage hotels to provide priority parking for electric vehicles and provide e-chargers. Provide priority parking for bus tours that use electric buses. Work with Visit Carmel to develop and initiate a Green Visitor Program that rewards tourists that use electric vehicles, carbon credits for air-miles, and that adhere to the City's sustainability practices while visiting the City. Require or incentivize major commercial building renovations/expansions to install e-chargers.	Scope 1 1,511 Scope 3 1,425	Scope 1 1,538 Scope 3 1,452	- EV incentives shared on City website, newsletters, and at energy fair - EV chargers installed at City parking lots - Electric bus parking created and associated outreach - Green Visitor Program established - Outreach at Visit Carmel re: EV chargers on hotel properties - EV chargers included in design guidelines for commercial remodels	2024-2026	Planning, Public Works, Community Activities	$ $ $	
Measure 2.3 Initiate Origin/Destination Transportation Model							
Action 2.3.1: Develop Model Develop an Origin Destination Transportation Model focused on Carmel-by-the-Sea using the AMBAG regional model as a base. Update the CAP with new VMT data once the Origin Destination Model is completed.	N/A	N/A	- ODTM Model developed - ODTM results incorporated in updated CAP	2024-2026	Planning, Public Works	$ $	

Goal 3. Renewable Energy Sources

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 3.1. Promote Clean Energy							
Action 3.1.1: Incentivize Clean Energy Installations Promote clean energy incentives to the community Incentivize solar panels installation on existing residential units Require or incentivize solar panel installation on major commercial building retrofits/expansions and commercial parking lots. Promote energy storage system installation with solar panels.	364	364	- Incentive information on website, at energy fair, and shared via new City outreach and recognition programs - Incentive for solar panel and/or energy storage installation developed	2024-2026	Building, Planning, Public Works	$ $	1.3.6
Action 3.1.2: Increase uptake of 3CE Renewable Generation portfolio Switch the City's electricity to 3CE's 100 Percent Renewable Energy Option Promote 3CE's 100 Percent Renewable Energy Option by encouraging residents and businesses to participate in the program.	-	-	- City electricity accounts switched to 3CE's 100% renewable option - 3CE 100% renewable energy option promoted at energy fair and via City outreach and recognition programs	2022-2024	Public Works, Planning	$ $	

Goal 4. Water Efficiency

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 4.1. Water Conservation in Landscaping							
Action 4.1.1: Continued Implementation and Promotion of City and Model Water Efficient Landscaping Ordinance Water Conservation Standards Increase promotion of landscaping water conservation standards on website and social media Ensure all projects comply with the City's low-irrigation landscaping requirements. Work with the Monterey Peninsula Water Management District (MPWMD) to promote incentives for existing landscaping retrofits to reduce water use.	2.9	3	- Landscaping water conservation information on website - 100% of projects including landscape retrofits comply with requirements - Landscape retrofit incentives developed and promoted in documents and outreach for development projects	2023-2025	Planning, Forestry, Public Works	$ $	3.1.7
Action 4.1.2: Exceed Water Efficiency Standards In partnership with the MPWMD, conduct direct outreach to HOAs, businesses, residents re: water conservation, grey water, rainwater harvesting Allow and promote recycled water for commercial and multi-family residential landscape irrigation. Allow and promote greywater systems and rainwater harvesting.	Supporting Action	Supporting Action	- Direct outreach to HOAs, businesses, residents thru outreach and recognition programs - Recycled water Standard Operating Guidance developed and promoted for commercial and multi-family construction projects - Grey water systems and rainwater harvesting information promoted in documentation for development projects	2024-2026	Building, Planning, Forestry	$	3.1.7

Goal 5. Waste Reduction

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 5.1. Reduce Waste that goes to the Landfill							
Action 5.1.1: Increase the City's solid waste diversion to reduce landfill methane emissions Promote zero waste events, including the use of reusable rather than recyclable materials, and buy local to reduce waste. Work with the Monterey Regional Waste Management District and the waste hauler to implement the requirements of SB 1383, including organic waste collection for all commercial and residential properties to process into compost. Conduct outreach to residents and businesses to ensure compliance and to minimize contamination. Promote home composting and community gardens. Educate the community on proper use of the City-provided grey/green/blue containers.	1500	1500	- Develop zero waste event checklist and require City events to abide by it. - SB 1383 requirements implemented and waste diversion tracked - Outreach to residents and businesses through mailers, newsletters, City website, hauler website, letters, direct outreach.	2022-2024	Public Works, Community Activities	$ $ $	

Goal 6. Urban Forest Protection and Heat Island Effect Reduction

Action	2030 GHG Reduction Achieved (MT CO2)		Metric	Timeframe	Implementation Lead	Cost	Corresponding Adaptation Measure
	No Enhancing	With Enhancing					
Measure 6.1. Urban Forest Maintenance for Shade and Energy Savings							
Action 6.1.1: Urban Forest Maintenance and Improvement Maintain the health of the urban forest tree canopy in the City to keep streets shaded and maintain cool surface and ambient air temperatures. Continue to work with the Friends of Carmel Forest and the community to facilitate urban forest maintenance. Update the City's Urban Forest Management Plan to include tree planting guidelines to promote tree health and maintain a healthy urban forest canopy.	-	-	- Urban Forest Management Plan Updated - Tree planting and maintenance guidelines updated - Number of replacement trees planted	2023-2025	Forestry, Public Works	$ $	2.1.2
Measure 6.2. Light-reflecting Surfaces for Energy Savings							
Action 6.2.1: Allow Cool Roof Options Evaluate the feasibility of allowing cool roof options in residential and commercial areas of Carmel. If feasible, revise existing ordinances to allow cool roof options on residential, commercial and office buildings. Support the use of "Green Roofs" as an option for cool roofs with the use of drought-tolerant plants.	-	-	- Cool roof options researched and evaluated for consistency with Carmel design guidelines - Design Guidelines and/or ordinances revised	2024-2026	Planning	$	

Summary of GHG Emissions Reductions

By implementing the Statewide and local reduction measures described in Table F, the City would reduce its communitywide GHG emissions by 48 percent below 2019 levels of emissions by 2030. Table G below summarizes the strategies and the potential total GHG reductions for the community.

Figure 4 on the following page summarizes the 2015 through 2019 emission inventories, projected 2020, 2030, and 2045 emission forecasts, as well as the 2020, 2030, and 2045 reduction targets after implementation of the local reduction measures.

As shown in Figure 4, with implementation of the local reduction measures, emissions in 2030 are anticipated to be below the 2030 reduction target and provide additional reductions beyond 2030. However, even the proposed set of reduction strategies will not achieve carbon neutrality by 2045.

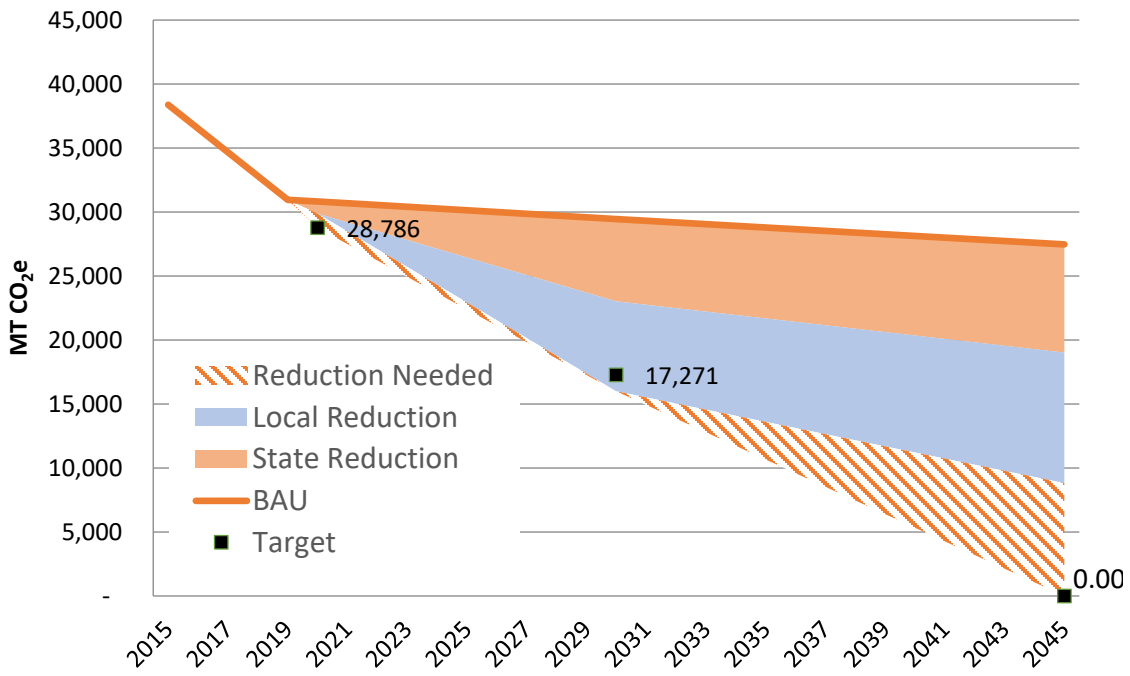
The City should track implementation of the Climate Action Plan over the next few years, update the 2045 ABAU forecasts, and provide local reduction strategy updates once the State has provided an updated Scoping Plan demonstrating how the State can achieve carbon neutrality by 2045.

Table G: Summary of Local GHG Reduction Strategies and Emissions Reductions

Goals and Measures	2030 Emission Reductions (MT CO_2e)
Goal 1: Energy Efficiency and Electrification of Residential and Commercial Buildings	
1.1: Energy Efficiency Training, Education, Incentives and Recognition for Residential and Commercial	71
1.2: Energy Efficiency in Renovation Projects	2,960
1.3: Energy Efficiency in New Construction Projects	0.01
Goal 2: Improved Transportation Choices	
2.1: Alternative Transportation Options	573
2.2: Electrify the Fleet	1,538
2.3: Initiate Origin-Destination Transportation Model	N/A
Goal 3: Renewable Energy Sources	
3.1: Promote Clean Energy	364
Goal 4: Water Efficiency	
4.1: Water Conservation in Landscaping	3
Goal 5: Waste Reduction	
5.1: Reduce Waste that Goes to the Landfill	1,500
Goal 6: Urban Forest Protection and Heat Island Effect Reduction	
6.1: Urban Forest Maintenance for Shade and Energy Efficiency	-
6.2: Light-reflecting Surfaces for Energy Savings	-
Total Community Measures	**7,009**

Source: Compiled by LSA 2022
MT CO_2e = metric tons of carbon dioxide equivalent
N/A = Not Applicable
- = Not quantified

Figure 4: Existing and Forecasted Emissions with Local Reduction Measure Implementation



IMPLEMENTATION

Implementation of the Climate Action Plan will require significant City staff time, consultants, and financial resources, along with collaboration with regulatory and utility partners to conduct community engagement. The successful implementation of the proposed actions will depend on the involvement of the whole community, including:

- City staff,
- Elected officials,
- Community group partners,
- Business community,
- Residents,
- Visitors.

This plan serves as a framework to strengthen the partnerships needed to meet the City's GHG reduction goals.

In addition to partnerships and community involvement, implementation of the Climate Action Plan will also require regular tracking and reporting to measure progress against the plan's goals. This section describes the guidance, tools, responsibilities, and analysis required to effectively implement and monitor progress with the adaptation strategy.

Strategies for Success

The strategies described below are recommended to ensure the successful implementation of this long-term multifaceted program:

- **Build on existing programs:** the Climate Action Plan focuses on building capacity based on existing programs and actions already in progress rather than "reinventing the wheel." There are many existing programs that the City can leverage, such as 3CE and PG&E incentive programs, LEED, and Energy Upgrade California, by ensuring businesses and residents have the knowledge and tools necessary to participate in them. Additionally, the CAP also builds on existing City policies and regulations that already provide GHG reduction benefits.
- **Leverage existing partnerships:** the CAP also prioritizes existing partnerships to leverage the expertise and resources that others, such as partner agencies and community groups, can bring to the table. This approach provides mutual benefits for the City and its partners.
- **Maintain communication:** it is essential to maintain communication within and between City departments, as well as with partners, elected bodies, and the community. A robust community outreach program, as well as regular updates to elected bodies, will be critical to the long-term success of the CAP.
- **Prioritize actions:** since the City and its partners cannot implement all the proposed measures and actions concurrently, each action has been prioritized for implementation over the next 10 years. Actions were prioritized in such a way that later actions could build on the outcomes of earlier actions. Early actions include those that can readily build on existing programs

and increase community awareness of necessary climate action measures to reduce the community's GHG emissions.

- **Regularly monitor implementation and evaluate success:** the Climate Action Plan will be monitored through tracking quantitative metrics, as described in the strategy table, to assess progress towards implementation of actions and measures. An annual report should be developed and should include an evaluation of the implemented actions and measures, assessing their effectiveness, and recommend modifications as needed. Elements that should also be considered in the evaluation include new regional and statewide programs and regulations, shifting community priorities, implementation hurdles, changes in best practice, and technological advances.
- **Seek guidance and leadership from elected bodies:** The City Council should consider establishing and appointing a new Sustainability Commission that could be responsible for reviewing the annual report, providing feedback on progress, and reviewing recommendations for enhancing the effectiveness of proposed measures. Based on feedback from the Sustainability Commission, City and partner staff, and the community, the City may conduct an update to the Climate Action Plan on or before 2030.
- **Funding:** although it is premature to estimate the overall cost of the CAP at this time, implementation will require significant staff time and capital investment. The City will ultimately need to develop a funding plan to implement the more costly actions in the Climate Action strategy. The City should consider a variety of revenue sources, including:
(1) adjusting existing fees to cover the costs associated with new or modified programs and services,
(2) allocating portions of new fees, such as a downtown parking fee, to fund sustainability projects and programs,
(3) exploring regional and state funding sources such as 3CE, the California Public Utilities Commission's California Solar Initiative, California Energy Commission and PG&E energy efficiency programs, the California Climate Action Corps Fellowship Program, CalRecycle grants and loans, and other similar programs.

Monitoring and Evaluation

The City should designate one department as the lead for carrying out implementation monitoring and evaluation of climate action. Although some GHG reduction measures and actions can be implemented using existing staff time, full implementation and coordination of efforts will require additional staff resources. For example, the City's Grant Writer/Climate Coordinator that is identified in the Climate Adaptation Plan could be tasked with carrying out implementation coordination, monitoring and evaluation of the CAP. The Grant Writer/Climate Coordinator could also lead the compilation of all monitoring data and an overall assessment of effectiveness annually.

Re-evaluation of GHG emissions reduction strategies should occur when new information indicates that a measure or action is either infeasible or ineffective. The CAP should be

monitored through tracking quantitative metrics as described in the strategy table (Table F). The CAP should be monitored and evaluated simultaneously with the City's Climate Adaptation Plan to measure the City's overall progress towards acting on climate change and increasing community sustainability and resilience.

Annually, the City should aggregate monitoring and evaluation results into an annual report describing achievements towards meeting the GHG reduction goals and measures in the Climate Action Plan. The report should be posted on the City's website and disseminated into the community, with support from engagement partners, to maintain awareness of success of the climate action strategies. Once implementation has been on-going for a few years and based on monitoring and evaluation results, as well as feedback from commissions, the City Council, and the public, the Climate Action Plan should be updated on or before 2030. As part of the Climate Action Plan update, the City should re-evaluate the ABAU forecast based on the latest State Scoping Plan, and should update its GHG emissions reduction strategy to reach Carbon Neutrality in 2045.

APPENDIX A

CARLSBAD
FRESNO
IRVINE
LOS ANGELES
PALM SPRINGS
POINT RICHMOND
RIVERSIDE
ROSEVILLE
SAN LUIS OBISPO

MEMORANDUM

DATE: April 11, 2022

TO: Agnes Martelet, City of Carmel By-The-Sea

FROM: Michael Hendrix, LSA

SUBJECT: Carmel By-The-Sea Greenhouse Gas Inventory Update, Forecast, Reduction Targets, and Strategies

The purpose of this technical memorandum is to present the City of Carmel-by-the-Sea (City) Greenhouse Gas (GHG) emissions inventory update, forecasts, targets, and reduction strategies to the City for review and feedback. The GHG emissions inventory update, forecasts and targets form the basis for the development of the GHG reduction strategies presented in this memorandum.

GREENHOUSE GAS EMISSIONS INVENTORY, FORECAST, AND TARGETS

An updated GHG emission inventory was prepared, as well as emission forecasts, and emission reduction targets as described in this section.

1.1 Greenhouse Gas Emissions Inventory Update

GHG emissions inventories are the foundation of planning for future reductions. Establishing an inventory of emissions helps to identify and categorize the major sources of emissions produced over a single calendar year. A community inventory includes GHG emissions that result from the activities of city residents and businesses. The inventory identifies the major sources of GHG emissions resulting from activities in sectors that are specific to community activities.

The Association of Monterey Bay Area Governments (AMBAG) prepared community inventories for the years 2005, 2010, 2015, 2018, and 2019. The 2019 inventory is the most recent year for which data is available. Table A provides the sectors evaluated in the GHG inventories.

Table A: Community Sectors Evaluated in the Inventories

Community Sectors
Residential Energy (Electricity and Natural Gas)
Commercial/Industrial Energy (Electricity and Natural Gas)
On-Road Transportation
Solid Waste
Wastewater

AMBAG calculated GHG emissions using the available activity data (e.g., kilowatt-hours of electricity) in the State Energy Efficiency Collaborative (SEEC) ClearPath tools to convert activity data to emissions output using relevant emission factors.

1.1.1 Vehicle Miles Traveled Analysis

One of the issues that needs to be resolved is the drastic reduction in the GHG emissions associated with the on-road transportation sector in years 2010 and 2015. LSA met with AMBAG and City staff to discuss the issue AMBAG stated that the transportation emissions were calculated by obtaining VMT data from the Caltrans California Public Roads Data (PRD) report. The PRD report uses Highway Performance Monitoring System (HPMS) Data to calculate the number of maintained miles for each jurisdiction in California and associated VMTs. In 2014 the HPMS data underwent methodology changes to assign the maintained miles of roadway to each jurisdiction using a GIS based system. Although the HPMS data is provided as is, and it is not possible to determine how much impact this methodology change had, AMBAG staff shared that the substantial reduction in GHG emissions may be artificial and due to this methodology change. Another issue to consider is that the HPMS allocated VMT is based on travel upon roads within the City boundaries rather than based upon vehicle trips origins or destinations.

AMBAG followed the International Council for Local Environmental Initiatives (ICLEI) protocols in developing the GHG inventories including the on-road transportation sector. Allocating VMT using the AMBAG Regional Travel Demand Model (RTDM) is an accepted practice.

However, the City has a unique tourist-based economy that attracts visitors from around the world and the State and the City wanted to better understand the relationship between its tourist economy and the GHG emissions resulting from tourism. There are two motivations the City has in understanding the relationship between tourism and GHG emissions. First, there is concern that the on-road transportation sector in the GHG inventories is underestimated because of the way the RTDM allocates VMT and the City wants to know the GHG emissions from the on-road transportation sector based upon the origins and destinations of vehicle trips attributable to the City. Second, the City wants to provide GHG reduction strategies that will be effective for different types of vehicle trips including vehicle trips resulting from tourism, vacation homes, employee commutes, delivery services, and other local trips. This second motivation requires that the City, not only know the origin and destination of the trip, but also be aware of the purposes of the vehicle trips.

There are several challenges in determining the origins and destinations of vehicle trips attributable to the City and its tourist economy as well as determining the types and purposes of vehicle trips. First, the schedule for completing the CAP does not allow for the time that would be required to develop, calibrate, and run an origin/destination traffic demand model for the City. In addition an origin/destination traffic demand model would not completely capture the full length of a visitor trip traveling from San Francisco to Carmel or other origins outside of the region.

To address these concerns and limitations, LSA proposed to evaluate the different types of trips and logical origins of trips associated with tourism, vacation homes, employee commutes, deliveries, as well as local trips, determine the distance between the trip origin and the City for each trip type,

estimate the number of vehicle trips per year using the RTDM, proportion the RTDM vehicle trips by trip type, and estimate VMT using the trip distances for each trip type.

First, LSA looked at tourists visiting Carmel-By-The-Sea. To do this LSA used several sources of information from the Carmel Chamber of Commerce and the Carmel Visitors Center including the Visit Carmel 2019 Annual Report,[1] and the Carmel Visitors Spending Report.[2]

These reports revealed that domestic tourists make up the majority (90.43 percent) of visitors and originated at the following locations:

- San Francisco Bay Area (41.95 percent with an average vehicle trip length of 110 miles),
- Salinas (39.79 percent with an average trip length of 27 miles),
- Los Angeles/Orange County (7.73 percent with an average trip length of 322 miles),
- Sacramento/Yolo County (5.31 percent with an average trip length of 190 miles),
- Fresno (2.21 percent with an average trip length of 157 miles), and
- New York/New Jersey/long Island (2.19 percent).

Salinas is a trip origin for a significant number of day visitors driving to Carmel-by-the-Sea. Visitors from San Francisco Bay Area, Los Angeles/Orange County, Sacramento/Yolo County, and Fresno also drove to Carmel-By-The-Sea; whereas visitors from New York, New Jersey and Long Island flew into San Francisco International Airport (SFO) and drove or took a tour bus with an average vehicle trip length of 110 miles.

The reports also reveal that approximately 9.57 percent of all visitors are international tourists who originated from the following locations:

- China (38.35 percent),
- Canada (26.38 percent),
- Brazil (9.3 percent),
- United Kingdom (15.74 percent),
- France (5.65 percent), and
- Australia (4.65 percent).

All of the international visitors flew into SFO and most (89.73 percent) took a tour bus. Each vehicle trip averaged 110 miles between SFO and Carmel-By-The-Sea.

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[1] Carmel Visitors Center. Visit Carmel 2019 Annual Report. Website: https://www.carmelcalifornia.com/userfiles/file/Visit_Carmel_2019_Annual_Report_Final_LowRes.pdf (accessed December 2021)

[2] Carmel Chamber of Commerce. 2014. Carmel Visitor Spending Report. Website: https://www.carmelchamber.org/carmel-visitor-spending-report/ (accessed December 2021)

Carmel Realty Company[1] assisted in providing generic information on second homes and vacation homes within the City, which resulted in an estimate of approximately 20 percent of vehicle trips result from the occupants of second homes with an average trip length of 120 miles between the origin of the trip and the second home/vacation home during the start and end of the visit. Vehicle trip lengths of the occupants of these homes during their stay averaged 6.5 miles.

Commute trips represented 38 percent of all vehicle trips in the City and averaged 27 miles per trip. Local trips (vehicle trips from local residents related to shopping, school, library and other local destinations) made up 6.5 percent of all vehicle trips in the City and averaged 6.5 miles.

Delivery services providing supplies to local businesses and construction sites within the City made up approximately 10 percent of all vehicle trips and averaged 27 miles.

Using the trip origins summarized above, it is estimated that a gross total of 134,607,473 VMT occurred in 2019. However, only local trips within the City are counted 100 percent. Vehicle trips with origins or destinations outside of the City are shared with the jurisdiction that the other end of the trip is located. The miles for these types of trips are multiplied by 0.5 to allocate half the trip length to Carmel-by-the-Sea. This results in a total of 67,439,064 VMT allocated to the City in 2019.

There is one final issue in estimating VMT using this method. Regional origin destination models are limited to the regional boundaries of the model. There is no origin destination model that would track vehicle trips between San Francisco, Los Angeles, Fresno, and the City. Such an analysis would require a statewide origin destination model. Because of this, the VMT distribution is limited to the regional model boundaries. Reviewing the AMBAG RTDM boundaries, the VMT attributable to the City is 32,658,143 in 2019.

Using the protocols[1,2], the GHG emissions associated with the VMT within the AMBAG RTDM boundaries are considered Scope 1 emissions and are counted in the GHG inventory and target setting. The United States Environmental Protection Agency (U.S. EPA) describes Scope 1 emissions as direct sources (smoke stacks or tailpipes that release emissions within an organizational boundary) of GHG emissions.[2] This definition fits well for on-road transportation related emissions within the RTDM boundaries.

The City is also interested in influencing tourist-related emissions and wants to provide strategies customized to reduce the emissions from vehicle trips originating in locations outside of the regional model limits. The U.S. Community Protocol for Accounting and Reporting GHG Emissions (version 1.2)[3] describes Scope 3 emissions as indirect emissions not covered under Scopes 1 and 2. The GHG emissions associated with the remaining VMT (34,780,921) outside of the AMBAG RTDM boundaries

[1] https://www.carmelrealtycompany.com/company-history.htm (accessed December 2021)

[2] U.S. EPA. 2020. Scope 1 and Scope 2 Inventory Guidance. Website: https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance (accessed January 2022).

[3] ICLEI. 2019. U.S Community Protocol for Accounting and Reporting GHG Emissions. Website: https://urbandrawdown.solutions/resource-database/uscp-ghge-accounting-2019 (accessed January 2022).

are considered Scope 3 indirect emissions and the City will develop reduction strategies focused on reducing these emissions as well.

Table B summarizes the activity data inputs for updating the 2019 GHG inventory using the revised VMT values.

Table B: 2019 Community GHG Inventory Data Inputs Used

Sector	2019 Data Input	Source
Electricity (KWh)		
Residential	2,493	3CE
Commercial	2,928	
Natural Gas (Therms)		
Residential	7,194	PG&E
Commercial	5,073	
Transportation		
On-Road (VMT) Scope 1	32,658,143	AMBAG Model with Out of Model Adjustments
On-Road (VMT) Scope 3	34,780,921	
Solid Waste (tons/year)	1,527	GreenWaste Recovery
Wastewater (million gallons)	74	California American Water (CalAm)/ Carmel Area Wastewater

MT CO_2e = metric tons of carbon dioxide equivalent
KWh: Kilowatt Hours
VMT: Vehicle miles traveled
PG&E: Pacific Gas & Electric
AMBAG: Association of Monterey Bay Area Governments
CARB: California Air Resources Board
3CE: Central Coast Community Energy

1.1.2 2019 Greenhouse Gas Emissions Summary

The City's total emissions in 2019 were 30,962 MT CO_2e. As shown in Table C, the on-road transportation sector was the largest contributor to emissions in the 2019 inventory, with 45.8 percent of the City's total GHG emissions. Natural gas made up 43.2 percent followed by solid waste at 10.3 percent of total emissions. Electricity (0.5 percent), and wastewater (0.2 percent) comprised the remainder of the emissions.

Table C: Communitywide GHG Emissions by Sector for 2019

Sector	2019 (MT CO_2e)	Percent of Total
On-road Transportation:		
Scope 1	14,173	45.8
Scope 3	15,115	
Electricity		
Residential	63	0.5
Commercial	92	
Natural Gas		
Residential	8,138	43.2
Commercial	5,250	
Solid Waste	3,178	10.3

Table C: Communitywide GHG Emissions by Sector for 2019

Sector	2019 (MT CO_2e)	Percent of Total
Wastewater	68	0.2
Total Scope 1 and Scope 2 Emissions **Total with Scope 3 Emissions**	**30,962** **46,076**	100

Source: AMBAG and LSA 2021.
MT CO_2e = metric tons of carbon dioxide equivalent

Figure 1 shows the 2019 GHG emissions by sector with energy (electricity and natural gas) divided between residential and commercial/industrial land uses. Figure 2 shows the proportion of electricity and natural gas in the energy sector.

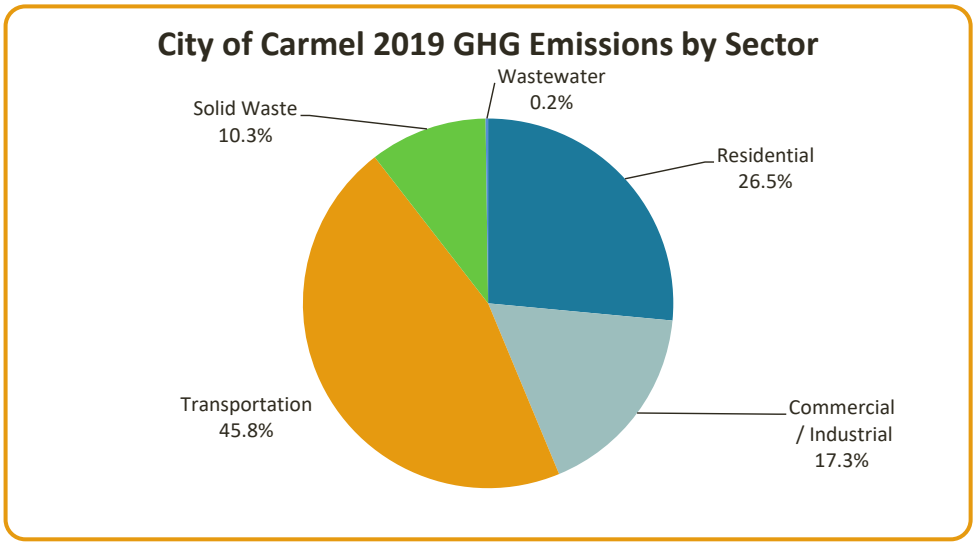


Figure 1: Communitywide GHG Emissions by Sector in 2019

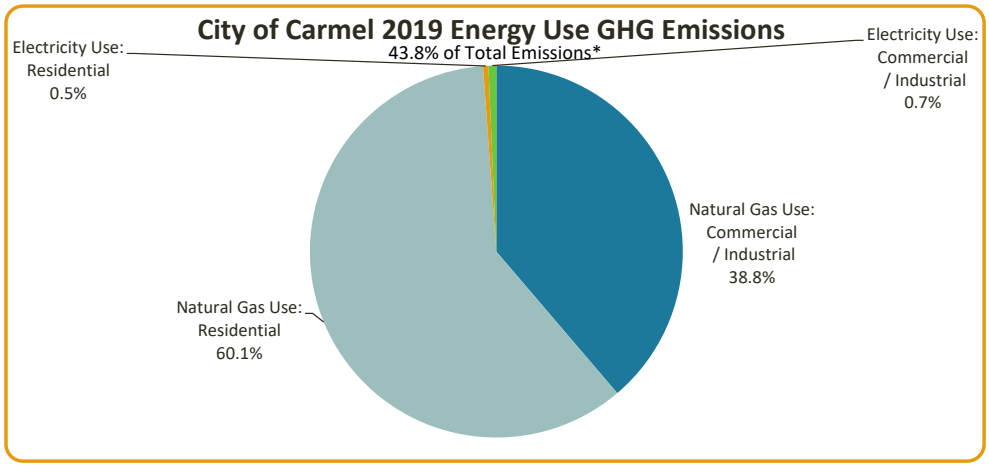


Figure 2: Energy Sector Emissions in 2019

Figure 3 breaks down the various sources of electrical generation by Central Coast Community Energy (3CE).

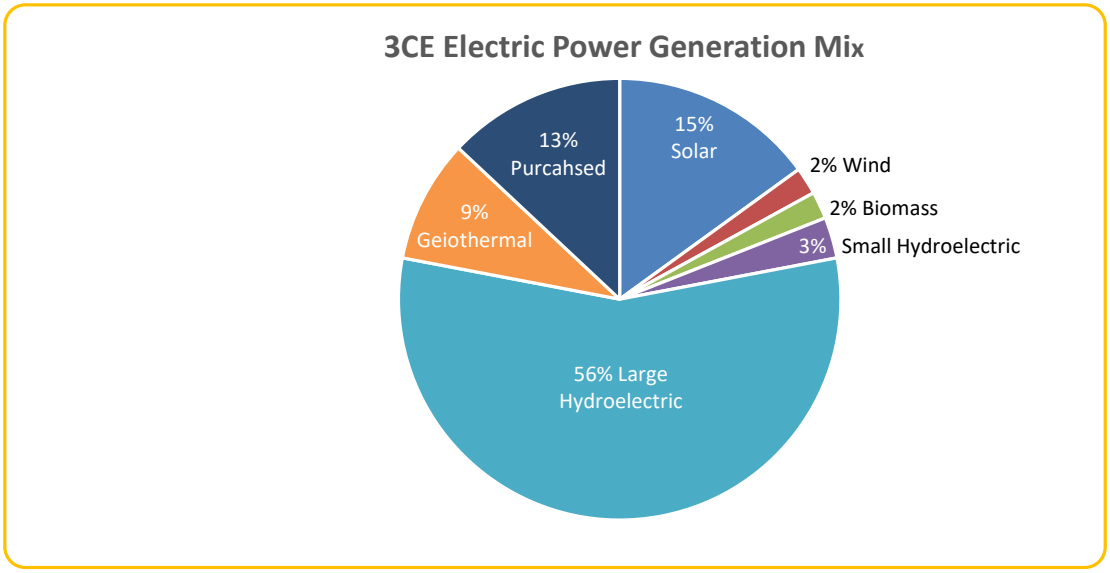


Figure 3: Sources of Electrical Power Generation

2.1 GHG Emissions Forecast

Forecasting future GHG emissions allows the City to understand how emissions are expected to increase or decrease in the future. Major changes in growth or land uses may affect how to best plan to reduce emissions in the future. GHG emissions are forecast using two scenarios: a Business-as-Usual (BAU) scenario and an Adjusted BAU (ABAU) scenario. The BAU scenario describes emissions based on projected growth in population and employment and does not consider policies that would reduce emissions in the future (that is, the policies and related efficiency levels in place in 2019 are assumed to remain constant through 2045). The City's projected growth is estimated using data from the AMBAG's adopted growth forecasts for Carmel by-the-Sea, which provides the City's demographic growth indicators for the years 2030 and 2045. The growth rates for households, population, and employment were estimated based on the available data and used to estimate the growth in households, population, and employment into the year 2045. Table D shows the growth projections used to develop the emissions forecasts.

Table D: Growth Indicators for 2020, 2030, and 2045

Sector	Demographic Indicator	2020	2030	2020–2030 CAGR[1] Percent	2045	2020–2045 CAGR Percent
Residential Energy	Households	3,437	3,442	0.0002	3,459	0.0064
Commercial/Industrial Energy	Jobs	3,556	3,674	0.0033	3,915	0.0040
N/A[2]	Population	3,949	3,954	0.0001	3,984	0.0035
VMT, Solid Waste and Wastewater	Service Population (Population + Jobs)	7,515	7,628	0.0015	7,899	0.0020

Source: AMBAG, 2022 Regional Growth Forecast
[1] CAGR = Compound annual growth rate.
[2] Not applicable. Population data are shown for informational purposes but are not used for forecasting any sector.

The Adjusted BAU scenario describes emissions based on projected growth and considers policies that will achieve GHG reductions in the future. By evaluating the two scenarios, the City can evaluate the effect that existing policies may have on future emissions and determine which local measures would provide additional reductions.

Two future years are forecast for each scenario: 2030 and 2045. The 2030 forecast year is consistent with the goals identified in the Senate Bill (SB) 32, and the corresponding Scoping Plan, which identifies Statewide GHG reduction targets for 2030.

The 2030 BAU emissions are estimated to be 29,445 MTCO_2e. By 2045, emissions are estimated to decrease to 27,471MT CO_2e. Table E shows the BAU emissions for different sectors. Table D shows a positive compounded annual growth rate (CAGR) of 0.0001 to 0.0033, which is extremely modest growth. The BAU forecast shows a modest reduction in GHG emissions (a modest negative percent change). This modest reduction of emissions within the BAU forecasts is due to changes over time as people purchase newer (and more efficient) automobiles and appliances.

Table E: Business As Usual (BAU) Forecast Emissions

Sector	2019 (MT CO_2e)	2020 (MT CO_2e)	Percent Change 2019–2020	2030 (MT CO_2e)	Percent Change 2019–2030	2045 (MT CO_2e)	Percent Change 2019–2045
On-road Transportation Scope 1: Scope 3:	 14,173 15,115	 14,117 15,055	-0.4%	 13,316 14,201	-5%	 12,582 13,418	-11%
Electricity Residential Commercial	 63 92	 63 91	-0.6%	 60 87	-5%	 56 82	-11%
Natural Gas Residential Commercial	 8,138 5,250	 8,122 5,193	-0.2	 7,759 4,961	-4%	 7,239 4,628	-11%
Solid Waste	3,178	3,175	-0.09	3,033	4%	2,830	-11%
Wastewater	68	62	-0.1	59	-5%	55	-12%
Total (Scope 1) **Total (Scope 3)**	**30,962** **46,076**	**30,824** **45,878**	-0.04	**29,445** **43,646**	-5%	**27,471** **40,889**	-11%

Source: LSA 2021
MT CO_2e = metric tons carbon dioxide equivalent

As shown in Table F, the City's ABAU emissions are estimated to be 30,287 MT CO_2e in 2020, 23,013 MT CO_2e in 2030, and 19,013 MT CO_2e in 2045. Table F shows the change in emissions from 2019 to 2045 under the ABAU scenario. Due to the stringent State regulations related to transportation (vehicle efficiency and low carbon fuel standards) and energy sectors (renewable energy portfolio standard and requirements for a portion of the natural gas supply to be renewable natural gas), emissions are expected to decrease significantly over time.

Table F: Community Adjusted Business As Usual (ABAU) Forecast Emissions

Sector	2019 (MT CO_2e)	2020 (MT CO_2e)	Percent Change (2019–2020)	2030 (MT CO_2e)	Percent Change (2019–2030)	2045 (MT CO_2e)	Percent Change (2019–2045)
Transportation							
Scope 1	14,173	13,679	-3.5%	10,407	-26.6%	8,708	-38.6%
Scope 3	15,115	14,646		11,105		9,285	
Electricity							
Residential	63	61	-3.0%	47	-25.4%	39	-38.1%
Commercial	92	89		68		57	
Natural Gas							
Residential	8,138	8,122	-0.2%	6,138	-24.6%	5,010	-38.4%
Commercial	5,250	5,193		3,935		3,203	
Solid Waste	3,178	3,077	-3.0%	2,372	-25.4%	1,958	-38.3%
Wastewater	68	66	-2.9%	46	-32.4%	38	-44.1%
Total (Scope 1)	**30,962**	**30,287**	-2.2%	**23,013**	**-25.7%**	**19,013**	**-38.6%**
Total (Scope 3)	**46,076**	**44,933**		**34,118**		**28,298**	

Source: LSA forecasts for the City of Carmel by-the-Sea, 2021.
MT CO_2e = metric tons carbon dioxide equivalent

3.1 Reduction Targets

3.1.1 Statewide GHG Reduction Goals

The State has set goals for reducing statewide GHG emissions by 2030 and 2045 through Assembly Bill (AB) 32, Senate Bill (SB) 32, SB 100, and Executive Order (EO)-B-55-18. The State has also provided guidance to local jurisdictions as "essential partners" in achieving the State's goals by identifying a 2030 GHG emissions target 40 percent below 1990 levels. Additionally, continued reduction goals should be implemented beyond the 2030 target to keep the State on a path toward Statewide climate neutrality by 2045.

3.1.2 Community Targets

In the City of Carmel-by-the-Sea, the State's target of 40 percent below 1990 levels by 2030 amounts to a reduction of 12,174 metric tons of CO_2 equivalent in annual emissions by 2030 compared to the BAU forecast (see Table G).

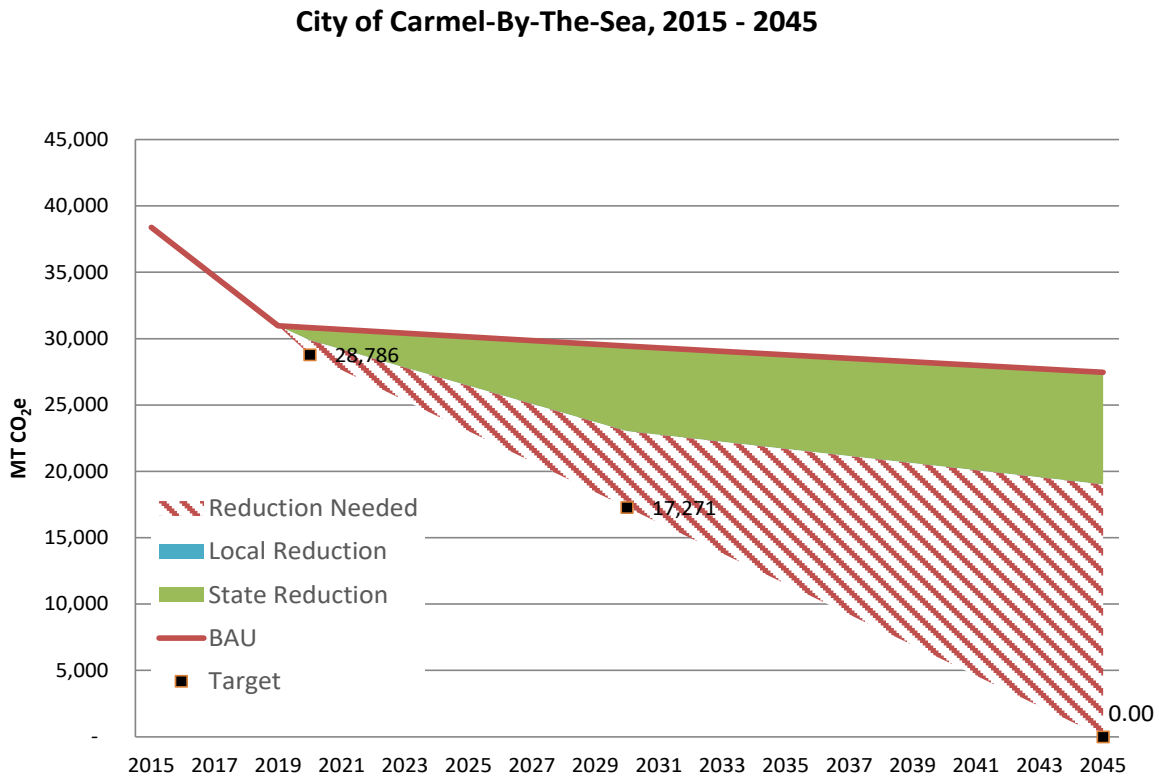
Under the ABAU scenario, Carmel-by-the-Sea would need to reduce its emissions by 5,742 MT CO_2e by 2030 to meet the State target. The City needs to implement additional strategies and measures to adhere to these State GHG reduction goals.

Table G: GHG Reduction Targets By Year

Sector	1990	2019	2030	2045
BAU Emissions (MT CO_2e)	28,786[1]	30,962	29,445	27,471
ABAU Emissions (MT CO_2e)	N/A	N/A	23,013	19,013
State-Aligned Target	N/A	N/A	40% below 1990 levels of emissions	Carbon Neutral
State-Aligned Emissions Goal (MT CO_2e)	N/A	N/A	17,271	0
Reductions from ABAU needed to meet the State-Aligned Target (MT CO_2e)	N/A	N/A	5,742	19,013

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
N/A = Not Applicable
1. 1990 levels of emissions approximated as 25 percent below the updated 2018 inventory of GHG emissions

Figure 4 depicts the BAU and ABAU forecasts, reduction targets, and additional GHG emission reductions required to meet the reduction targets.



ABAU: adjusted business as usual
BAU: business as usual
MT CO_2e = metric tons of carbon dioxide equivalent

Figure 4: Community Emissions Inventory, Forecasts, and Targets

GHG REDUCTION STRATEGIES

The following details how the City would meet its GHG reduction target by implementing goals, measures, and actions at the community level. The goal describes the overarching objective. Within each goal, one or more measures are presented indicating the City's commitment toward meeting the goal. Within each measure, one or more actions are presented that indicate the steps the City will take in achieving the measure. Each measure includes the GHG reduction potential in 2030. Actions are designed to include the steps needed to implement the measure.

4.1 Goals, Measures and Actions for the Reduction of GHG Emissions

The City of Carmel-by-the-Sea has chosen a total 9 goals, 22 measures, and 75 actions designed to achieve the 2030 GHG reduction target and provide continued progress toward carbon neutrality. The goals, measures, and actions are as follows:

4.1.1 Increasing Energy Efficiency in Existing Residential

The following measures in Goal 1 are shown in Table H and focus on increasing energy efficiency in existing residential buildings through behavior modification of residents and encouraging and incentivizing home energy retrofits.

Table H: Goal 1: Increase Energy Efficiency in Existing Residential Units

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 1.1 Energy Efficiency Training, Education, and Recognition in the Residential Sector				
Actions	Post links on website and social media and provide materials at public events. Promote an annual energy efficiency fair. Promote PG&E energy centers. Building Inspectors to hold trainings on energy efficiency and Title 24 requirements.	Supporting Measure	Supporting Measure	Years 1-3
Measure 1.2: Increase Community Participation in Existing Energy Efficiency Programs				
Actions	Partner with AMBAG and 3CE to promote incentive programs	1.7	1.7	Years 2-4
Measure 1.3 Home Energy Evaluations				
Action	Promote and provide energy audits with PG&E	Supporting Measure	Supporting Measure	Years 1-3

Table H: Goal 1: Increase Energy Efficiency in Existing Residential Units

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 1.4 Residential Home Energy Renovations				
Actions	Enhance enforcement of Title 24 compliance Promote participation in green building programs such as Leadership in Energy and Environmental Design (LEED), and Energy Upgrade California. Promote financing programs for home upgrades, such as Home Energy Renovation Opportunity (HERO) and Property Assessed Clean Energy (PACE) Evaluate feasibility of streamlining online permitting to facilitate electrification retrofits Initiate a Green Citizen Program for residents that initiate home renovations that include an all-electric home, improve energy efficiency, and install an e charger. Promote incentives available to homeowners to convert to all-electric homes. Evaluate the feasibility of providing additional incentives. Develop a Reach Code to require major home renovations/additions to convert to all-electric homes.	1,217.5	1,294.6	Years 2-4

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
1. With Enhancing = increased participation due to supporting measures that result in greater reductions.

4.1.2 Increasing Energy Efficiency in New Residential

This goal supports City staff becoming resources in implementing energy efficiency building measures beyond those required in current Title 24 standards. This goal also ensures that, as Title 24 standards are updated, City staff are well informed and can implement updates quickly and effectively. Note that the growth assumptions (see Table D) provided by AMBAG show an increase of five households between 2020 and 2030. In addition, Title 24 will include three updates over that timeframe. Since Title 24 updates are already included in ABAU, the additional local GHG reductions associated with Goal 2 account for only 0.01 MT CO_2e. Table I on the next page summarizes Goal 2.

Table I: Goal 2: Increase Energy Efficiency in New Residential Units

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 2.1 Exceed Energy Efficiency Standards				
Actions	Educate City staff and developers on future Title 24 updates. Promote Tier 1 and Tier 2 green building ratings such as LEED, Build it Green or Energy Star certified buildings. Evaluate feasibility of streamlining online permitting. Require new residential buildings to be all-electric homes.	0.01	0.01	Years 1-3

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
1. With Enhancing = increased participation due to supporting measures that result in greater reductions.

4.1.3 Increasing Energy Efficiency in Existing Commercial Land Uses

The following measures focus on increasing energy efficiency in existing commercial buildings through behavior modification of business owners and encouraging and incentivizing commercial energy retrofits. Table J summarizes Goal 3.

Table J: Goal 3: Increase Energy Efficiency in Existing Commercial Buildings

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 3.1 Energy Efficiency Training, Education, and Recognition in the Commercial Sector				
Actions	Post links on website and social media and provide materials at public events. Promote an annual energy efficiency fair. Promote PG&E energy centers. Building Inspector to hold trainings on energy efficiency and Title 24 requirements.	Supporting Measure	Supporting Measure	Years 1-3
Measure 3.2: Increase Business Participation in Existing Commercial Energy Efficiency Programs				
Actions	Partner with AMBAG and 3CE incentive programs	69.4	69.4	Years 1-3
Measure 3.3 Non-Residential Building Energy Audits				
Action	Promote and provide energy audits with PG&E	Supporting Measure	Supporting Measure	Years 1-3

Table J: Goal 3: Increase Energy Efficiency in Existing Commercial Buildings

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 3.4 Commercial Energy Renovations				
Actions	Enhance enforcement of Title 24 compliance			
	Promote participation in green building programs such as Leadership in Energy and Environmental Design (LEED), and Energy Upgrade California.			
	Promote financing programs for home upgrades, such as Property Assessed Clean Energy (PACE)			
	Evaluate the feasibility of streamlining online permitting to facilitate electrification retrofits			
	Initiate a Green Business Certification Program for businesses that follow the California Green Business Program standards (www.greenbusinessca.org).	1,206.2	1,666	Years 3-5
	Promote existing incentives for businesses to convert to all-electric buildings. Evaluate the feasibility of providing additional incentives.			
	Develop a Reach Code to require major commercial renovations/expansions to convert to all-electric building unless the business can show a need for natural gas (restaurants, pottery kilns etc.)			

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
1. With Enhancing = increased participation due to supporting measures that result in greater reductions.

4.1.4 Increasing Energy Efficiency in New Commercial Buildings

This goal will evaluate feasibility of streamlining online permitting to facilitate electrification retrofits and support City staff becoming resources in implementing energy efficiency within new commercial businesses. Note that the GHG emissions reductions for this goal includes some conservative assumptions that new businesses will be exempt from the requirement to be all-electric buildings and that Title 24 updates will include all of the energy efficiency reductions, which would mean no anticipated reductions from this goal. Table K on the next page summarizes Goal 4.

Table K: Goal 4: Increase Energy Efficiency in New Commercial Buildings

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 4.1 Exceed Energy Efficiency Standards				
Actions	Educate City staff and developers on future Title 24 updates. Promote Tier 1 and Tier 2 green building ratings such as LEED, Build it Green or Energy Star certified buildings. Evaluate feasibility of streamlining online permitting Create an energy award program for zero-net-energy businesses. Require new commercial buildings to be all-electric with exemptions for business that can show a need for natural gas (restaurants, pottery kilns etc.)	0.0	0.0	Years 2-4

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
1. With Enhancing = increased participation due to supporting measures that result in greater reductions.

4.1.5 Increasing Energy Efficiency through Water Conservation

This goal will continue the water efficiency and conservation programs the City has already initiated. This goal also promotes education and website links encouraging residents to implement water efficiency and conservation measures. Table L summarizes Goal 5.

Table L: Goal 5: Increase Energy Efficiency Through Water Conservation

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 5.1 Water Efficiency Through Continued Implementation of SB X7-7				
Actions	Post links on website and social media Continue with the low-irrigation landscaping requirements the City has in place.	2.9	3.0	Years 2-4
Measure 5.2 Exceed Water Efficiency Standards				
Actions	Conduct direct outreach to HOA, businesses, and the public Allow recycled water for commercial and multi-family residential landscape irrigation. Allow greywater systems and promote rainwater harvesting.	-	-	Years 3-5

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
= Not quantified
1. With Enhancing = increased participation due to supporting measures that result in greater reductions.

4.1.6 Decreasing Energy Demand through Reducing the Urban Heat Island Effect

Trees and vegetation lower surface and air temperatures by providing shade and through evapotranspiration, making vegetation a simple and effective way to reduce urban heat islands. Shaded surfaces may be 20–45 degrees Fahrenheit ([°F] 11–25 degrees Celsius [°C]) cooler than the peak temperatures of un-shaded materials. In addition, evapotranspiration, alone or in combination with shading, can help reduce peak summer temperatures by 2–9 °F (1–5 °C). Trees and vegetation that directly shade buildings can reduce energy use by decreasing demand for air conditioning. In addition, roofing and paving materials that reflect light (cool roofs and cool pavement) decrease the urban heat island effect which reduces energy use. Table M summarizes Goal 6. Note in Table M that the GHG reductions from this measure were not quantified. This is because the City already has a dense urban forest canopy and maintaining it ensures that shading will continue to reduce the urban heat island effect that would otherwise be present. Also, the City currently has roof and paving style ordinances that prevent the use of light reflecting roofing and paving. The City needs to revise these ordinances in order to be able to begin using light reflecting surfaces. For these reasons GHG reductions have not been quantified.

Table M: Goal 6: Decrease Energy Use through Reducing the Urban Heat Island Effect

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 6.1 Tree Planting for Shade and Energy Savings				
Actions	Maintain the health of the urban forest tree canopy in the City. Continue to work with the Friends of Carmel Forest and the community to facilitate urban forest maintenance. Update the City's Urban Forest Management Plan to include tree planting guidelines to promote tree health and maintain a healthy urban forest canopy.	-	-	Years 1-3
Measure 6.2 Light-reflecting Surfaces for Energy Savings				
Actions	Revise existing ordinances to allow cool roof options on residential, commercial and office buildings where feasible.	-	-	Years 3-5

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
- = Not quantified
1. With Enhancing = increased participation due to supporting measures that result in greater reductions.

4.1.7 Decrease GHG Emissions through Reducing VMT Traveled and Electric Vehicles

On-road transportation emissions include emissions from light- and medium-duty vehicles and heavy-duty trucks associated with land use activity. Emissions originate from the combustion of fossil fuels (such as diesel and gasoline) to power the vehicles. These are direct emissions and accounted for approximately nearly 46 percent of total emissions in 2019. On-road transportation measures can achieve significant benefits for both individual residents and the City as a whole. Reductions in and

traffic congestion would reduce smog-forming emissions, toxic air contaminants, and diesel particulate matter.

The City has a unique tourist-based economy that attracts visitors from around the world and the relationship between its tourist economy and the GHG emissions resulting from tourism are a significant source of VMT and GHG emissions. As described in Section 1.1.1 of this document, tourist based VMT results in both Scope 1 direct source GHG emissions, and Scope 3 indirect GHG emissions. Because of this, some of the actions within Measure 7.1 and Measure 7.4 focus on tourism based GHG emissions and will reduce both Scope 1 and Scope 3 emissions. Table N summarizes the measures and actions within Goal 7. Measures that reduce both Scope 1 and Scope 3 emissions include quantification that shows both.

Table N: Goal 7: Decrease GHG Emissions through Reducing VMT and Electric Vehicles

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 7.1 Alternative Transportation Options				
Actions	Work with AMBAG to remove barriers to alternative transportation such as exploring ways to provide safe pedestrian and bicycle access to the City across Highway 1. Explore the feasibility of increasing land use density in downtown during the next General Plan Land Use Element update. Identify and promote within the hotels and visitors center existing shuttle services between Carmel and the airports. Work with Monterey Airport and AMBAG to explore the feasibility of an electric shuttle service between Monterey Airport and destinations in the City.	Scope 1 563 Scope 3 89	Scope 1 563 Scope 3 89	Years 2-10
Measure 7.2 Develop Bicycle Master Plan to Create Safe Bike Routes around the City				
Actions	Develop customized bike routes to improve bike transit. Provide signage, reduce speed limits as necessary, and develop safety education programs on "sharing the road" with bikes.	10	10	Years 3-5
Measure 7.3 Ride-Sharing and Bike to Work Programs within Businesses				
Actions	Promote ride-sharing and facilitate air district incentives for ride-sharing Provide reserved preferential parking spaces for ride-sharing, carpooling, and ultra-low or zero emission vehicles in City parking lots and private businesses that have employee parking. Require businesses of a certain size to provide facilities such as bike racks and showers.	-	-	Years 1-3
Measure 7.4 Electrify the Fleet				

Table N: Goal 7: Decrease GHG Emissions through Reducing VMT and Electric Vehicles

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Actions	Promote electric vehicle incentive programs at outreach events. Apply for grants to install e-chargers at public facilities. Work with community groups and businesses to install additional e-chargers. Promote priority parking at hotels for electric vehicles and provide e-chargers. Provide priority parking for bus tours that use electric buses. Work with Visit Carmel to develop and initiate a Green Visitor Program that rewards tourists that use electric vehicles, carbon credits for air-miles, and that adhere to the City's sustainability practices while visiting the City. Require or incentivize major commercial building renovations/expansions to install e-chargers.	Scope 1 1,511 Scope 3 1,425	Scope 1 1,538 Scope 3 1,452	Years 3-5
Measure 7.5 Initiate Origin/Destination Transportation Model				
Actions	Develop an Origin Destination Transportation Model focused on Carmel-by-the-Sea using the AMBAG regional model as a base. Update the CAP with new VMT data once the Origin Destination Model is completed.	N/A	N/A	Years 3-5

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
Scope 1 = Direct source emissions that require quantification.
Scope 3= Indirect source emissions that are voluntarily quantified.
N/A = Not Applicable
1. With Enhancing = increased participation due to supporting measures that result in greater reductions.

4.1.8 Decreasing GHG Emissions through Reductions in Solid Waste Generation

According to Statewide Waste Characterization data, the commercial sector generates nearly three fourths of the solid waste in California[1]. Furthermore, much of the commercial sector waste disposed in landfills is readily recyclable. Increasing the recovery of recyclable materials will directly reduce GHG emissions. In addition to recyclables, it is also essential to focus on diverting organic waste from all the sectors as it can represent 30 percent of the total waste stream in the City. The SB 1383 requires Californians to reduce organic waste disposal by 50% by 2020 and 75% by 2025.

Table O summarizes the measures and actions within Goal 8.

[1] CalRecycle. 2020 Statewide Waste Characterization data. Website: https://www2.calrecycle.ca.gov/WasteCharacterization/Study (Accessed March 2022).

Table O: Goal 8: Decrease GHG Emissions through Reducing Solid Waste Generation

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 8.1 Reduce Waste at Landfills				
Actions	Promote zero waste events, use reusables rather than recyclable materials, and buy local to reduce waste. Require waste hauler to pick up organic waste in compliance with SB 1383 and conduct outreach to residents and businesses to ensure compliance and minimize contamination. Promote home composting and community gardens. Educate the community on proper use of the City-provided grey/green/blue containers.	1,500	1,500	Years 1-3

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
1. With Enhancing i= increased participation due to supporting measures that result in greater reductions.

4.1.9 Decreasing Energy Demand through Clean Energy Use

Renewable energy sources especially those that have zero or near zero emissions such as photovoltaic (PV) solar and wind generation are clean energy. Distributed renewable energy generation such as rooftop PV solar provides locally important environmental and economic benefits because the clean energy is being generated within the City. Ability to store energy is also crucial for enabling widespread adoption, stabilization, and grid integration of renewable energy. Energy storage can reduce power fluctuations, enhance system flexibility, and enable the storage and dispatch of electricity generated by variable renewable energy sources. Energy storage also helps customers better prepare for outages and Public Safety Power Shutoffs (PSPS).

Besides distributed renewable energy generation, the City is also participating in 3CE, a Community Choice Aggregation (CCA) within Monterey, San Luis Obispo, Santa Barbara, and Ventura Counties that is delivering grid-based electricity comprising at least 31 percent renewable energy and 56 percent large hydroelectric generation to the City. 3CE is scheduled to increase renewable energy to 100 percent on or before 2030. Goal 9 will decrease GHG emissions by increasing the use of renewable and other clean energy sources. Table P summarizes the measures and actions within Goal 9.

Table P: Goal 9: Decrease GHG Emissions through Increasing Clean Energy Use

Measure	Actions	2030 GHG Reduction Achieved (MT CO_2)		Timing (Phased Implementation)
		No Enhancing	With Enhancing[1]	
Measure 9.1 Promote Clean Energy				
Actions	Promote clean energy incentives to the community Incentivize solar panels installation on existing residential units Require or incentives solar panel installation on major commercial building retrofits/expansions (70 percent or more of the building area) and commercial parking lots. Promote energy storage system installation with solar panels.	364	364	Years 3-5
Measure 9.2 Continue Participation with 3CE to increase the Renewable Generation Portfolio of Electricity in Carmel				
Actions	Promote 3CE's 100 Percent Renewable Energy Option in the City by encouraging residents and businesses to participate ir the program.	-	-	Years 1-3

Source: Compiled by LSA 2022
MT CO_2e = metric tons carbon dioxide equivalent
-= Not quantified
1. With Enhancing i= increased participation due to supporting measures that result in greater reductions.

4.2 GHG Reduction Summary and Comparison with the 2030 Reduction Target

By implementing the Statewide and local reduction measures described in Section 4.1, the City would reduce its communitywide GHG emissions by 48 percent below 2019 levels of emissions by 2030. Table Q summarizes the strategies and the potential GHG reductions for community and municipal operations, respectively.

Table Q: Summary of Community GHG Reduction Strategies and Emissions Reductions

Goals and Measures	2030 Emission Reductions (MT CO_2e)
Goal 1: Increase Energy Efficiency in Existing Residential	
1.1: Energy efficiency training, education, and recognition in the residential sector	Supporting Measure
1.2: Increase community participation in existing energy efficiency programs	1.70
1.3: Home energy evaluations	Supporting Measure
1.4: Residential home energy renovations	1,294.60
Goal 2: Increase Energy Efficiency in New Residential Units	
2.1: Exceed energy efficiency standards	0.01
Goal 3: Increase Energy Efficiency in Existing Commercial Units	
3.1: Energy efficiency training, education, and recognition in commercial sector	Supporting Measure
3.2: Increase business participation in existing energy efficiency programs	69.40
3.3: Non-residential building energy audits	Supporting Measure
3.4: Non-residential building retrofits	1,666.00

Table Q: Summary of Community GHG Reduction Strategies and Emissions Reductions

Goals and Measures	2030 Emission Reductions (MT CO_2e)
Goal 4: Increase Energy Efficiency in New Commercial Units	
4.1: Exceed energy efficiency standards	-
Goal 5: Increase energy efficiency through water efficiency	
5.1: Water efficiency through continued implementation of SBX7-7	3.00
5.2: Exceed water efficiency standards	Supporting Measure
Goal 6: Decrease Energy Demand through Reducing Urban Heat Island Effect	
6.1: Tree planting for shading and energy efficiency	-
6.2: Light-reflecting surfaces for energy efficiency	-
Goal 7: Decrease Greenhouse Gas Emissions through Reducing Vehicle Miles Traveled	
7.1: Alternative Transportation Options	563.00
7.2: Develop Bicycle Master Plan to Create Safe bike routes in the City	10.00
7.3 Ride-sharing and bike-to-work programs within businesses	-
7.4: Electrify the fleet	1,538.00
7.5 Initiate Origin/Destination Transportation Model	N/A
Goal 8: Decrease Greenhouse Gas Emissions through Reducing Solid Waste Generation	
8.1: Reduce waste to landfills	1,500.00
Goal 9: Decrease Greenhouse Gas Emissions through Increasing Clean Energy Use	
9.1: Promote clean energy	364.00
9.2: Continue participation in 3CE Program	-
Total Community Measures	**7,009.71**

Source: Compiled by LSA 2022
3CE = Central Coast Clean Energy
MT CO_2e = metric tons of carbon dioxide equivalent
N/A = Not Applicable
SB = Senate Bill
- = Not quantified

Figure 5 on the following page provides a summary graph of the local emission reductions.

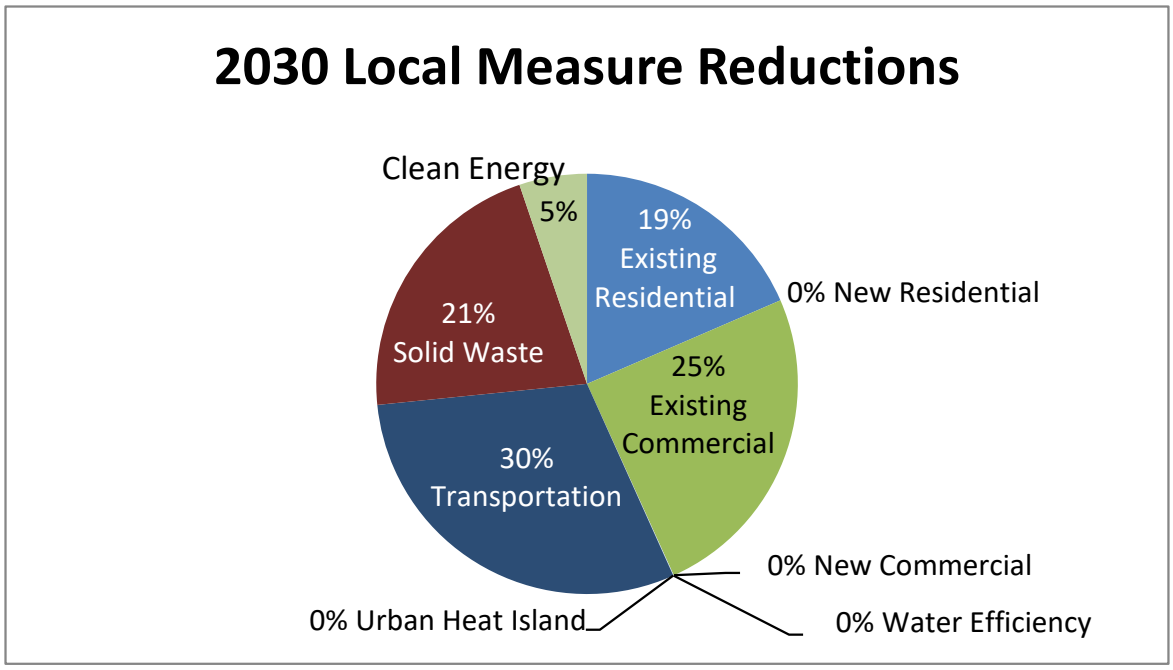


Figure 5: Local Reduction Measures

As shown in Figure 5, reductions in Transportation represent the largest (30 percent of total reductions) portion of reductions, followed by energy efficiency retrofits of existing commercial at 25 percent, solid waste diversion at 21 percent, energy efficiency retrofits of existing residential at 19 percent, and clean energy at 5 percent.

Figure 6 on the following page summarizes the 2015 through 2019 emission inventories, projected 2020, 2030, and 2045 emission forecasts, as well as the 2020, 2030, and 2045 reduction targets after implementation of the local reduction measures.

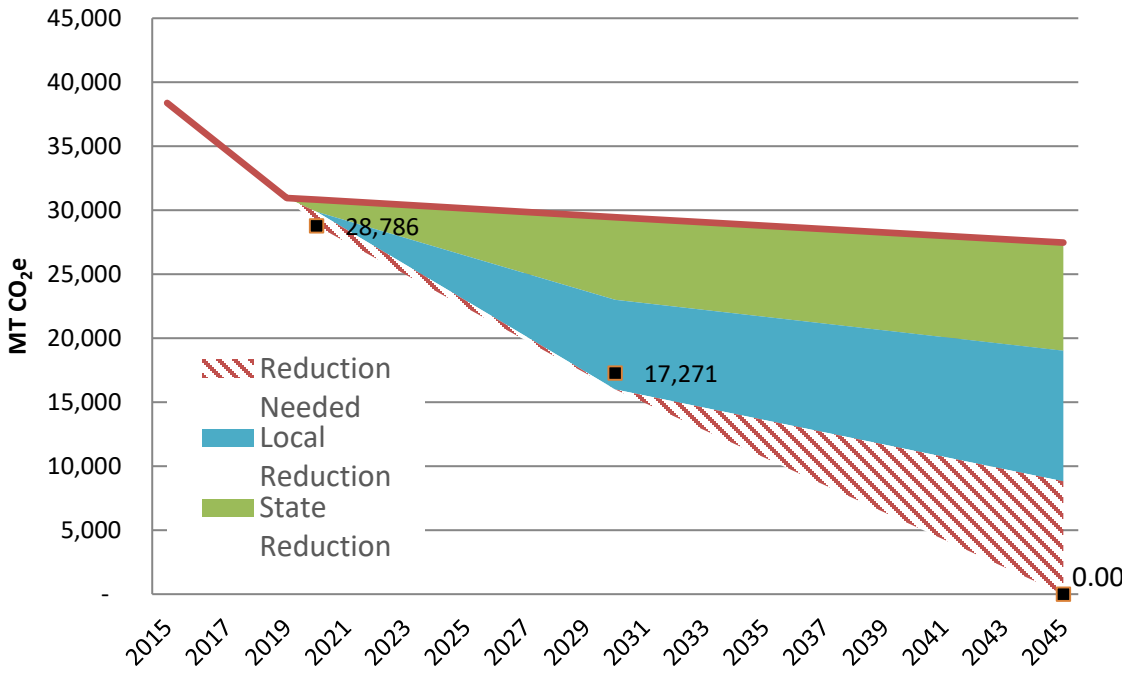


Figure 6: Existing and Forecasted Emissions with Local Reduction Measure Implementation

As shown in Figure 6, with implementation of the local reduction measures, emissions in 2030 will be below the 2030 reduction target and provide additional reductions beyond 2030. However, the current set of reduction strategies will not achieve carbon neutrality by 2045.

CONCLUSIONS

The City will see a total reduction of 13,442 MT CO_2e (6,432 MT CO_2e from State measures, and 7,010 MT CO_2e from local measures) in 2030 with implementation of all the measures. The remaining 2030 GHG emissions for the City after measure implementation will be approximately 16,003 MT CO_2e, which is below the 2030 reduction target of 17,271 MT CO_2e. However, with the current set of reduction strategies the City will not achieve carbon neutrality by 2045.

The City of Carmel-by-the-Sea should update the 2045 ABAU forecasts and provide local reduction strategy updates once the State has provided an updated Scoping Plan demonstrating how the State will achieve carbon neutrality.

Appendix B
Climate Vulnerability Assessment

City of Carmel-by-the-Sea

CLIMATE CHANGE VULNERABILITY ASSESSMENT

FINAL REPORT

July 2021

Acknowledgments

Climate Committee Members:

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Appendix A: Historical Hazards

Appendix B: Climate Committee Presentation Summaries

I. Introduction

The purpose of this Vulnerability Assessment is to characterize climate hazards that will impact the community and City assets in Carmel-by-the-Sea, determine our community's major climate vulnerabilities, and identify work that has already been done to improve community resilience. The Vulnerability Assessment will help provide focus to the City's adaptation planning efforts.

II. Historical Hazards

Historical hazards provide information about hazards that may be exacerbated by climate change, as well as potential vulnerabilities of City assets to those hazards. A table of historical hazards assembled from the Monterey County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP), the National Oceanic and Atmospheric Administration (NOAA) Storm Events Database, and historic records at the Carmel Library, is included in **Appendix A**. Additionally, a map of historic wildland fires in Monterey County from the MJHMP is also included in **Appendix A**.

III. Changing Hazards with Climate Change

This 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 Cal-Adapt modeling tool provides climate change projections based on two different future greenhouse emissions gas scenarios: a high-emissions scenario, Representative Concentration Pathway (RCP) 8.5, in which greenhouse gas emissions continue to rise over the 21st century, and a low-emissions scenario, RCP 4.5, in which greenhouse gas emissions level off around the middle of the 21st century, and, by the end of the century, are lower than 1990 levels.

Increased Temperatures

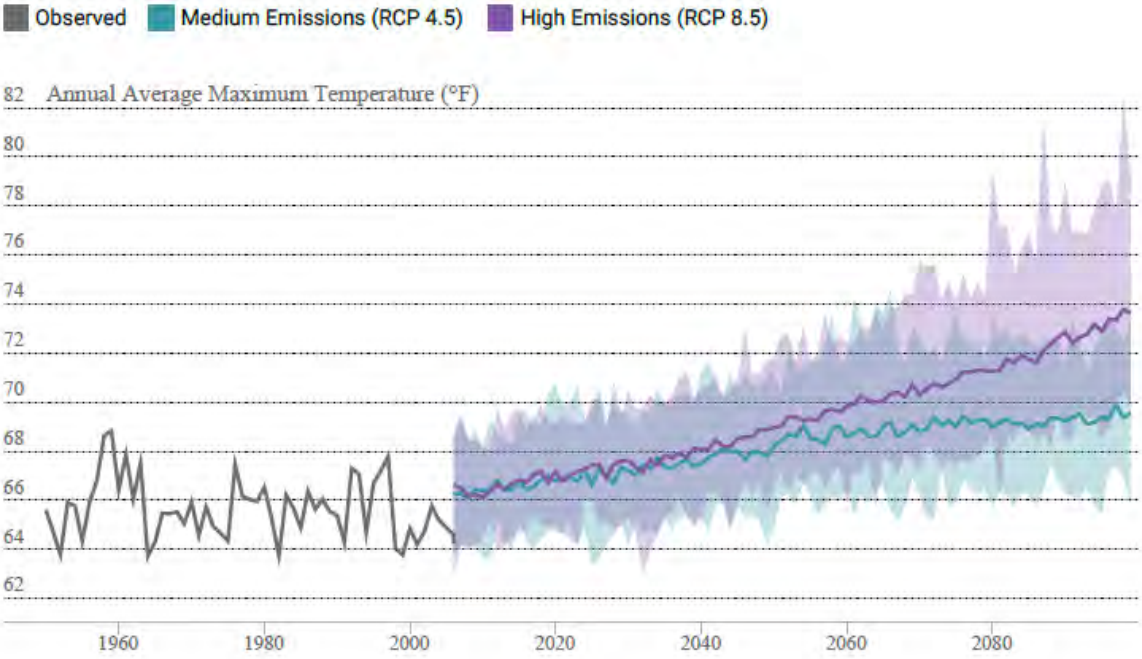
According to the State's Cal-Adapt modeling tool, overall temperatures are projected to rise in California during the 21st century. However, coastal areas will be less impacted due to the moderating effect of the Pacific Ocean. The current average annual maximum temperature (the average of all the hottest daily temperatures in a year) in Carmel-by-the-Sea is 65.6 degrees Fahrenheit (°F). According to the RCP 8.5 model, annual average maximum temperatures in Carmel-by-the-Sea could increase by 3.3°F by mid-century to 68.9°F, and by 6.3°F to 71.9°F by the end of the century.

The number of extreme heat days, defined as days with daily maximum temperature above 87.9 °F, is also projected to increase from 3 days to an average of 6 days per year by mid-century, and to an average of 7 to 13 days per year by the end of the century, depending on the emissions scenario. It is important to note that these are modeled averages and that some years will have more extreme heat days, and others fewer.

While the community and essential facilities of Carmel-by-the-Sea may be able to adapt to these temperature changes, local ecosystems are likely to be adversely impacted by the increased heat.

Annual Average Maximum Temperature

Average of all the hottest daily temperatures in a year.



		30yr Average	30yr Range
Baseline (1961-1990)			
MODELED HISTORICAL	-	65.6 °F	65.3 - 65.8 °F
Mid-Century (2035-2064)			
MEDIUM EMISSIONS (RCP 4.5)	+2.6 °F	68.2 °F	66.7 - 69.6 °F
HIGH EMISSIONS (RCP 8.5)	+3.3 °F	68.9 °F	67.3 - 70.6 °F
End-Century (2070-2099)			
MEDIUM EMISSIONS (RCP 4.5)	+3.6 °F	69.2 °F	67.3 - 71.5 °F
HIGH EMISSIONS (RCP 8.5)	+6.3 °F	71.9 °F	69.2 - 76.0 °F

Source: Cal-Adapt Local Climate Change Snapshot for Carmel-by-the-Sea

Drought

In 2014, the State of California, including Monterey County, faced one of the most severe droughts on record. Governor Brown declared a drought State of Emergency in January 2014, and directed State officials to take all necessary actions to prepare for water shortages during what was considered an "unprecedented" drought.

Prior to the 2014 drought, the National Climatic Data Center has recorded no instances of severe drought conditions in the Monterey County forecast zone for the period of 1/1/1996 through 12/31/2013.

According to the Fourth California Climate Assessment, even minor fluctuations in rainfall patterns will increase pressure on Monterey County's water resources, which are already over-stretched by the demands of a growing agriculture economy and population. Decreasing spring stream flows, coupled with increasing demand for water resulting from both a growing population and hotter climate, could lead to increasing water shortages.

According to the State's Cal-Adapt modeling tool, research suggests that for much of the state, wet years will become wetter and dry years will become drier. Dry years are also likely to be followed by dry years, increasing the risk of drought. While California does not see the average annual precipitation changing significantly in the next 50-75 years, precipitation will likely be delivered in more intense storms and within a shorter wet season. We are already seeing some of the impacts from a shift towards larger year to year fluctuations.

Fog Changes

According to California's Fourth Climate Assessment, the formation of coastal fog is very complex and involves highly dynamic ocean, air, and land processes. Ocean upwelling, once thought to drive the formation of coastal fog, is secondary to the global atmospheric circulation pattern that situates a North Pacific zone of atmospheric high-pressure. This air mass generates inversions under which coastal fog forms. The frequency and thickness of summertime fog depends on the location of the high-pressure zone, the strength of the inversion, and sea surface temperatures.

The future of coastal fog under climate change remains uncertain. Long term fog trends over the coastal ocean from ship observations since 1951 show an increase, while fog trends over land show a decrease. The effect of other land surface changes such as forest fires on fog is unknown.

Changes in coastal fog could have a significant impact on coastal ecosystems. Fog provides an important source of water for many coastal plant communities through fog drip, and it also acts to keep moisture in the ecosystem, preventing evaporation and maintaining cooler temperatures during the summer months. Ecosystems such as the coastal redwoods and maritime chaparral are dependent on fog for their survival. A decline in coastal fog could also lead to increased water use and an increased demand for water in the Central Coast Region due to warmer temperatures and increased evaporation during the summer months. This in turn could lead to increased agricultural and landscape water use.

Ocean Warming

According to information provided by the National Oceanic and Atmospheric Administration (NOAA), Office of National Marine Sanctuaries, water temperatures in the Monterey Bay Sanctuary have risen slightly over the past century and offshore waters could warm by 7 degrees Fahrenheit by 2100. In addition to rising average temperatures, marine heatwaves are expected to increase in frequency, duration, and intensity.

Monterey Bay is at an ecological transition zone that is the northern range edge of many warm-water species. Thus, warming of ocean waters may have a significant impact on marine communities by shifting warm-water species northward. Warming waters also hold less oxygen and may increase the mortality of a variety of local organisms, including mussels, oysters, sea stars, rockfish, kelp, and deep-water corals.

Many impacts of warming waters were observed during the 2014-2016 marine heatwave known as "The Blob", during which water temperatures in the Sanctuary reached 7.2 degrees Fahrenheit above normal. That marine heatwave caused significant impacts in the Bay, including a large Harmful Algal Bloom, reduced numbers of zooplankton, and migration of southern species. These changes in turn caused mass mortalities of seabirds and marine mammals, and early closure and delayed opening of the Dungeness crab fishery. Effects of the heatwave also led to significant declines in kelp forests in the region.

The varied impacts of The Blob on the marine ecosystems of the Monterey Bay and the fisheries that rely on them demonstrated the potential significant impacts of climate change on local marine communities; however, marine systems are complex, impacted by not only water temperature, but also upwelling, sea level rise, storm patterns, and ocean acidification. Thus, the long-term effects of climate change on local marine ecosystems are still under study and are difficult to predict.

Wildfires

Wildfires occur frequently in the Central Coast region. In recent years, much of California, including the Central Coast, has seen an increased risk of wildfire, with a wildfire season that starts earlier, runs longer, and features more extreme fire events.

According to California's Fourth Climate Assessment, annual climatic water deficit, which measures water availability relative to water demand, is generally a strong predictor of fire occurrence in semi-arid regions, largely due to the correlation between annual water deficit and fuel moisture. Warmer temperatures will increase water demand and climate water deficit, and thus fire risks.

A key factor affecting wildfires on the Central Coast will be precipitation patterns. Northern Central Coast areas typically have higher precipitation and may see fewer, more severe, wildfires; while areas to the south may see more frequent, less severe, wildfires as warming temperatures increase climatic water deficit there but also could reduce vegetation growth rates and fuel loads. Another important factor in wildfire severity will be wind; at this time, climate models have not determined yet how climate change will affect major wind patterns in the Central Coast.

Given the uncertainties in climate predictions of precipitation and wind for the Central Coast region and the sensitivity to precipitation and climatic water deficits of our local ecosystems, it is difficult to accurately predict the change in wildfire frequency and severity; however, there is little doubt that large, severe wildfires will continue to occur in this region. Thus, growing populations and expansion into the Wildland Urban Interface (WUI) will increase vulnerability to fires. Projected increases in precipitation intensity during storms may also increase post-fire impacts such as sediment flows, nutrient pulses in nearshore waters, and the spread of invasive grasses.

Stronger Storms

Projections of changes in precipitation in California are more nuanced than projected changes in temperature and have less separation between RCP4.5 and 8.5 scenarios. There is a projected increase of year-to-year variability with wetter days during periods of precipitation, but with fewer total days with precipitation. This means that storms will intensify and rainfall will come in more intense bursts; however, drought years may also be more common and the wet season will become shorter. When combined with higher temperatures, these changes will create significant challenges for the state's water supplies, potentially creating more serious flooding events as well as more frequent drought conditions.

According to California's Fourth Climate Assessment, extreme atmospheric river events, which are associated with strong winds and severe flooding, are expected to increase under projected climate change in California. Atmospheric rivers are the dominant drivers of locally-extreme rainfall events along the Central Coast. During the winter of 2016-2017, a large number of atmospheric rivers that struck the Central Coast caused tremendous flooding and damage throughout the Monterey Bay region. During the winter of 2018-19, a series of atmospheric rivers struck the Monterey Peninsula with significant wind and rainfall that caused widespread power outages and road closures due to fallen trees and broken branches (Appendix A).

Periodic El Niño events also can significantly impact the intensity of storm events on the Central Coast. El Niño events are associated with seasonally-elevated ocean water levels as high as 1 foot above normal, and, on average, 30 percent larger winter wave energy in California. Extreme El Niño events of 1982-83 and 1997-98 caused significant coastal erosion due to strong winter waves. The magnitude and frequency of El Niño events, which may increase with climate change, will have significant impacts on coastal resources and will exacerbate the impacts of sea level rise.

Sea Level Rise

Global sea level rise is driven primarily by thermal expansion caused by the warming of the oceans and the loss of land-based ice such as glaciers and polar ice caps due to increased melting. The Monterey County MJHMP (September 2014) estimates that Monterey County may experience an approximate 5-foot (150 cm) rise in sea level by the year 2100. Figure 1 below is a chart from the Coast and Ocean Summary Report of California's Fourth Climate Assessment (August 2018). The chart indicates potentially more extreme sea level rise than previously anticipated, particularly if greenhouse gas emissions are not controlled. The chart also illustrates the rapid and drastic sea level rise between 2050 and 2100, especially under an unmitigated greenhouse gas emission scenario.

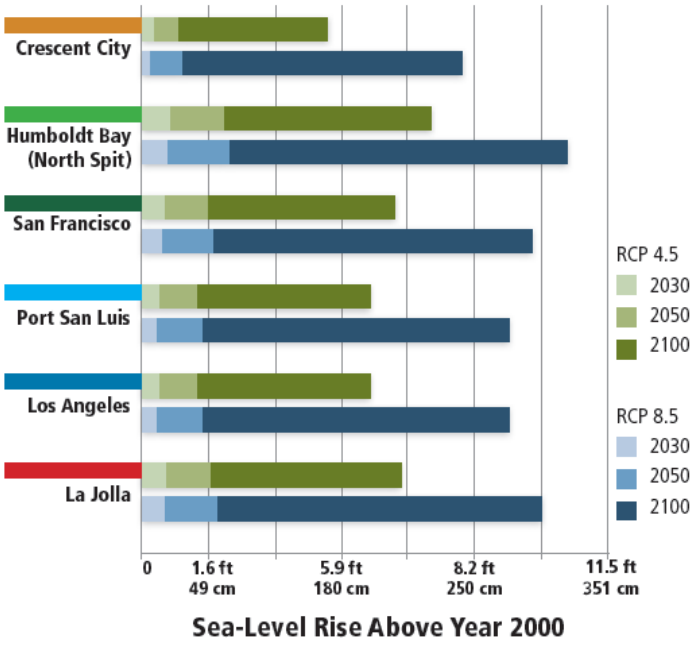
Figure 2 is from the USGS Coastal Storm Modeling System and shows a range of inundation zones, starting with 1) current conditions, 2) 1.6 feet (50 cm) of Sea Level Rise (SLR) by mid-century under normal conditions, 3) 1.6 feet of SLR during a 1-year storm, and 4) 5 feet of sea level rise by 2100 (no storm).

The figures indicate that the Carmel bluffs provide an important barrier against sea level rise impacts to property, which will be increasingly impacted by the rising tides. Particularly during storms, as the beach continues to narrow, the bluffs and seawalls will endure an increasing amount of the erosive force of ocean waves. Carmel Beach will continue to become narrower, particularly at the southern end of the bay, as well as the northern end, near Pescadero Canyon, and, by mid-century, will be inaccessible during and after storms. This phenomenon of beach loss is already happening after large winter storms in Carmel. With 5 feet of sea level rise

(near the end of the century under an RCP 4.5 scenario), the southern end of the beach will be gone, as well as the northern portions, even under normal conditions.

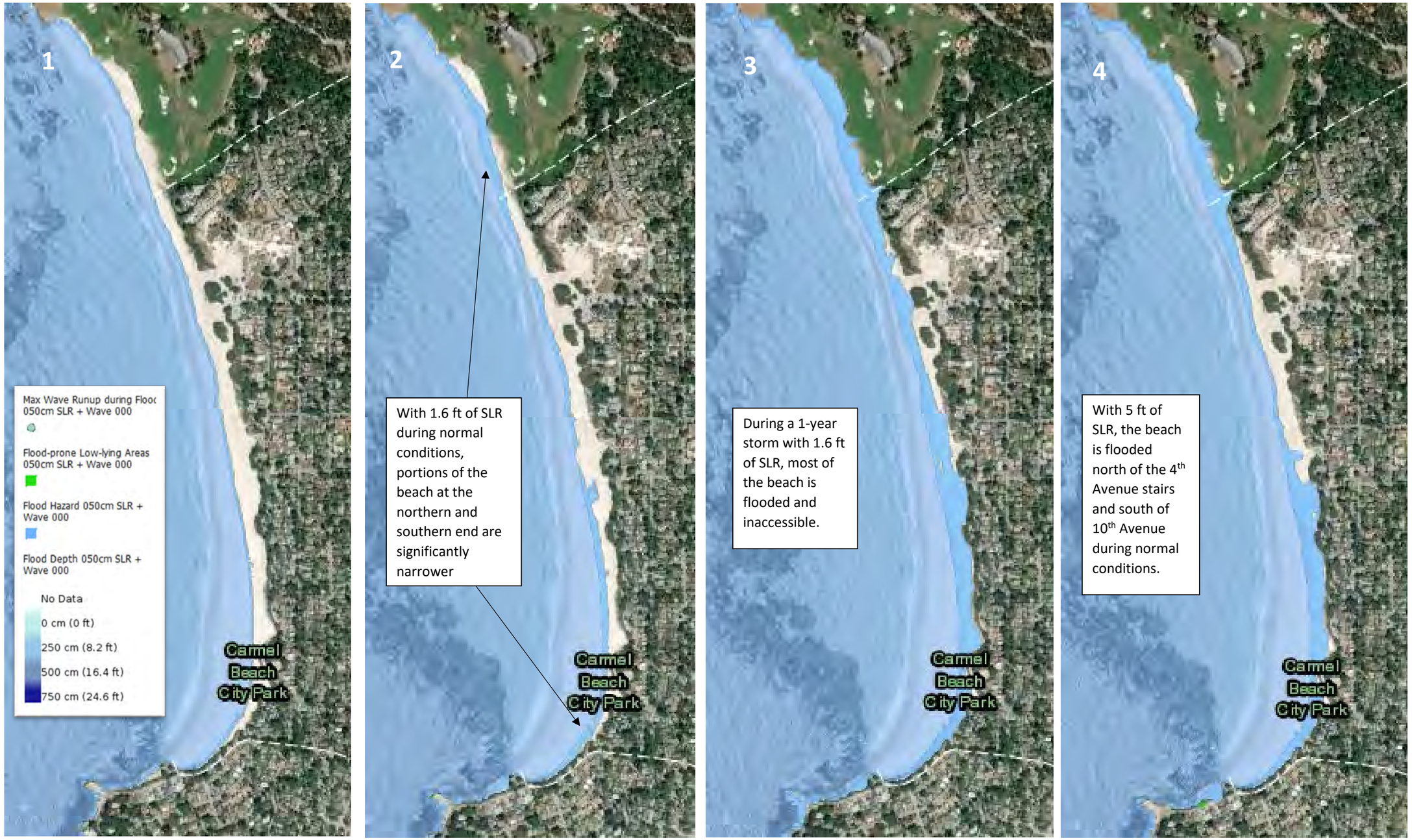
The loss of Carmel Beach will impact not only the recreational, environmental, and economic resources it provides but it also will amplify the impacts of hazard events such as storms, as well as coastal erosion. Coastal erosion analysis indicates that retreat rates for the Carmel bluffs average 2-4 inches per year. It is important to note that there are wide variations in coastal erosion from year to year and that, during El Nino years, which are characterized by stronger storms, the bluffs experience significantly more erosion. For example, during the winter of 1982-83, as much as 40 feet of bluff were lost in some areas of Carmel (Appendix A). Sea level rise, combined with amplified coastal erosion could cause considerable damage to the City's coastal facilities, including sea walls, revetments, access stairs, the Scenic pathway, bathrooms, Scenic Road, and utilities including the sanitary sewer, water supply, and stormwater systems.

Figure 1: Chart of Sea Level Rise along the California Coast



Source: California's Coast and Ocean Summary Report, California's Fourth Climate Change Assessment

Figure 2: Comparison of Carmel Beach maximum wave run-up during: 1) current conditions, 2) with 1.6 ft of sea level rise (SLR) and no storm, 3) 1.6 ft of SLR and 1-year storm, and 4) 5 ft of SLR and no storm.



Source: Our Coast Our Future, https://data.pointblue.org/apps/ocof/cms/

IV. Hazard Ranking

Based on the information provided by historical hazards (Appendix A), as well as projected changes from climate change, several climate effects will significantly impact Carmel over the coming years. Climate hazards are ranked in the table below by the timeframe of their impacts, with hazards that are already causing observable impacts or representing a significant near-term risk in orange and those with potentially significant impacts into the future in yellow. Hazards in yellow have a longer planning time horizon. Hazards for which we do not have enough data yet are shown in grey.

- Orange: already causing observable impacts or a near-term significant risk
- Yellow: significant mid- to long-range impacts
- Grey: not enough data

Stronger Storms
Wildfires
Sea Level Rise
Drought
Increased Temperature
Fog Changes
Ocean Warming

V. Vulnerable City Assets and Populations

Climate change does not have the same effects in all parts of the community. Some people and physical assets will be affected more severely than others, and adaptation planning efforts should evaluate the full range of potential effects of climate change. Priority assets and populations at risk are organized in Table 1 below under the following main categories:

- Natural Assets
- Community
- Utilities
- Regional Infrastructure
- Local Infrastructure

Virtually all people and assets in our community will be affected by climate change in some way over the planning horizon; however, it is not feasible to assess the vulnerability of every group or every asset in our community. Thus, we have focused on those assets that face greater harm, require special consideration, or are critical to the community's well-being. They are listed below with potential hazards that may affect them.

Table 1: Vulnerable City Assets and Populations

Priority Assets at Risk	Priority Hazards						
	Stronger Storms	Wildfires	Sea Level Rise	More Droughts	Increased Temperature	Fog Changes	Ocean Warming
Natural Assets							
Mission Trail Nature Preserve	X	X	X	X	X	X	
North Dunes			X	X	X	X	
Urban forest	X	X		X	X	X	
Marine Sanctuary	X			X	X	X	X
Carmel Beach			X			X	X
Community							
Elderly population and people with disabilities	X	X		X	X		
Residents	X	X		X	X		
Visitors	X	X	X				X
Local businesses	X	X	X	X	X		X
Service industry workers	X	X	X		X		
Second homes	X	X	X		X		
Utilities							
Water supply		X	X	X	X		
Sanitary sewer system	X		X				
Power grid	X	X			X		
Overhead communication lines	X	X			X		
PG&E/communication underground lines (gas, cable)		X	X				
Regional Infrastructure							
Wastewater treatment facility	X		X		X		
Transportation infrastructure (Caltrans)	X	X	X				
Hospital and emergency medical care facilities	X	X			X		
Landfill & waste management	X						

Priority Assets at Risk	Priority Hazards						
	Stronger Storms	Wildfires	Sea Level Rise	More Droughts	Increased Temperature	Fog Changes	Ocean Warming
Local Infrastructure							
Shoreline access infrastructure: Scenic trail, public restrooms, beach stairs, coastal roadways, and parking	X	X	X		X (visitors)	X	
Seawalls and revetments	X		X				
Storm drainage system	X		X				
Other city streets	X						
Emergency response facilities (Fire station, EOC, PD, PW, City Hall, etc.)	X	X			X		

VI. Existing Strategies and Policies for Adaptation

The City has several existing documents that provide guiding policies and strategies that will help address elements of climate change adaptation. A summary of recommended projects in those documents that will help reduce the City's vulnerability to climate change is presented below, by asset category.

Natural Assets

a. Mission Trail Nature Preserve

Mission Trail Nature Preserve Master Plan

Adopted by the City Council: 1996

The Mission Trail Nature Preserve Master Plan has policies that will be beneficial to the short- and long-term health of the Preserve's ecosystems in the face of climate change. These policies can make the Preserve more resilient to increased heat, drought, and wildfires:

- O5-25: Preserve and enhance the vegetative diversity in Mission Trail Nature Preserve consisting of Monterey pine forest, central coast willow riparian forest, wet meadow, coast live oak woodland, redwood, box elder, cottonwood, coastal terrace prairie.
- O5-31: Maintain natural drainage patterns except where erosion or human safety problems may be created. Encourage/allow the channelized ditch to revert to a more natural channel in order to enhance the park's wetlands (riparian forest, wet meadow) and natural character.

- Prepare annual maintenance plans for habitats within the Preserve. Encourage native vegetation to reestablish on sites previously mowed, cut, or invaded by exotic species.

Implementation Status: *Initiated.* Many elements of the Mission Trail Nature Preserve Master Plan, including enhancing native habitats and site hydrology, have been initiated and are currently in progress. The City has been working with its private non-profit partners on invasive species and fire fuel removal throughout the Preserve for several years.

Mission Trail Nature Preserve Baseline Biological Assessment

Prepared by Nicole Nedeff: January 2016

The Mission Trail Nature Preserve Baseline Biological Assessment was completed in 2016 and includes an implementation plan for maintenance and enhancement of the various habitats of the Preserve. This is the primary guiding document for habitat restoration projects in the Preserve.

Implementation Status: *Initiated.* Many elements of the Mission Trail Nature Preserve Baseline Biological Assessment, including weed removal and improving the site's hydrology, have been initiated and are currently in progress. The City has been working with the Friends of Mission Trail Nature Preserve on invasive species and fire fuel removal throughout the Preserve.

Mission Trail Stream Stability Study

Prepared by Dudek and Waterways Consulting: February 2019

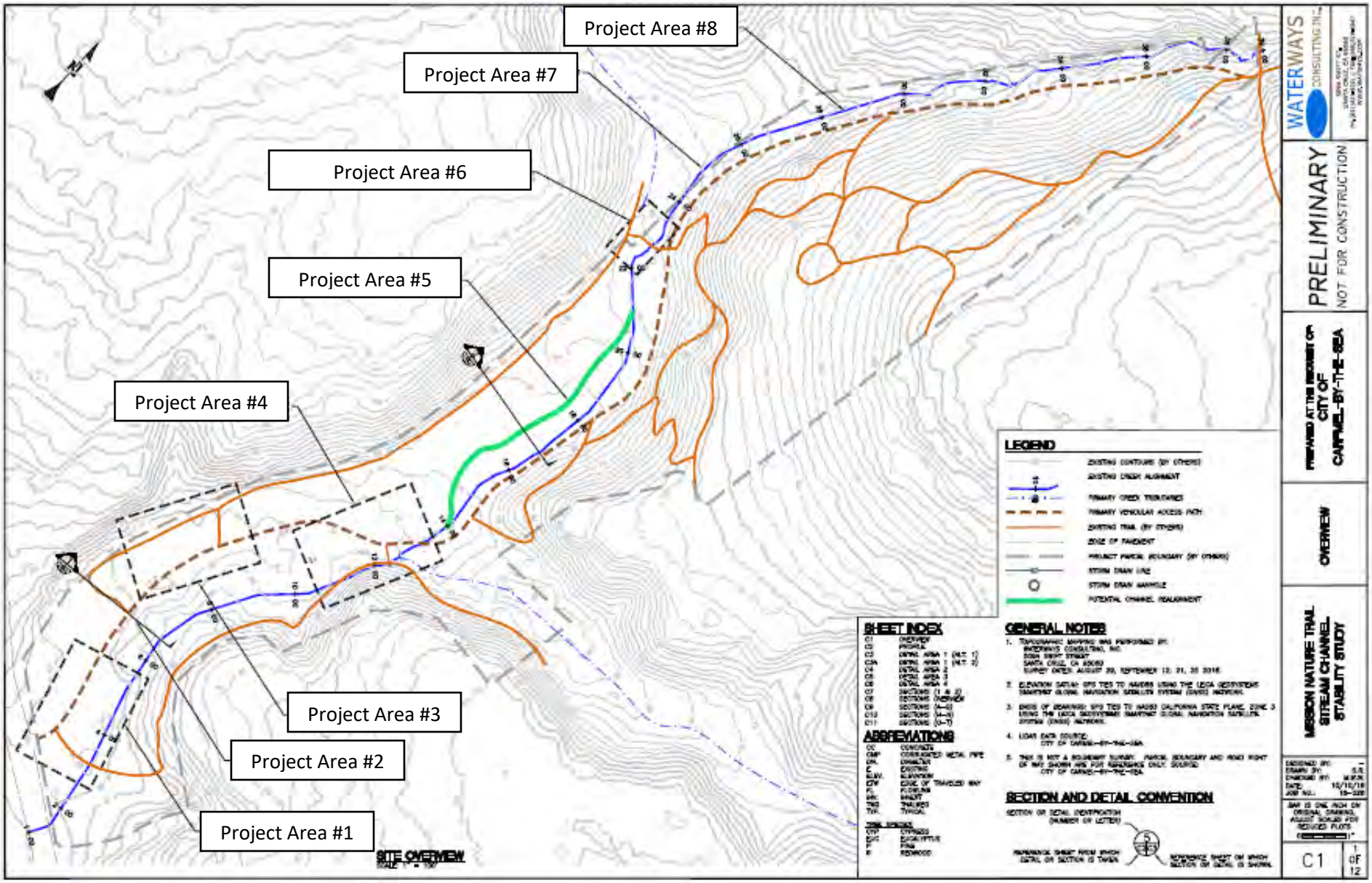
The Stream Stability Study was completed in 2019 to determine factors contributing to channel instability in Mission Trail Nature Preserve, to determine the stability of drainage improvements in the Preserve, and to recommend actions to restore the stream and habitat conditions in the riparian corridor. The study identified eight projects to restore natural hydrology and stream stability in the Preserve. The projects are shown on Figure 2 below and listed in Table 2.

Table 2: Mission Trail Stream Restoration Projects

PROJECT AREA	PROJECT COMPONENTS	APPROXIMATE COSTS	
		DESIGN	IMPLEMENTATION & ESTABLISHMENT
1 (Alt 1)	RAISE ENTRANCE ROAD, INSTALL NEW CULVERT BELOW ENTRANCE ROAD, CONSTRUCT OPEN SWALE TO CREEK	$17,000	$90,000
1 (Alt 2)	RAISE ENTRANCE ROAD, INSTALL NEW CULVERT BELOW ENTRANCE ROAD, CONSTRUCT PIPE TO CREEK	$17,000	$95,000
1 (Alt 3)	RAISE ENTRANCE ROAD, INSTALL NEW CULVERT BELOW ENTRANCE ROAD	$15,000	$75,000
2	CONSTRUCT APPROX. 100 LF PEDESTRIAN BOARDWALK	$8,000	$40,000
3	INSTALL CULVERT OR ROCKED FORD AND REALIGN TRIBUTARY DRAINAGE, INSTALL SMALL DITCH CULVERT AND PERFORM DITCH MAINTENANCE	$7,500	$22,500
4	DEMOLISH PORTION OF EXISTING FORD, RESTORE DOWNSTREAM REACH OF CHANNEL, REALIGN TRAIL, CONSTRUCT PEDESTRIAN BRIDGE, RESTORE OLD TRAIL ALIGNMENT	$17,500	$100,000
5	REALIGN APPROX. 700 LF OF CHANNEL. RESTORE OLD CHANNEL BED, REVEGETATE DISTURBED AREAS	$27,500	$300,000
6	REPLACE EXISTING UNDERSIZED BRIDGE, RESTORE DOWNSTREAM CHANNEL AND ARMOR REACH TO PREVENT FURTHER INCISION UPSTREAM	$25,000	$230,000
7	REMOVE EXISITING WEIR, LOWER CHANNEL, STABILIZE NEW CHANNEL BED AND BANKS	$9,500	$30,000
8	PERFORM BOUNDARY SURVEY, DETAILED TOPOGRAPHY, GEOLOGIC & GEOTECHNICAL INVESTIGATION. PRIORITIZE A PHASED REPAIR PLAN, AND PREPARE PRELIMINARY AND FINAL DESIGNS FOR GRADE CONTROL.	$50,000	N/A

Implementation Status: *Initiated*. A successful grant application for $178,000 for the design and construction of Projects 1-3 has been submitted to the Per Capital Grant Program and is awaiting contract.

Figure 2: Mission Trail Stream Stability Projects



b. North Dunes

Del Mar Master Plan and North Dunes and Del Mar Dunes Habitat Restoration Plan (2009)

Adopted by the City Council: September 2009

The Del Mar Master Plan provides a framework for improving parking, circulation, pedestrian flow, handicap accessibility, aesthetics and environmental resources in the Del Mar and North Dunes areas. At the time of the Master Plan development, the North Dunes were a 4 to 5 acre tract of substantially disturbed dunes with small pockets of remaining native species. The Master Plan has several policies that support the restoration of the native habitats in the North Dunes, which will improve sensitive habitat resilience in the face of climate change:

P5-103: Identify and protect environmentally sensitive habitat areas against any significant disruption of habitat values. Only uses dependent upon those resources shall be allowed.

P4-48: Discourage any further incursion of recreational activities into the North Dunes habitat. Sensitive resources in the North Dunes habitat area shall be protected.

P5-28: Restore dune areas to improve habitat for Tidestrom's lupine and other native dune plants.

O5-7: Protect the fragile dunes and sensitive plants in the Del Mar Dunes and North Dunes against any significant disruption of habitat values.

P5-27: Maintain an attractive mix of plant material that favors native species and other, drought-tolerant, noninvasive species.

P5-29: Control the spread, and prohibit planting of, invasive non-native plants.

O5-40: Ensure that long-term management activities maintain the natural dune ecology of Carmel Beach in a manner consistent with public safety. Protect areas of the beach from the loss of habitat, where special status plant species are growing.

P5-173: Retain a qualified botanist to monitor the population of Tidestrom's lupine and other special status species on the North Dunes of Carmel Beach. The population should be assessed annually (or based upon a schedule agreed upon by the Department of Fish and Game, Coastal Commission and U.S. Fish and Wildlife Service) to determine if the population is stable and if measures to protect the population should be instituted. If the population appears heavily affected by public use, the City should consider fencing or placing barriers around the lupine habitat on the beach.

P5-176: Implement a Dune Restoration Plan.

P4-34 : Post educational/interpretive signs where appropriate along Scenic Road and in the North Dunes area.

P4-3: Improve and sign the vertical access at Fourth Avenue. Consider development of a pedestrian path from the foot of Jane Powers walkway to the Fourth Avenue beach access through Sand and Sea. Investigate and implement opportunities to establish or reestablish additional vertical access from North San Antonio to the beach to the extent feasible.

P4-18: Improve the pedestrian experience through the Del Mar Parking area for those arriving on foot and from parked vehicles to the beach. Consider construction of boardwalks or other improvements to aid beach circulation, protect tree roots and protect the sensitive vegetation in the North Dunes area.

A Habitat Restoration Plan for the North Dunes and Del Mar Dunes is included as an appendix to the Del Mar Master Plan, which guides the specific habitat restoration actions at the North Dunes. The Habitat Restoration Plan has the following success criteria:

- Aggressive non-native species shall have less than 1% of coverage in the project area.
- The dune scrub plant coverage should reach at least 70% coverage in the project area, with the other 30% occupied by bare sand or Monterey cypress within the cypress corridor.
- All planted species must be displaying evidence of reproduction.
- The dune scrub shall be comprised of all 22 native species listed in the report.
- Successful establishment of 10 locations of Tidestrom's lupine with at least 100 plants each.
- Successful establishment of the quantity and quality of available habitat for Black Legless Lizards, including the habitat corridor between Del Mar and North Dunes.
- Annual monitoring of the Tidestrom's lupine population is performed and results reported to the CA Department of Fish and Game's Data Base.
- The trail system has been established and is being used exclusively for visiting or traversing the dunes. No foot traffic impact is occurring within the Del Mar or North Dunes.
- Interpretive panels are increasing the visitors' experience and knowledge of the dune habitat.

Implementation Status: *substantial progress*. In 2010, the City installed a boardwalk connecting the 4th Avenue beach stairway to the dune access at the end of 4th Avenue, which reduces impacts on dune habitat and endangered Tidestrom's lupine. In 2016, the City obtained a CDP to conduct habitat restoration actions at the North Dunes. Significant strides have since been made in removing invasive weeds and restoring native dune vegetation throughout the North Dunes. The City retained a biologist who has been monitoring the progress of restoration activities. The latest preliminary results for the 2021 monitoring indicate that average percent cover of native species along 18 transects in the dunes is 65% and the average weed cover is 10%. The monitoring also indicated that 39 different native species were recorded in the North Dunes.

c. Urban Forest

Forest Management Plan (2000)

Prepared by: Michael Branson, City Forester, December 2000

Adopted by the City Council: March 2001

The Forest Management Plan establishes a broad set of goals and policies for management of the City's urbanized forest. Some policies of the Forest Management Plan are beneficial to drought and wildfire mitigation, and provide other adaptation benefits:

- Promote undergrounding of utilities where feasible and with minimum detriment to the root systems of trees.
- Monitor tree pest and disease problems and take appropriate measures to minimize their impact.
- Plant native Monterey pine seedlings of different genotypes to maximize resistance to diseases and make these seedlings available to the public.
- Establish and implement a procedure for removal of invasive vegetation.
- Maximize retention of surface water on each site through site design and use of best management practices.
- Where feasible, direct street runoff to open-space areas on public property for percolation into the soil.
- Implement development standards that minimize runoff and the amount of area paved with impervious surfaces.
- Require approval of landscape plans for drought tolerance and trees by the Forestry department on new construction.

Implementation Status: *Initiated.* Requirements for stormwater infiltration, drought tolerance, and trees on private property are in place in the municipal code and are enforced by City staff. The City Forester monitors tree pest and disease problems. Invasive vegetation removal is an on-going task.

d. Opportunities to build on Existing Adaptation Strategies for Natural Resources:

The following opportunities to build on existing adaptation strategies were identified based on technical expert presentations at Committee meetings (Appendix B) and from the review of previous reports:

- Update the Forest Management Plan to (1) address transitioning the urbanized forest to tree species that can withstand the projected temperatures of the second half of the century, and (2) include planting guidelines to improve tree health, (3) incorporate tree species that have greater drought and wildfire resistance, and (4) in addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property.
- Encourage stormwater infiltration features as part of street CIP projects to reduce runoff volume and increase groundwater infiltration.
- When designing projects recommended in the Mission Trail Stream Stability Study, size improvements to handle larger storms.
- Earmark CIP funding for design, permitting, and implementation of stream stability study projects. Include strategies in 2021 MJHMP and Integrated Regional Watershed Management Program (IRWMP) for potential regional funding.
- Update the Mission Trail Nature Preserve Master Plan to consider the potential impacts of climate change and to reduce wildfire risk for neighboring private properties. Incorporate Best Practices into an annual maintenance plan, including cost estimates for implementation and revenue sources for implementation.
- Continue maintenance and monitoring at the North Dunes to determine how the changing climate will affect dune habitats.

Community

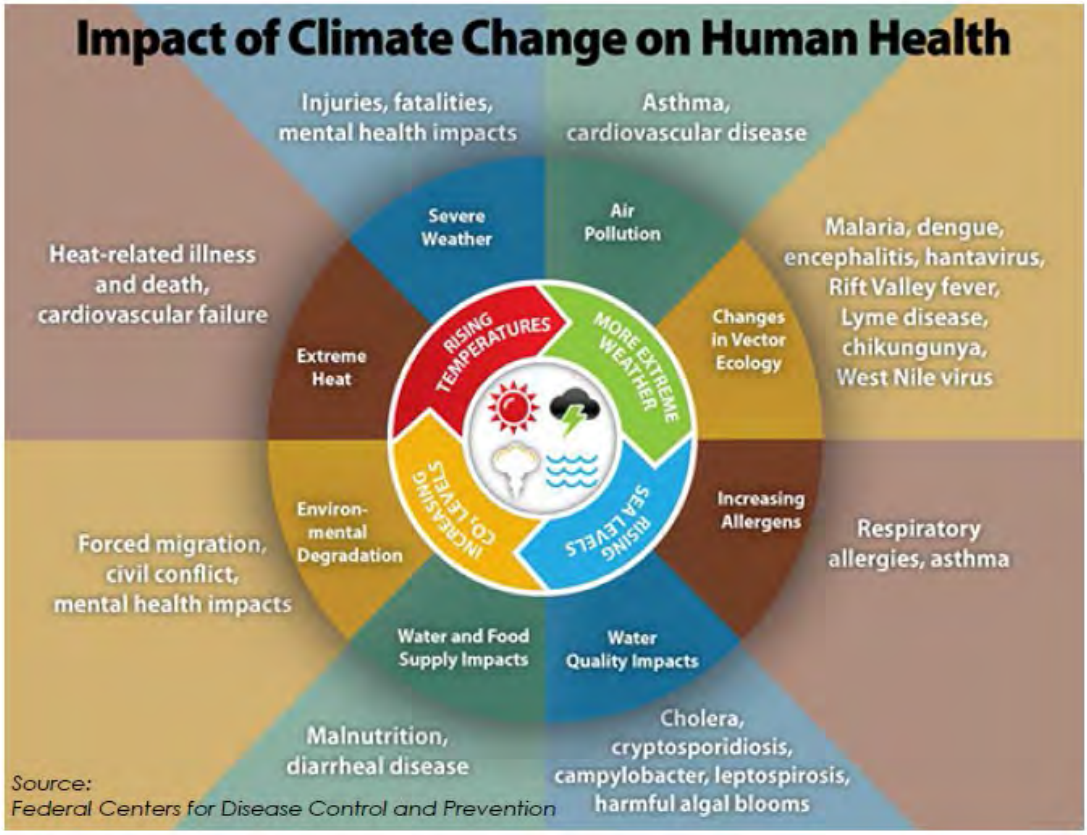
a. Elderly population and people with disabilities

Climate Change and Health Profile Report: Monterey County (2017)

Prepared by: California Department of Public Health, Office of Health Equity

Researchers have examined the pathways in which increased temperatures and hydrologic extremes can impact health and generally recognize three main pathways: direct exposures, indirect exposures, and socio-economic disruption. As shown in Figure 3 below, all Californians are vulnerable to the health impacts of climate change.

Figure 3: Impact of Climate Change on Human Health



Based on medical reviews of individuals who died during heat waves and other extreme weather events, those who are particularly vulnerable to the direct effects of climate change include the very old and very young, individuals who have chronic medical conditions and psychiatric illness, people taking multiple medications, people without means for evacuation (no access to public transit or private cars), people who are socially isolated, medically fragile, and those living in institutions.

A much larger part of the population is vulnerable to intermediate or socioeconomic factors such as preexisting physical and mental health conditions, cultural or physical isolation, occupations involving outdoor or high risk work, a precarious socioeconomic status, or lack of social cohesion and collective

efficacy. Collective efficacy and local community cohesion may be associated with effective action to plan and coordinate responses to climate threats.

The Health Profile Report provides the following useful health statistics for the County of Monterey:

- In 2012, nearly 46% of adults (149,059) reported one or more chronic health conditions including heart disease, diabetes, asthma, severe mental stress or high blood pressure.
- In 2009, approximately 86% of households were estimated to lack air conditioning.
- In 2010, Monterey County had approximately 28,971 outdoor workers whose occupation increased their risk of heat illness.
- In 2005-2010, there was an annual average of 27 heat-related emergency room visits in the County.
- In 2010, approximately 14% (58,314 residents) of the county's population lived in fire hazard zones of moderate to very high severity.

b. Residents and Private Properties

California Green Building Standards (CALGreen) (2019)

CALGreen is California's first green building code and first in the nation state-mandated green building code. It is formally known as the California Green Building Standards Code, Title 24, Part 11, of the California Code of Regulations. The purpose of CALGreen is to improve public health, safety, and general welfare through enhanced design and construction of buildings using concepts which reduce negative impacts and promote those principles which have a positive environmental impact and encourage sustainable construction practices. CALGreen applies to the planning, design, construction, use, and occupancy of every newly-constructed building or structure on a statewide basis unless exempt. Additions and alterations to existing buildings which increase the building's conditioned area, interior volume, or size are also covered by CALGreen.

The latest iteration of CALGreen standards was issued in 2019. CALGreen includes minimum requirements for water and energy efficiency, waste reduction and recycling, use of materials that are less polluting, and better indoor air quality.

Defensible Space Inspection Program

Community wildfire preparedness is supported by Monterey Fire's Defensible Space Inspection Program and coordination with surrounding fire prevention organizations to limit fire and wildfire risk through planning, prevention, and mitigation. CalFire's Fire & Resource Assessment Program (FRAP) and Fire Hazard Severity Zone (FHSZ) maps are available online with information on forest assessment, fire severity zones, and defensible space. Monterey Fire personnel have inspected and graded all Carmel parcels as pass, pending, or fail. Grading criteria are evolving as knowledge on fire spread is developed. Current criteria are based on dry fuel accumulation, spark arrestors, and overhanging tree limbs.

Multi-Jurisdictional Hazard Mitigation Plan (2015)

Prepared by: The Monterey County Hazard Mitigation Planning Team with Professional Planning Assistance from AECOM, June 2015

The Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) provides a framework for regional collaboration on hazard mitigation and resilience. The goals of the plan are: (1) To protect life and property by reducing the potential for future damages and economic losses that result from known hazards; (2) To qualify for additional grant funding, in both the pre-disaster and post-disaster environment; (3) To speed recovery and redevelopment following future disaster events; (4) To sustain and enhance existing governmental coordination throughout Monterey County; and (4) To comply with federal and state requirements for local hazard mitigation plans. The MJHMP is currently in the process of being updated. The following City-specific community outreach projects that would improve community and private property resilience were included in the 2016 MJHMP:

Table 3: MJHMP City Community Resilience Actions

Action No.	Description	Priority	Admin. Dept	Potential Funding	Timeframe	Narrative Update/ Explanation
2	Develop a sustained public outreach program that encourages consistent hazard mitigation content. For example, consider publishing tsunami inundation maps in telephone books, wildland fire defensible space tips with summer water bills, and the safe handling and disposal of hazardous waste and chemicals with garbage bills.	High	City Clerk	General Funds, HMGP, and PDM Grants	0-1 years	The City has installed new tsunami warning signs along shoreline areas and beach access points. The City will be revamping its website in the next few years and can add information on hazard mitigation such as wildland fire prevention actions, evacuation routes, and hazardous waste disposal.
5	Develop and provide funding and/or incentives for defensible space measures (e.g., free chipping day, free collection day for tree limbs).	High	Fire	General Funds, HMGP, and PDM Grants	Ongoing	Due to staff and fund shortages, this item has not been implemented. The City has provided, and will continue to provide, inspection, information, and enforcement of fuel management on private property as appropriate.

General Plan Environmental Safety Element (2009)

Adopted by the City Council: 2009

The Environmental Safety Element focuses on reducing human injury, loss of life, property damage, and the economic and social dislocation caused by natural and human-caused hazards. The policies included in this element are intended to provide a framework to address natural and human induced hazards through prevention and emergency response. This element seeks to guide the continuous development of preventative measures that address existing and potential hazards, while also providing contingent emergency response procedures in the instance of a local or regional emergency.

The following issues were identified as relevant to the City of Carmel-by-the-Sea and are addressed in the Goals, Objectives, and Policies and Supporting Information sections.

- Earthquakes
- Landslides
- Drainage/Flooding
- Tsunami
- Fire
- Disaster Preparedness

The following policies from the safety element relate to storms, wildfire, sea level rise, drought, and increased temperatures:

P8-14 Educate the public regarding seismic, geologic, flood, fire, tsunami, and other potential disasters, by preparing periodic news articles for local media outlets, such as Carmel Pine Cone.

P8-16 Encourage property owners to retrofit older structures with fire detection and/or warning systems.

P8-19 Encourage new development located in or adjacent to fire hazard areas to incorporate fire preventative site design, access, landscaping and building materials, and other fire suppression techniques.

P8-20 Control excessive buildup of flammable vegetative material on vacant lots and within and adjacent to high severity fire hazard zones (such as Mission Trails and Pescadero Canyon), especially following wet springs.

c. Opportunities to build on Existing Community Adaptation Strategies:

The following opportunities to build on existing adaptation strategies were identified based on technical expert presentations at Committee meetings (Appendix B) and from the review of previous reports:

- Update City Planning guidelines to reflect and/or not conflict with current California codes (CBC Chapter 7 & CRC R337) in the Very High Fire Hazard Severity (VHFHS) Zone.
- Incorporate defensible space design in landscaping guidelines.

- Collaborate with Monterey Fire on its inspection and outreach efforts to reduce fire risks. Help spread information at critical times to increase resident awareness and knowledge of how to reduce wildfire risk and prepare for emergencies.
- Evaluate the feasibility of gaining Firewise Community Certification in Carmel-by-the-Sea.
- Consider updating the General Plan's Safety Element policy P8-17 to include "move or remedy existing" utilities in high severity fire hazard zones.
- Review and publicize the evacuation plan for the community in the event of a wildfire or other disaster.

Utilities

a. Water Supply

Integrated Regional Water Management Plan

The Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management Plan (IRWMP) was updated in 2019. Integrated regional water management in California is established as a way to increase regional self-sufficiency by encouraging local water resource managers to take a proactive role in solving water management problems through collaboration with stakeholders to create innovative strategies and effective actions to achieve water management objectives. The Monterey Peninsula Regional Water Management Group (RWMG), the body responsible for the development and implementation of the IRWM Plan, includes 17 local agencies and organizations, including the City. The Monterey Peninsula IRWM Plan region is approximately 350 square miles and includes the coastal cities of Carmel-by-the-Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City, and Seaside. Also included are the unincorporated portions of Monterey County in Carmel Valley, Pebble Beach, the Carmel Highlands, the Laguna Seca area, and a portion of the Ord Community.

The IRWMP has the following prioritized regional objectives, which support climate change resilience:

- Improve regional water supply reliability through environmentally responsible solutions that promote water and energy conservation. Protect the community from drought and climate change effects with a focus on interagency cooperation and conjunctive use of regional water resources.
- Protect and improve water quality for beneficial uses consistent with regional community interests and the RWQCB Basin Plan through planning and implementation in cooperation with local and state agencies and regional stakeholders.
- Ensure that flood protection strategies are developed and implemented through a collaborative and watershed-wide approach and are designed to consider climate change effects and maximize opportunities for comprehensive management of water resources.
- Ensure that erosion management strategies are developed and implemented through a collaborative and watershed-wide approach and are designed to consider climate change effects.

- Develop watershed scale management strategies, considering climate change effects and maximizing opportunities for comprehensive management of water resources.
- Preserve the environmental health and well-being of the Region's streams, watersheds, and the ocean by taking advantage of opportunities to assess, restore and enhance these natural resources when developing water supply, water quality, and flood protection strategies. Seek opportunities to conserve water and energy, and adapt to the effects of climate change.
- Adapt the region's water management approach to deal with impacts of climate change using science-based approaches, and minimize the regional causal effects related to water resources.
- Identify an appropriate forum for regional communication, cooperation, and education. Develop protocols for encouraging integration and reducing inconsistencies in water management strategies between local, regional, State, and Federal entities.

The IRWMP identified the high priority adaptation strategies included in Table 3 below. Additionally, within the City of Carmel-by-the-Sea, the following three projects were submitted as concept proposals for inclusion in the IRWMP and potential future grant funding:

- **Carmel-by-the-Sea Pilot Wet-Dry Weather Diversion Program:** The goal of this project is to capture and treat runoff to substantially reduce the pollutants that enter the Carmel Bay Area of Special Biological Significance (ASBS). This project proposes to install a diversion facility at the City's 4th Avenue and Ocean Avenue storm drains, which capture most of the residential areas on the north side of the City and the downtown area. These diversion facilities would capture dry weather, first flush and small storm runoff from approximately 170 acres (approximately 50% of the City's watersheds that drain directly to the Pacific Ocean at Carmel Beach). Runoff captured would flow to the sanitary sewer collection system and ultimately to the Carmel Area Wastewater District's Wastewater Treatment Plant where the water would be treated and beneficially reused for irrigation of landscape at the Pebble Beach property.

- **Forest Hill Park Creek Restoration**: The goal of this project is to reduce erosion of the drainage channel that flows through Forest Hill Park on the north side of the City of Carmel-by-the-Sea and provide sediment capture to improve water quality flowing to the Carmel Bay ASBS from the City's largest watershed. The restoration would consist of rerouting and stabilizing the creek channel, which is eroding and impacting tree roots, slopes and nearby pedestrian walkways. Reducing sediment loads that flow into the storm drain system and to Carmel Bay from the City will also reduce heavy metals that bind to sediments such as lead and particulate copper.

- **Park Branch Library-Devendorf Rainwater Capture**: The goals of this project are to harvest and use dry weather flows and storm water from the Park Branch Library site for irrigation of neighboring Devendorf Park. This project also proposes to install permeable pavement at the Park Branch Library to allow storm water to infiltrate into the ground instead of running off in the street. This project could be integrated with the proposed Sixth Avenue / Devendorf Park Plaza.

Table 4: IRWMP High Priority Climate Adaptation Strategies

ADAPTATION RESPONSE STRATEGIES TO THE EFFECTS OF CLIMATE CHANGE		
Climate Change Effects	**Adaptation and Response Strategies**	**Initial Actions**
Rangelands are expected to be drier	Prepare fire reduction strategies to protect watershed lands using ecologically sustainable strategies. Implement adaptation strategies to conserve California's biodiversity.	N/A
Domestic landscaping water needs will be higher	Integrate land use and climate adaptation planning	Education Incentive programs Demonstration programs Grey water Xeriscaping Expand water supplies (purple pipe) and storage Aquifer management
Decrease in local rainfall	Promote community resilience to reduce vulnerabilities: Food sustainability Implement water conservation and supply management efforts Manage watersheds, habitat, and vulnerable species	Education Incentive programs Demonstration programs Grey water Xeriscaping
Sea level rise and higher groundwater extraction will lead to increased rates of seawater intrusion	Prepare a regional sea level rise adaptation strategy Promote working landscapes with ecosystem services Integrate land use and climate adaptation planning	Education Incentive programs Demonstration programs Grey water Xeriscaping Expand water supplies (purple pipe) and storage Aquifer management Expand agriculture water conservation programs

Adaptation Response Strategies To The Effects Of Climate Change		
Climate Change Effects	**Adaptation and Response Strategies**	**Initial Actions**
Droughts will be more frequent and severe	Implement adaptation strategies to conserve California's biodiversity. Educate, empower, and engage citizens regarding risks and adaptation Integrate land use and climate adaptation planning Promote community resilience to reduce vulnerabilities	Human safety response Education Incentive programs Demonstration programs Grey water Xeriscaping Expand water supplies (purple pipe) and storage Aquifer management Expand agriculture and urban water conservation programs
Lower seasonal surface flows can lead to higher pollutant concentrations	Manage watersheds, habitat, and vulnerable species	Minimize non-point source pollution Buffers
Changes in storm intensity will increase sediment loading in many systems	Prepare fire reduction strategies to protect watershed lands using ecologically sustainable strategies	Erosion control on farms and creeks Buffers
Channel stability will be impacted from higher storm flows causing additional turbidity	Provide guidance on protecting critical creek/river ecosystems and development	Erosion control on creeks Wastewater and stormwater infrastructure vulnerability analysis
Sea level rise will impact current estuary brackish water interface towards more marine systems	Implement adaptation strategies to conserve California's biodiversity	Retain freshwater in watershed Habitat migration Buffers Erosion control
Regional levees will provide less protection during higher storm flow events	Support essential data collection and information sharing Manage watersheds, habitat, and vulnerable species Prepare a regional sea level rise adaptation strategy	Refurbish or expand levees or tide gates (upgrade priority infrastructure) Map/inventory infrastructure

Adaptation Response Strategies To The Effects Of Climate Change		
Climate Change Effects	**Adaptation and Response Strategies**	**Initial Actions**
Natural creeks throughout the region and managed conveyance within the Carmel Valley will see higher flow rates leading to increased erosion and flooding	Manage watersheds, habitat, and vulnerable species	Refurbish or expand levees or tide gates(upgrade priority infrastructure) Map/inventory infrastructure
Coastal levees and control structures will be undersized to manage the combined influences of higher flow events and sea level rise	Support essential data collection and information sharing Prepare a regional sea level rise adaptation strategy	Refurbish or expand levees or tide gates(upgrade priority infrastructure) Map/inventory infrastructure/levee locations and WCS, ownership Phase II task 5 activity 3 - ecosystem services - be aware of services available Elevations of levees and sea walls - maybe with PWA-management strategies USGS elevation data
State recommendations suggest no new critical facilities be built within the 200-year flood plain(DWR 2008, DWR 2009b, CNRA2009)	Integrate land use and climate adaptation Planning	Work with Monterey County and cities, Coastal Commission (local jurisdiction)
Migration patterns and species distribution will change	Establish a system of sustainable habitat Reserves	Reduce migration impediments (dams, etc.) Compile data on species distribution Primary focus species - amphibians, waterfowl, salmonids, redwoods, tide water gobies Maintain habitat corridors - contiguous areas Fish and Game - wildlife adaptation plan - vulnerability for key species for each region
Invasive species populations will expand	Habitat/ecosystem monitoring and adaptive management	What are the invasive species and their ranges? Will they expand, be introduced? How are the habitats shifting (awareness)? Ecological adaptation investigation and strategy

Adaptation Response Strategies To The Effects Of Climate Change		
Climate Change Effects	**Adaptation and Response Strategies**	**Initial Actions**
Coastal wetland systems are especially vulnerable to the combined influences of climate change	Establish regional policies to protect critical habitats Provide guidance on protecting critical coastal ecosystems and development	Identify critical habitats and ecosystems Integrate ecosystem management Regulatory mechanisms dedicated to protecting future locations of these areas Inventory of wetlands currently
Some locally unique species such as coastal redwoods and giant kelp are susceptible to changes in certain locally favorable climate variables (fog duration, coastal upwelling)	Manage watersheds, habitat, and vulnerable species	Identify how they will be impacted - What are the changes? USGS study outcome - get a better handle on modeling fog changes in climate change

b. Wastewater

Carmel Area Wastewater District Sea Level Rise Study

CAWD conducted a Sea Level Rise study for their wastewater treatment facility in 2018. According to CAWD's study, the sea level rise projections do not identify new hazards to the WWTP of greater concern than the 100-year flood risks that CAWD has previously planned for. However, increased storm intensities as well as higher sea levels may increase the base flood elevations. According to the study, increased storm intensity, as well as sea level rise, will not detrimentally effect the CAWD WWTP before the year 2062 under the"Extreme Risk Aversion" scenario. The study also identified facility retrofits needed to maintain operations of essential infrastructure. This will allow for 40 years of continued operation in the existing location while evaluating options of future improvements to increase flood resiliency vs. relocating the WWTP. Long term options for the facility seem to be:

- Retreat up Carmel Valley
- Pump to Monterey One Water

c. Opportunities to build on Existing Utilities Adaptation Strategies:

The following opportunities to build on existing adaptation strategies were identified based on technical expert presentations at Committee meetings (Appendix B) and from the review of previous reports:

- Provide information and incentives for residential water use reduction.
- Incorporate the Carmel projects included in the IRWMP into the City's 5-year CIP. Seek potential regional or State funding for projects.

Infrastructure

a. Local Infrastructure

General Plan Environmental Safety Element (2009)

Adopted by the City Council: 2009

The Environmental Safety Element focuses on reducing human injury, loss of life, property damage, and the economic and social dislocation caused by natural and human-made hazards. The following policies from the safety element relate to local utilities and infrastructure resilience to storms, wildfire, sea level rise, drought, and increased temperatures:

P8-7 Ensure that water, gas, and sewage utilities serving critical facilities are in good condition and are engineered to withstand damage from disasters.

P8-17 Avoid and discourage locating public structures and utilities in high severity fire hazard zone.

P8-18 Ensure adequate water supply for fire emergencies.

P8-30 Reduce flooding hazards in areas with flooding potential by improving drainage and minimizing the alteration of natural drainage and natural protective barriers that accommodate or channel floodwaters.

Multi-Jurisdictional Hazard Mitigation Plan (2015)

Prepared by: The Monterey County Hazard Mitigation Planning Team with Professional Planning Assistance from AECOM, June 2015

The following City-specific infrastructure and utility projects were included in the 2016 Multi-Jurisdictional Hazard Mitigation Plan:

Table 5: MJHMP Infrastructure and Utility Resilience Actions

Action No.	Description	Priority	Admin. Dept	Potential Funding	Timeframe	Narrative Update/ Explanation
1	Identify hazard-prone critical facilities and infrastructure and carry out acquisition, relocation, and structural and nonstructural retrofitting measures as necessary.	High	Planning and Building	HMGP and PDM Grants	Ongoing	The City has retained an engineering firm to assist in project management of Public Services Department hazard evaluation. The City will also be retaining an engineering consultant to evaluate the City's revetments and other shoreline protection structures in the next year or two.
4	Continue to conduct current fuel management programs and investigate and apply new and emerging fuel management techniques.	High	Fire	General Funds and PDM Grant	Ongoing	The City has provided for fuel management on City owned lands and will provide that service annually. Staff will explore the use of goats as a new method to do this work to improve the fuel management in steeper terrain areas.
6	Work with the Utility Companies (especially PG&E) to build and strengthen relationships to improve communication regarding emergency situations and develop an emergency response plan that includes all emergency responders and 911 communications.	Priority / Moderate	Public Safety/PD	General Funds	Ongoing	New action for 2014-2019.

b. Storm Drainage System

Storm Drain Master Plan (2020)

Prepared by: Schaaf & Wheeler for the City

The Storm Drain Master Plan was completed in 2020. The master plan identifies current system capacity, condition, and maintenance issues. The master plan also identifies 17 projects to restore the system's ability to handle a 10-year 24-hour storm without localized flooding in various locations in the City. The projects are shown on the map below (Figure 4) and listed, with cost estimates in Table 6. Modeling of a 16% increase in storm intensity that could be associated with Climate Change showed that, with the system upgrades outlined in the plan, most of the system could handle the increased storm intensity, with some localized flooding in Mission Trail Nature Preserve, the northeast part of the City, the 4th Avenue drainage, and the southwest near Santa Lucia Avenue. There is greater risk for flooding for larger storms as the city's drainage system was only designed for 10-year, 24-hour storms.

Figure 4: Map of Storm Drain Master Plan Projects

Table 6: Storm Drain Improvement Projects

Priority	Asset Name	Estimated Cost[1]
High Priority	Mission Street Bypass	$820,000
	Forest Hill Park – Emergency Repair	$130,000
	Santa Rita 1	$220,000
	High Priority Total	**$1,170,000**
Medium Priority	Junipero	$800,000
	Rio Road 1	$2,420,000
	Santa Rita 2	$170,000
	Ocean Ave	$250,000
	Santa Fe	$490,000
	Carpenter	$270,000
	11th and San Antonio	$400,000
	2nd and Monte Verde	$830,000
	Forest Hills Park - Realignment	$700,000
	Medium Priority Total	**$6,330,000**
Low Priority	2nd Avenue	$150,000
	5th and Junipero	$660,000
	Mission Trail Preserve Projects	$940,000
	Camino del Monte	$30,000
	Dolores	$20,000
	Rio Road 2	$140,000
	Lasuen	$460,000
	Low Priority Total	**$2,400,000**
Grand Total		**$9,900,000**

[1]Includes Contingencies (40%). 2020 Construction cost only. Construction cost includes mobilization, traffic control, trench, and surface restoration. Does not include costs associated with permitting, land acquisition, or other unforeseen special circumstances.

Implementation Status: *Initiated*. Staff is seeking funding to design and construct some priority repairs. Implementation included in the City's 5-year Capital Improvement Plan.

c. Shoreline Access and Protection Infrastructure

Shoreline Management Plan (2003)

Prepared by: David Shonman and Greg D'Ambrosio
Accepted by the City Council: September 2003

The Shoreline Management Plan provides an overview of the many resources of the Carmel coastline and management policies for long-term maintenance and enhancement of coastal resources. The Shoreline Management Plan includes information on erosion processes along the shoreline and the City's existing shoreline protection structures. A long-term coastal bluff erosion analysis was conducted by Johnson (1984), who analyzed aerial photographs from 1908 to 1983, and indicated that the coastal bluff was eroding at an average rate of 0.4 feet/year in the north and 0.3 to 0.7 feet/year in the southern portion. Aerial photograph analysis indicated some periods of extreme bluff erosion, including the loss of at least 20 feet of bluff near 13th Avenue and near Martin Way between 1968 and 1970.

Approximately 50% of the City's shoreline protection structures are seawalls. Most of Carmel's seawalls have held up well over the years. One seawall built in 1978 failed, apparently due to poor design. Since 1978, the City has used rock revetments to protect nearly one quarter of its shoreline.

Shoreline Management Plan Policies supporting sea level rise adaptation:

- Pursue scientific studies that document physical processes occurring at Carmel Beach (e.g. sediment transport, sand bar dynamics, influences from the Carmel Bay offshore canyon).
- Limit development along the Carmel shoreline to facilities that support passive and active recreational activities, beach access, bluff protection and protection of infrastructure. Bluff protection and protection of infrastructure shall be permitted only when required to protect existing structures that are in danger from erosion.
- Discourage any further incursion of recreational activities into the North Dunes habitat. Sensitive resources in the North Dunes habitat area shall be protected.
- Protect the fragile dunes and sensitive plants in the Del Mar Dunes and North Dunes against any significant disruption of habitat values.
- Maintain records of sand moved and the volumes needed to cover each revetment. When revetments fail or need to be substantially reconstructed, consider vertical seawalls as an alternative.
- Construct new shoreline armoring in areas previously unprotected only when required to protect existing structures in danger of erosion and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply.
- Obtain and maintain an accurate digitized map of the Carmel shoreline to develop the City's beach management and maintenance policies. Analyze historic beach trends using aerial photo analysis and other available tools. Update topographic information at least every 5 years and analyze shoreline changes to facilitate early identification of erosion hot spots, sand losses/gains, migration of revetments, and other long-term impacts.
- Place a series of permanent surveyed benchmarks inland of the bluffs running the length of Carmel Beach for long-term monitoring.
- Protect public access, Scenic Road, and the aesthetic character of the coast by maintaining existing seawalls and engineered revetments. When any existing seawalls or revetments need to be replaced or substantially reconstructed, review other beach management strategies and

determine the best balance among objectives for access, aesthetics, and protection of coastal resources. Protect the natural character and features of the Del Mar and North Dunes by prohibiting the construction of any new shoreline protective structures unless required to protect existing structures in danger of erosion.

- Sand and bluff profiles shall be surveyed in 2003 and 2005 to establish a baseline. Thereafter, a set of sand profiles shall be taken at five-year intervals, beginning in 2010 to establish an on-going record of shoreline trends on Carmel's beaches and bluffs. For each set of profiles, measurements shall be taken at mid-winter (lowest sand level), at spring (prior to sand redistribution activities), at early summer (after sand redistribution), and in the early fall (before offshore retreat).
- After each 5-year period of monitoring beach sand elevations, review available data to make preliminary determinations on the effects of seawall structures and sand redistribution activities.
- If data indicate that the beach has been losing sand over time, investigate options for beach nourishment using offshore deposits or other sources matching Carmel Beach sand.

Geotechnical Inspection of Carmel Beach Shoreline Improvements (2016) and 2016 Shoreline Assessment Update

Inspections of the City's shoreline infrastructure were conducted in the winters of 2015 and 2016 by Easton Engineers. The inspection noted that the shoreline improvements were in acceptable condition with relatively minor repairs required. The Inspection results included the recommendations shown below in Table 7. Additional recommendations were included in the 2016 Shoreline Assessment Update and are included in Table 8.

Table 7: Recommendations from the Geotechnical Inspection of Carmel Beach Shoreline Improvements (2016)

Location	Recommendation
4th Avenue Outfall	Replacement of the outfall structure should be considered in the next few years, with a focus on how drainage can be appropriately released in a non-erosive manner. Additional recommendations: Prevent public access atop the structure and inspect the outfall structure when the beach is scoured and the structure's base is exposed.
10th Avenue Stairs Retaining Wall and Revetment	Settled portions of revetment should be restacked. Stairs, walls, and and revetments should be inspected when the beach is scoured.
10th Avenue Retaining Wall	Wall footing appears in good condition. Inspect when the beach is scoured.
Revetment south of 11th Avenue Stairs	Downcoast third of the revetment should be monitored. Additional large rip rap should be added to the downcoast third of the revetment and this portion keyed into bedrock and restacked to a more stable configuration.

Unprotected bedrock at 12th Avenue outfall	Inspect location when the beach is scoured so the base of the bluff is exposed. To protect the base of the bluff from undercutting, rip-rap revetment may be extended downcoast to a point just beyond the storm drain outfall.
Cove North of 13th Avenue Point	The wall's footing and repaired areas should be monitored and infilled with concrete as needed to help prevent further undermining. Remaining undercuts should be filled. Where constructed on potentially unstable material, the footing of the retaining wall should be underpinned. Restack fugitive rip-rap.
Retaining wall just north of 13th Avenue Point	Footing is significantly undermined and should be protected from further erosion by restacking the seaward revetment or constructing a deepened footing.
Rip-rap at Santa Lucia Stairs	The blufftop should be monitored for continued signs of erosion. The toe of the revetment should be monitored when the sand is scoured.
Seawalls between Santa Lucia & Martin Way	Wall segment A footing should be protected from further undermining by constructing a deepened footing or a rip-rap revetment across the areas of concern. The undercut, exposed portions of the footing should at a minimum be infilled with structural concrete to prevent further undermining. A deepened footing along the entire A through F wall segments will improve the stability and longevity of the walls. Alternatively, a rip-rap revetment along the base of the walls will help prevent continued undermining.
Martin Way Stairway	A concrete pedestal or piers should be constructed at the base of the stairs to support the stairs.

Table 8: Recommendations from the 2016 Carmel Shoreline Assessment Update

Location	Recommendation
Revetments: Unstable Rip Rap	Carmel's shoreline revetments should be regularly monitored (especially after the end of the storm season); perched riprap should be re-stacked and exposed revetments covered with redistributed sand whenever feasible.
Revetments: Migrated Riprap (12th & 13th Ave. Coves)	The re-stacking of migrated riprap should be conducted the next time conditions allow. This will best be accomplished if conducted during low sand conditions. Such work has been conducted in the past, but usually during periods of significant sand scour, a condition that is often accompanied by strong waves and a narrowing of Carmel Beach. This operation should be conducted with the advice of a qualified geotechnical specialist. It should be planned in advance so that all necessary preliminary steps (including funding, permits, and contracts) can be in-place of ahead of time, increasing the chances that it will be completed before the high sand level returns.
Stairways: general	The extensive list of stairway repairs recommended in the Graebe report (dated March 2, 2015) should be addressed as soon possible.
Shoreline Landscape Barriers (SLBs)	The Shoreline Landscape Barriers should be redesigned during FY 2016/2017, and rebuilt as soon as feasible. Their design should

Location	Recommendation
	conform with Carmel's design traditions, and the new barriers should be able to be maintained, repaired and replaced by staff. The installation and locations of the new SLBs should be coordinated with the re-surfacing of the Pathway and re-vitalization of the Carmel bluff-top landscape. Because people often trampled landscape vegetation to walk over to the SLBs, it has been suggested that new barriers be placed within 12-18" of the Pathway.
Monitoring Program	An effective monitoring program should be developed to be conducted by City staff as they work along the shoreline. This program would take advantage of the skills of staff as well as their familiarity with the Carmel shoreline. If done correctly, it will encourage staff to report conditions that are not necessarily in their direct area of responsibility. Asking staff to be alert for conditions of concern as they work along the shore would serve as a "force multiplier," greatly expanding the City's ability to address conditions at an early, more manageable, stage.
Stairway Closures	To protect the safety of those who use Carmel's shoreline stairways, the City should employ effective methods for closing these access ways when conditions warrant. Such methods should involve physical barriers, clearly worded signage and enforcement. City staff should also focus on re-opening the stairways to public use, once safer conditions return.

Implementation Status: *Partially initiated.* Public Works closes stairways to the public when hazardous conditions exist. Essential repairs to the stairs have been made. A landscape design was created and approved by the Planning Commission that incorporated restoration of the shoreline landscape barriers.

d. Regional Infrastructure

Climate Change Vulnerability Assessment Summary Report: Caltrans District 5 (2019)

Prepared by: Caltrans

Caltrans' District 5 incorporates the Counties of Monterey, Santa Cruz, San Benito, San Luis Obispo, and Santa Barbara. The Summary Report presents information on potential vulnerabilities to the Caltrans District 5 portion of the State Highway System (SHS), including climate stressors and their potential effects on how highways are planned, designed, built, operated, and maintained. Identified vulnerabilities are summarized below:

- Higher temperatures:
    - Higher temperatures could cause expansion that deteriorates bridge joint seals, which could accelerate replacement schedules, and even affect bridge superstructure.
    - Extreme heat could affect employee health and safety, especially for those working long hours outside.

    - High temperatures for extended periods could increase the need for protected transit facilities along roadways.
    - Right-of-way landscaping and vegetation must be able to survive longer periods of high temperatures.
    - Pavement quality will be affected by long-term temperature changes
- Wildfires:
    - Much of the SHS lies within high fire hazard zones.
    - Maintenance issues associated with wildfires for the SHS include: increased erosion and runoff, increased landslide potential, debris blocking culverts and bridges during rain events, destruction of signs and guardrails, damage to culverts and bridges
- Sea Level Rise:
    - SHS impacts from sea level rise are expected to be significant in Monterey County. Significant impacts of combined sea level rise and storm surges to Highway 1 are expected in the low-lying areas between Moss Landing and Castroville, and south of Carmel-by-the-Sea where the highway crosses the mouth of the Carmel River. Additionally, cliff erosion is expected to impact Highway 1 in Big Sur.

Additionally, Caltrans will need to consider the role of the SHS during a disaster when planning for climate change. The SHS is the backbone of most county-level evacuation plans and often provides the only high-capacity evacuation routes from rural communities. State highways also serve as the main access routes for emergency responders, and may serve as a physical line of defense such as a firebreak, an embankment against floodwaters, etc. As climate-related disasters become more frequent and more severe, this aspect of SHS usage will assume a greater importance that should be reflected in highway design.

e. Opportunities to build on Existing Infrastructure Adaptation Strategies:

The following opportunities to build on existing adaptation strategies were identified based on technical expert presentations at Committee meetings (Appendix B) and from the review of previous reports:

- Determine the feasibility of undergrounding power lines in Mission Trail Nature Preserve and in priority transportation corridors in the VHFHZ
- Upsize SDMP improvements, especially when making repairs in the lower reaches of watersheds, to handle larger storms.
- Consider incorporating green infrastructure in street and sidewalk projects to reduce runoff volumes into the City's storm drain system.
- Earmark CIP funding for design, permitting, and implementation of storm drain repairs. Include strategies in 2021 MJHMP for potential regional funding.
- Reinstate beach sand monitoring program described in the Shoreline Management Plan.
- Implement bluff structural monitoring program and do follow-up monitoring post-storm to identify additional footing stability issues.

- Earmark CIP funding for design, permitting, and implementation of repairs. Include strategies in 2021 MJHMP for potential regional funding.
- Reach out to local researchers (e.g. CSUMB) or other sources to conduct Carmel Cove sand supply dynamics analysis.
- Hire a coastal engineer with experience in planning for climate change to conduct:
    - Further assessment of the risks to our coastal assets, including sea walls, revetments, bluffs, stairs and access, public bathrooms, parking areas, drainage infrastructure, and utilities.
    - Determine adaptation measures and LCP policy options.
        - Prioritize adaptations and projects that protect and maintain public resources and beach access, and the viability of the community and tourism.
        - Determine how the options and strategies along the coast are different for the:
            - Mostly natural, unarmored North Dunes area
            - Mostly armored bluffs along Scenic Road south of 8th Avenue
            - Unarmored dunes along private property between 8th Avenue and Del Mar Parking Lot
            - Armored private properties on the bluffs at the north end of the City (Pescadero Canyon area).
        - Evaluate feasibility and phasing, the use of thresholds for when different elements of these strategies are implemented. For example, maintaining armory or other defenses up to a point, but then if a threshold is reached, embracing a new bluff line and different adaptive measure.
- Update Shoreline Management Plan and LCP based on results of coastal engineering analysis.
- The City has an opportunity in 2021 to provide an updated list of projects to include in the MJHMP Update. The City should include a comprehensive list of projects based on its existing plans, as well as identified gaps in this Vulnerability Assessment.

VIII. Vulnerability Scoring Matrix

The vulnerability scoring matrix incorporates the potential threat of a climate hazard with the existence of current policies to mitigate hazards to vulnerable assets and populations. The matrix provides information to identify and prioritize vulnerable assets and populations that have not yet been addressed by City policies or projects.

Color coding:

- Already causing observable impacts or a near-term significant risk
- Mid- to long-range impacts
- Not enough data

YES Some policy/action initiated
NO No policy/action initiated

Priority Assets at Risk	Priority Hazards						
	Stronger Storms	Wildfires	Sea Level Rise	More Droughts	Increased Temperature	Fog changes	Ocean Warming
Natural Assets							
Mission Trail Nature Preserve	YES	YES	X	YES	YES	X	
North Dunes			**NO**	YES	YES	X	
Urban Forest	YES	**NO**		YES	**NO**	X	
Marine Sanctuary	X			X	X	X	X
Carmel Beach	YES		YES			X	X
Community							
Elderly population and people with disabilities	**NO**	**NO**		**NO**	**NO**		
Residents	YES	YES		YES	**NO**		
Visitors	**NO**	**NO**					X
Local Businesses	**NO**	**NO**	**NO**	YES	**NO**		X
Service industry workers	**NO**	**NO**	**NO**		**NO**		
Second homes	YES	YES	**NO**				
Utilities							
Water Supply		YES	YES	YES	YES		
Sanitary Sewer System	X		YES				
Power Grid	**NO**	**NO**			**NO**		
Overhead communication	**NO**	**NO**			X		

Priority Assets at Risk	Priority Hazards						
	Stronger Storms	Wildfires	Sea Level Rise	More Droughts	Increased Temperature	Fog changes	Ocean Warming
PG&E/communication underground lines (gas, cable)		NO	NO				
Regional Infrastructure							
Wastewater Treatment Facility	YES		YES		X		
Transportation Infrastructure (Caltrans)	YES	YES	YES				
Hospital and emergency medical care facilities	X	X			X		
Landfill & Waste Management	YES		X				
Local Infrastructure							
Shoreline Access Infrastructure: Scenic trail, public restrooms, beach stairs, coastal roadways, and parking	YES		YES		X (visitors)	X	
Seawalls and revetments	YES		YES				
Storm drainage system	YES		YES				
Emergency response facilities (Fire station, EOC, PD, PW, City Hall, etc.)	YES	YES			NO		

IX. Conclusion And Next Steps

The Climate Change Vulnerability Assessment provides the basis for the City to develop a Climate Adaptation Plan by identifying existing hazards, assets and communities at risk, as well as actions that have already been taken that enhance climate change resilience. The Climate Committee should utilize the Vulnerability Scoring Matrix and the list of opportunities to build on existing strategies as a starting point to identify and prioritize potential climate change adaptation strategies.

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APPENDIX A

APPENDIX A - Historical Hazards

Data sources for historical hazards include: Monterey County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP), the National Oceanic and Atmospheric Administration (NOAA) Storm Events Database, and historic records at the Carmel Library

Disaster Type (Storm, drought, wildfire, heat event)	**Date**	**Location**	**Local Impact**
Storm	Winter of 1982/83	Monterey Peninsula	El Niño winter. During this period, severe winter storms struck Carmel every 10 days. More sand was removed from the beach than at any previous time in the memory of long-term residents or documented history. Additionally, heavy rains overwhelmed the City's storm drain system. Uncontrolled stormwater flows washed away portions of the City's coastal bluffs and undermined beach access stairways. Between 1983 and 1988, the entire Scenic Road storm drain system was rebuilt with larger drain pipes and catch basins, and moving outfalls to less erosive locations. Johnson (1984) recorded several areas of significant erosion during the 1982/83 winter: - Loss of 20 feet of bluff north of 8th Avenue, - Loss of 25 feet of bluff between 10th and 11th Avenues, - Loss of 30 feet of bluff between 8th and 9th Avenues, - Loss of 30 feet of bluff near Santa Lucia Avenue, - Loss of 40 feet of bluff between 9th and 10th Avenues.
Wildfire	July 1987	Pebble Beach/Carmel	The fire that rushed up a canyon and destroyed 32 homes in Pebble Beach on May 31 was fueled by acres of dead underbrush and thick stands of trees, according to a forester who toured the area Thursday . Bill Ruskin, a vegetative management coordinator with the California Department of Forestry and Fire Protection in Felton, said after the tour: "It was a situation that was waiting to happen." Ruskin described the devastated residential area as one located in a "perilous" position, on top of a box canyon containing an "incredible number of stems per acre — about 200 to 300 per acre." Fanned by strong winds and funneled by steep terrain, the fire raced up the canyon as it burned dense underbrush and released gases that ignited above the tree crowns, creating a "crown fire" effect, Ruskin said. Ruskin collected fuel data in Del Monte Forest to simulate the path of the fire in a computer model. He said results would not be available until later this summer. "It may or may not verify whether the response should have been different," Ruskin said. In the computer model, Ruskin said, he will be able to use fuel data, topography and weather conditions to determine ways to manage the forest and devise ways to fight further fires in the area. As for the disastrous Sunday afternoon when heat from an illegal campfire ignited pine needles and set off the tragic chain of events,

			leaving 49 people homeless, Ruskin said the heat was so intense from the fire that houses began burning just from the radiated heat instead of flames. "The point is that you had so much heat going up that canyon," said Ruskin, 36, who has been a forester with CDF for five years and received a forestry management degree from the University of California at Berkeley. The point of origin of the fire has been determined as being on forested property owned by Pebble Beach Co. and adjacent to the Morse Botanical Reserve. Notified of Results The property was surveyed Tuesday by Pebble Beach Co., which notified the Del Monte Forest Foundation, owner of the botanical reserve, of the results in a letter this week. Ruskin said that dead materials, including fallen limbs and pine needles, burned the thickly packed Monterey pine trees and sent gases above the ground smoke to be fanned by oxygen and winds. The intense gaseous fire created "radiated and convected" heat that spared few of the homes." Only the houses made of stucco and not having wood on the outside and one with double-pane windows were able to withstand the heat," Ruskin said. "It was not a crown fire in those trees," Ruskin said. "... Flames shooting up and over the trees could very well have been gases going up to meet oxygen in the wind. That's where they were being ignited." In the wake of the fire, Ruskin said, the bad news is that many of the trees in the 160-acre swath cut by the four-day blaze did not survive. However, he said, seeds released by exploding pine cones will regenerate the forest. Alternative Vegetation Ruskin said that as equipment is used to clear trees and brush, now is a good time to consider alternative vegetation — coastal and coyote brush — that would stay succulent throughout a fire season and be less likely to add fuel to a fire. Ruskin added that selective hand-cutting of trees could also be done in forest management. Controlled burns, Ruskin said, can be effective but "it may not be aesthetically desirable from what we learned at Point Lobos." Foresters learned that a controlled burn last October at Point Lobos led to "an unexpectedly high amount of tree mortality." "The Monterey pine is a shallow-rooted tree," Ruskin said. "Even in a controlled burn, you are killing a lot of roots." In addition, Ruskin said, the controlled burn at Point Lobos created "burning pitch pockets," which also weaken trees. "I'm not sure that a prescribed burn is an acceptable management alternative," Ruskin said. Ruskin observed after the tour that the fire appeared to have fed on pine trees 60 to 80 years old and "petered out" in younger trees. Mission Trail Park Ruskin also toured Camel's Mission Trail Park to assess the amount of fuel there that could lead to fire. Ruskin recommended to Gary Kelly, Carmel city forester, that some clearing of brush and fallen trees should take place and that a "pre-suppression plan" should be devised for the park area. Ruskin said that "fire-retardant vegetation" should be planted at the park rather than pine trees. Ruskin said the Mission Trail Park area did not have as much stored fuels as the Pebble Beach area. "He didn't seem to find any major concerns other than cleanup and a pre-fire plan," Kelly said. Ruskin was invited to tour the area by Kelly and Roy Perkins, CDF district fire chief.

Heat Event	April 1988	Monterey Region	Hot temperatures Sunday in the mid-80s in Monterey and into the low-90s in Carmel Valley set weather records for April 10. Monterey's high temperature of 86 degrees at 2 p.m. topped the record of 80 degrees in 1968 for the date, according to Robert J. Renard, observer in Monterey for the National Weather Service. It also marked only the seventh time in 37 years of recordkeeping that the temperature reached 86 or higher during a day in April, he said. There has never been an 86-degree reading recorded in Monterey for January, February and March, he said, and Sunday's high temperature was the third earliest recording of an 86 or higher in a calendar year. Twice in previous years on April 2, the temperature climbed to 86 or above, with 88 and 87, respectively. Sunday's low temperature in Monterey also was a record. The 57 degrees was the highest minimum not only for April 10 but also for this early in the calendar year, Renard said. Meanwhile, in Carmel Valley, where temperatures on hot days are typically up to 10 degrees warmer than Monterey, the high temperature got up to 93 after an early morning low of 51, according to Graham Matthews, who keeps weather records for Carmel Valley. The 93 reading, which set a record for the date, topped the previous mark of 85 degrees set in 1968, Matthews said. Source: Monterey Herald, April 1988
Storm	January 1995	Monterey Region	In January 1995, sustained precipitation fell throughout the region and over 125 residential properties in the Carmel Valley sustained damage. Two months later, Monterey County experienced a second significant winter storm, which resulted in further sustained precipitation falling on already saturated watersheds. Devastating flooding occurred throughout Monterey County, particularly in the unincorporated communities of Castroville, Mission Fields, Carmel Valley, Cachagua, Carmel Highlands, Spreckels, and Big Sur. Over 1,500 residences and 100 businesses were damaged.
Storm	January 10, 1995	Carmel Area	A Monterey County Sheriffs deputy evacuates two elderly residents from their flooded Mission Fields neighborhood home in Carmel on January 10,1995. According to a new study, extreme weather swings — a historic drought followed by drenching winter storms that cause flooding — will become the norm over coming generations. Source: Monterey Herald, April 2, 2018
Wildfire	Oct – Nov 1996	Northern Big Sur	This fire known as the Big Sur fire began Oct 18 near Ventana Camp Park. Much of the fire occurred in the Ventana wilderness area. 2500 Fire fighter participated. 4400 acres were burned. Light rain helped control fire. The cost of fighting the fire is estimated 12.3 million. 180 fire engines were used. 13 helicopters and 3 air tankers were used.
Storm	December 21, 1996	Monterey Peninsula	2.96" of rain in 11 hours at Monterey, Seaside had 2.5"and Marina had 2.12". Streets and intersections were flooded in Monterey, Del Rey Oaks, Pacific Grove, Carmel Highlands, and Carmel. HWY 101 N of Salinas was flooded.

Wildfire	September 1999	Carmel Valley	A surface low off the CA Coast brought tropical moisture and mild instability over the coastal CA are and lightning continued through the night over the entire Central Coast and San Francisco Bay area. Kirk Complex (consisted of Tassajara, Five, Big Pine, Elephant, Lone Pine, Freed, 7, Torre, Devil, Kirk and Hare Fires) Complex was divided into the North and South Components). Cause: Lightning strikes Location: In the Ventana Wilderness approximately 20 miles Southeast of Carmel, CA. Monterey Co. Size: 85,634 acres (as of 10/19/99) Containment: October Fatalities: none Structures Lost: none Cost: $66.9 million (as of 10/19/99)
Storm	January 2008	Monterey Peninsula	Strong coastal storm brought flooding rains, high winds, record high surf and coastal flooding to Monterey County and resulted in nearly $1 million in property damages. Approximately 30 homes in the Carmel Lagoon area were affected by some degree of flooding.
Wildfire	December 2013	Northern Big Sur	The Pfeiffer Fire started on December 17th 2013 around midnight in the vicinity of Pfeiffer Ridge in the Monterey Ranger District of Los Padres National Forest. The fire burned 917 acres. Thirty four (34) residence and 4 outbuildings were damaged/destroyed. The fire was declared contained on December 20 2013 at 6:00 p.m.
Storm	January 8, 2017	Monterey Peninsula	Potent atmospheric river bringing heavy rain, strong southerly winds, and storm surge issues. This AR is following a normal to slightly above normal 3 month period, meaning the grounds were saturated. Three to four feet of standing water at Casa Verde Road and SR 1N.
Storm	February 9, 2017	Monterey Peninsula	A cold front passed over the area Thursday Feb 9. There were strong winds ahead of the front and heavy rains associated with the frontal passage that produced roadway flooding and debris flows.
Storm	February 20, 2017	Monterey Peninsula	Potent AR brought copious amounts of rain to the region causing widespread flooding, debris flow, accidents, and over topping of reservoir spillways. Roadway flooding on Quail Meadows Dr in Carmel Valley. Large section of roadway flooded, vehicles sliding.
Lightning / Wildfire	September 11, 2017	Central Coast/Monterey County	A disturbance rotating around an upper level low west of San Diego brought thunderstorm activity to the Bay Area on September 11. Widespread reports of lightning were received along with a few small hail reports and strong wind gusts. It has been reported that there were over 40,000 lightning strikes across the Central Coast of California during this event. Several brush fires were also ignited due to lightning strikes.

			Various lightning strikes sparked 15 fires in Monterey County that were contained on the same day http://www.mercurynews.com/2017/09/13/crews-contain-15-fires-started-by-lightning-in-monterey-county/. Timing has been estimated.
Storm	November 29, 2018	Monterey Peninsula	A mid/upper level low moved through the region at the end of November. A cool unstable air mass allowed for the development of scattered thunderstorms across the region that produced lightning and small hail. An associated surface low approached the coast during this time causing high surf and gusty winds. Some locations saw wave heights above 25 feet. This system caused roadway flooding, minor debris flows, and downed trees along with damage from gusty winds. Flooding at Hwy1 and Hwy 68.
Storm	January 2019	Carmel/Monterey Peninsula	After a strong cold front brought severe weather to the Central Coast on Wednesday night, the cleanup process began Thursday. Pacific Gas & Electric Co. crews worked to restore power after more than 10,000 Monterey Peninsula customers lost power due to the storm. Power was restored to about half of those without power by early afternoon Thursday and spokeswoman Mayra Tostado said PG&E was aiming to restore power by the evening to customers without any access issues caused by mudslides, flooding or blocked roads…. According to Carmel City Administrator Chip Rerig, a significant trunk line transformer just outside the city blew up, causing a citywide power outage. In Carmel, 12 streets were closed due to trees that fell on electrified wires. City crews began cleaning up the streets after PG&E removed trees touching or adjacent to live wires. "The storm last night hit us hard," Rerig wrote in a post to Carmel's website. "Fortunately there have been no reported injuries to residents, guests, staff, or contractors." The city opened the Carmel Youth Center as a warming center, welcoming residents to stop by and charge their mobile devices and get a cup of coffee or water. Speaking by phone Thursday afternoon, Rerig said city staff worked with PG&E to open up many of the streets that had been closed and explained the city came together overnight into Thursday to respond to the storm damage. "We really had a great concerted effort last night with our police department, our public works, who are fantastic, Monterey Fire (Department), which is our contracted fire services, responded to 1 think 32 calls, we had a series of volunteers, our Community Emergency Response Team and a litany of other staff members," he said. People from Senior Helping Seniors checked in on some of the city's elderly population to make sure they were OK during the outage. The Carmel Unified School District canceled classes and activities at all of its schools for Thursday due to the road closures and power outages but planned on opening its schools Friday. Source: Monterey Herald, Jan 18, 2019
Storm	February 4, 2019	Monterey Peninsula	A mid/upper low with a very cold air mass moved through in early February bringing snow to lower elevation peaks across the region prompting a rare Winter Weather Advisory. Junipero Serra Peak received around a foot of snow. Rainfall just ahead of this

			system also brought roadway flooding and minor debris flows. Carmel River flooding near Mid Valley. SR 1 at Rio Rod culvert is flooding, water going over the roadway.
Storm	November 30, 2019	Carmel	A low pressure system moving in from the Gulf of Alaska and drawing in moisture from the tropics combined to bring the first atmospheric river event of the winter season to the Greater Bay Area. This system brought widespread heavy rainfall, roadway flooding, and strong winds to the region. Rare Storm Warnings were issued over the coastal waters where buoys reported wind gusts in excess of 50 mph. Bay Area peaks recorded wind gusts between 60 to 70 mph with gusts along the Monterey Peninsula and Big Sur Coast at 50 to 60 mph. These winds caused downed trees and power outages across the area. Street at 3438 Martin Rd in Carmel, CA is flooding along with potential flooding at residence as water is being diverted down reporting party's driveway.
Storm	December 3, 2019	Carmel	A low pressure system moving in from the Gulf of Alaska and drawing in moisture from the tropics combined to bring the first atmospheric river event of the winter season to the Greater Bay Area. This system brought widespread heavy rainfall, roadway flooding, and strong winds to the region. Rare Storm Warnings were issued over the coastal waters where buoys reported wind gusts in excess of 50 mph. Bay Area peaks recorded wind gusts between 60 to 70 mph with gusts along the Monterey Peninsula and Big Sur Coast at 50 to 60 mph. These winds caused downed trees and power outages across the area. Carmel River Lagoon rose significantly overnight after 3 to 5 inches of rain fell over the Carmel River Basin. The Monterey OES phoned to say Public Works tried to breach the Lagoon and was unable to do so in time so the surrounding area had to be evacuated due to flooding. Minor Street flooding was observed along 15th, 16th, 17th Ave as well as Carmelo St and Scenic Rd. The unofficial flood stage of the Carmel River Lagoon is 10 ft. The gauge exceeded 10 ft during this time period before the Lagoon was breached and the water level fell dramatically just after 1 am.
Wildfire	August - September 2020	Central Coast, Carmel Valley	A prolonged and oppressive heat wave swept the Central Coast and Bay Area for almost a week from August 14th to August 19th with widespread record breaking temperatures observed across the region. This was caused by a strong high pressure system over the Desert Southwest that expanded westward into California. This dome of heat brought hot temperatures to the area for several days. Multiple days of triple digit afternoon highs were recorded inland with some coastal locations even reaching the mid-90s. Several days of hot and dry weather further dried fuels over the area increasing fire danger. During this event, a surge of monsoonal and tropical moisture from a former Tropical Storm advected northward with sufficient instability to generate multiple high based and dry thunderstorms that produced several thousand lightning strikes over the Greater Bay Area. Many locations saw wind gusts of 40-50 mph with isolated areas seeing gusts of 60-75 mph. This prompted the San Francisco Bay Area forecast office to issue a rare severe thunderstorm warning. These lightning strikes in combination with gusty and erratic outflow winds sparked hundreds of wildfires across the state of California. Several smaller

			fires combined to form complexes some of which are now among the largest wildfires in state history. Most of which were still actively burning at the end of August. Hundreds of thousands of acres have been burned with several hundred structures destroyed as well as a handful of deaths and injuries. Tens of thousands of residents were also forced to evacuate. Additionally, all of these wildfires burning simultaneously across the state gave the Bay Area the worst air quality in the world at one point. Lightning sparked the River Fire in Monterey County on the afternoon of the 16th. Several evacuation orders were issued throughout the month and four people including fire personnel and civilians were injured. Both the River and Carmel Fires caused smoke and ash to rain down on surrounding cities. The River Fire continued to burn through early September. A total of 48,088 acres burned with 30 structures destroyed, 13 damaged, and 4 injuries https://www.fire.ca.gov/incidents/2020/8/16/river-fire/.

Figure E-11. Historic Wildland Fires

Monterey County, California
Multi-Jurisdictional Hazard Mitigation Plan

URS

Carmel-by-the-Sea | Marina | Pacific Grove | Seaside
Del Rey Oaks | Monterey | Sand City

Monterey Bay

Pacific Ocean

Santa Cruz County | Santa Clara County | San Benito County | San Luis Obispo County | Fresno County | Kings County

Pajaro | Las Lomas | Aromas | Moss Landing | Elkhorn | Prunedale | Castroville | Boronda | Salinas | Spreckels | Chualar | Gonzales | Soledad | Greenfield | King City | San Lucas | San Ardo | Bradley

Pacific Grove | Marina | Sand City | Monterey | Seaside | Del Rey Oaks | Carmel-by-the-Sea | Del Monte Forest (Pebble Beach) | Carmel Valley Village

Los Padres National Forest | Hunter Liggett Military Reservation | Camp Roberts Mil. Res.

Lake San Antonio

Monterey Peninsula Airport | Marina Municipal Airport | Salinas Municipal Airport | King City Municipal Airport

City of Seaside Not Considered in Plan

339.07 degree rotation for all views

County Map Scale

1 inch equals 4 miles

0 1 2 4 6 8
Miles

City Inset Map Scale

1 inch equals 1.5 miles

0 0.75 1.5 2.25 3
Miles

Legend

Census Designated Place

Jurisdictional Boundaries
- County Boundary
- City Limits, Monterey County
- National Forest
- Military Reservation

Circulation
- US Highway
- State Highway
- County Highway
- Major Roads
- Local Roads *(City Insets Only)*
- Active Railroad (Union Pacific)

Hydrology (Perennial and Intermittent)
- Lake or Pond
- River, Creek or Tributary
- Artifical Path, Canal/Ditch or Connector

Basemap
Hillshades created from USGS 1" (county-wide) and 1/3" (city insets) National Elevation Dataset.

Fire Perimeters (1911 - 2005)

Fire Occurrence 1986 - 1996
Total Acres Burned
- 1 - 30
- 31 - 300
- 301 - 1000
- 1001 - 3000
- 3001 - 8850

Data Sources: County of Monterey - GIS Department, URS Corporation, US Geological Survey (USGS), US Census Bureau, University of California Santa Barbara (UCSB), HAZUS-MH MR2, Fire Sciences Laboratory - Rocky Mountain Research Station, Fire and Resource Assessment Program - California Department of Forestry and Fire Protection (CDF-FRAP)

T:\Monterey_County\RHMP\deliverables\E11_HistoricWildlandFires.mxd

APPENDIX B

CITY OF CARMEL-BY-THE-SEA

Hazard and Asset Summary Sheet for Wastewater Treatment Facility and Associated Underground Infrastructure

September 17, 2020

TO:	Climate Committee Members
SUBMITTED BY:	Jeff Baron, Councilmember

SUMMARY

Asset: Wastewater treatment facility and associated underground infrastructure (CAWD)
Hazards: Sea level rise, Stronger Storms, More variable rainfall
Version: 2

General Comments and Outlook: The Carmel Area Wastewater District treatment facility (and underground infrastructure) will be under increasing environmental pressure as sea level rises and storms (and hence rainfall drainage down the Carmel River watershed) increase in intensity. CAWD's prediction is that the facility will need to be relocated by 2062, which is approximately 40 years in the future. The long term options for the facility seem to be

1. Retreat up the valley
2. Pump to Monterey One Water

Identified Issues:

- Both long term projects are said to be expensive, in the neighborhood of $100,000,000.
- It will take a significant amount of time to make the decision as to which path to take.
- The value (cost) of the current facility (which may have to be abandoned) is approximately $200,000,000
- The lagoon situation will become increasingly precarious as time passes.

Outstanding Issues:

- Do not understand (yet) an overrun scenario if the move is not completed in time. What are the consequences and/or costs if the plant is flooded during an extreme weather event?
- Of lesser visibility but still important are possible mitigation measures required for the CAWD underground and pumping infrastructures, particularly along the coastline.

Possible Committee Comments or Actions for Final Report

- The committee could/should recommend that the Carmel City Council pass a resolution on this topic, ensuring that the city monitors the transition towards a relocated plant, and perhaps has formal, written input into this process. The resolution might:
    - Document the asset and the various hazards
    - Assign staff/council personnel as liaisons to CAWD, with an eye towards resolution of this asset's vulnerability
    - Urge CAWD to take specific actions

REFERENCES

- The CAWD Sea Level Rise Study can found at https://www.cawd.org/2018-sea-level-rise-study
- The CAWD presentation to the Committee: https://ci.carmel.ca.us/sites/main/files/file-attachments/ccc_presentation_v3.pptx?1600365293
- Recording of the September 17, 2020 Meeting at which CAWD presented: https://drive.google.com/file/d/1PZK0tP8b2jB_XoTtBJLPcXmLVEl9kY1Z/view

HISTORY

- Version 1 presented at Committee meeting on 10/15/2020
- Version 2 presented at Committee meeting on 11/19/2020.

CITY OF CARMEL-BY-THE-SEA

Hazard and Asset Summary Sheet for the Urban Forest

October 15, 2020

TO:	Climate Committee Members
SUBMITTED BY:	Scott Lonergan, Committee Member

SUMMARY

Asset: Urban Forest
Hazards: Stronger Storms & Wind, More Variable Rainfall, Increased Temperature, Wildfires
Version: 1

General Comments and Outlook:

- Carmel-by-the-Sea's upper canopy trees impart a distinctive ambiance and identify to the City, and provide several climate adaptation benefits including reducing urban heat island effect, capturing stormwater runoff, improved air quality, and sequestering carbon
- Increased transpiration and water demand, coupled with less consistent water availability as a result of fewer, larger storms, and reduced fog, is increasing tree stress
- Tree species selection and density is a 50 to 100-year decision with implications for 1) tree resilience and ecology, 2) aesthetics, and 3) safety and maintenance cost

Identified Issues:

- Our urban forest lacks age and species diversity and is currently showing signs of stress.

Remaining Issues to be Understood:

- Urban forest consideration as part of Action Plan e.g. carbon capture, walkability and desirability of the environment

Possible actions to be recommended in the committee's Final Report

- Update the CBTS Forest Management Plan, including a public process to determine tree canopy species and density objectives, and a process for ongoing monitoring and plan review.

REFERENCES

- CBTS Forest Management Plan: https://ci.carmel.ca.us/sites/main/files/file-attachments/forest_management_plan_0.pdf?1510272614
- Sara Davis, City Forester 15-Oct-2020 Climate Change Committee presentation video: https://carmel.novusagenda.com/agendapublic/VODPreview.aspx?meetingVideoID=898ec714-3a25-42a8-ae8f-2441cf4c1440&index=329
- Canopy.org including the 16-Jul-2020 Resilient Trees for a New Climate webinar, including presentations from Igor Lacan, and Dave Muffly: https://canopy.org/more-trees-please/

History

- Version 1 presented at committee meeting on 11/19/2020
- Sent for comments to Sara Davis (City Forester) on 11/10/2020

CITY OF CARMEL-BY-THE-SEA

Hazard and Asset Summary Sheet – Community Wildfire Preparedness

October 15, 2020

TO:	Climate Committee Members
SUBMITTED BY:	John Hill, Committee Member

SUMMARY

Asset: Public and Private Property, Public Safety
Hazards: Local Fires and Wildfire damage due to accumulated dry fuel & increasing wind and weather events.
Version: 1

General Comments and Outlook: The severity of fires and wildfires in California continues to increase in intensity and occurrence. California had low intensity fires until the logging of old growth forests, the introduction of grazing and invasive grasses, indigenous burning was replaced by fire suppression, and urban sprawl invaded the wildland areas. Community wildfire preparedness is supported by Monterey Fire's Defensible Space Inspection Program and coordination with surrounding fire prevention organizations to limit fire and wildfire risk through planning, prevention, and mitigation. Monterey Fire and the Carmel Public Works Department have working relationships with the Pebble Beach Services District for fire mitigation in Pescadero Canyon, and partner with the Friends of Mission Trail Nature Preserve for fuel reduction in Mission Trail Nature Preserve. CalFire's Fire & Resource Assessment Program (FRAP) and Fire Hazard Severity Zone (FHSZ) maps are available on line with information on forest assessment, fire severity zones, and defensible space. Monterey Fire personnel have inspected and graded all Carmel parcels as pass, pending, or fail. Grading criteria is evolving as knowledge on fire spread is developed. Current criteria is based on dry fuel accumulation, spark arrestors, overhanging tree limbs, etc.

Identified Issues:

- Some northern and eastern areas within City limits are within the Very High Fire Hazard Severity and Wildland Urban Interface (WUI) Zones.
- Some areas within the City limits and adjacent communities have accumulated fuel levels as well as overhead infrastructure (i.e. Mission Trail Park) that present fire and wildfire risks.
- An integrated approach to fire resilience in the landscape along with hardening structures against fire are ways to mitigate fire impact on lives and property.
- Fire resiliency can be controlled by creating defensible space with Fire Defense Zones around structures, an ignition zone (5 feet), a defense zone (30 feet) and reduced fuel zone (100 feat)
- Fuel is affected by the height and placement of plants & their chemical content. Pine forests and Oak woodlands are resilient but dead material and limbed branches in the understory must be maintained.
- Fire retardant plants, trees, and ground covers can absorb heat and fire without burning, trap embers, reduce wind speed, and slow the travel of a fire.
- 9 out of 10 structures lost are due to low intensity ground fire and embers in the 5-foot zone around them. Combustible materials such as decks, wood chips, and plant material should not be located within 5 feet of nor attached to the structure.

- Vents and windows are the most vulnerable areas in a house, gaps in vent screening should be no more than 1/8" maximum and plants should not be located near or below windows.
- The City's Building Department has adopted the California Building Code requirements in the Very High Fire Hazard Zone but the City's planning guidelines currently do not address them or may be in conflict with them.

Possible actions to be recommended in the committee's Final Report

- Carmel City Council consider fire hazard severity and evacuation plans in the safety elements of the General Plan and monitor the level of fire hazards within and surrounding the community. Resolutions and/or Ordinances could include:
    - Documenting the various existing hazards.
    - Assigning staff/council personnel as liaisons to CalFire (Cypress Fire District), and adjacent communities which could threaten Carmel in a wildfire.
    - Assist Monterey Fire in its current efforts in inspecting and identifying fire risks.
    - City Forester consider fire retardant trees and plants in City controlled areas and for tree replacement requirements for private property.
    - Update City Planning guidelines to reflect or not conflict with current California codes (CBC Chapter 7 & CRC R337) in the Very High Fire Hazard Severity (VHFHS) Zone.

REFERENCES

- Fire and Resource Assessment Program (FRAP) ResilientCA.org
- Monterey Fire Defensible Space Inspection Program mry.maps.arcgis.com , monterey.org/fire
- CalFire Defensible Space/Home Hardening readyforwildfire.org
- CalFire Fire Severity Zone Viewer gis.data.ca.gov
- Wildland Urban Interface (WUI) frap.fire.ca.gov
- Every Building's Wildfire Risk in Monterey County defensibleapp.com
- The A.I.A. Designing for Fire Presentation http://youtu.be/MWslhXidZnc

History

- Version 2 presented at committee meeting on 12/17/2020

CITY OF CARMEL-BY-THE-SEA

Hazard and Asset Summary Sheet for the Multi-Jurisdictional Hazard Mitigation Plan

November 19, 2020

TO:	Climate Committee Members
SUBMITTED BY:	Agnes Martelet, Environmental Compliance Manager

SUMMARY

Asset: multiple
Hazards: multiple
Version: 1

General Comments and Outlook:

- The Multi-jurisdictional Hazard Mitigation Plan (HMP) was presented by Kelsey Scanlon of the Monterey County Office of Emergency Services. The HMP establishes a broad local vision and guiding principles for reducing hazard risk, and proposes specific mitigation actions to reduce identified vulnerabilities. The plan is due for renewal in 2021.

- This plan helps local jurisdictions comply with the climate change planning requirements of SB 379, and also allows them to be eligible for pre- and post-disaster mitigation project grant funding from the Federal Emergency Management Agency (FEMA).

- Objectives of the HMP include:
    - Protect life and property
    - Minimize economic losses
    - Enhance community resilience
    - Reduce burden on local government and taxpayers
    - Break the cycle of repetitive disaster damages
    - Speed disaster recovery
    - Integrate hazard mitigation planning with other local planning and decision-making

- The HMP addresses the impacts of Climate Change and shares many objectives with Climate Adaptation Plans. Identified hazards that will be exacerbated by Climate Change in Monterey County include: wildfires, flooding, coastal erosion, landslides and debris flows, extreme heat and drought, human health hazards, and mass migration.

Identified Issues / To-do:

- Each of the 12 cities in the County will provide mitigation strategies and projects to include into the HMP. By including projects into the HMP, jurisdictions may be eligible for FEMA grant funding.

Possible Committee Actions

- The Committee could provide feedback and recommendations for hazard mitigation projects to include in the HMP. The Monterey County Office of Emergency Services anticipates soliciting comments and projects in the Spring of 2021.

REFERENCES

- Monterey County Hazard Mitigation webpage: http://www.co.monterey.ca.us/government/departments-a-h/administrative-office/office-of-emergency-services/hazard-mitigation

History

- Version 1 presented at committee meeting on 12/17/2020

CITY OF CARMEL-BY-THE-SEA

Hazard and Asset Summary Sheet – Storm Drain Master Plan

December 17, 2020

TO:	Climate Committee Members
SUBMITTED BY:	Agnes Martelet, Environmental Compliance Manager

SUMMARY

Asset: Public and Private Property, Public Safety
Hazards: Flooding due to stronger storms
Version: 1

General Comments and Outlook: The Director of Public Works presented the City's first Storm Drain Master Plan (SDMP), which was completed in 2020. The plan includes an evaluation of the physical condition of the existing storm drain system, a hydrologic and hydraulic analysis, and a prioritization of improvements to fix deficiencies and capacity issues. With the proposed improvements outlined in the SDMP at an estimated cost of $9.9 million, the drainage system could handle a 10-year storm (3 inches in 24 hours) without flooding.

Identified Issues:

- The City's storm drain system was built to handle only a 10-year storm; it was less costly to construct over the years but incurs the potential for more frequent flooding due to reduced capacity. Most agencies have storm drainage systems that accommodate 20-year storms.

- Repairs are needed for the system to currently be able to handle a 10-year storm.

- Climate change may cause storm intensities to increase by 12 to 20%. Models indicate that, with larger storms, some flooding may occur in the northeast part of the City, the southwest corner near Santa Lucia, and in Mission Trail Nature Preserve, even with improvements.

Possible actions to be recommended in the committee's Final Report

- Funding of the SDMP projects as part of the City's CIP and including them in the Multi-jurisdictional Hazard Mitigation Plan for potential FEMA funding.
- Upsizing pipes as repair projects are conducted so that critical components of the system can eventually handle larger storms

REFERENCES

- Carmel-by-the-Sea Storm Drain Master Plan: https://ci.carmel.ca.us/sites/main/files/file-attachments/complete_final_sdmp_report_september_2020_small.pdf?1602098761

History

- Version 1 presented at committee meeting on 2/18/2021

CITY OF CARMEL-BY-THE-SEA

Hazard and Asset Summary Sheet for the Beach, Bluff, Coastal Armoring, Public Infrastructure, and Private Property

February 18, 2021

TO:	Climate Committee Members
SUBMITTED BY:	Scott Lonergan, Committee Member

SUMMARY

Asset: Beach, Bluff, Coastal Armoring, Public Infrastructure, and Private Property
Hazards: Sea Level Rise, Stronger Storms and Waves, More Variable Rainfall
Version: 8-Feb-2021

General Comments and Outlook:

- It is not widely understood that the climate change threat to coastal infrastructure, private property, the beach, along with the associated impacts on tourism and Carmel's economy, is so substantial, and that the potential solutions so complex.
- Nearly the entire coastline south of 8th Avenue has been armored by a combination of seawalls, vertical or stepped retaining walls, or engineered rock revetments. Secondary impacts to armoring often include escalating maintenance costs, and the loss of beach, aesthetics, and ecology.
- Coastal erosion and storm events already pose a threat, and climate change driven sea level rise and storm intensity will dramatically increase that threat.
- Longer term, the degree to which the City should, or can, forestall the natural processes driven by climate change is not fully understood.

Identified Issues:

- The frequency and duration of beach inundation and wave attack on armoring and natural barriers is increasing. The impacts of armoring on beach sand loss, as well as the seasonal migration of sand on and off shore, has not been investigated.
- The natural erosion processes along the mostly unarmored North Dunes area will accelerate bluff retreat and potentially create space for the beach to migrate inland. North Dune habitat at the retreating bluff would be reduced in this case.
- Seawall integrity is being compromised by ongoing erosion of the relatively soft sandstone base of some seawalls. Equipment access to areas on the beach required for completing repairs and maintenance is increasingly limited.
- Public infrastructure at risk along the coast including Scenic Road and the bluff walkway, beach access stairways, bathrooms, armoring, Del Mar Avenue beach parking, and some utilities.
- Private property at risk along the coast including: 1) that along Scenic Road, 2) that between 8th Avenue and Del Mar Avenue, and 3) that at the north end of the City (Pescadero Canyon area).
- The need to educate the community about the climate change threat to coastal infrastructure, private property, the beach, and the associated impacts on tourism and Carmel's economy, along with the potential solutions.

Remaining Issues to be Understood (in Preparation for the Committee's Final Report):

- Engagement of a coastal engineer with experience in planning for climate change in an LCP context.
    - Further assessment of the risks to our coastal assets.

- Determine adaptation measures and LCP policy options. Draft updated or new LCP for certification with the Coastal Commission.
    - Prioritize adaptations and projects that protect and maintain public resources and beach access, and the viability of the community and tourism.
    - Coordinate with regional partners (e.g. County, Pebble Beach) and align with the Coastal Commission on acceptable plans.
    - Determine how the options and strategies along the coast are different for the:
        - Mostly natural, unarmored North Dunes area
        - Mostly armored bluffs along Scenic Road south of 8th Avenue
        - Unarmored dunes along private property between 8th Avenue and Del Mar Avenue
        - Armored private properties on the bluffs at the north end of the City (Pescadero Canyon area).
    - Evaluate feasibility and phasing, the use of thresholds for when different elements of these strategies are implemented. For example, maintaining armory or other defenses up to a point, but then if a threshold is reached, embracing a new bluff line and different adaptive measure.
    - Consider legal liabilities, coastal armoring and building regulations, real estate disclosures, and fiscal impacts.
    - Community-wide outreach and education, including that focused on exposed property owners.

- Actions independent of engaging a coastal engineer including:
    - Characterize erosion hot spot areas of particular concern along the City's coastline based on maintenance records, historical knowledge, and further assessment.
    - Research Carmel Cove sand supply dynamics through the engagement of local experts (e.g. CSUMB, NPS) or other resources.
    - Assess risks with the USGS Coastal Storm Modeling System (CoSMoS).
    - Investigate and, if appropriate, apply for pre-disaster planning and mitigation funding from the State or other sources.
    - Amend City documents, if appropriate, to enable the request of FEMA disaster relief post-disaster.

Possible Actions to be Recommended in the Committee's Final Report

- Update the CBTS Shoreline Management Plan and the General Plan / LUP.
- Proactive sourcing or contracting for repair resources prior to episodic events.

REFERENCES

- Coastal Resource Management Element of the Carmel-by-the-Sea General Plan: https://ci.carmel.ca.us/post/general-plan
- Carmel-by-the-Sea / Shoreline Management Plan: https://ci.carmel.ca.us/post/additional-forestry-division-resources
- David Shonman and Greg D'Ambrosio 19-Nov-2020 Climate Change Committee presentation slides: https://ci.carmel.ca.us/sites/main/files/file-attachments/shonman_-_ccc_presentation_-_final_nov_19_2020.pdf?1605903015
- USGS representative, Andrea O'Neill, 17-Dec-2020 Climate Change Committee presentation video: https://carmel.novusagenda.com/agendapublic/MeetingView.aspx?MeetingID=922&MinutesMeetingID=510&doctype=Agenda
- California Coastal Commission and Local Government Public Workshop on 17-Dec-2020 to discuss sea level rise planning in an LCP context: https://documents.coastal.ca.gov/reports/2020/12/SM-Th3/th3-12-2020-report.pdf

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History

- Version 8-Feb-2021

CITY OF CARMEL-BY-THE-SEA

Water Supply Summary

January 21, 2021 Meeting

TO:	Climate Committee Members
SUBMITTED BY:	Michael LePage, Committee Member

SUMMARY

Asset:
Monterey Peninsula water supply

Hazards:
Seasonal drought, climate warming, sea level rise

General Comments and Outlook:
California is located in a drought-prone area of the United States. Even though there are yearly seasonal variations in rainfall, the average temperature in California is trending up. This is the result of climate change. A warming climate leads to the increase of drought frequency and duration.

Additionally, climate change is predicted to increase local sea level rise by 1.5 meters by the century's end. Storm surges along with high tides and extreme weather events will result in much higher levels of sea level rise. This will have an impact on the local water delivery infrastructure which is located in the areas of projected sea level rise.

The Monterey Peninsula's water supply has historically been provided by the Carmel River, local reservoirs and ground water. The State Water Resources Control Board has issued a Cease and Desist Order, 95-10, that requires California American Water Company (CalAm) to reduce its unlawful pumping of water from the Carmel River. The original pumping deadline has been extended to 2021. In response to the Cease and Desist Order, CalAm is pursuing a permit for a desalinization water treatment plant located in Marina that would utilize slant wells to source seawater for desalinization.

Simultaneously with this project, the Monterey Peninsula Water Management District (MPWMD) has worked in collaboration with 9 local agencies to create the Pure Water Monterey Project. The project sources water from four sources, domestic waste water, agriculture produce water, agriculture waste water and storm water. By the use of advanced water recycling technology, all these water sources are purified to provide potable water for domestic and agricultural use. Additionally, the project injects seasonal water flows into the Seaside aquifer to provide ground water replenishment. The project potentially will provide one third of the water demand for the area it serves.

Identified Issues:

- California is located in a drought-prone area of United States.
- Average temperatures are trending upward because of climate change
- Global warming is causing dryer weather patterns resulting in more frequent droughts.

- The State Water Resources Control Board has issued a Cease and Desist Order (95-10) to reduce unlawful pumping from the Carmel River.
- The proposed desalinization plant requires a cumbersome permitting process resulting in an expensive water source.
- Climate change is causing sea level rise that will impact water related infrastructure, both delivery and waste treatment

Possible actions to be recommended in the committee's Final Report

- Keep informed regarding the Carmel Lagoon Ecosystem Protective Barrier and the Scenic Road Protective Barrier System.
- Provide maps of predicted sea level rise for the required shore line assessment reports
- Review city infrastructure opportunities for implementing additional water conservation measures

REFERENCES

- Monterey Peninsula Water Management website, https://www.mpwmd.net/
- Pure Water Monterey Project, https://purewatermonterey.org/
- Monterey Peninsula Integrated Regional Water Plan, https://www.mpwmd.net/environmental-stewardship/irwm-program/final-draft-monterey-peninsula-integrated-regional-water-management-plan-update/
- Carmel Lagoon Ecosystem Protective Barrier and Scenic Road Protective Barrier System, https://www.co.monterey.ca.us/government/departments-i-z/resource-management-agency-rma-/planning/current-major-projects/carmel-lagoon-ecosystem-protective-barrier-and-scenic-road-

History

- Version 1 presented at committee meeting on 4/15/21

CITY OF CARMEL-BY-THE-SEA

2018 Draft Greenhouse Gas Inventory Summary

February 18, 2021 Meeting

TO:	Climate Committee Members
SUBMITTED BY:	Evan Kort, Associate Planner

SUMMARY

Asset:
2018 Draft Greenhouse Gas (GHG) Inventory

Hazards:
N/A

Key Terms:

- Baseline Year: A specific year against which emissions are tracked over time.
- Greenhouse gases (GHG): Carbon dioxide (CO2), methane (CH4), and nitrous oxide (N20). Emissions are expressed in equivalents of carbon dioxide (CO2e).
- Community Greenhouse Gas Inventory: A calculation of GHG emissions generated as a result of activities within a community.

General Comments and Outlook:
The Association of Monterey Bay Area Governments (AMBAG) has prepared GHG Inventories for member agencies for 2005, 2010, 2015. Starting 2018, in partnership with Central Coast Community Energy (3CE), AMBAG is preparing GHG Inventories for 3CE member jurisdictions for 2018, 2019, and 2020 –this 2018 GHG Inventory was prepared as part of the MOU between AMBAG and 3CE.

The state of California has adopted a baseline year of 1990 for statewide targets. The 2020 target (AB 32) was to return to 1990 emission levels, and the 2030 target (SB 32) is a 40% reduction from 1990 levels with the 2050 target (executive order: S-3-05) being an 80% reduction from 1990 levels. In 2018, the Governor signed an executive order (B-55-18) with the goal of achieving carbon neutrality by 2045. Most cities do not have 1990 inventories and it is not possible to go back and establish a 1990 baseline. Therefore, in order to quantify targets, most cities use 2005 inventories and assume emissions increased by approximately 15% between 1990 and 2005.

The emission inventory is broken into 5 sectors: Residential, Commercial/Industrial, Transportation, Solid Waste, Wastewater. Residential and commercial/industrial sectors inventory electricity and natural gas emissions. The transportation sector is an inventory of emissions resulting from travel on local roads in the City of Carmel-by-the-Sea. Solid waste is an inventory of emissions from the waste that is generated by the community and sent to the landfill, and wastewater is an inventory of emissions from the treatment of wastewater.

AMBAG gathered data directly from PG&E and 3CE for electricity and natural gas consumption. Transportation data is gathered from an annual report prepared by the California Department of Transportation (CalTrans) that looks at the amount of Vehicle Miles Traveled on local roads as well as the CARB's EMFAC model, which is used to estimate emissions based on on-road travel. Solid waste data is obtained from CalRecycle's annual

report as well as characteristic studies that study the composition of materials in the landfill. Lastly, wastewater data is gathered from a population-based method that uses the population to estimate the emission.

2018 Inventory Findings:

- Electricity between 2005 to 2018 has become cleaner. Electricity use has remained stable; however, the carbon intensity of the electricity has been drastically reduced (likely due to the local energy procurement being taken over by 3CE).
- Data sources have reported less and less travel on local roads over time resulting in a reduction in GHG for the transportation sector.
- Solid waste being sent to the landfill from the city has decreased significantly (46% emission reduction) and the composition of the solid waste being sent to the landfill is less impactful in 2018 than it was in 2005.
- Wastewater: not discussed.

Identified Issues:

- The California Air Resources Board (CARB) is required to update their Scoping Plan every 5 years. The scoping plan was last updated in 2017, prior to the executive order establishing a goal of carbon neutrality by 2045 so the carbon neutrality target has yet to be included in the Scoping Plan (80% reduction by 2050 is still the official target). When the scoping plan is updated in 2022, the 2045 carbon neutrality target will likely be included in the Scoping Plan and is expected to be the main target moving forward. There is still uncertainty regarding 2045 vs 2050 goal.
- The significant decrease in GHG emissions in the transportation sector may be the result of a change in methodology by CalTrans in preparing their annual report, which may account for some or most of the reduction in GHG emissions. The report provided to AMBAG from CalTrans is a finished product that does not provide the opportunity to evaluate the methodology used.
- CalRecycle reports the solid waste data and the reason for the significant decrease in emissions is unclear.

Possible actions to be recommended in the committee's Final Report

- Maintain the 2030 goal outlined in SB 32. Although there is still uncertainty regarding the 2045 vs 2050 goals, the Committee is interest in using the more rigorous 2045 carbon neutrality target as its goal for emissions reductions.
- Re-evaluation of emissions may be required as a result of possible changes in methodology that may have impacted the outcomes of the inventory. Consultant assistance will be required in making a determination regarding the accuracy of the inventory and methodology.

REFERENCES

- City of Carmel Draft 2018 Greenhouse Gas Inventory
- EMFAC Model: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools

History

- Version 2 presented at committee meeting on 7/15/21

CITY OF CARMEL-BY-THE-SEA

Central Coast Community Energy

February 18,2021 Meeting

TO:	Climate Committee Members
SUBMITTED BY:	Agnes Martelet, Environmental Compliance Manager

SUMMARY

Asset:
Power Supply

Hazards:
Greenhouse gas emissions

General Comments and Outlook:
Central Coast Community Energy (3CE, formerly Monterey Bay Community Power) is a Joint Powers Authority with 33 municipal members to deliver energy throughout the Central Coast. 3CE delivers the energy to the power grid that is operated by PG&E locally. 3CE has a goal to reach 100% clean and renewable energy by 2030, although they have clarified that there will be times of the day when there will be natural gas on the grid for reliability when renewables are not available.

Regionally, 3CE is investing in technology to increase supply and storage capacity for reliable and clean power. Locally, 3CE is investing in programs to increase the pace of electrification, including in the transportation and construction sectors, and in the agricultural industry. 3CE also provides an incentive for local municipalities to adopt reach codes for energy conservation and electrification to reduce the use of natural gas in the built environment. Reach codes are more advanced or enhanced building codes that go above and beyond the State's building code requirements.

Identified Issues:

- Providing 100% clean energy power supply is challenging due to the times of energy use that do not always match the times of peak power supply from renewable sources. Thus, natural gas will remain a source of energy on the power grid.

Possible actions to be recommended in the committee's Final Report

- Consider taking advantage of 3CE's reach code incentive to amend the City's municipal code to increase the pace of energy conservation and electrification in local construction projects.

REFERENCES

- 3CE Presentation at the Climate Committee meeting: https://carmel.novusagenda.com/agendapublic/VODPreview.aspx?meetingVideoID=5ddd8ae3-bf7f-456c-8c9f-38f55eeb55a6&index=3004
- 3CE Energy Programs: https://3cenergy.org/energy-programs/

History

- Version 1 presented at committee meeting on 5/20/21

CITY OF CARMEL-BY-THE-SEA

Hazard and Asset Summary Sheet for Electrical Grid Resilience

May 20, 2021

TO:	Climate Committee Members
SUBMITTED BY:	Jeff Baron, Councilmember

SUMMARY

Asset: Electrical Grid
Hazards: Stronger Storms, Increasing temperatures
Version: 1

General Comments and Outlook: The electrical grid in Carmel has been historically somewhat unreliable during weather events, with outages affecting from half a block to the entire community. In the future, we could see causes of disruptions (related to climate change) include:

1. Larger weather events (storm damage to power line infrastructure.)
2. Public safety power shutoffs (related to the threat of wildfire during wind events along transmission lines.)
3. Supply shortages (related to grid shortages, as seen during the summer of 2020.)

Identified Issues:

Grid failure can lead to numerous effects, including:

- Residential – spoiled food, cold and dark homes
- Commercial – essential businesses shuttered
- Tourism – loss of income of reputation
- Government services impacts (police and fire, public works)

Outstanding Issues:

- Would be good to have access to PG&E Grid map to better understand power grid
- Ask PG&E for historical outage map (or list) with causes
- Work with PG&E to understand possible PSPS transmission lines. Which lines are subject to these? How does this effect Carmel?
- PG&E: Microgrids
  - Power sources within the power grid?
  - Could we get power from somewhere else, some dedicated “outside line” not subject to power outages?
- Community business survey to determine which businesses are grid resilient

Possible Committee Comments or Actions for Final Report

Explore and make recommendations on possible mitigation measures:

- Prevention
  - Tree planning and maintenance - Work with PG&E to prioritize tree trimming
  - Explore the possibility of undergrounding select or all utility lines (via with property assessments)
- Personal resiliency
  - Require new homes to be “ready” for home power storage
  - Require homes to be “EV ready” (also helps with GHG metrics.)

    - Explore new home requirements for home power generation (solar, fuel cells, generators)
- Carmel resiliency
    - Explore areas in which Carmel should or could provide resiliency services to local residents and business, beyond the simple continuation of essential government services. For example:
        - Warming or cooling areas
        - Electrical phone and other small appliance charging facilities
        - Food and other supplies (for visitors)
        - Communication infrastructure
- Regional resiliency
    - Explore possible peninsula microgrid

REFERENCES

- Click here to enter text.

HISTORY

- Version 1 presented at Committee meeting on 5/20/2021

CITY OF CARMEL-BY-THE-SEA

2018 Draft Greenhouse Gas Inventory Summary

January 21, 2021 Meeting

TO:	Climate Committee Members
SUBMITTED BY:	Carrie Theis, Committee Member

SUMMARY

Asset:
Regional recycling, waste processing and disposal facility

Hazards:
Methane gas emissions

General Comments and Outlook:
The Monterey Regional Waste Management District is located north of Marina and has been operating since 1951 to handle the waste processing and disposal along with recycling for the Monterey Peninsula. Over the years they have added programs to their facility producing an integrated approach to reduce, reuse and recycle the waste produced on the Monterey Peninsula.

The decomposing of waste materials and organics creates methane gas. Extraction of methane from the landfill creates renewable power for the use by the District and Monterey 1 Water (M1W) to help produce recycled water. Soon the District will be converting landfill gas to Compressed Natural Gas (CNG) to provide fuel for the trash trucks. CNG is a carbon negative fuel. The extraction of methane gas from the landfill produces 5 megawatts of power and the CO2 offset is about 22,000 tons per year.

Windrow Composting is used to manage organics processing to produce compost for nearby organic farms. This process keeps the yard trimmings and organics out of the landfill and creates a nutrient rich compost. It has been shown that applying ¼" of compost (California Carbon Project) to grasslands will improve the soil environment for over a 100 years. Plants thrive more by pulling CO2 out of the air to help offset greenhouse gas emissions. A more widespread application of compost could work to reverse climate change by becoming a carbon bank.

Food recovery and organics processing has become a priority for the State of California with the implementation of AB1826 in 2014 for the mandatory commercial organics recycling and SB1383 in 2016 to mitigate climate change with the Short-Lived Climate Pollutant Reduction Strategy.

The goal of SB1383 is to divert 75% of organic material from the landfill and 20% of edible food for recovery by 2025. To try to obtain the goal of 75% diversion of organic food waste, the waste haulers will be Implementing the collection of residential food waste sometime this year. To handle the increased tonnage of organic materials, the Waste Management District will need to implement a larger anaerobic digesting system to prevent the methane gas from being released into the environment. The edible food recovery part of this bill will be accomplished by having the restaurants partner with the Monterey County Food Bank.

Identified Issues:

- The challenges will be to meet the diversion goals set by the State by continuing to educate the public about recycling and introduce the concept of organics waste diversion. The program logistics of diverting edible food from the restaurants to the Monterey Fook Bank program is yet to be determined.

REFERENCES

- Monterey Regional Waste Management District website – www.mrwmd.org.
- Monterey Regional Waste Management District presentation to the Climate Committee: https://www.youtube.com/channel/UCAu0elLwM1JCDkzD7Js86mA

History

- Version 1 presented at committee meeting on 8/19/21

Stakeholder and Public Input

This appendix includes presentation slides, the Mural activity completed at the virtual public workshop in November 2021, and responses to comments.

Appendix C
Outreach

Appendix C
Outreach

Presentation Slide Deck from September 16, 2021, Climate Committee Meeting

RINCON CONSULTANTS, INC.

Environmental Scientists | Planners | Engineers

City of Carmel-by-the-Sea

Potential Climate Adaptation Goals, Policies, and Actions

Climate Committee Meeting

Photo by Chris Leipelt on Unsplash

Vulnerability Assessment

- Carmel-by-the-Sea is experiencing and will continue to experience
  - Stronger storms
  - Increased wildfire risk
  - Sea level rise
  - Extended drought conditions
  - Increased temperature

Vulnerability Assessment

- Identified gaps
- Opportunities to build on existing adaptation strategies

Color coding:
- Already causing observable impacts or a near-term significant risk
- Mid- to long-range impacts
- Not enough data

YES Some policy/action initiated
NO No policy/action initiated

Priority Assets at Risk	Priority Hazards						
	Stronger Storms	Wildfires	Sea Level Rise	More Droughts	Increased Temperature	Fog changes	Ocean Warming
Natural Assets							
Mission Trail Nature Preserve	YES	YES	X	YES	YES	X	
North Dunes			NO	YES	YES	X	
Urban Forest	YES	NO		YES	NO	X	
Marine Sanctuary	X			X	X	X	X
Carmel Beach	YES		YES			X	X
Community							
Elderly population and people with disabilities	NO	NO		NO	NO		
Residents	YES	YES		YES	NO		
Visitors	NO	NO					X
Local Businesses	NO	NO	NO	YES	NO		X
Service industry workers	NO	NO	NO		NO		
Second homes	YES	YES	NO				

Potential Adaptation Strategies Table

- Structure
  - Goals – Broad statements describing community desires
  - Policies – Specific position statements that support the achievement of goals and serve as guides to the City when making decisions
  - Actions – Specific methods to implement and achieve policies and goals.

Potential Adaptation Strategies Table

- Action Sources
  - Carmel-by-the-Sea Vulnerability Assessment
  - State/Regional Plans
    - Safeguarding California Plan: 2018 Update, California's Climate Adaptation Strategy, California Natural Resources Agency
    - Southern California Adaptation Planning Guide
      - Appendix F – General Plan and Local Coastal Plan Model Policies
      - Appendix B – Matrix of Adaptation Strategies and Actions
  - Local Plans and Ordinances
    - Pacifica All-Electric Reach Code
    - Berkeley Existing Building Electrification Strategy

Principles for Implementable Actions

6 principles to consider when selecting adaptation actions

1. Measurable increase in resilience
2. Institutional structures
3. Funding
4. Engagement
5. Partnership
6. Equity

Photo by Adomas Aleno on Unsplash

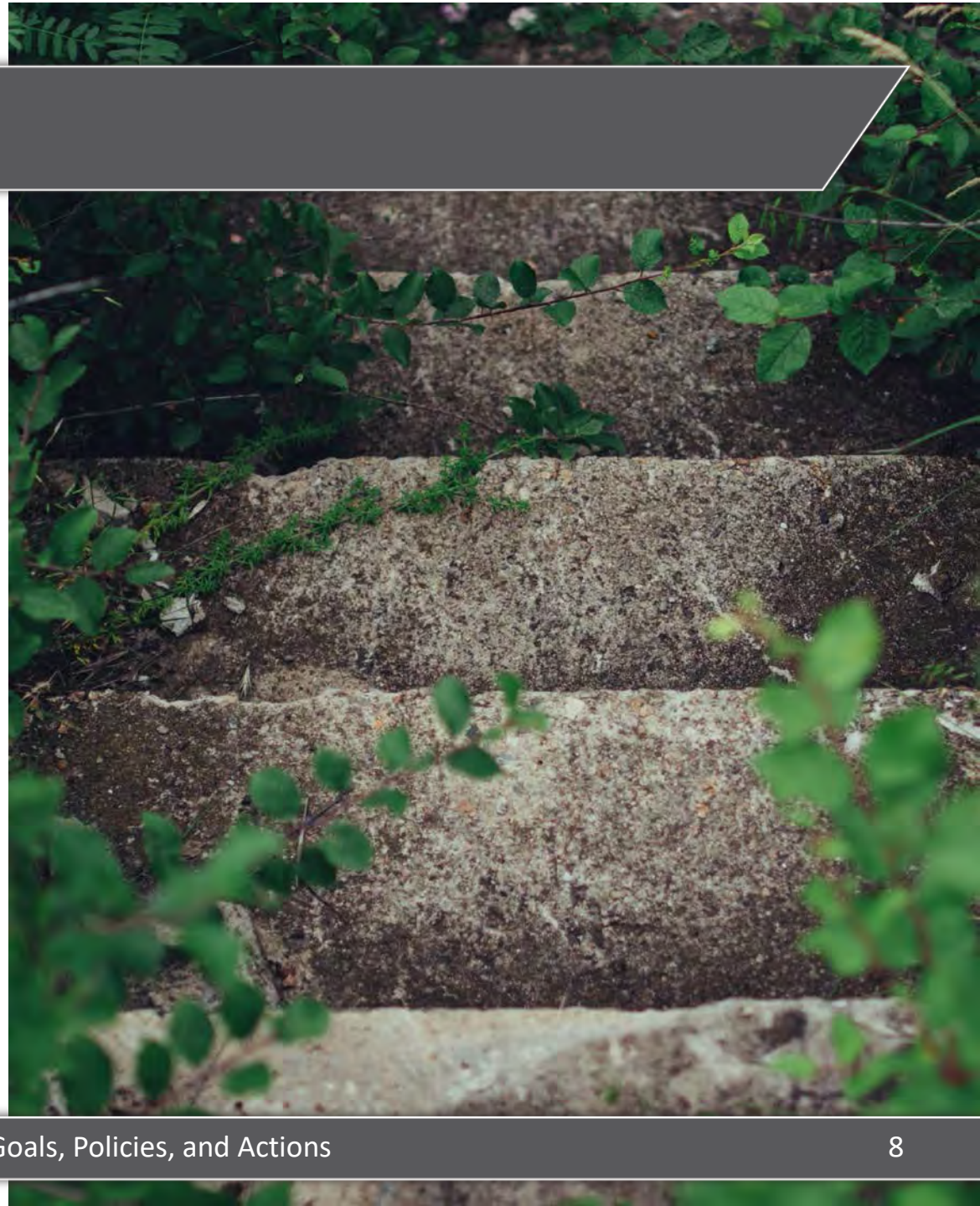
Potential Adaptation Strategies Table

City of Carmel-by-the-Sea Potential Adaptation Strategies

Goal/Policy/Action	Climate Hazard	Asset	Potential Metric	Timeframe	Potential Lead	Cost	Source
Goal 1. A Healthy, Safe, and Resilient Community							
Policy 1.1. Provide effective emergency preparedness and response following a climate-related disaster							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies
Action 1.1.1. Improve Emergency Preparedness. Incorporate climate change risk and impact considerations into Carmel CERT programming and materials, to promote emergency preparedness at a neighborhood block-by-block scale.	All	Residents, Local Businesses, Second Homes	# of block captains formed	TBD	TBD	TBD	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions

Next Steps

- **Collect** comments from Climate Committee before the October meeting
- **Refine** the goals, policies and actions based on comments
- **Present** the refined list at the public workshop on November 18th



Thank you for your time!

Questions?

Extra Slides

Goals

ICARP Adaptation Visions and Principles	City of Carmel-by-the-Sea Adaptation Goals
All people and communities respond to changing average conditions, shocks, and stresses in a manner that minimizes risks to public health, safety, and economic disruption and maximizes equity and protection of the most vulnerable.	Goal 1. A Healthy, Safe, and Resilient Community
Natural systems adjust and maintain functioning ecosystems in the face of change.	Goal 2. A Natural Environment Resilient to Climate Hazards
Infrastructure and built systems withstand changing conditions and shocks, including changes in climate, while continuing to provide essential services.	Goal 3. Resilient Infrastructure and Built Environment

Appendix C
Outreach

Presentation Slide Deck from October 21, 2021, Climate Committee Meeting

RINCON CONSULTANTS, INC.

Environmental Scientists | Planners | Engineers

City of Carmel-by-the-Sea

Revised Climate Adaptation Goals, Policies, and Actions

Climate Committee Meeting

Photo by Chris Leipelt on Unsplash

Resources

- Summary of Comments and Responses
- Revised Potential Adaptation Strategies

Photo by anna breaux on Unsplash

Comment Categories

- Electrification
- Evacuation, traffic, and congestion
- Vulnerable populations
- Tree maintenance and Monterey Pines
- Stormwater runoff and wastewater

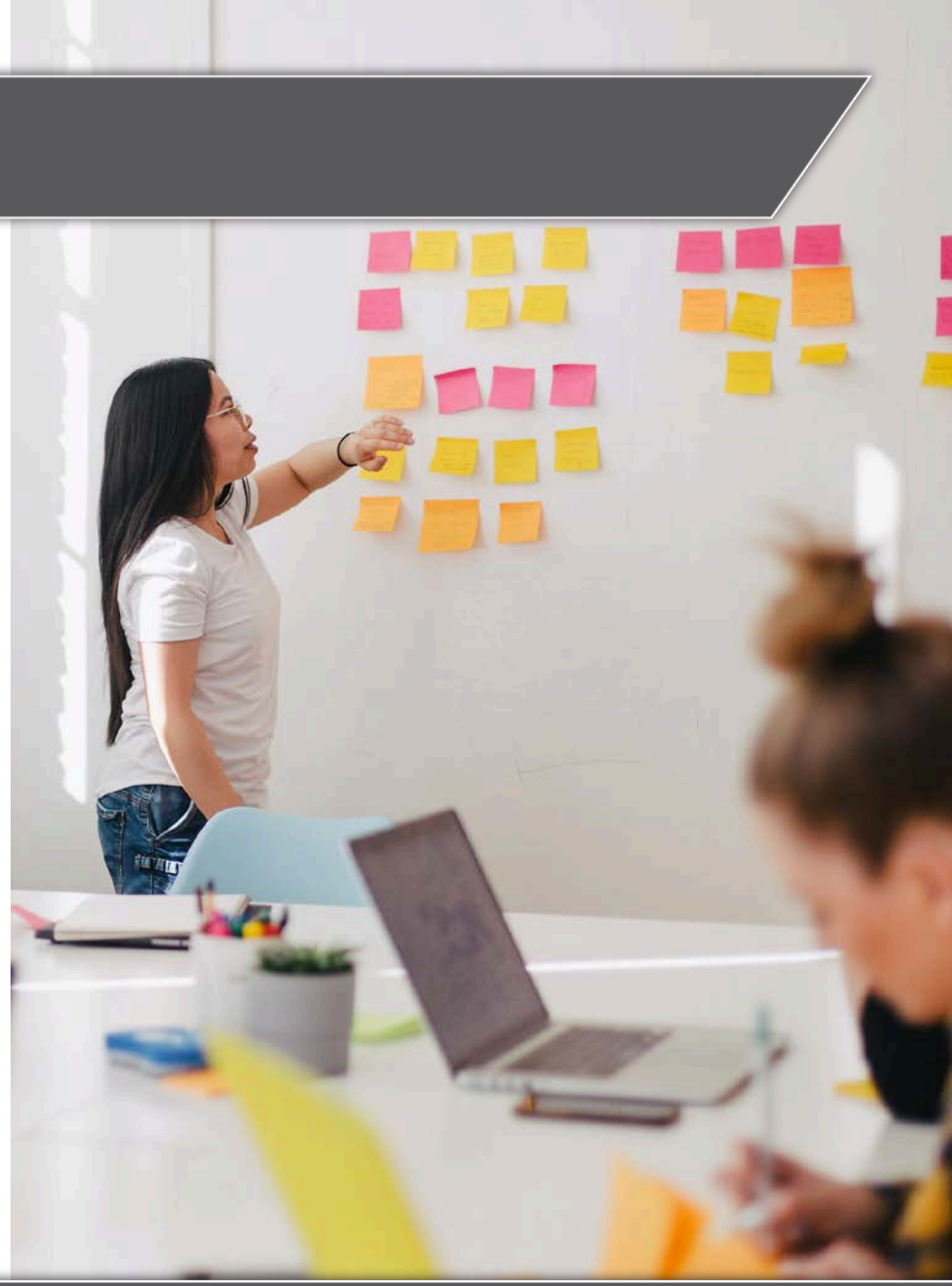


Photo by Leon on Unsplash

Electrification

- It is noted that members of the Climate Committee would prefer to move these types of strategies to the Climate Action Plan.
- Electrification actions will remain in the list of potential adaptation goals, policies, and actions for the public to weigh in on.

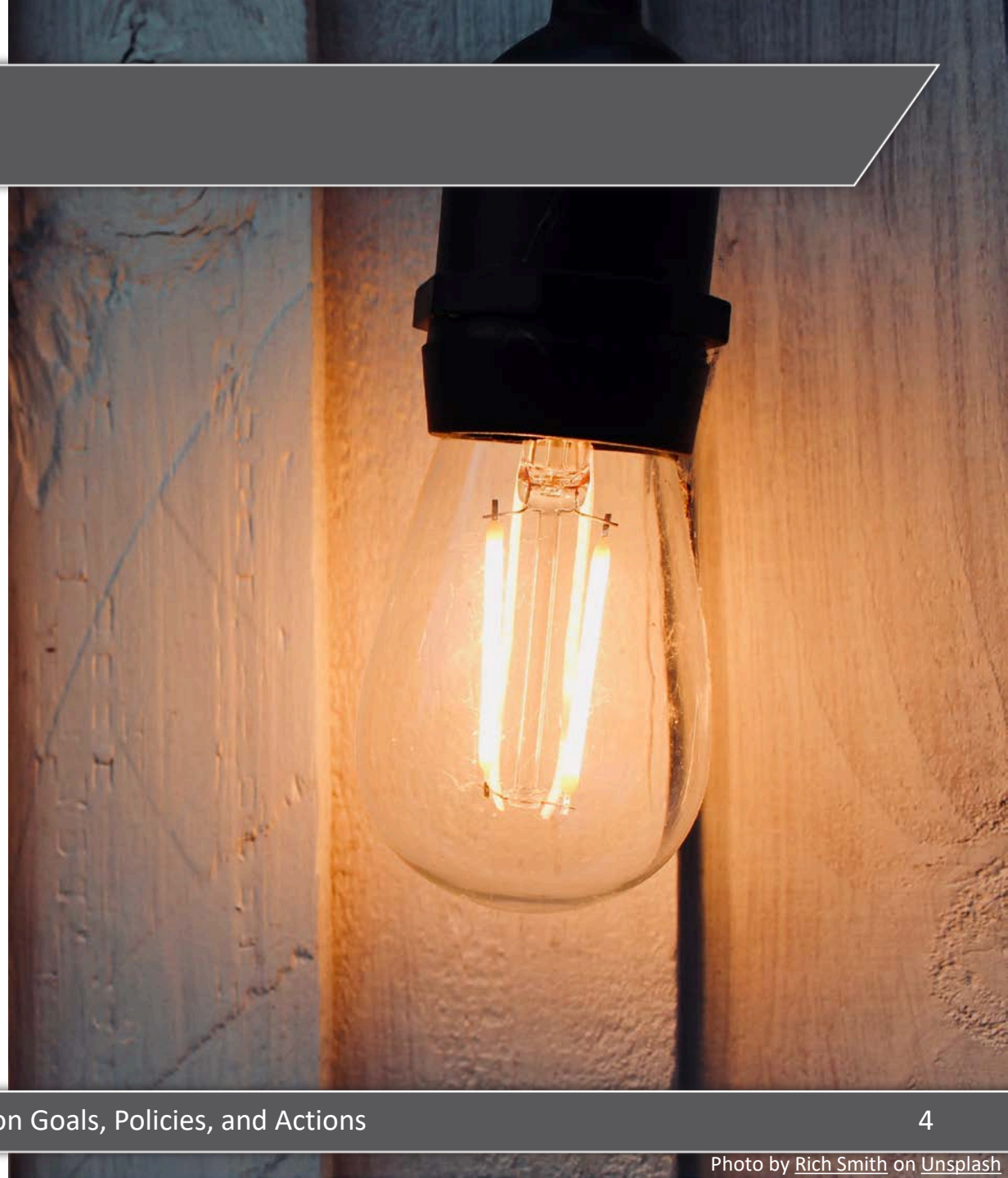


Photo by Rich Smith on Unsplash

Evacuation, Traffic, Congestion

- New actions added
  - **Action 1.1.5. Evacuation Access.** Investigate potential congestion issues in the event of an evacuation and develop and maintain a list of residents who may have difficulty evacuating and provide evacuation options for residents with mobility challenges.
  - **Action 1.1.6. Evaluate Evacuation Route Capacity.** Evaluate evacuation route capacity, safety, and viability under a range of emergency scenarios and identify and implement mitigating actions.
  - **Action 1.1.7. Evacuation Alternatives.** Develop and employ evacuation alternatives and/or alternative emergency access routes in neighborhoods that have single ingress/egress.

Vulnerable Populations

- New actions added
  - **Action 1.2.4. Social Support Network.** Collaborate with the Carmel Foundation and other community-based organizations to develop an inventory of locations with isolated seniors and people with disabilities and develop a plan for a social support network to increase resilience to climate change.
  - **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.

Tree maintenance and Monterey Pines

- Revised action 2.1.2.
  - **Action 2.1.2. Increase Forest Resilience.** Update the Forest Management Plan to:

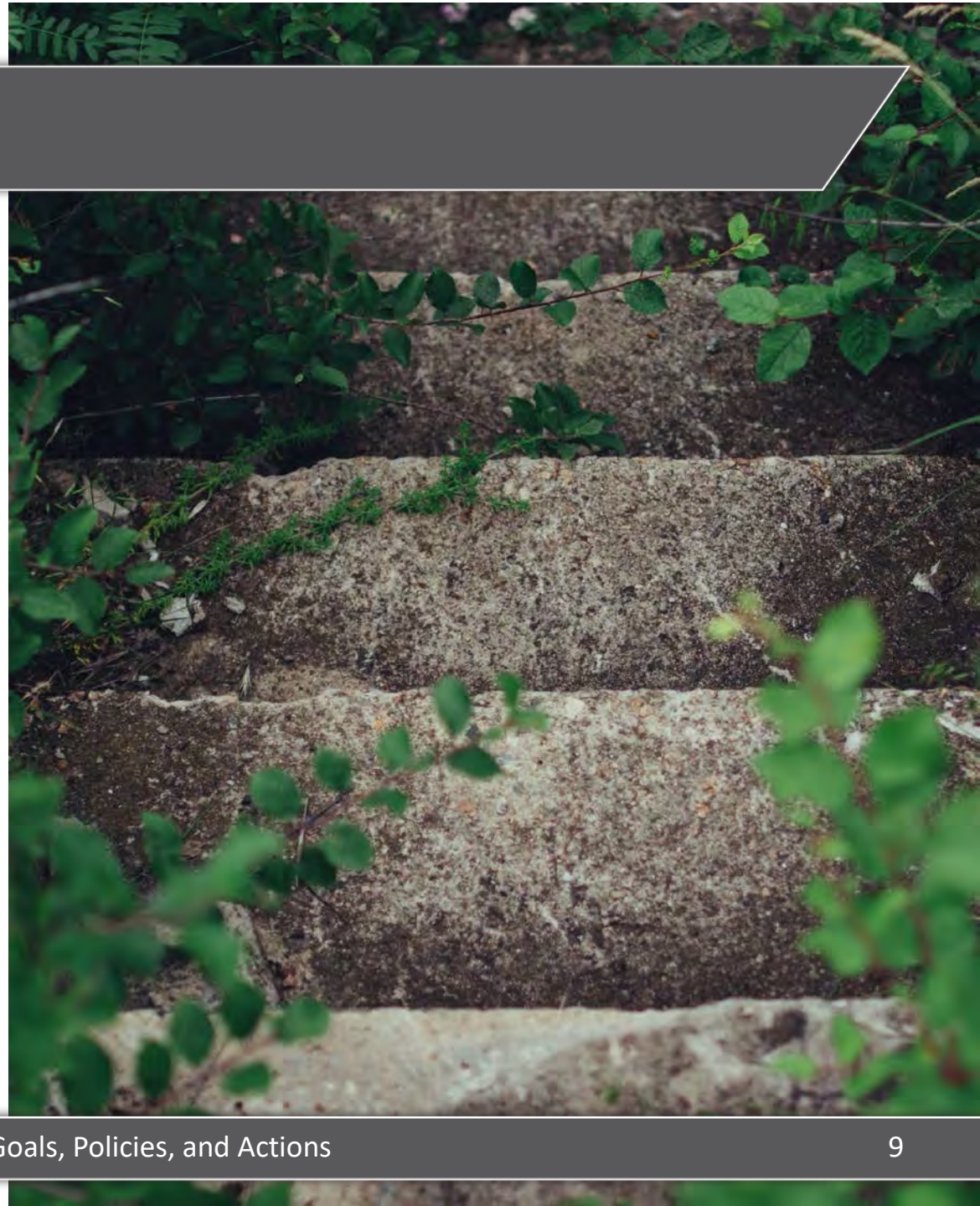
    1. Review and consider modifications to the preferred urbanized tree species that would result in improved resilience in the context of the expected climate of the second half of the century, reduce wildfire hazard, **and that takes into account aesthetics and the ecological benefits of natives or near-native (e.g., native species from the Southwestern US or Mexico would likely be preferred to European species).**
    2. Include planting **and maintenance** guidelines to improve tree health, particularly in the public right-of-way
    3. Incorporate tree species that have greater drought and wildfire resistance
    4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property.
    5. Enhance carbon sequestration potential

Stormwater Runoff and Wastewater

- New actions added
  - **Action 3.1.3. Reduce Stormwater Runoff.** Reduce stormwater runoff through implementation of a stormwater diversion project to divert all dry weather flows and first flush runoff to the large sanitary sewer that runs along San Antonio Avenue, such that they can be directed to the Wastewater District.
  - **Action 3.1.9. Wastewater Treatment.** Collaborate with the Carmel Area Wastewater District (CAWD) to increase the facility's resilience to sea level rise and stronger storms, and incentivize reduction of water use in the community and transitioning to reclaimed water use for irrigation. Maintain staff/council personnel as liaisons to CAWD.

Next Steps

- **Present** the goals, policies, and actions at the November 18th public workshop
- **Collect** comments from the public
- **Refine** the goals, policies, and actions based on public and climate committee comments



Thank you for your time!

Questions?

Appendix C
Outreach

Presentation Slide Deck from November 18, 2021, Public Workshop

CITY OF CARMEL-BY-THE-SEA

WORKSHOP

Climate Adaptation and Greenhouse Gas Reduction Strategies for Carmel

Climate Committee

November 18, 2021

Workshop Agenda & Logistics

- Project Background
- Carmel Vulnerability to Climate Change
- Carmel Greenhouse Gas Reduction Goals
- Forum: Vision for the Future in Carmel
- Forum: Review of Potential Climate Adaptation and Greenhouse Gas Reduction Strategies

- Providing comments during the workshop
- Providing comments after the workshop

Project Background

- Climate Action and Adaptation Project initiated during Fiscal Year 2019/2020
  - Action: reducing greenhouse gas emissions
  - Adaptation: Developing strategies to adapt to the changing climate
- Climate Committee formed in Fall 2019 with 8 members:
  - 2 Council members: Jeff Baron and Carrie Theis
  - 4 members of the public: John Hill, Michael LePage, Scott Lonergan, LaNette Zimmerman
  - 2 staff members: Agnes Martelet, Environmental Compliance Manager, Evan Kort, Associate Planner
- Consultants: Rincon Consultants, LSA Associates

Progress to Date

- Monthly presentation series to better understand climate threats and opportunities for action in Carmel
- Outreach to community groups and regional partners
- Climate Change Vulnerability Assessment
- Greenhouse Gas Inventories and Draft Forecast
- List of Potential Adaptation Strategies
- List of Potential Strategies to reduce Greenhouse Gas Emissions

Climate Change Hazards

Climate Change Vulnerability Assessment

Stronger Storms
Wildfires
Sea Level Rise
Drought
Increased Temperatures
Fog Changes
Ocean Warming

Climate Change Hazards

Climate Change Vulnerability Assessment

Stronger Storms
Wildfires
Sea Level Rise
Drought
Increased Temperatures
Fog Changes
Ocean Warming

More intense storms projected

Climate Change Hazards

Climate Change Vulnerability Assessment

Stronger Storms
Wildfires
Sea Level Rise
Drought
Increased Temperatures
Fog Changes
Ocean Warming

Large, severe wildfires will continue to occur in the Central Coast region

Climate Change Hazards

Climate Change Vulnerability Assessment

Stronger Storms
Wildfires
Sea Level Rise
Drought
Increased Temperatures
Fog Changes
Ocean Warming

Monterey County is projected to experience ~5 feet in sea level rise by 2100

Climate Change Hazards

Climate Change Vulnerability Assessment

Stronger Storms
Wildfires
Sea Level Rise
Drought
Increased Temperatures
Fog Changes
Ocean Warming

Dry years are projected to get drier and are likely to be followed by dry years

Climate Change Hazards

Climate Change Vulnerability Assessment

Stronger Storms
Wildfires
Sea Level Rise
Drought
Increased Temperatures
Fog Changes
Ocean Warming

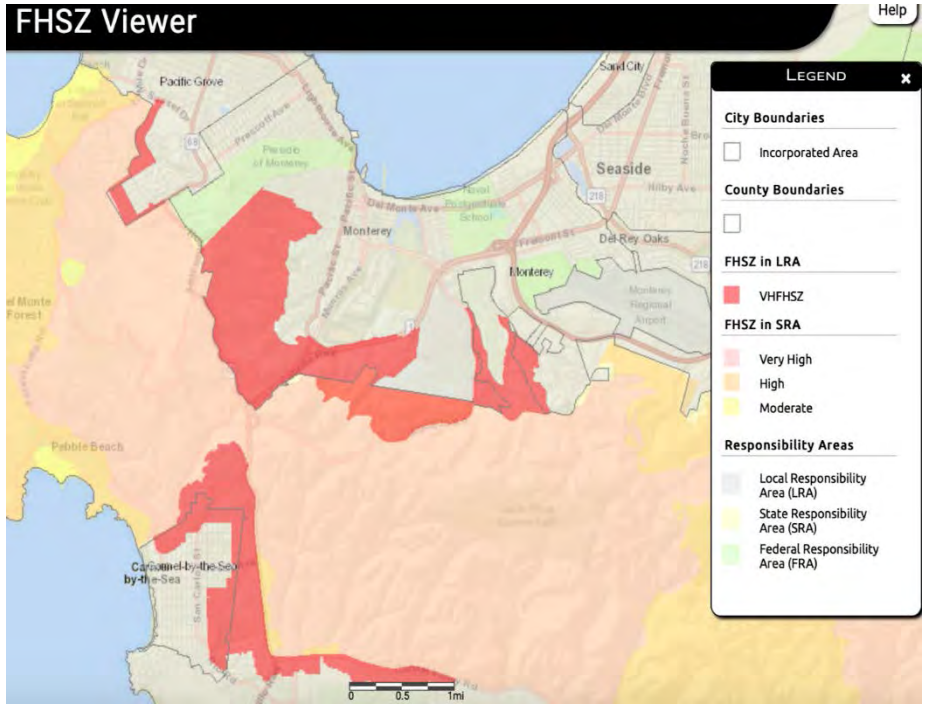
Annual average maximum temp is projected to increase by 3.3°F by mid-century and 6.3 °F by end of the century.

CBTS Assets to Consider

- Community
  - Elderly population and people with disabilities
  - Residents
  - Visitors
  - Local businesses and workers
- Natural Environment
  - Beach
  - Special Habitats and Open Spaces on land and in the ocean
  - Urban Forest
- Infrastructure and Built Environment
  - Utilities (incl. electricity, water, sewer, storm drainage)
  - Shoreline infrastructure (incl. access infrastructure and sea walls and revetments)
  - Critical community facilities
  - Downtown and residences

Vulnerabilities - Community

- Very High Fire Hazard Severity Zones (VHFHSZ) in Carmel
- Wildfire vulnerability can be reduced with better siting, landscape design, and building materials
- Lack of a plan for evacuating at-risk community members
- Lack of a plan to support at-risk workers and businesses



Vulnerabilities - Community

- Stronger storms could lead to localized flooding, which could isolate residents
- Increased temperature could lead to negative health impacts for older adults and individuals living with disabilities

Vulnerabilities – Natural Environment

- Increased tree stress due to increased heat, more variable water supply
- Open spaces with sensitive habitats will be impacted by stronger storms, hotter temperatures, drought, and wildfires
- Beach and dune loss from sea level rise
- Monterey Bay National Marine Sanctuary impacts from ocean warming and acidification
- Carmel's urban forest lacks age and species diversity

Vulnerabilities – Infrastructure

Utilities and Infrastructure:

- Access and utility infrastructure along the coastline
- Coastal protection infrastructure: revetments, sand ramps, and sea walls. Sea walls undercutting due to erosion and retreat of surrounding sand stone. 10 hot spots with significant damage after major storms (1982-83)
- Storm drain system only designed to handle 10-year storms and in need of repairs
- CAWD wastewater facility will need to be relocated by 2062
- Power grid impacts of wildfires and storms

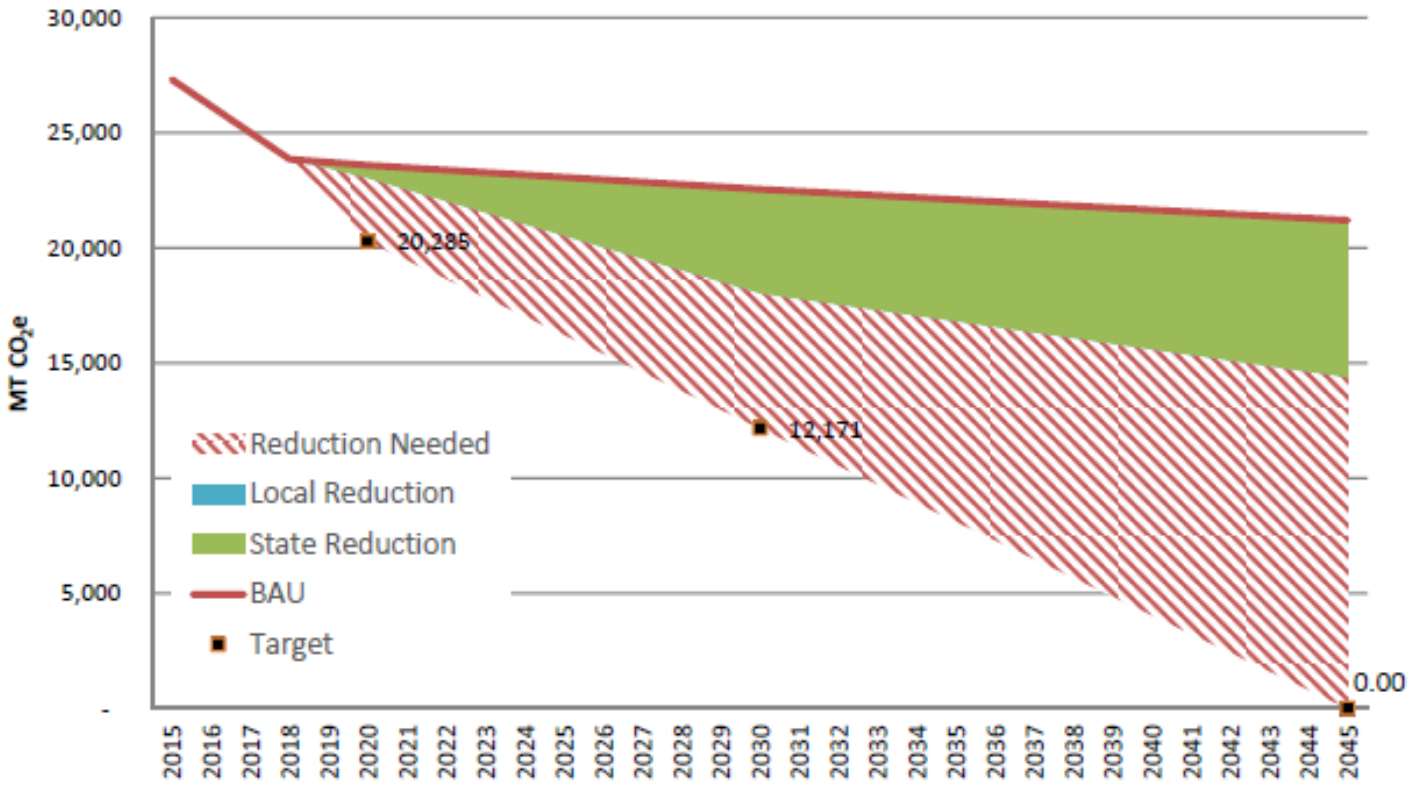
Vulnerabilities – Built Environment

- City Planning guidelines conflict with California fire codes in the VHFHSZ
- Lack of defensible space around homes
- Extreme heat may lead to increased use of air condition which could tax the electrical grid
- Lack of cooling infrastructure

Climate Change Mitigation

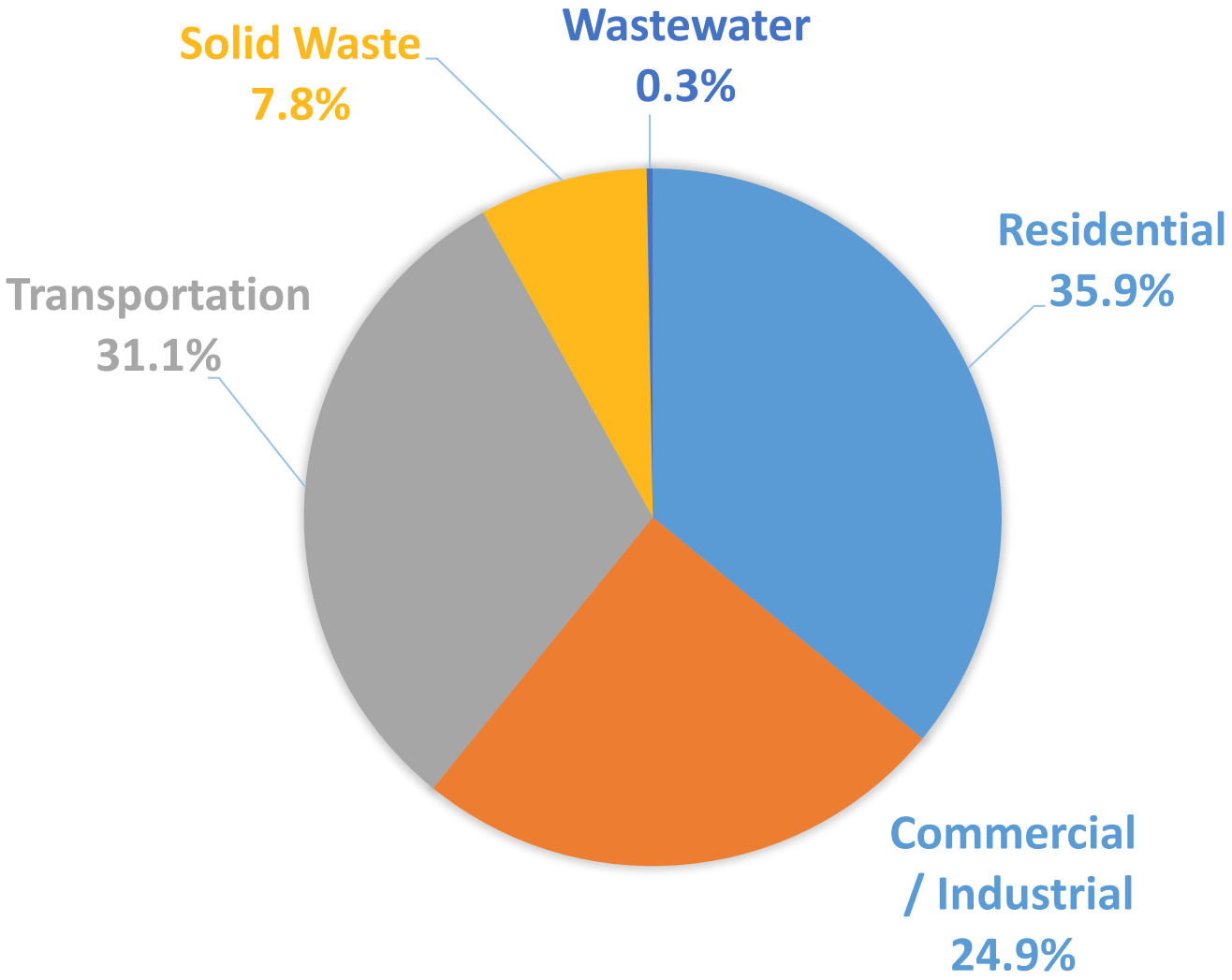
Carmel Greenhouse Gas Reduction Goals

FIGURE 1: State and Local Reductions Comparison with Targets
City of Carmel-By-The-Sea, 2015 - 2045



State measures and reduction goals are estimated based on the 2015 *GHG Inventory and Population Forecasting* by AMBAG. Targets are set based on CARB recommendations using the 2015 GHG Inventory as a baseline (2020 target = 15% reduction from 2015 emissions, 2030 target = 40% reduction from the 2020 target, 2045 target = net zero emissions).

Carmel 2018 GHG Emissions by Sector



Forum: Envision Resilient Carmel in 2050

- What aspects of Carmel help the community's resilience? What actions have the city and constituents taken to reduce their impact and adapt to climate change?
- What does a resilient Carmel community look like? What outcomes are we hoping to achieve?

Forum: Envision Sustainable Carmel in 2050

Mural

Potential Strategies for Adaptation and GHG Reduction

Structure:

- **Goals** –Broad statements describing community desires
- **Policies / Measures** –Specific position statements that support the achievement of goals and serve as guides to the City when making decisions
- **Actions** –Specific methods to implement and achieve policies and goals.

Potential Adaptation Goals

Goal 1. A Healthy, Safe, and Resilient Community

Goal 2. A Natural Environment Resilient to Climate Hazards

Goal 3. Resilient Infrastructure and Built Environment

Goal 1. A Healthy, Safe, and Resilient Community

Policy 1.1. Provide effective emergency preparedness and response in anticipation of potential climate-related disasters.

Action 1.1.1 .Improve Emergency Preparedness by incorporating Climate Change risk in CERT programming

Action 1.1.2. Collaborate with Monterey Fire on inspection and outreach for fire risk reduction

Action 1.1.3. Publicize Local Evacuation Routes

Action 1.1.4. Maintain and Update Evacuation Plan

Action 1.1.5. Evacuation Access for residents with disabilities

Action 1.1.6. Evaluate Evacuation Route Capacity

Action 1.1.7. Evacuation Alternative

Action 1.1.8. Update City Planning Guidelines in the Fire Hazard Zones

Action 1.1.9. Development Standards in the Fire Hazard Zones.

Action 1.1.10. Increase Resistance to Wildfire Structural Damage.

Goal 1. A Healthy, Safe, and Resilient Community

Policy 1.2. Focus adaptation efforts and engagement on the most vulnerable populations.

Action 1.2.1. Establish a Resilience Hub.

Action 1.2.2. Limit the Impacts of Climate Change on the Most Vulnerable Populations.

Action 1.2.3. Educate the Community.

Action 1.2.4. Social Support Network.

Action 1.2.5. Back-up Power for Vulnerable Populations

.

Goal 1. A Healthy, Safe, and Resilient Community

Policy 1.3. Minimize health impacts of climate change.

Action 1.3.1. Partner with Monterey County Health Department.

Action 1.3.2. Initiate a Heat Pump Retrofit Program.

Action 1.3.3. Improve Resilience in Critical Facilities.

Action 1.3.4. Conduct a Feasibility Study for Existing Building Electrification.

Action 1.3.5. Improve Resilience in Housing Stock.

Action 1.3.6. Electrify Fireplaces.

Action 1.3.7. Identify Funding and Financing.

Goal 1. A Healthy, Safe, and Resilient Community

Policy 1.4. Increase Economic Resilience

Action 1.4.1. Support Displaced Workers.

Action 1.4.2. Establish Partnerships to Develop a Resilient Economy.

Action 1.4.3. Business Resilience Outreach Program.

Forum: Adaptation Strategies for Community Resilience

- Did we miss anything?
- Which policies and actions should be prioritized for Community Resilience?

Forum: Adaptation Strategies for Community Resilience

Mural

Goal 2. A Natural Environment Resilient to Climate Hazards

Policy 2.1. Protect and restore climate-vulnerable habitat and ecosystems.

Action 2.1.1. Increase Funding for Climate Adaptation.

Action 2.1.2. Increase Forest Resilience and Update the Forest Management Plan

Action 2.1.3. Update the Mission Trail Nature Preserve Master Plan to increase resilience

Action 2.1.4. Increase Resilience of the North Dunes

Action 2.1.5. Increase Resilience to Stronger Storms by sizing improvements for larger storms

Action 2.1.6. Beach Sand Monitoring Program

Action 2.1.7. Carmel Cove Sand Supply Analysis

Forum: Adaptation Strategies for Natural Environment Resilience

- Did we miss anything?
- Which policies and actions should be prioritized for Natural Environment Resilience?

Forum: Adaptation Strategies for Natural Environment Resilience

Mural

Goal 3. Resilient Infrastructure and Built Environment

Policy 3.1. Support greater resilience, redundancy, and reliability of local and regional infrastructure and the built environment.

Action 3.1.1. Evaluate Undergrounding Utilities in Fire Hazard Zones

Action 3.1.2. Increase Green Infrastructure.

Action 3.1.3. Reduce Stormwater Runoff.

Action 3.1.4. Storm Drain Repair Funding and Improvements.

Action 3.1.5. Retrofit Existing Critical Buildings and Related Infrastructure to handle Climate Hazards.

Action 3.1.6. Water Conservation.

Action 3.1.7. Bluff Structural Monitoring Program.

Action 3.1.8. Hire Coastal Engineer to evaluate coastal protection infrastructure.

Action 3.1.9. Wastewater Treatment.

Goal 3. Resilient Infrastructure and Built Environment

Policy 3.2. Incorporate climate change adaptation into relevant plans and standards.

Action 3.2.1. Develop a Guidance Project Checklist.

Action 3.2.2. Incorporate Climate Change Adaptation into Local Plans.

Action 3.2.3. Update Shoreline Management Plan.

Action 3.2.4. Multi-Jurisdictional Hazard Mitigation Plan.

Forum: Adaptation Strategies for Infrastructure Resilience

- Did we miss anything?
- Which policies and actions should be prioritized for Infrastructure Resilience?

Forum: Adaptation Strategies for Infrastructure Resilience

Mural

Greenhouse Gas Reduction Policies for the Built Environment

Goal 1/3: Increase Energy Efficiency in Existing Residential and Commercial Units

- Energy Efficiency education and recognition in the residential and commercial sectors.
- Increase participation in energy efficiency programs.
- Home / Business Energy Evaluations.
- Residential home / Commercial energy renovations.
  - Promote participation in green building programs.
  - Provide incentives to homeowners / businesses to convert to electrification.
  - Streamline the permitting process for energy efficiency retrofits.
  - Require green building programs for large commercial renovations

Greenhouse Gas Reduction Policies for the Built Environment

Goal 2/4: Increase Energy Efficiency in New Residential / Commercial Units

- Educate City staff and the community on future Title 24 compliance.
- Promote Tier 1 and Tier 2 Green Building Standards.
- Incentivize electrification in new residential/commercial units.
- Streamline the permitting process for Tier 1 and Tier 2 Green Building applications

Goal 9: Increase Clean Energy Use

- Incentivize solar panel installation for residential and small commercial.
- Promote energy storage systems installation with solar panels.
- Require large commercial renovations to install solar panels.
- Encourage residents and businesses to participate in the 3CE 100 percent renewable Program.

Forum: Greenhouse Gas Reduction Policies for the Built Environment

- Did we miss anything?
- Which policies and actions should be prioritized?

Forum: Greenhouse Gas Reduction Policies for the Built Environment

Mural

Greenhouse Gas Reduction Policies

Goal 5: Energy Efficiency Through Water Conservation

- Exceed State Water Efficiency Standards.
- Recycled water for certain types of commercial and multi-family landscaping.
- Grey Water Systems.
- Promote rainwater harvesting.

Goal 6: Decrease Energy Demand by Reducing the Heat Island Effect.

- Maintain the health of the Urban Forest Canopy.
- Modify codes to allow light reflecting surfaces on rooftops (cool roofs).
- Where feasible, use cool pavement options when repaving roadways.

Greenhouse Gas Reduction Policies

Goal 7: Decrease GHG Emission By Reducing VMT.

- Develop Bicycle Master Plan.
- Ride Sharing and Bike to Work Programs.
- Electric Vehicle Infrastructure.
- Neighborhood Electric Vehicles (NEV) and NEV Shuttles.
- Shuttle service between the Monterey Airport and destinations in the City.

Goal 8: Reduce Solid Waste

- Promote Zero Waste events.
- Promote home composting.
- Promote reusable containers rather than recyclables.
- Educate the community on use of City provided containers.

Forum: Greenhouse Gas Reduction Policies

- Did we miss anything?
- Which policies and actions should be prioritized?

Forum: Greenhouse Gas Reduction Policies

Mural

Next Steps

- Refine Strategy Tables based on feedback from the Workshop
- Develop cost ranges and implementation timelines, and identify primary implementation parties
- Finalize Climate Adaptation and Action Plans

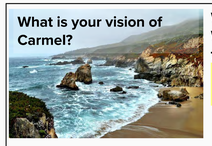
CITY OF CARMEL-BY-THE-SEA

Thank you for participating!

Contact for comments:
amartelet@ci.carmel.ca.us

Appendix C
Outreach

Interactive Activity Results from November 18, 2021, Public Workshop



What is your vision of Carmel?

What aspects of Carmel help the community's resilience? What actions have the city and constituents taken to reduce their impact and adapt to climate change?

- Safety during weather events.
- Equity/vulnerable community risk
- Vision associated with each asset
- What are the top priorities around assets. What are the costs associated with them?
- Non action is WAY more expensive

What does a resilient Carmel community look like? What outcomes are we hoping to achieve?

Goal 1. A Healthy, Safe, and Resilient Community

Policy 1.1. Provide effective emergency preparedness and response in anticipation of potential climate-related disasters.

- Maintaining and updating the evacuation plan should be higher in the priority list.
- Fire and the elderly are a high priority
- I think creating a comprehensive plan for the elderly community would be a priority
- The Fossils community certification seem like a great opportunity for Carmel because the town is so small and its overlap with the Fossils certification would be awesome!
- Presentation on this. Very interesting.
- Provide adaption to keep the urban forest healthy
- 11.8 and 9... Why limit to high fire severity zones, make it Citywide.
- Consistent building code
- Permit streamlining for high performing projects.

Policy 1.2. Focus adaptation efforts and engagement on the most vulnerable populations.

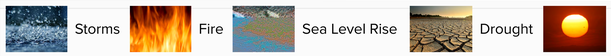
- Connecting the plans and implementing them.
- The residents that care about protection, versus what to go and/or get info. The residents that aren't care about protection, how do we engage with (retiree/ vacation rental/ home owners)
- Second home owners hard to reach
- Social media, public workshops
- Neighborhood Organizations
- Update codes to match and not conflict with CA codes. (Fire for example)
- Wine and Dine approach! Have some parties to reach the community.

Policy 1.3. Minimize health impacts of climate change.

- Make it clear why electrification is an adaptation issue.
- More specific actions under the policies
- Clear and implementable actions
- More SMART goals
- The youth center as a resilience location. Water treatment, elderly communities.
- Health impacts of natural gas combustion
- What does educate the community mean?
- Smaller steps that add up to larger actions (more detail)

Policy 1.4. Increase Economic Resilience

Goal 2. A Natural Environment Resilient to Climate Hazards



Policy 2.1. Protect and restore climate-vulnerable habitat and ecosystems.

- Not able to hire shoreline engineer (beach sand analysis)
- Add action to hire a shoreline engineer to better understand issues / Opportunities
- Consider hiring a grant writer to gain additional funding.
- Might be an action to add.
- Make a distinction between parks and urban forest?
- Urban forest is not the same as parks
- Pescadero Canyon as a fire safety issue
- Add "urban" to 2.1.2
- Improved parklands vs. forests
- habitat value, corridors
- For forest resilience, maybe reach out to CSUMB to conduct an analysis on the current state of the forest?
- Urban forest is important to town.
- What does that look like?
- Forest and Beach commission
- Hill Park is in desperate need for major renovation work. *I'd never take children there.*
- Not controlled burns in Carmel! But in Del Monte Forest and Jacks Peak.

Goal 3. Resilient Infrastructure and Built Environment

Policy 3.1. Support greater resilience, redundancy, and reliability of local and regional infrastructure and the built environment.

- I'm almost positive that dual plumbing is to code. It's a requirement for structure to reuse (a graywater for toilet flushing and irrigation. If I understand that correctly.
- Intelligent landscaping design can definitely reduce water runoff
- Do not think Carmel city code allows graywater?
- CA allows washing machine graywater only. I believe without a permit as well.

Policy 3.2. Incorporate climate change adaptation into relevant plans and standards.

Climate Mitigation

Goal 1/3: Increase Energy Efficiency in Existing Residential and Commercial Units

- Looking for ideas for personal actions community can take
- Housing stock will be around for quite a while and most of the housing stock came built a long time ago. Improvements can be made by increasing the efficiency of existing housing stock is crucial
- Synergies between energy efficiency and adaptation
- Ways to shift towards solar
- Heat pumps!
- Largest source of emissions. Hard to make mandatory
- How do we incentivize?
- Under the new infrasturture Federal program monies are being funneled to both counties and cities if we stay on top of the rollout.
- Panel Upgrades as a major hurdle
- Technological shifts (away from solar hot water towards electrification)
- Limit/eliminate natural gas hookups - Reach Codes (City of Berkeley Example)
- Title 24 is the lowest requirements. City should go above and beyond.

Goal 2/4: Increase Energy Efficiency in New Residential / Commercial Units

- Reach Codes. Santa Cruz as an example City.
- EV Ready Codes
- Battery storage ready
- Need to include remodels as well.
- Add to Water requirements (already in T.24)
- "REQUIRE"
- Thresholds for remodels?
- Hook to fire sprinkler requirement

Goal 9: Increase Clean Energy Use

Goal 5: Energy Efficiency Through Water Conservation

- hard to make storage tank pencil out, but greywater could be good
- dual plumbing code
- "Greywater ready"
- Need incentives
- Does carmel have non-potable water now? Purple pipe?

Goal 6: Decrease Energy Demand by Reducing the Heat Island Effect.

Goal 7: Decrease GHG Emission By Reducing VMT.

- EV chargers fits into rennovation well.
- Hotels as an important place for chargers.
- Public EV chargers are needed throughout town.
- Walking/biking villiage. Improve character.
- We will need public EV chargers. Ocean Ave., The Plaza and Sunset Center come to mind
- Need more VMT reduction policies
- Yes only two lanes on Ocean Ave. would be a great transition.
- Parking fees
- Reduce trips into town
- Bus use
- Free electric shuttles
- Shuttle services
- Bus passes
- More housing in town?
- worker housing near jobs?
- Drive only tourists
- Monterey Airport and Shuttle to town
- Take lanes away from cars and use for bikes/ ped.

Goal 8: Reduce Solid Waste

- Incentivize or require disassembly of buildings. (construction diversion requirements.)

Unnamed area
Unnamed area

What aspects of Carmel help the community's resilience? What actions have the city and constituents taken to reduce their impact and adapt to climate change?

Safety during weather events.

Equity/vulnerable community risk

Vision associated with each asset

What are the top priorities around assets. What are the costs associated with them?

Non action is WAY more expensive

Unnamed area

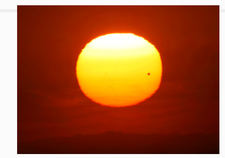
Goal 1. A Healthy, Safe, and Resilient Community

Storms

✔ Fire

Sea Level Rise

✔ Drought



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Goal 2. A Natural Environment Resilient to Climate Hazards

Storms

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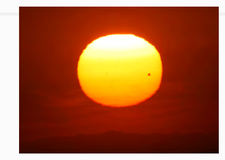

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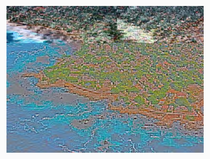

Sea Level Rise

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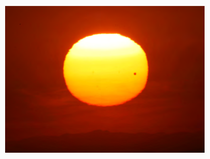

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Synergies between energy efficiency and adaptation

Ways to shift towards solar

Heat pumps!

Largest source of emissions. Hard to make mandatory

How do we incentivize?

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We will need public EV chargers. Ocean Ave., The Plaza and Sunset Center come to mind

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Yes only two lanes on Ocean Ave. would be a great transition.

Parking fees

Reduce trips into town

Driven by tourists

Bus use

Shuttle services

Free electric shuttles

Bus passes

More housing in town?

worker housing near jobs?

Monterey Airport and Shuttle to town

Take lanes away from cars and use for bikes/ ped.

Goal 8: Reduce Solid Waste

Incentivize or require disassembly of buildings. (construction diversion requirements.)

Appendix C
Outreach

Presentation Slide Deck from January 20, 2022, Climate Committee Meeting

RINCON CONSULTANTS, INC.

Environmental Scientists | Planners | Engineers

City of Carmel-by-the-Sea

Climate Adaptation Goals, Policies, and Actions

Climate Committee Meeting

Photo by Chris Leipelt on Unsplash

Agenda

- Progress to date
- Comments from 11/18/21 Public Workshop & how they were addressed
- Additions to the Adaptation Strategy
  - Timeframe, lead, costs
- Next Steps
- Questions/Discussion

Photo by anna breaux on Unsplash

Progress to Date

- Draft Adaptation Strategy developed (Aug)
- Updated Draft Adaptation Strategy based on Climate Committee comments (Sept/Oct)
- Revised Draft Adaptation Strategy shared at 11/18/21 public workshop
- Adaptation Strategy refined based on comments from public workshop
  - Timeframe, lead, and costs added to Adaptation Strategy

Photo by anna breaux on Unsplash

11/18/2021 Public Workshop Comment Categories

- Evacuation and senior residents
- Apply updated City Planning Guidelines and Development Standards citywide (not just in the VHFHSZ)
- Support for more partnerships in engagement efforts
- Need for a grant writer
- Desire for more specific actions
- Support for policies/actions already in place (e.g., evacuation, vulnerable communities, Firewise Community certification, and more)

Photo by Leon on Unsplash

Evacuation and Senior Residents

- A clear evacuation plan for seniors in the community was suggested.
- **Action 1.1.1** revised:
  - **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.

Photo by Fabian Quintero on Unsplash

Planning Guidelines and Development Standards

- It was suggested that City Planning Guidelines and Development Standards apply citywide rather than only in the Very High Fire Hazard Severity Zone (VHFHSZ)
- Actions revised:
  - **Action 1.1.8. 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.
  - **Action 1.1.9. Development Standards.** Evaluate City's development standards for consistency with best practices for reducing wildfire risk for both new and existing development, including but not limited to incorporating defensible space design in landscaping guidelines.

More Partnerships for Engagement

- Many additional potential outreach partnerships and ideas for new outreach methods suggested.
- Examples of Actions revised:
  - **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.
  - **Action 1.2.3. Engage the Community.** Ensure the community knows 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.

Grant Writer

- Action added
  - **Action 1.4.4. Hire a Grant Writer.** Hire a grant writer to ensure implementation of the City's adaptation strategy.

Photo by Kaitlyn Baker on Unsplash

Desire for More Specific Actions

- Actions are specific while still leaving room to refine based on new information received during the implementation process.
- Specific examples of potential projects will be included under select actions in the Carmel Climate Change Adaptation Plan.

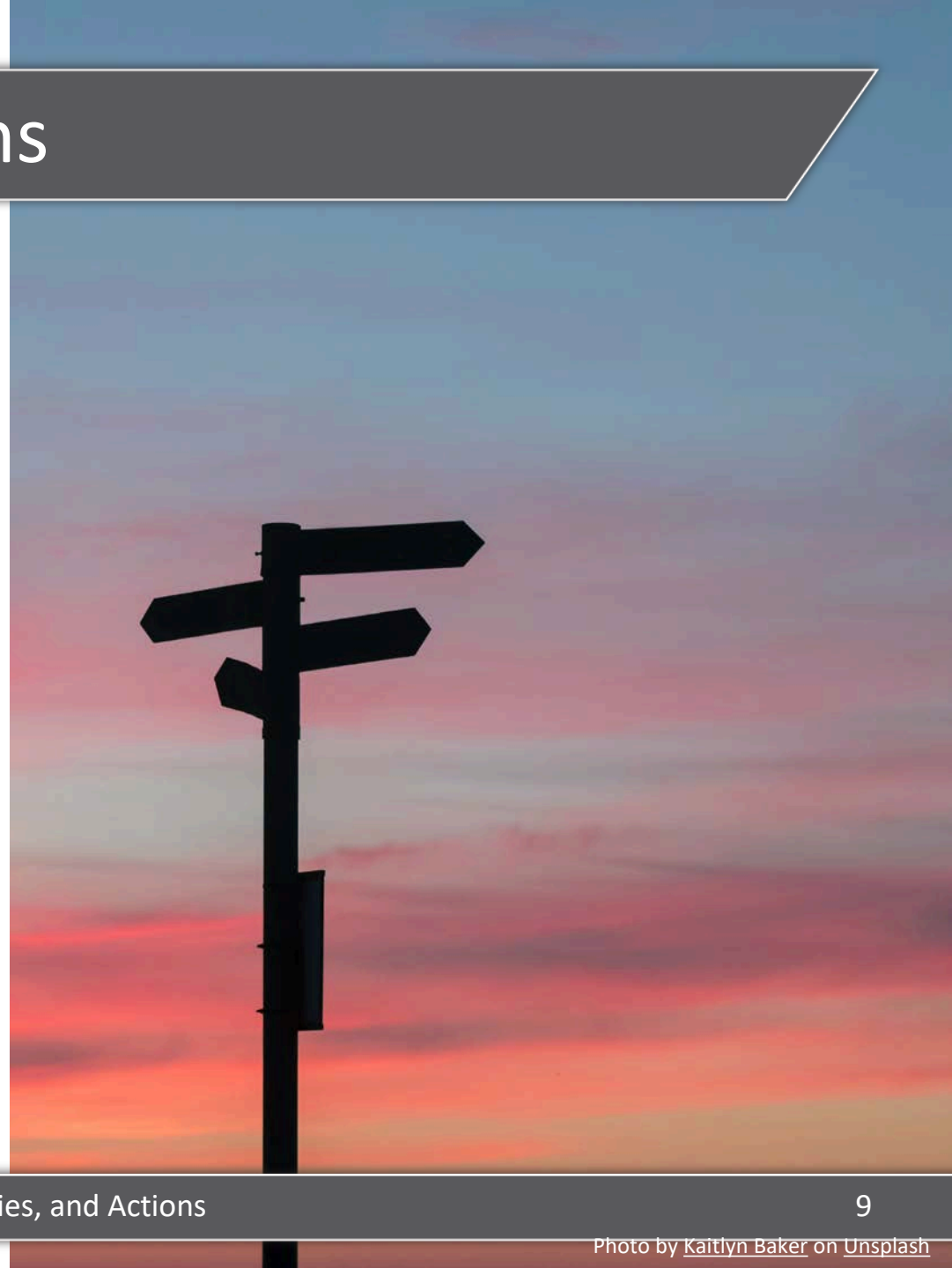


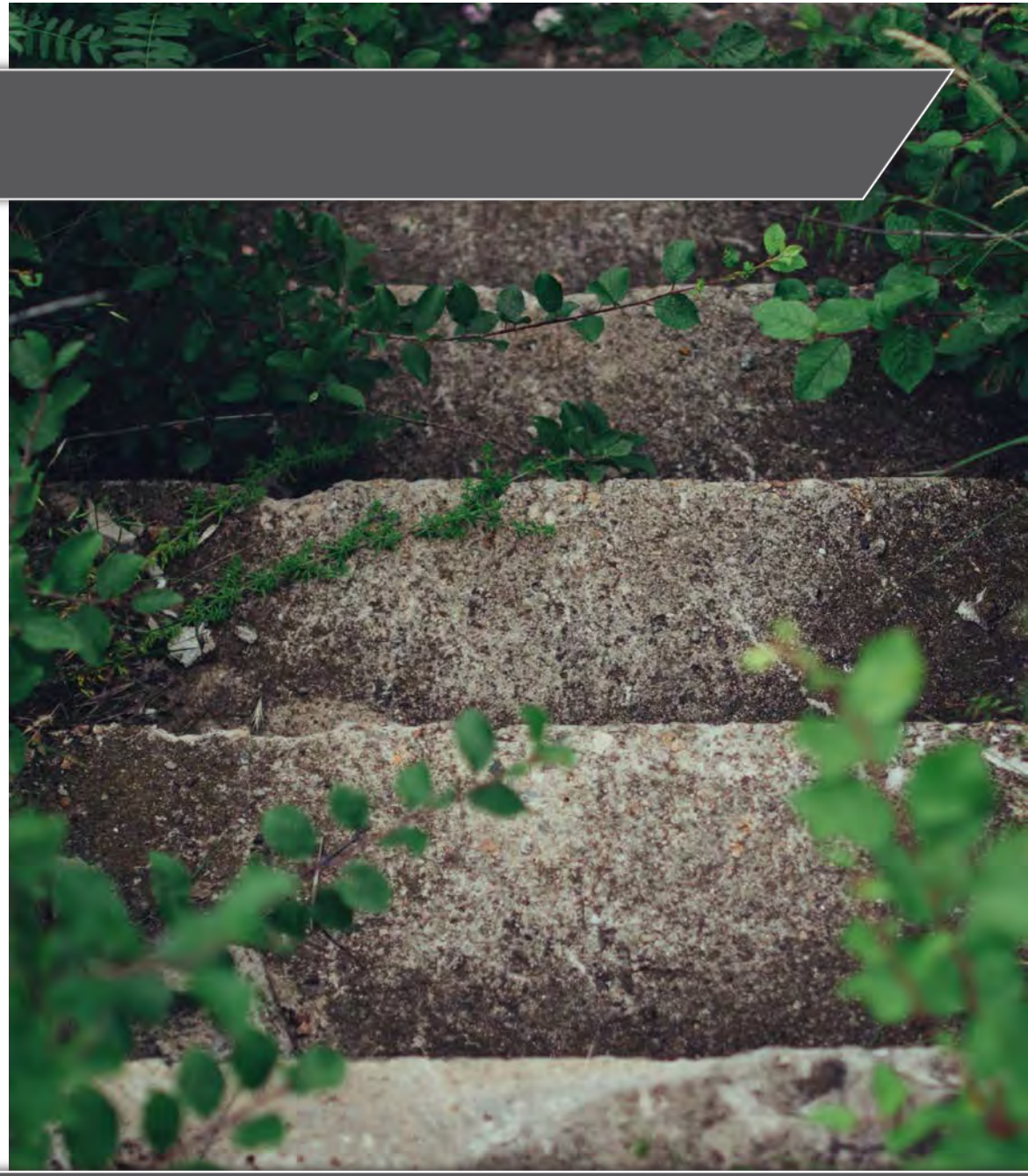
Photo by Kaitlyn Baker on Unsplash

Additions to the Adaptation Strategy

Timeframe	Potential Lead	Cost
Near-term (1-2 years); Mid-term (3-5 years); Long-term (5-10 years)		$-Low (<$50K); $$-Medium ($50K - $100K); $$$-High (>$100K)
Near-term and Ongoing	Police & Fire	$

Next Steps

- **Prepare** Adaptation Report January - February
- **Share** Adaptation Report with Climate Committee in March
- **Present** Adaptation Report to Commissions and City Council for feedback and approval April - May



Thank you for your time!

Questions?

Appendix C
Outreach

Response to Comments Received From September 2021 to January 2022

Commenter	Comment	Response
Scott Lonergan	Reducing polluted runoff from going into the Bay (even if just in the form of investigation). Might be able to use Rio Park as a settling pond to capture some urban runoff	**Added the following action:** **Action 3.1.3. Reduce Stormwater Runoff.** Reduce stormwater runoff through implementation of a stormwater diversion project to divert all dry weather flows and first flush runoff to the large sanitary sewer that runs along San Antonio Avenue, such that they can be directed to the Wastewater District.
Scott Lonergan	Electrification, how will these be reconciled with CAP, maybe adaptation plan is not the place for these sorts of actions.	**The electrification actions will remain in the list of potential adaptation strategies to share with the public, but it is noted that some Climate Committee Members would prefer to move these types of strategies to the Climate Action Plan.**
Scott Lonergan	3.2.2. consider including traffic congestion/pedestrian (add here or create new item)	**Updated policy below to include investigation of congestion issues in the event of an evacuation. Additional evacuation policies added. More transportation (including active and public transportation) will be included in the Climate Action Plan.** **Action 1.1.5. Evacuation Access.** Investigate potential congestion issues in the event of an evacuation and develop and maintain a list of residents who may have difficulty evacuating and provide evacuation options for residents with mobility challenges. **Action 1.1.6. Evaluate Evacutaion Route Capacity.** Evaluate evacuation route capacity, safety, and viability under a range of emergency scenarios and identify and implement mitigating actions. **Action 1.1.7. Evacuation Alternatives.** Develop and employ evacuation alternatives and/or alternative emergency access routes in neighborhoods that have single ingress/egress.
Scott Lonergan	2.1.2. including planning AND maintenance	**Added "maintenance" to action 2.1.2.** **Action 2.1.2. Increase Forest Resilience.** Update the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. Enhance carbon sequestration potential
Linda Smith + Scott Lonergan	Suggest re-writing Action 2.1.2. Action 2.1.2. Increase Forest Resilience. Update the Forest Management Plan to: 1. 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. 2. Include planting and maintenance guidelines to improve tree health particularly in the public right-of-way 3. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 4. Enhance carbon sequestration potential	**Action 2.1.2. updated to reflected recommended changes.** **Action 2.1.2. Increase Forest Resilience.** Update the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. Enhance carbon sequestration potential
Salmeh Moghimi	Wood-burning smoke falls under the umbrella of supporting climate change and should be considered as it contributes to air pollution and GHG emissions	**Action 1.3.6., shown below, is maintained in the list of potential adaptation strategies to address the health risk of wood-burning fire places.** **Action 1.3.6. Electrify Fireplaces.** Explore the feasibility of incentivizing electric fire places and induction ranges for existing and new development. Develop outreach materials explaining the health, environmental, and potential cost benefits of switching to electric fire places and induction ranges.
Jeff Baron	Emission from wood smoke, is an environmental issue, but is not within the scope of the climate change committee. That's more likely to be the Planning commission, for one, and failing that, the city council, though the Forest and Beach commission does manage some (other) aspects of the environment. My fear is that if the climate committee begins to take on items that are outside of our specific purview, it will begin to dilute the strength of the climate change message that we are endeavoring to deliver.	**Action 1.3.6., shown below, is maintained in the list of potential adaptation strategies to address the health risk of wood-burning fire places. However, it is noted that Climate Committee members believe this is out of the scope of adaptation.** **Action 1.3.6. Electrify Fireplaces.** Explore the feasibility of incentivizing electric fire places and induction ranges for existing and new development. Develop outreach materials explaining the health, environmental, and potential cost benefits of switching to electric fire places and induction ranges.
John Hill	Action 1.1.7. add "neighborhoods within" before "Carmel-by-the-Sea	**Recommended changes made to Action 1.1.7. (now 1.1.10.)** **Action 1.1.10. Increase Resistance to Wildfire Structural Damage.** Evaluate the feasibility of gaining Firewise Community Certification in neighborhoods within Carmel-by-the-Sea.
John Hill	Action 1.3.2. Replacing cooling with "water heating and space heating" and heating with "cooling"	**Recommended changes made to Action 1.3.2.** **Action 1.3.2. Initiate a Heat Pump Retrofit Program.** Create a program to aid homeowners in converting to heat pumps, which provide water heating and space heating in addition to cooling and can improve indoor air quality.
John Hill	Action 1.3.4. add "reducing or" before eliminating and words like "incentivize" instead of require. Softer language would be better.	**Recommended changes made to Action 1.3.4.** **Action 1.3.4. Conduct a Feasibility Study for Existing Building Electrification.** Perform an electrification feasibility study/existing building analysis in order to understand the potential for, and associated costs of, electrification retrofitting, including heat pumps, on-site energy generation, and battery storage, in the City of Carmel-by-the-Sea and establish a plan for reducing or eliminating natural gas from existing buildings and building resilience to potential electrical grid shutoffs. **Recommended changes made to Action 3.2.5 from "require" to "provide incentives" (this is the only action that included the term "require") (now 3.1.5.)** **Action 3.1.5. Retrofit Existing Critical Buildings and Related Infrastructure.** Provide incentives to ensure that all first responder and municipal facilities are properly retrofitted for existing and future 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.
John Hill	Action 1.3.6. add "and induction ranges" after electric fire places	**Recommended changes made to Action 1.3.6.** **Action 1.3.6. Electrify Fireplaces.** Explore the feasibility of incentivizing electric fire places and induction ranges for existing and new development. Develop outreach materials explaining the health, environmental, and potential cost benefits of switching to electric fire places and induction ranges.
John Hill	Action 2.1.1 add "for downtown and" before in the Mission Trail...	**Recommended changes made to Action 2.1.5. - made broader by saying designing projects in the city (rather than just downtown or Mission Trail).** **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.
John Hill	Action 2.1.4. Reword second sentence to: "Coordinate with CAL FIRE, Carmel, and the Monterey Fire Departments to..."	**Recommended changes made to Action 2.1.3.** **Action 2.1.3. Increase Resilience of the Mission Trail Nature Preserve.** Update 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 CAL FIRE and the Monterey Fire Departments to incorporate Best Practices into an annual maintenance plan, including cost estimates for implementation and revenue sources for implementation.
John Hill	Action 3.1.1 (and maybe others) be clearer about whether we are talking about city owned buildings or all buildings (could provide incentives for residential and commercial buildings too.	**Action 3.1.1. removed as it was reduntant with 1.3.3.**
John Hill	3.1.2 and 3.1.4 are redundant - can combine	**Policies 3.1.2. and 3.1.4. combined. Now 3.1.1.** **Action 3.1.1. Underground Utilities in Fire Hazard Zones.** Determine the feasibility of undergrounding power lines in the Mission Trail Nature Preserve and designated evacuation routes.
Jeff Baron	Would like to see more details for each action.	**More details not added to action list but can be provided for select measures in the report development phase.**
Jeff Baron	Concerns with banning gas fire places	**Electrification actions are kept in the list of potential adaptation strategies sheet, but it has been noted that some Climate Committee members prefer not to include these types of actions in the adaptation report**
Jeff Baron	1.1.3. publicize evacuation routes, not evacuation plans, issues with publicizing plans because it all depends on the type of hazard/event what evacuation will be possible. Only 1 or 2 main way out, big issue here.	**Recommended changes made to Action 1.1.3. Policy was split up as shown below.** **Action 1.1.3. Publicize Local Evacuation Routes.** Publicize both City and Monterey County evacuation routes for the community, especially among the most vulnerable, in the event of a wildfire or other disaster. **Action 1.1.4. Maintain and Update Evacuation Plan.** Maintain and update an Evacuation Plan every 8 years at a minimum to account for all types of emergencies. **Evacuation concern addressed with new policy** **Action 1.1.5. Evacuation Access.** Investigate potential congestion issues in the event of an evacuation and develop and maintain a list of residents who may have difficulty evacuating and provide evacuation options for residents with mobility challenges. **Action 1.1.6. Evaluate Evacuation Route Capacity.** Evaluate evacuation route capacity, safety, and viability under a range of emergency scenarios and identify and implement mitigating actions. **Action 1.1.7. Evacuation Alternatives.** Develop and employ evacuation alternatives and/or alternative emergency access routes in neighborhoods that have single ingress/egress.
Jeff Baron	1.2 - more emphasis. Carmel foundation - serves the elderly	**Two new actions added to address vulnerable populations.** **Action 1.2.4. Social Support Network.** Collaborate with the Carmel Foundation and other community-based organizations to develop an inventory of locations with isolated seniors and people with disabilities and develop a plan for a social support network to increase resilience to climate change. **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.
Jeff Baron	Goal 3 issue with water and sewer system, make sure city takes an active role. The City has one seat on water board and wastewater district elector - use these better. Evaluate Carmel's own drought risk/SLR rather than relying on these larger districts (CAWD etc.) Call out relationships in the plan.	**New action added related to wastewater treatment.** **Action 3.1.9. Wastewater Treatment.** Collaborate with the Carmel Area Wastewater District (CAWD) to increase the facility's resilience to sea level rise and stronger storms, and incentivize reduction of water use in the community and transitioning to reclaimed water use for irrigation. Maintain staff/council personnel as liaisons to CAWD.
Jeff Baron	Suggest moving Action 1.1.2, 1.1.5, 1.1.6, 1.1.7 (fire prevention strategies) to Goal 3, since Policy 1.1 says "... following a climate-related disaster"	**Fire prevention actions are maintained under Goal 1 and Policy 1.1. because these are related to emergency preparedness as well as response following a disaster. See updated Policy 1.1. language below.** **Policy 1.1.** Provide effective emergency preparedness and response in anticipation of potential climate-related disasters

Jeff Baron	Policy 1.3.4 belongs in the CAP, not this document (concern about access to enough power generation to be part of a micro-grid. More education needed before taking it further – concerns about batteries as well.)	**The electrification actions will remain in the list of potential adaptation strategies to share with the public, but it is noted that some Climate Committee Members would prefer to move these types of strategies to the Climate Action Plan.** **Modified Action 1.3.7. to address resilience concerns regarding power generation.** **Action 1.3.7. Identify Funding and Financing.** Work with partners like 3CE and PG&E to identify and promote potential resilience opportunities and accessible funding and financing mechanisms to pay for home electrification, weatherization, and battery backups.
Jeff Baron	Policy 1.3.6 also does not belong in this document	**The electrification actions will remain in the list of potential adaptation strategies to share with the public, but it is noted that some Climate Committee Members would prefer to move these types of strategies to the Climate Action Plan.**
Jeff Baron	Policy 1.4 - like this but it will be a sell - especially 1.4.1, and 1.4.2., and 1.4.3 (people that work in Carmel don't live in the City – needs more exploration of who is responsible – maybe not the City)	**Noted, this could be a good policy to focus more discussion around in the plan, and it will be important to identify a lead (likely not the City).**
Jeff Baron	Action 2.1.1 seems to refer to 2.1.4. Recommend keeping the policy unchanged, have the "overall funding action" first, and then three actions, one corresponding to MTNP, the urban forest, and the North Dunes. Consider adding one for the beach itself	**Actions were reorganized as recommended. A new action for Carmel Beach was not created, but two actions (previously 3.2.9, and 3.2.11) regarding Carmel Beach were moved to this section.** **Action 2.1.6. Beach Sand Monitoring Program.** Reinstate beach sand monitoring program described in the Shoreline Management Plan. **Action 2.1.7. Carmel Cove Sand Supply.** Reach out to local researchers (e.g., California State University Monterey Bay) or other sources to conduct Carmel Cove sand supply dynamics analysis.
Jeff Baron	Action 3.1.1. Encourage Energy Generation. Text seems to imply PV and other green systems, but that's biased towards green energy and implies discounting of generators, which probably have an important part in this action.	**Action 3.1.1. removed as it was redundant with 1.3.3.**
Jeff Baron	Action 3.1.2 - Updating the GP is not strong enough. "allocating monetary resources" is stronger, and probably belongs in more policies than just this one. Money should be more prominent in the report, I think, as should policies that require more than a simple GP update. In general, actions 3.1.2, 3.1.3, and 3.1.4, should refer to the same "type of thing" (like comment above about Action 2.1.1.) rather than being more	**Action 3.1.2 updated to include feasibility study, which would include cost. Reference to GP updates removed because it is too specific (and there are many more updates that will be required). In addition, Action 2.1.1. is to increase adaptation funding.** **Action 3.1.1. Underground Utilities in Fire Hazard Zones.** Determine the feasibility of undergrounding power lines in the Mission Trail Nature Preserve and designated evacuation routes. **Action 2.1.1. Increase Funding for Climate Adaptation.** Earmark Capital Improvement Program (CIP) funding for design, permitting, and implementation of adaptation projects, including stream stability study projects. Include strategies in the 2021 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) and Integrated Regional Watershed Management Program (IRWMP) for potential regional funding.
Jeff Baron	Action 3.2.2. and 3.2.1 overlap. Both are good but overlap should be removed and actions more fleshed out.	**Actions combined to eliminate overlap and a new action to reduce stormwater runoff was developed.** **Action 3.1.2. Increase Green Infrastructure.** Modify CIP project design and review approach 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. **Action 3.1.3. Reduce Stormwater Runoff.** Reduce stormwater runoff through implementation of a stormwater diversion project to divert all dry weather flows and first flush runoff to the large sanitary sewer that runs along San Antonio Avenue, such that they can be directed to the Wastewater District.
Jeff Baron	Action 3.2.3. and 3.2.4. closely related, might be better to have one action related to the storm drain, with a few sentences underneath it.	**Actions combined as recommended.** **Action 3.1.4. 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.
Jeff Baron	Action 3.2.9,3.2.10,3.2.1.., and 3.2.12, aren't "infrastructure" though 3.2.10 and 3.2.12 might be. Recommend moving these to the natural environment section, with a nod to the revetments etc. in the section of "infrastructure"	**Actions previously labeled 3.2.9 and 3.2.11 were moved to the natural environment section, the rest remain in the infrastructure section as they refer to coastal infrastructure.**
Jeff Baron	Don't see anything related to CAWD. Nor to regional roads (possible evacuation routes) or to regional electrical infrastructure or to waste management. Should be added.	**Actions related to CAWD, evacuation, and electrical infrastructure are included. Waste management actions should be included in the Climate Action Plan.** **Action 3.1.9. Wastewater Treatment.** Collaborate with the Carmel Area Wastewater District (CAWD) to increase the facility's resilience to sea level rise and stronger storms, and incentivize reduction of water use in the community and transitioning to reclaimed water use for irrigation. Maintain staff/council personnel as liaisons to CAWD. **Action 1.1.5. Evacuation Access.** Investigate potential congestion issues in the event of an evacuation and develop and maintain a list of residents who may have difficulty evacuating and provide evacuation options for residents with mobility challenges. **Action 1.1.6. Evaluate Evacutaion Route Capacity.** Evaluate evacuation route capacity, safety, and viability under a range of emergency scenarios and identify and implement mitigating actions. **Action 1.1.7. Evacuation Alternatives.** Develop and employ evacuation alternatives and/or alternative emergency access routes in neighborhoods that have single ingress/egress. **Action 3.1.1. Underground Utilities in Fire Hazard Zones.** Determine the feasibility of undergrounding power lines in the Mission Trail Nature Preserve and designated evacuation routes.
Jeff Baron	Would prefer if the policies and actions and goals more closely resembled the vulnerability matrix - it would be easier to track from that document to this one.	**The spreadsheet addresses all priority assets at risk identified in the vulnerability assessment (as described in the introduction tab of the adaptation strategy spreadsheet). At this stage, the policies, actions, and goals will not be reorganized given budget and timeline constraints, but can be organized differently for the report. To be discussed with the Committee.**
LaNette	Big jump – who's doing what?	**After the public workshop - a final list of adaptation actions will be developed and timeframe, lead agency/group, and cost will all be determined. The City will not be responsible for doing everything, but rather for coordinating with other agencies/groups.**
LaNette	1.4.1 workers – service workers are a huge asset to the City – no discussion currently on the impacts of climate change on them. Chamber of Commerce can be very helpful here.	**Chamber of Commerce added as potential lead for actions related to service workers (1.4.1., 1.4.2., 1.4.3.).**
LaNette	1.2. more on vulnerable populations	**Two new actions added to address vulnerable populations.** **Action 1.2.4. Social Support Network.** Collaborate with the Carmel Foundation and other community-based organizations to develop an inventory of locations with isolated seniors and people with disabilities and develop a plan for a social support network to increase resilience to climate change. **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.
Carrie	Resilience Hub (Youth Center?) Police Chief could be a good resource, this might be a continuum, rather than a new action.	**Added the Youth Center to Action 1.2.1 (Establish a Resilience Hub).**
Carrie	Incentivize rather than mandate	**Mandate and require have been replaced with incentivize (Action 3.2.6.), and reduce was added to Action 1.3.4.** **Action 1.3.4. Conduct a Feasibility Study for Existing Building Electrification.** Perform an electrification feasibility study/existing building analysis in order to understand the potential for, and associated costs of, electrification retrofitting, including heat pumps, on-site energy generation, and battery storage, in the City of Carmel-by-the-Sea and establish a plan for reducing or eliminating natural gas from existing buildings and building resilience to potential electrical grid shutoffs. **Recommended changes made to Action 3.2.6 (now numbered 3.1.5.) from "require" to "provide incentives" (this is the only action that included the term "require")** **Action 3.1.5. Retrofit Existing Critical Buildings and Related Infrastructure.** Provide incentives to ensure that all first responder and municipal facilities are properly retrofitted for existing and future 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.

Date	Commenter	Mode	Policy	Comment	Response
11/18/2021	Unknown	Workshop Mural	1.1	Maintaining and updating the evacuation plan should be higher in the priority list	Addressed. Moved to the top of the list.
11/18/2021	Unknown	Workshop Mural	1.1	Fire and the elderly are a high priority	General comment. No action required.
11/18/2021	Unknown	Workshop Mural	1.1	I think creating a clear evacuation plan for the elderly community would be a priority	Addressed by including more detail to Action 1.1.1: **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.
11/18/2021	Unknown	Workshop Mural	1.1	The Firewise community certification seem like it might be very applicable in Carmel because the lots are so small and do overlap. Incentivizing that certification would be awesome!	General comment. No action required, action 1.1.10 addresses exploring the feasibility of and gaining firewise community certification.
11/18/2021	Unknown	Workshop Mural	1.1	Provide adaptation to keep the urban forest healthy	No action required. Adaptation to keep the urban forest healthy included: **Action 2.1.2. Increase Urban Forest Resilience.** Update the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. Enhance carbon sequestration potential Update of the Plan should include collaboration with stakeholders, such as the Monterey Pine Forest Watch and California State University, Monterey Bay.
11/18/2021	Unknown	Workshop Mural	1.1	1.1.8 and 1.1.9... why limit to high fire severity zones, make it citywide	Addressed. Updated to make the actions citywide. **Action 1.1.8. 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. **Action 1.1.9. Development Standards.** Evaluate City's development standards for consistency with best practices for reducing wildfire risk for both new and existing development, including but not limited to incorporating defensible space design in landscaping guidelines.
11/18/2021	Unknown	Workshop Mural	1.1	Consistent building code	General comment. No action required, action 1.1.9 addresses consistent codes.
11/18/2021	Unknown	Workshop Mural	1.1	Permit streamlining for high performing projects	This comment seems related to new construction - streamline permits for projects that meet GHG reduction/adaptation goals. Could be an option, but sometimes difficult to actually make permit process easier. Need to discuss feasbility with Planning.
11/18/2021	Unknown	Workshop Mural	1.2	Connecting the plans and implementing them	General comment. No action required. The City will ensure that plans are connected and implemented.
11/18/2021	Unknown	Workshop Mural	1.2	The residents that care about preparedness - know what to go and/or get info. The residents that don't care are the bigger challenge. engage with parttime/vacation rental home owners. Second home owners hard to reach. Social media, public workshops, home owner associations.	Addressed. Updated action below to include outreach to second home owners through community groups. **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.
11/18/2021	Unknown	Workshop Mural	1.2	Neighborhood organizations (support for engagement)	Addressed. Updated action 1.2.3 **Action 1.2.3. Engage the Community**. Ensure the community knows 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.
11/18/2021	Unknown	Workshop Mural	1.2	update codes to match and not conflict with CA codes (fire for example)	No action required. Action 1.1.9 addresses codes.
11/18/2021	Unknown	Workshop Mural	1.2	Wine and Dine approach, have some parties to reach the communities.	Addressed. Updated action below to include outreach with the support of restaurants and other community groups. **Action 1.1.3. Collaborate with Monterey Fire.** Collaborate with Monterey Fire on its inspection and outreach efforts to reduce fire risks. Coordinate with the CERT program, home owner associations, restaurants, and other community groups to help distribute information to increase resident and homeowner awareness and knowledge of how to prepare for emergencies.
11/18/2021	Unknown	Workshop Mural	1.3	Make it clear why electrification is an adaptation issue	No action needed. To be discussed in plan development (narrative).
11/18/2021	Unknown	Workshop Mural	1.3	Health impacts of natural gas combustion	No action needed. To be discussed in plan development (narrative).
11/18/2021	Unknown	Workshop Mural	1.3	More specific actions under the policies	General comment. No action required. Actions are as specific as feasible while leaving room to refine based on new information during implementation. Examples will be added to the Adaptation Strategy Report.
11/18/2021	Unknown	Workshop Mural	1.3	What does educate the community mean?	Addressed. Changed to "Engage the Community."
11/18/2021	Unknown	Workshop Mural	1.3	clear and implementable actions	General comment. No action required. The City will ensure the actions are clear and implementable.
11/18/2021	Unknown	Workshop Mural	1.3	Smaller steps that add up to larger actions (more detail)	General comment. No action required. Actions are as specific as feasible while leaving room to refine based on new information during implementation. Examples will be added to the Adaptation Strategy Report.
11/18/2021	Unknown	Workshop Mural	1.3	More SMART goals	No action required. Actions are where the specifics come into play (not the goals). Measurable actions will include metrics and general time-frame will be added and included in the plan.
11/18/2021	Unknown	Workshop Mural	1.3	The youth center as a resilience location. Water treatment, elderly communities	No action needed. Youth center called out as resilience location in action 1.2.1. Water treatment addressed in action 3.1.9. Elderly communities are addressed throughout actions under policy 1.1
11/18/2021	Unknown	Workshop Mural	2.1	Add action to hire a shoreline engineer to better understand issues/opportunities	Hiring a coastal engineer is addressed in the action below: **Action 3.1.8. Hire Coastal Engineer.** Hire coastal engineer with experience in planning for climate change to conduct: 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. 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). 3. Evaluate feasibility and phasing, the use of thresholds for when different elements of these strategies are implement. For example, maintaining armory or other defenses up to a point, but then if a threshold is reached, embracing a new bluff line and different adaptive measure. 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.
11/18/2021	Unknown	Workshop Mural	2.1	Consider hiring a grant writer to gain additional funding (potential new action)	Addressed. Added the following action: **Action 1.4.4. Hire a Grant Writer.** Hire a grant writer to ensure implementation of the City's adaptation strategy.
11/18/2021	Unknown	Workshop Mural	2.1	Make a distinction between parks and urban forest? Urban forest is not the same as parks. Add "urban" to 2.1.2	Addressed. Added "urban" **Action 2.1.2. Increase Urban Forest Resilience.** Update the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. Enhance carbon sequestration potential Update of the Plan should include collaboration with stakeholders, such as the Monterey Pine Forest Watch and California State University, Monterey Bay.
11/18/2021	Unknown	Workshop Mural	2.1	Pescadero Canyon as a fire safety issue	General comment. No action needed. To be considered in narrative/implementation of the plan. This has been discussed at length and fire fuel reduction is already being conducted in the canyon to the extent feasible.
11/18/2021	Unknown	Workshop Mural	2.1	Improved parklands vs. forests - habitat value, corridors	No update needed. Addressed in actions 2.1.1. and 2.1.7.
11/18/2021	Unknown	Workshop Mural	2.1	For forest resilience, maybe reach out to CSUMB to conduct an analysis on the current state of the forest	Added CSUMB as potential collaborators: **Action 2.1.2. Increase Urban Forest Resilience.** Update the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. Enhance carbon sequestration potential Update of the Plan should include collaboration with stakeholders, such as the Monterey Pine Forest Watch and California State University, Monterey Bay.
11/18/2021	Unknown	Workshop Mural	2.1	Urban forest is important to town. What does that look like? Forest and beach commission	Urban forest addressed in action below: **Action 2.1.2. Increase Urban Forest Resilience.** Update the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. Enhance carbon sequestration potential Update of the Plan should include collaboration with stakeholders, such as the Monterey Pine Forest Watch and California State University, Monterey Bay.
11/18/2021	Unknown	Workshop Mural	2.1	Hill Park is in desperate need for major renovation work. I'd never take children there	No action necessary. Though Forest Hill Park could use renovation - it is not directly connected to adaptation.
11/18/2021	Unknown	Workshop Mural	2.1	No controlled burns in Carmel! But in Del Monte Forest and Jacks Peak.	General comment. No action required (the strategy does not mention controlled burns in the City.

11/18/2021	Unknown	Workshop Mural	3.1	I'm almost positive that dual plumbing is to code now, which enables a structure to reuse its greywater for toilet flushing and irrigation, if I understand that correctly. Do not think Carmel City code allows graywater. CA allows washing machine graywater only. I believe without a permit as well. Intelligent landscaping design can definitely reduce water runoff	Dual plumbing is a voluntary measure for non-residential uses when non-potable water is availabe. Greywater for washing machines is also allowed as a voluntary measure for residential. Both included in Calgreen (CA Building Code). The City code is silent on greywater.
9/23/2021	Jill Petker	Email		1.1.6 Defensible Space: I think we should get serious about this. No one is going to be able to have 100 feet of defensible space — there would be almost no trees in the city. But certainly within the first 5 or maybe 20 feet, I think we should let homeowners remove trees even if they don't meet the current size criteria. I wouldn't go so far as to require the removal of plants within the first 5-20 feet, but I don't think the city should stop anyone who wants to. This is related to 2.1.2, point 4. 1.3.4 Building Electrification: Just curious, why is it important to remove natural gas from buildings? Is this seen as a fire hazard, or is this just a recognition that eventually there may be no more natural gas supplies (at least without fracking, which I'm vehemently opposed to). 3.1.2 Resilience of Utilities: I'm not sure what this strategy means. 3.2.2 Green Infrastructure: How do we reconcile planting more trees and shrubs with wildfire risk? I'm glad to see rain capture, gray water recycling, and what I think is water-permeable surfacing on the list. I'm also glad to see solar energy on the list, but why just for city buildings? Should we facilitate solar energy for private buildings? I haven't tried, so I don't know how difficult it is to get approval for solar panels.	Defensible space will be addressed as part of the plan implementation. Specifically, the action below addresses incorporating defensible space design in landscaping guidelines. **Action 1.1.9. Development Standards.** Evaluate City's development standards for consistency with best practices for reducing wildfire risk for both new and existing development, including but not limited to incorporating defensible space design in landscaping guidelines. Electrification - this was discussed in the meeting and will be addressed in the adaptation strategy narrative. Heat pump water heaters can use electricity from rooftop or community solar to heat water and store it for over 24 hours, while modern gas water heaters (required by A building code in new homes with gas) require electricity to operate, as well as a functioning gas system, and will not work during gas or eletric outages. Heat pumps offer the most efficient heating and cooling systems, in one, which gas furnaces can't offer (it is also more expensive to have two separte systems (heating + cooling) instead of one. Induction cooking also helps in heat waves as it does not heat up the whole room/house, but only the bottom of the pot/pan directly using magnts (not flames). This is twice as efficient as gas. Storms and other manifestations of cliamte change are expected to be catastrophic to California's gas infrastructure. The gas system take 30 times longer to restore than the electric system after natural disasters. (https://www.sierraclub.org/articles/2019/10/electrification-for-climate-resiliency) 3.1.2. Updated the wording slightly to increase clarity **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. Reconciling planting trees and shrubs with wildfire risk to be addressed as part of implementation for action 2.1.2 **Action 2.1.2. Increase Urban Forest Resilience.** Update the Forest Management Plan to: 1. 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
9/23/2021	Fran Vardamis	CRA meeting		Wouldn't burying the electric lines be a big step in avoiding fires and blackouts during inevitable climate-change disasters. An urban forest with electric/communication wires strung among the vulnerable trees is a recipe for eventual disaster, both from downed lines sparking and from blackouts. Buried wires is something the city can and should do	No action required. Undergrounding utilities is included in action 3.1.1
9/23/2021	Nancy Twomey	CRA meeting		What about addressing water quality and litter as part of storm drain upgrades?	No action required. Water quality and trash capture are already addressed in the City's stormwater program and ASBS requirements. Projects to reduce stormwater quality impacts are in the City's Storm Drain Master Plan.
9/23/2021		CRA meeting		Support for burying power lines and wondering how feasible it is.	No action required. Undergrounding utilities is included in action 3.1.1, where feasibility will be explored
9/23/2021	Wanda Vollmer	CRA meeting		Regarding the power lines, I volunteer San Carlos street as test street. :)	No action required. Undergrounding utilities is included in action 3.1.1
9/23/2021	Susan Bjerre	CRA meeting		Does PG&E have any motivation to contribute to the cost of burying power lines?	No action required. Undergrounding utilities is included in action 3.1.1, where feasibility (including potential funding) will be explored. Yes, PG&E does have motivation to underground utilities.
9/23/2021		CRA meeting		Might the City conduct a survey of Carmel homeowners to gauge interest in burying power lines?	Addressed. Action 3.1.1 updated: **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 and designated evacuation routes.
9/24/2021	Salmeh Moghimi	Email		Dear Jeff, Thanks again for this environmental gathering and discussing the issues that are so relevant to climate change and our town. I am however confused that regulating wood-burning smoke does not fall under this umbrella of supporting climate change. I believe the pollution from the smoke that gets into our atmosphere in town especially when we have these devastating fires that are also creating smoke is an environmental issue. Also the fact that Covid is a respiratory disease, cleaner air is better for everyone. We all know wood-burning smoke is toxic and that's been already addressed. So when we speak about adapting and changing our ways, I feel it starts with things we as individual Carmel residents can do too. Carmel's landscape of homes are very close to one another for this kind of activity to be left without any kind of regulation. Being part of the environmental committee, I hope you consider this. You we're kind enough to mention that I can raise this concern to another panel of people. Can you please let me know who they are.	No action required. Wood burning smoke/natural gas issues addressed in action 1.3.4 and 1.3.6.
10/15/2021	Michael DeLapa	Email		If Carmel is similar to other cities in Monterey County whose greenhouse gas inventories we've examined — and of course we would need to look a lot closer at Carmel's actual data to know for sure — the City's three most important climate mitigation strategies are: 1) Transportation policies that facilitate transition from gas cars to EVs; 2) Building policies that facilitate transition from natural gas to electric (appliances, heating, etc.) in both commercial and residential buildings 3) Land use policies that support infill, upzoning, and mixed use to facilitate walking, biking, and public transportation (buses).	No action required. This is a mitigation comment.
11/15/2021	Georgina Armstrong	Email		I'm particularly pleased that the bluffs are now getting the attention they deserve. I used to say that, while many of the non-profits were "Friends of….." there were no "Friends of the Bluffs" for obvious reasons - the hazard is too great for resident volunteers. The bluffs are the workhorses of shoreline protection, and Carmel depends upon their resiliency in the era of climate change. I'm glad that the suggestion is for the Forest and Shoreline Management Plans to be updated, and I hope that new plans become better integrated into the day-to-day operations of the City than the first emanations. I know that Mayor Potter believes that too much money is spent on studies that end up collecting dust on shelves, but if they are incorporated into the everyday structure of staff responsibilities, they can make a difference in future outcomes. They can also save the City a lot of money, since getting it right today is much cheaper than paying to get it done tomorrow. I remember being impressed with how the Santa Cruz Climate Action Plan was woven into everything that every department brought to the City Council or to the commissions in their department reports and recommendations which made the likelihood of success much higher. I know that grant applications are onerous when the City is short-staffed, but it seems that it will be crucial that funding sources be identified and used if the huge price tag on protecting Carmel from climate change vulnerabilities is to be achieved. In looking at creating defensible space which is probably the greatest challenge of all in Carmel where roofs come within 3' to 5' of touching, and buildings are about 10-15' apart, I think that accessing the big pockets of the Grants Clearinghouse's federally-funded grant program that the California Fire Safe Council maintains might go a long way to help reassure people that action on climate adaptation challenges in at least the high risk fire hazard zone is feasible since the City's budget is always so tight and staffing so limited. With an ignition zone of 5' being a real issue in Carmel in keeping an adequate clearance around buildings, the 30' defense zone is daunting. There are, of course, so many residents who have decks and stairs that are attached to their homes, and with so many properties being second homes, outside maintenance often leaves much to be desired.	Mostly general (implementation) comments that do not require action. Funding will be addressed in the plan (narrative). Added a new action about hiring a grant writer: **Action 1.4.4. Hire a Grant Writer.** Hire a grant writer to ensure implementation of the City's adaptation strategy.
11/22/2021	Nikki Nedeff	Email		My only suggestion about the proposed update to the Forest Management Plan is to recommend that substitute species not have to potential to invade into Monterey Pine Forest habitat. For example, in an effort to plant what seemed like a good idea at the time, Torrey pines were planted by Caltrans along Highway 1 in Marina, and also at Rancho Canada golf course years ago. Torrey pines are now aggressively colonizing rare Maritime Chaparral habitat in Marina and have jumped Carmel Valley Road and are invading the native pine forest below Jacks Peak. Who knew this would be a problem?!	No action required. This is more of an implementation comment (very detailed). See row below for details on inclusion of explicit collaboration with stakeholder groups such as MPFW during update of the Forest Management Plan.
11/18/2021	Joyce Stevens	Email		Mr. Chairman and Members of the City of Carmel by the Sea Climate Committee: I'm Joyce Stevens, a founding member and past president of Monterey Pine Forest Watch. Our group came together in 1992 in order to facilitate better understanding of our beautiful native Monterey Pine Forest, in the face of increasing threats from development. Not only does our local forest give the Peninsula its fundamental character, but it has long been of interest to a worldwide industry of forest products based on Monterey Pine, as it serves as the most important genetic repository for this industry. Huge development projects were in the works and the threat of pitch canker reared its ugly head right after we formed our group. As you may know there are only 5 populations of native Monterey Pines in the world…3 on the coast of California and 2 on two small islands off the coast of Baja California. Our forest is the oldest of the California stands. It is the largest and also the most impacted by human activity. In concert with the California Native Plant Society and the California Department of Fish and Game, we sponsored a scientific ecological assessment of the Peninsula forest and put on two symposia to highlight its findings and to take a look at the threat of pitch canker and it's implication for the native forest. Fortunately our forest has done what natural systems do best. It has developed resistance on its own to this fungal disease and the consequences for the native forest have been blessedly inconsequential. As the Climate Committee and Carmel authorities grapple with the threat of Climate Change on Carmel and its urbanized Monterey Pine forest, we hope you will include our group and use it as a resource. Carmel's forest is in special category, as Carmel was the only municipality locally to embrace it at its inception. In fact its visionary founders and residents were intent upon preserving it and living in harmony with the beautiful forest. And Carmel can play an important role in safeguarding the local native forest which surrounds it. We have accumulated an enormous amount of scientific information during our most active period and are proud to have contributed to the preservation of over 1200 acres of native forest habitat, most lately at Aguajito. And we published a book in 2011 entitled Coastal California's Living Legacy, The Monterey Pine Forest. We want to be involved and share our experience, insights and information with you because we love our beautiful Monterey Pines and all the life they support! Sincerely, Joyce Stevens	Updated action 2.1.2 to include explicit collaboration with stakeholder groups such as MPFW. **Action 2.1.2. Increase Urban Forest Resilience.** Update the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. Enhance carbon sequestration potential Update of the Plan should include collaboration with stakeholders, such as the Monterey Pine Forest Watch and California State University, Monterey Bay.

City of Carmel-by-the-Sea Potential Adaptation Strategies

Background

Carmel-by-the-Sea (City) is currently experiencing, and will continue to experience, climate change impacts, including stronger storms, increased wildfire risk, sea level rise, extended drought conditions, and increased temperature. The City developed a Climate Adaptation Plan to increase resilience of the community and assets in Carmel-by-the-Sea. In September 2019, a Climate Committee was convened to develop and guide the preparation of the Climate Adaptation Plan. The City published a Climate Change Vulnerability Assessment in July 2021. The Vulnerability Assessment characterizes climate hazards that will 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 resilience.

This workbook provides the City's Climate Adatpation Goals, Policies and Actions to take to improve the resilience of its community members, natural environment, infrastructure and built environment. The adaptation goals, policies, and actions were developed to address all priority assets at risk in the City's Vulnerability Assessment. The **All Goals, Policies & Actions** tab shows all adaptation goals, policies and actions developed. The **Near-Term**, **Mid-Term**, and **Long-Term** tabs provides actions to be completed in the near term, mid-term, and long-term, respectively (organized by goal and policy) to support implementation.

Definitions

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). Each goal is focused on increasing the resilience of one of the following broad asset categories: community, natural assets, and infrastructure 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 implement and achieve policies and goals.

Appendix D
Implementation Tracking Tool

City of Carmel-by-the-Sea Potential Adaptation Strategies

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City of Carmel-by-the-Sea Adaptation Strategies

Goal/Policy/Action	Climate Hazard	Asset	Metric	Timeframe	Implementation Lead	Cost	Source
Goal 1. A Healthy, Safe, and Resilient Community							
Policy 1.1. Provide effective emergency preparedness and response in anticipation of potential climate-related disasters				Near-term (1-2 years); Mid-term (3-5 years); Long-term (5-10 years)		$-Low (<$50K); $$-Medium ($50K - $100K); $$$-High (>$100K)	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Evacuation Plan updated every 8 years, with the first update by 2023	Near-term (by 2024) and Ongoing	Police & Fire	$	Suggested by Climate Committee Members
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.	All	Residents, Local Businesses, Second Homes	Number of block captains formed, climate change risk incorporated into	Near-term (by 2024)	Police & Fire	$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
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.	Wildfire	Residents, Local Businesses, Second Homes	Number of meetings held with Monterey Fire and CERT program; educational materials distributed	Near-term (by 2024)	Police & Fire	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
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.	All	Elderly Population and People with Disabilities, Residents	Educational materials distributed	Near-term (by 2024)	Police & Fire	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Analysis evaluating evacuation route capacity completed	Mid-term (by 2027)	Police & Fire	$$	Assembly Bill 747 Requirement
Action 1.1.6. Evacuation Alternatives and Access. Identify neighborhoods that have single ingress/egress, pursuant to Senate Bill 99, and develop and employ evacuation alternatives, such as a gathering facility, and/or alternative emergency access routes in those neighborhoods. Evaluate potential congestion issues in the event of an evacuation and develop and maintain a list of residents who may have difficulty evacuating. Evaluate options to provide evacuation, such as a shuttle service, for residents with mobility challenges.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Analysis identifying neighborhoods that have single ingress/ egress and evacuation alternatives completed; List of limited-mobility residents developed	Mid-term (by 2027)	Police & Fire	$$	Senate Bill 99 Requirement
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.	Wildfire	Residents, Second Homes	Number of meetings held to publicize Firewise Community Certification	Mid-term (by 2027)	Police & Fire	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Policy 1.2. Focus adaptation efforts and engagement on the most vulnerable populations.							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Resilience Hub established; Existing facilities upgraded to provide all essential resources	Near-term (by 2024)	Public Works / Police & Fire / Library	$$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Carmel-by-the-Sea Equity Framework developed	Mid-term (by 2027)	Community Planning & Building	$	Inspired by the City of Berkeley Existing Building Electrification Strategy
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Community engagement plan developed	Near-term (by 2024)	Library / City Hall / Police Department	$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
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.	All	Elderly Population and People with Disabilities	Social support network created; Inventory of locations created	Mid-term (by 2027)	Police Department / CERT / Community Planning & Building	$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
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.	All	Elderly Population and People with Disabilities	Number of households with backup power established	Long-term (by 2032)	Police & Fire / Public Works	$$$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
Policy 1.3. Minimize health impacts of climate change.							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies
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.)	All	Elderly Population and People with Disabilities, Residents, Local Businesses, Service Industry Workers	Emergency early warning systems updated	Near-term (by 2024)	Police & Fire	$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
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.	Wildfire, Increased Temperature	Elderly Population and People with Disabilities, Residents, Local Businesses, Service Industry Workers	Number of heat pumps installed; Number of heat pumps serving at risk residents	Mid-term (by 2027)	Community Planning & Building	$$	Inspired by the City of Berkeley Existing Building Electrification Strategy
Action 1.3.3. Invest in Improving Resilience in Critical Facilities. Invest in sustainable backup power sources to provide redundancy and continued services for critical facilities, including City Hall, Carmel Police Department, Carmel Fire Department, the Libraries, and assisted living facilities, in the event of a power outage triggered by a climate event.	All	Elderly Population and People with Disabilities, Residents	Number of critical facilities with sustainable backup power sources.	Mid-term (by2027)	Public Works	$$$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions

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.	Wildfire, Increased Temp	Elderly Population and People with Disabilities, Residents	Feasibility Study for Existing Building Electrification and Back-up Power completed	Mid-term (by 2027)	Public Works	$$	Inspired by the City of Berkeley Existing Building Electrification Strategy
Action 1.3.5. Improve Resilience in Existing Building Stock. Develop a program for identifying funding and incentives to weatherize residential and commercial buildings that addresses severe weather protection, energy efficiency, indoor air quality improvements, and other housing improvements. Include an outreach campaign as part of this program to advertise the benefits of weatherizing and electrifying buildings.	All	Elderly Population and People with Disabilities, Residents	Nubmer of retrofitted structures		Community Planning & Building		Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies (City of Placentia policy)
Action 1.3.6. Promote Funding Opportunities. Work with partners like 3CE and PG&E to identify and promote potential resilience opportunities and accessible funding and financing mechanisms to pay for building electrification, weatherization, and battery backups.	All	Elderly Population and People with Disabilities, Residents, Local Businesses	Funding identified and promoted to community; Number of projects initiated with incentives	Long-term (by 2032) Near-term (by 2024)	Community Planning and Building/Police and Fire/Public Works	$$ $	Passive House Principles Inspired by the City of Pacifica All-Electric Reach Code
Policy 1.4. Increase economic resilience.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
Action 1.4.1. Develop Partnerhsips 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.	All	Service Industry Workers, Local Businesses	Commitment from business community to develop a plan to support displaced workers	Near-term (by 2024)	Community Planning & Building / City Hall	$$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies
Action 1.4.2. Establish Partnerships to Develop a Resilient Economy. Partner with the County of Monterey Economic Development Department, Carmel Chamber of Commerce, and the Monterey County Workforce Development Board, to develop more integrated strategies for protection of jobs, economic sustenance, and for the protection of vulnerable populations more at-risk of temporary or permanent job dislocation due to climate change.	All	Service Industry Workers, Local Businesses	Number of meetings held to develop strategies for job protection	Mid-term (by 2027)	Community Planning & Building / City Hall	$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies
Action 1.4.3. Business Resilience Outreach Program. Collaborate with businesses in the city to better understand shared climate risks and identify opportunities to advance shared climate resilience priorities. Partner with the Carmel Chamber of Commerce and Visit Carmel to pilot and implement a local business resilience initiative to build small business capacity before a time of crisis by increasing the awareness of, and preparedness for, business continuity risks faced by the city's local businesses, providing a toolkit of intervention to help local businesses manage risks and enhance business resilience, and conducting outreach campaigns to engage leaders from the business, government, and community sectors to enhance preparedness for economic resilience.	All	Service Industry Workers, Local Businesses	Toolkit of intervention developed to help support local businesses manage risks and enhance resilience	Near-term (by 2024)	Community Planning & Building / City Hall	$$	Adapted from Gateway Cities Climate Adaptation Model General Plan Language (December 2018)
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	All	Grant writer/climate coordinator hired	Near-term (by 2024)	City Hall	$$$	Suggested at the 11/18/2021 public meeting
Goal 2. A Natural Environment Resilient to Climate Hazards							
Policy 2.1. Protect and restore climate-vulnerable habitat and ecosystems.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
Action 2.1.1. Increase Funding for Climate Adaptation. Earmark Capital Improvement Program (CIP) funding for design, permitting, and implementation of adaptation projects and strategies, such as those in the 2021 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) and Integrated Regional Watershed Management Program (IRWMP).	All	Urban Forest, Mission Trail Nature Preserve, North Dunes, Carmel Beach, Water Supply	Number of adaptation projects funded through CIP	Near-term (by 2024)	Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 2.1.2. Increase Urban Forest Resilience. Update and implement the Forest Management Plan to: 1. 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). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. 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.	Drought, Increased Temp, Wildfire	Urban Forest	Forest Management Plan Updated	Near-term (by 2024) and Ongoing	Public Works Forestry Division / Forest and Beach Commission	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 2.1.3. Increase Resilience of the Mission Trail Nature Preserve. Update and implement the Mission Trail Nature Preserve Master Plan to consider the potential impacts of climate change and to reduce wildfire risk for neighboring private properties. Coordinate with CAL FIRE and the Monterey Fire Departments to incorporate Best Practices into an annual maintenance plan, including cost estimates for implementation and revenue sources for implementation.	All	Mission Trail Nature Preserve	Mission Trail Nature Preserve Master Plan updated	Mid-term (by 2027) and Ongoing	Community Planning & Building and Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
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.	All	North Dunes	Regular maintenance and monitoring occurring at North Dunes	Ongoing	Community Planning & Building and Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 2.1.5. Increase Resilience to Stronger Storms. When designing projects in the city, including those recommended in the Mission Trail Stream Stability Study, size improvements to handle larger storms consistent with best available climate change projections.	Stronger Storms	Mission Trail Nature Preserve	Number of projects sizing improvements to handle larger storms.	Near-term (by 2024)	Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 2.1.6. Beach Sand Monitoring Program. Reinstate beach sand monitoring program described in the Shoreline Management Plan.	Sea Level Rise	Carmel Beach	Active beach sand monitoring program in place	Near-term (by 2024)	Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 2.1.7. Carmel Cove Sand Supply. Partner with local researchers (e.g., California State University Monterey Bay) or other sources to conduct Carmel Cove sand supply dynamics analysis.	Sea Level Rise	Carmel Beach	Carmel Cove sand supply dynamics analysis completed	Long-term (by 2032)	Community Planning & Building and Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Goal 3. Resilient Infrastructure and Built Environment							
Policy 3.1. Support greater resilience, redundancy, and reliability of local and regional infrastructure and the built environment.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
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.	Wildfire	Water Supply, Sanitary Sewer System, Power Grid, Overhead Communication, PG&E/Communication Underground Lines-gas, cable	Feasibility Study completed; Plan developed based on Feasibility Study; Number of utilities moved underground	Near-term (by 2024)	Community Planning & Building and Public Works	$$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)

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.	Stronger Storms, Increased Temp, Wildfire	Urban Forest, Storm Drain System	Change in impervious surface coverage.	Near-term (by 2024)	Public Works	$$	Adapted from the Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 3.1.3. Reduce Stormwater Runoff. Reduce stormwater runoff through implementation of stormwater diversion and infiltration projects that reduce pollution problems caused by more frequent and intense storms and more extreme flooding events.	Stronger Storms	Storm Drain System, Carmel Beach	Stormwater diversion project implemented	Long-term (by 2032)	Public Works	$$$	Suggested by Climate Committee Members
Action 3.1.4. 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.	Stronger Storms	Storm Drain System	Number of adaptation projects funded through CIP	Near-term (by 2024)	Public Works	$$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 3.1.5. Retrofit Existing Critical Buildings and Related Infrastructure. Conduct an evaluation of all first-responder and municipal facilities to determine retrofits that may be needed for long-term resilience to climate change hazards including sea-level rise related flooding and erosion, increased wind/storm events, an increase in high heat days, and/or wildfire depending upon location and risk factors. Develop a budget and schedule for retrofits based on the findings of the municipal facilities. Retrofit existing critical buildings as detailed in the program schedule.	All	Emergency Response Facilities – Fire station, EOC, PD, PW, City Hall, etc., Hospital and Emergency Medical Care Facilities	List of critical buildings and related infrastructure requiring retrofits	Near-term (by 2024)	Public Works	$$$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies
Action 3.1.6. 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.	Drought	Water Supply	Water demand reduced, incentives for grey water reuse developed and shared	Near-term (by 2024)	Community Planning & Building and Public Works	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 3.1.7. Bluff Structural Monitoring Program. Implement bluff structural monitoring program and do follow-up monitoring post-storm to identify additional footing stability issues.	Sea Level Rise	Carmel Beach	Bluff structural monitoring program implemented	Mid-term (by 2027)	Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 3.1.8. Sea Level Rise Coastal Vulnerability Study. Hire coastal engineer with experience in planning for climate change to: 1. Conduct research and prepare a Sea-Level Rise Vulnerability Study to further assess the risks to the city's coastal assets, including the beach, sea walls, revetments, bluffs, stairs and access, public bathrooms, parking areas, drainage infrastructure, and utilities. 2. Determine adaptation measures and Local Coastal Program policy options, including but not limited to: a) Mostly natural, unarmored North Dunes area; b) mostly armored bluffs along Scenic Roach south of 8th Avenue; c) Unarmored dunes along private property between 8th Avenue and Del Mar Parking Lot; d) Armored private properties on the bluffs at the north end of the City (Pescadero Canyon area). 3. Evaluate the use of thresholds for phasing adaptation projects based on changing coastal conditions. Consider applying an adaptive pathways approach which establishes trigger thresholds for different adaptive measures based on the severity of the impact from flooding and erosion associated with sea-level rise.	Sea Level Rise	Carmel Beach, Shoreline Access Infrastructure, Seawall and Revetments	Sea-level rise vulnerability study completed	Near-term (by 2024)	Public Works	$$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 3.1.9. Wastewater Treatment. Collaborate with the Carmel Area Wastewater District (CAWD) to increase the facility's resilience to sea level rise and stronger storms. Maintain staff/council personnel as liaisons to CAWD.	Sea Level Rise, Stronger Storms	Water Supply, Storm Drain System	Number of collaboration meetings with CAWD regarding facility's resilience	Near-term (by 2024) and Ongoing	Community Planning & Building and Public Works	$	Suggested by Climate Committee Members
Policy 3.2. Incorporate climate change adaptation into relevant plans and standards.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions
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.	All	Residents, Local Businesses, Second Homes	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	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
Action 3.2.2. Update City Planning Guidelines. Update the City's municipal code to maintain consistency with current California codes (California Building Code Chapter 7 and California Residential Code R337) throughout the City.	Wildfire, Stronger Storms, Wildfire	Residents, Local Businesses, Second Homes	City municipal code consistent with current California codes	Near-term (by 2024)	Community Planning and Building	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
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	All	Number plans updated to incorporate adaptation	Mid-term (by 2027)	Community Planning & Building / Public Works	$$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies
Action 3.2.4. Update Shoreline Management Plan. Update Shoreline Management Plan and Local Coastal Program based on results of Sea-level Rise Vulnerability Study.	Sea Level Rise	Carmel Beach	Shoreline Management Plan and Local Coastal Program updated	Long-term (by 2032)	Community Planning & Building and Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)
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	All	Number of adaptation projects included in the Multi-Jurisdictional Hazard Mitigation Plan	Near-term (by 2024)	Community Planning & Building, Police, and Public Works	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)

City of Carmel-by-the-Sea Near-Term/Ongoing Adaptation Strategies

Goal/Policy/Action	Climate Hazard	Asset	Metric	Timeframe	Implementation Lead	Cost	Source	Status	Notes
Goal 1. A Healthy, Safe, and Resilient Community									
Policy 1.1. Provide effective emergency preparedness and response in anticipation of potential climate-related disasters				Near-term (1-2 years); Mid-term (3-5 years); Long-term (5-10 years)		$-Low (<$50K); $$-Medium ($50K-$100K); $$$-High (>$100K)	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Evacuation Plan updated every 8 years, with the first update by 2023	Near-term (by 2024) and Ongoing	Police & Fire	$	Suggested by Climate Committee Members		
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.	All	Residents, Local Businesses, Second Homes	Number of block captains formed, climate change risk incorporated into	Near-term (by 2024)	Police & Fire	$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
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.	Wildfire	Residents, Local Businesses, Second Homes	held with Monterey Fire and CERT program; educational materials distributed	Near-term (by 2024)	Police & Fire	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
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.	All	Elderly Population and People with Disabilities. Residents	Educational materials distributed	Near-term (by 2024)	Police & Fire	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Policy 1.2. Focus adaptation efforts and engagement on the most vulnerable populations.							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Resilience Hub established; Existing facilities upgraded to provide all essential resources	Near-term (by 2024)	Public Works / Police & Fire / Library	$$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Community engagement plan developed	Near-term (by 2024)	Library / City Hall / Police Department	$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Policy 1.3. Minimize health impacts of climate change.							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
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.)	All	Elderly Population and People with Disabilities, Residents, Local Businesses, Service Industry Workers	Emergency early warning systems updated	Near-term (by 2024)	Police & Fire	$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
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.	All	Elderly Population and People with Disabilities, Residents, Local Businesses	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	$	Inspired by the City of Pacifica All-Electric Reach Code		
Policy 1.4. Increase economic resilience.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Action 1.4.1. Develop Partnerhsips 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.	All	Service Industry Workers, Local Businesses	Commitment from business community to develop a plan to support displaced workers	Near-term (by 2024)	Community Planning & Building / City Hall	$$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
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.	All	Service Industry Workers, Local Businesses	Toolkit of intervention developed to help support local businesses manage risks and enhance resilience	Near-term (by 2024)	Community Planning & Building / City Hall	$$	Adapted from Gateway Cities Climate Adaptation Model General Plan Language (December 2018)		
Action 1.4.4. Hire a Grant Writer/Climate Coordinator. Hire a grant writer/Climate coordinator to pursue available grants to fund climate adaptation implementation and track progress.	All	All	Grant writer/climate coordinator hired	Near-term (by 2024)	City Hall	$$$	Suggested at the 11/18/2021 public meeting		
Goal 2. A Natural Environment Resilient to Climate Hazards									
Policy 2.1. Protect and restore climate-vulnerable habitat and ecosystems.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
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).	All	Urban Forest, Mission Trail Nature Preserve, North Dunes, Carmel Beach, Water Supply	Number of adaptation projects funded through CIP	Near-term (by 2024)	Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Action 2.1.2. Increase Urban Forest Resilience. Update and implement the Forest Management Plan to: 1. Review and consider modifications to the preferred urbanized tree species that would result in improved resilience in the context of the expected climate of the second half of the century, reduce wildfire hazard, and that takes into account aesthetics and the ecological benefits of natives or near-native (e.g., native species from the Southwestern US or Mexico would likely be preferred to European species). 2. Include planting and maintenance guidelines to improve tree health, particularly in the public right-of-way 3. Incorporate tree species that have greater drought and wildfire resistance 4. In addition to drought-tolerant landscaping, include landscaping guidelines that reduce wildfire hazard on private property. 5. Enhance carbon sequestration potential Update of the Plan should include collaboration and engagement with stakeholders, such as the Monterey Pine Forest Watch, California State University, Monterey Bay, and vulnerable communities.	Drought, Increased Temp, Wildfire	Urban Forest	Forest Management Plan Updated	Near-term (by 2024) and Ongoing	Public Works Forestry Division / Forest and Beach Commission	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
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.	All	North Dunes	Regular maintenance and monitoring occurring at North Dunes	Ongoing	Community Planning & Building and Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Action 2.1.5. Increase Resilience to Stronger Storms. When designing projects in the city, including those recommended in the Mission Trail Stream Stability Study, size improvements to handle larger storms consistent with best available climate change projections.	Stronger Storms	Mission Trail Nature Preserve	Number of projects sizing improvements to handle larger storms.	Near-term (by 2024)	Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Action 2.1.6. Beach Sand Monitoring Program. Reinstate beach sand monitoring program described in the Shoreline Management Plan.	Sea Level Rise	Carmel Beach	Active beach sand monitoring program in place	Near-term (by 2024)	Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Goal 3. Resilient Infrastructure and Built Environment									
Policy 3.1. Support greater resilience, redundancy, and reliability of local and regional infrastructure and the built environment.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Action 3.1.1. Underground Utilities in Fire Hazard Zones. Determine the feasibility of, and community support for, undergrounding power lines in the Mission Trail Nature Preserve, designated evacuation routes, and in other high priority areas in the Very High Fire Hazard Severity Zone. Develop a plan for undergrounding utilities based on results from the feasibility study and begin implementation in the most vulnerable communities.	Wildfire	Water Supply, Sanitary Sewer System, Power Grid, Overhead Communication, PG&E/Communication Underground Lines-gas, cable	Feasibility Study completed; Plan developed based on Feasibility Study; Number of utilities moved underground	Near-term (by 2024)	Community Planning & Building and Public Works	$$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
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.	Stronger Storms, Increased Temp, Wildfire	Urban Forest, Storm Drain System	Change in impervious surface coverage.	Near-term (by 2024)	Public Works	$$	Adapted from the Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Action 3.1.4. Storm Drain Repair Funding and Improvements. Earmark Capital Improvement Program (CIP) funding for design, permitting and implementation of storm drain repairs. Include strategies in the 2021 Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) for potential regional funding. Upsize Storm Drain Master Plan (SDMP) improvements, especially when making repairs in the lower reaches of watersheds, to handle larger storms.	Stronger Storms	Storm Drain System	Number of adaptation projects funded through CIP	Near-term (by 2024)	Public Works	$$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Action 3.1.5. 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.	All	Emergency Response Facilities – Fire station, EOC, PD, PW, City Hall, etc., Hospital and Emergency Medical Care Facilities	List of critical buildings and related infrastructure requiring retrofits	Near-term (by 2024)	Public Works	$$$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
Action 3.1.6. Water Conservation. Partner with the Monterey Peninsula Water Management District to reduce water demand and increase water recycling, such as stormwater capture and grey water reuse, through education and outreach. Provide information and incentives for residential water use reduction, focusing engagement on vulnerable communities first.	Drouaht	Water Supply	Water demand reduced, incentives for grey water reuse developed and shared	Near-term (by 2024)	Community Planning & Building and Public Works	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Action 3.1.8. Sea Level Rise Coastal Vulnerability Study. Hire coastal engineer with experience in planning for climate change to: 1. Conduct research and prepare a Sea-Level Rise Vulnerability Study to further assess the risks to the city's coastal assets, including the beach, sea walls, revetments, bluffs, stairs and access, public bathrooms, parking areas, drainage infrastructure, and utilities. 2. Determine adaptation measures and Local Coastal Program policy options, including but not limited to: a) Mostly natural, unarmored North Dunes area; b) mostly armored bluffs along Scenic Roach south of 8th Avenue; c) Unarmored dunes along private property between 8th Avenue and Del Mar Parking Lot; d) Armored private properties on the bluffs at the north end of the City (Pescadero Canyon area). 3. Evaluate the use of thresholds for phasing adaptation projects based on changing coastal conditions. Consider applying an adaptive pathways approach which establishes trigger thresholds for different adaptive measures based on the severity of the impact from flooding and erosion associated with sea-level rise.	Sea Level Rise	Carmel Beach, Shoreline Access Infrastructure, Seawall and Revetments	Sea-level rise vulnerability study completed	Near-term (by 2024)	Public Works	$$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Action 3.1.9. Wastewater Treatment. Collaborate with the Carmel Area Wastewater District (CAWD) to increase the facility's resilience to sea level rise and stronger storms. Maintain staff/council personnel as liaisons to CAWD.	Sea Level Rise, Stronger Storms	Water Supply, Storm Drain System	collaboration meetings with CAWD regarding facility's resilience	Near-term (by 2024) and Ongoing	Community Planning & Building and Public Works	$	Suggested by Climate Committee Members		
Policy 3.2. Incorporate climate change adaptation into relevant plans and standards.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
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.	Wildfire, Stronger Storms, Wildfire	Residents, Local Businesses, Second Homes	City municipal code consistent with current California codes	Near-term (by 2024)	Community Planning and Building	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
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	All	Number of adaptation projects included in the Multi-Jurisdictional Hazard Mitigation Plan	Near-term (by 2024)	Community Planning & Building, Police, and Public Works	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		

City of Carmel-by-the-Sea Mid-Term Adaptation Strategies

Goal/Policy/Action	Climate Hazard	Asset	Metric	Timeframe	Implementation Lead	Cost	Source	Status	Notes
Goal 1. A Healthy, Safe, and Resilient Community									
Policy 1.1. Provide effective emergency preparedness and response in anticipation of potential climate-related disasters				Near-term (1-2 years); Mid-term (3-5 years); Long-term (5-10 years)		$-Low (<$50K); $$-Medium ($50K - $100K); $$$-High (>$100K)	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Analysis evaluating evacuation route capacity completed	Mid-term (by 2027)	Police & Fire	$$	Assembly Bill 747 Requirement		
Action 1.1.6. Evacuation Alternatives and Access. Identify neighborhoods that have single ingress/egress, pursuant to Senate Bill 99, and develop and employ evacuation alternatives, such as a gathering facility, and/or alternative emergency access routes in those neighborhoods. Evaluate potential congestion issues in the event of an evacuation and develop and maintain a list of residents who may have difficulty evacuating. Evaluate options to provide evacuation, such as a shuttle service, for residents with mobility challenges.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Analysis identifying neighborhoods that have single ingress/egress and evacuation alternatives completed; List of limited-mobility residents developed	Mid-term (by 2027)	Police & Fire	$$	Senate Bill 99 Requirement		
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.	Wildfire	Residents, Second Homes	Number of meetings held to publicize Firewise Community Certification	Mid-term (by 2027)	Police & Fire	$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Policy 1.2. Focus adaptation efforts and engagement on the most vulnerable populations.							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
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.	All	Elderly Population and People with Disabilities, Residents, Service Industry Workers	Carmel-by-the-Sea Equity Framework developed	Mid-term (by 2027)	Community Planning & Building	$	Inspired by the City of Berkeley Existing Building Electrification Strategy		
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.	All	Elderly Population and People with Disabilities	Social support network created; Inventory of locations created	Mid-term (by 2027)	Police Department / CERT / Community Planning & Building	$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Policy 1.3. Minimize health impacts of climate change.							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
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.	Wildfire, Increased Temperature	Elderly Population and People with Disabilities, Residents, Local Businesses, Service Industry Workers	Number of heat pumps installed; Number of heat pumps serving at risk residents	Mid-term (by 2027)	Community Planning & Building	$$	Inspired by the City of Berkeley Existing Building Electrification Strategy		
Action 1.3.3. Invest in Improving Resilience in Critical Facilities. Invest in sustainable backup power sources to provide redundancy and continued services for critical facilities, including City Hall, Carmel Police Department, Carmel Fire Department, the Libraries, and assisted living facilities, in the event of a power outage triggered by a climate event.	All	Elderly Population and People with Disabilities. Residents	Number of critical facilities with sustainable backup power sources.	Mid-term (by2027)	Public Works	$$$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
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.	Wildfire, Increased Temp	Elderly Population and People with Disabilities. Residents	Feasibility Study for Existing Building Electrification and Back-up Power completed	Mid-term (by 2027)	Public Works	$$	Inspired by the City of Berkeley Existing Building Electrification Strategy		
Policy 1.4. Increase economic resilience.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Action 1.4.2. Establish Partnerships to Develop a Resilient Economy. Partner with the County of Monterey Economic Development Department, Carmel Chamber of Commerce, and the Monterey County Workforce Development Board, to develop more integrated strategies for protection of jobs, economic sustenance, and for the protection of vulnerable populations more at-risk of temporary or permanent job dislocation due to climate change.	All	Service Industry Workers, Local Businesses	Number of meetings held to develop strategies for job protection	Mid-term (by 2027)	Community Planning & Building / City Hall	$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
Goal 2. A Natural Environment Resilient to Climate Hazards									
Policy 2.1. Protect and restore climate-vulnerable habitat and ecosystems.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Action 2.1.3. Increase Resilience of the Mission Trail Nature Preserve. Update and implement the Mission Trail Nature Preserve Master Plan to consider the potential impacts of climate change and to reduce wildfire risk for neighboring private properties. Coordinate with CAL FIRE and the Monterey Fire Departments to incorporate Best Practices into an annual maintenance plan, including cost estimates for implementation and revenue sources for implementation.	All	Mission Trail Nature Preserve	Mission Trail Nature Preserve Master Plan updated	Mid-term (by 2027) and Ongoing	Community Planning & Building and Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Goal 3. Resilient Infrastructure and Built Environment									
Policy 3.1. Support greater resilience, redundancy, and reliability of local and regional infrastructure and the built environment.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Action 3.1.7. Bluff Structural Monitoring Program. Implement bluff structural monitoring program and do follow-up monitoring post-storm to identify additional footing stability issues.	Sea Level Rise	Carmel Beach	Bluff structural monitoring program implemented	Mid-term (by 2027)	Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Policy 3.2. Incorporate climate change adaptation into relevant plans and standards.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Action 3.2.1. Development Standards. Evaluate City's development standards for consistency with best practices for reducing climate change risk (e.g., wildfire risk) for both new and existing development, including but not limited to incorporating defensible space design in landscaping guidelines and permitting the use of fire-resistant building materials that may conflict with current Design Guidelines. Develop a project checklist for building and site adaptation measures. The checklist, included with permit applications, should serve to provide education to permit applicants on modifications to site plans and structures that can improve a project's resilience to existing and potential future climate change hazards.	All	Residents, Local Businesses, Second Homes	implementing adaptation measures, City development standards consistent with best practices for reducing wildfire risk	Mid-term (by 2027)	Community Planning and Building	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
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	All	Number plans updated to incorporate adaptation	Mid-term (by 2027)	Community Planning & Building / Public Works	$$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		

City of Carmel-by-the-Sea Long-Term Adaptation Strategies

Goal/Policy/Action	Climate Hazard	Asset	Metric	Timeframe	Implementation Lead	Cost	Source	Status	Notes
Goal 1. A Healthy, Safe, and Resilient Community									
Policy 1.2. Focus adaptation efforts and engagement on the most vulnerable populations.							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
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.	All	Elderly Population and People with Disabilities	Number of households with backup power established	Long-term (by 2032)	Police & Fire / Public Works	$$$	Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Policy 1.3. Minimize health impacts of climate change.							Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies		
Action 1.3.5. Improve Resilience in Existing Building Stock. Develop a program for identifying funding and incentives to weatherize residential and commercial buildings that addresses severe weather protection, energy efficiency, indoor air quality improvements, and other housing improvements. Include an outreach campaign as part of this program to advertise the benefits of weatherizing and	All	Elderly Population and People with Disabilities, Residents	Nubmer of retrofitted structures	Long-term (by 2032)	Community Planning & Building	$$	Adapted from the Southern California Adaptation Planning Guide, Appendix F - General Plan and Local Coastal Plan Model Policies (City of Placentia policy) Passive House Principles		
Goal 2. A Natural Environment Resilient to Climate Hazards									
Policy 2.1. Protect and restore climate-vulnerable habitat and ecosystems.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
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.	Sea Level Rise	Carmel Beach	Carmel Cove sand supply dynamics analysis completed	Long-term (by 2032)	Community Planning & Building and Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		
Goal 3. Resilient Infrastructure and Built Environment									
Policy 3.1. Support greater resilience, redundancy, and reliability of local and regional infrastructure and the built environment.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
Action 3.1.3. Reduce Stormwater Runoff. Reduce stormwater runoff through implementation of stormwater diversion and infiltration projects that reduce pollution problems caused by more frequent and intense storms and more extreme flooding events.	Stronger Storms	Storm Drain System, Carmel Beach	Stormwater diversion project implemented	Long-term (by 2032)	Public Works	$$$	Suggested by Climate Committee Members		
Policy 3.2. Incorporate climate change adaptation into relevant plans and standards.							Adapted from the Southern California Adaptation Planning Guide, Appendix B Matrix of Adaptation Strategies and Actions		
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.	Sea Level Rise	Carmel Beach	Shoreline Management Plan and Local Coastal Program updated	Long-term (by 2032)	Community Planning & Building and Public Works	$$	Carmel-by-the-Sea Vulnerability Assessment (July 2021)		

Appendix E
Implementation Case Studies

Implementation Case Studies

This appendix illustrates adaptation examples that align with a selection of adaptation actions and show how adaptation policies and actions can be effectively implemented.

West Oakland Resilience Hubs

Photo: West Oakland Resilience Hub Planning Meeting https://norcalresilience.org/case-study-west-oakland-resiliency-hub/

Location: West Oakland, CA

The City of Oakland identified three facilities owned and operated by the City that were in need of physical infrastructure upgrades which could serve as climate resilience hubs: West Oakland Senior Center, West Oakland Branch of the Oakland Public Library, and the DeFremery Recreation Center and Park. The facilities were upgraded to offer the following services: cooling, warming, sanitation, communication, transportation, medical area, filtered indoor spaces during forest fires and high air pollution times, and renewable and non-polluting energy sources, including solar energy, and back-up power to run critical operations when the power grid is down. The upgrades involved partnerships between the City, PG&E, and the Bay Area Air Quality Management District. Design phase costs are estimated to be $500,000 and initial known implementation estimates amount to approximately $1.6 million. Funding was provided by a combination of stakeholder financing, funding through California Air Resources Board, and the City of Oaklands Capital Improvement Plan.

Related 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.

Berkeley Existing Buildings Electrification Strategy

Location: Berkeley, CA

Photo: Existing Buildings Electrification Strategy https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Draft_Berkeley_Existing_Bldg_Electrification_Strategy_20210415.pdf

Berkeley's Existing Buildings Electrification Strategy analyzes the existing building stock of the City, with a focus on low-rise residential, and identifies a pathway for an equitable transition to all-electric buildings. To model electrification costs for Berkeley's existing homes, the project team estimated Berkeley's building stock, using Alameda County Assessor data, to better understand the distribution of building types and existing conditions. The analysis was followed by research into electrification measures and costs and the data was used to model different retrofit packages to identify the most cost-effective options. To ensure Berkeley's pathway to all-electric buildings avoids negative impacts to equity and improves current conditions, the City developed an Equity Framework called Equity Guardrails with stakeholder and community feedback. The Equity Guardrails reflected priorities and concerns of marginalized communities, highlighting the need to protect people against potential unintended consequences of building electrification like gentrification and displacement. The City developed four equity guardrails that each potential policy was assessed against and will be used in the future as new policies are developed. The four equity guardrails are:

- Access to health and safety benefits
- Access to economic benefits
- Maximize ease of installation
- Promote housing affordability & anti-displacement.

Related 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.

Related 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

2500 R Midtown Development

Photo: Rooftop solar panels at the 2500 R Street Community Development. Sunverge Energy https://cdn.cleanegroup.org/wp-content/uploads/2500R-solar-on-roof-900x675.jpeg

Location: Sacramento, CA

Sacramento Municipal Utility District (SMUD) partnered with Sunverge Energy, and Pacific Housing to create a net zero energy (ZNE) community within a single-family home affordable housing development.[1] The incorporation of solar PV as well as battery storage demonstrates the feasibility of microgrid level projects in using alternative energy while still ensuring power reliability. The project was funding through the US Department of Energy ARRA, Solar SMART program, California SGIP incentives, and private capital leveraging special financial structures that take advantage of Pacific Housing's non-profit status.

Related 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.

Related 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.

[1] California Energy Commission. Microgrid Analysis and Case Studies Report California, North America, and Global Case Studies: Page 19-23. 2018. Available: <https://www.energy.ca.gov/sites/default/files/2021-06/CEC-500-2018-022.pdf>. Accessed February 4, 2022

Marina Dune Preserve Restoration

Location: Marina, CA

Photo: Monterey Peninsula Regional Park District, Marina Dunes Preserve https://www.mprpd.org/marina-dunes-preserve

The Marina Dunes encompass part of the Monterey Bay dune complex spanning Moss Landing to Seaside California. This dune restoration project was a collaborative effort between project partners of the Monterey Peninsula Regional Parks District, Return of the Natives, Burleson Consulting Inc/Terracon, and Native Solutions.[2] Restoration activities included control and eradication of non-native species, sand stabilization, and re-vegetation efforts. Re-vegetation of native species included the collection of site-specific seed, broadcast seeding, hydroseeding, and the out planting of propagated seedlings. Restoration through the eradication of non-natives and re-vegetation of native species increases dune resilience to climate stress.[3] Structural improvement activities included delineation of pathways and fences to protect restoration areas as well as signage to educate the community on dune habitat restoration.

Related 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.

[2] California Coastal Dune Science Network. Marina Dune Preserve Restoration. 2021. Available: <https://www.resilientcoastlines.com/projects/marina-dune-preserve-restoration>. Accessed February 4, 2022

[3] National Oceanic and Atmospheric Administration (NOAA). Office for Coastal Management. Peer-to-Peer Case Study: Dune Restoration Increases Flood Protection and Access for Community. Available: < https://coast.noaa.gov/digitalcoast/training/cardiff-state-beach.html >. Accessed February 8, 2022.

San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook

Photo: San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook https://nnala.com/san-mateo-county-sustainable-green-streets-and-parking-lots-design-guidebook/

Location: San Mateo County, CA

The county of San Mateo created a guidebook to address green infrastructure and stormwater management.[4] With a specific focus on green streets and parking lots, the San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook was developed with input from the City/County Association of Governments of San Mateo County, the Program's New Development Subcommittee, and the City/County Engineers' Association of San Mateo County. The recommended actions include site layout strategies, stormwater facility strategies, pervious pavements, and urban tree canopy additions.[5] The final chapter of the guidebook is dedicated to implementation considerations. The topics covered include reducing project costs, changing municipal code/policy, and public education and outreach. Additionally, there are four example projects listed to demonstrate feasibility. The main takeaway for implementation was to bundle stormwater management solutions with general street improvements. Funding was sourced by vehicle registration fees collected in San Mateo County for congestion and stormwater management authorized by California Assembly Bill 1546 and California Senate Bill 348.

Related 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.

Related Action 3.1.3. 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.

Related Action 3.1.4. 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.

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[4] American Society of Landscape Architects. Green Infrastructure and Stormwater Management Case Study. 2009. Available: <https://www.asla.org/uploadedFiles/CMS/Advocacy/Federal_Government_Affairs/Stormwater_Case_Studies/Stormwater%20Case%20081%20San%20Mateo%20County%20Sustainable%20Green%20Streets,%20San%20Mateo,%20CA.pdf>. Accessed February 2, 2022

[5] San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook. Available: <https://www.flowstobay.org/documents/municipalities/sustainable%20streets/San%20Mateo%20Guidebook.pdf>. Accessed February 2, 2022

Pajaro Dunes Geologic Hazards Abatement District

Location: Santa Cruz County, CA

Photo: Pajaro Dunes. https://www.resortsandlodges.com/lodging/usa/california/central-coast/pajaro-dunes-resort.html

The Pajaro Dunes Geologic Hazards Abatement District (GHAD) is one example of an abatement district formed to mitigate sea level rise and storm impacts. The Pajaro Dunes community includes private single-family residences as well as townhouses and condominiums. These residences were built along a narrow strip of land bounded by the Pacific Ocean on the southwest and by the Pajaro River on the northeast and southeast. The development is protected by an approximately 6,000-foot-long seawall constructed of large riprap along the ocean-side of the development and a steel sheet wall along the inland Pajaro River side of the development. The rock revetment has been repeatedly damaged by coastal erosion, occurring during server winter storms.[6] The GHAD is working to fund repairs to the seawall.

Related to funding and financing mechanisms.

[6] Pajaro Dunes Geologic Hazard Abatement District. N.d. 2020 Grading Overview Document. Available: <https://pdghad.org/bg_pdghad.org/reports/>. Accessed February 11, 2022.