



# CITY OF CARMEL-BY-THE-SEA

## California Adaptation Planning Guide

Climate Committee Meeting

December 10, 2019

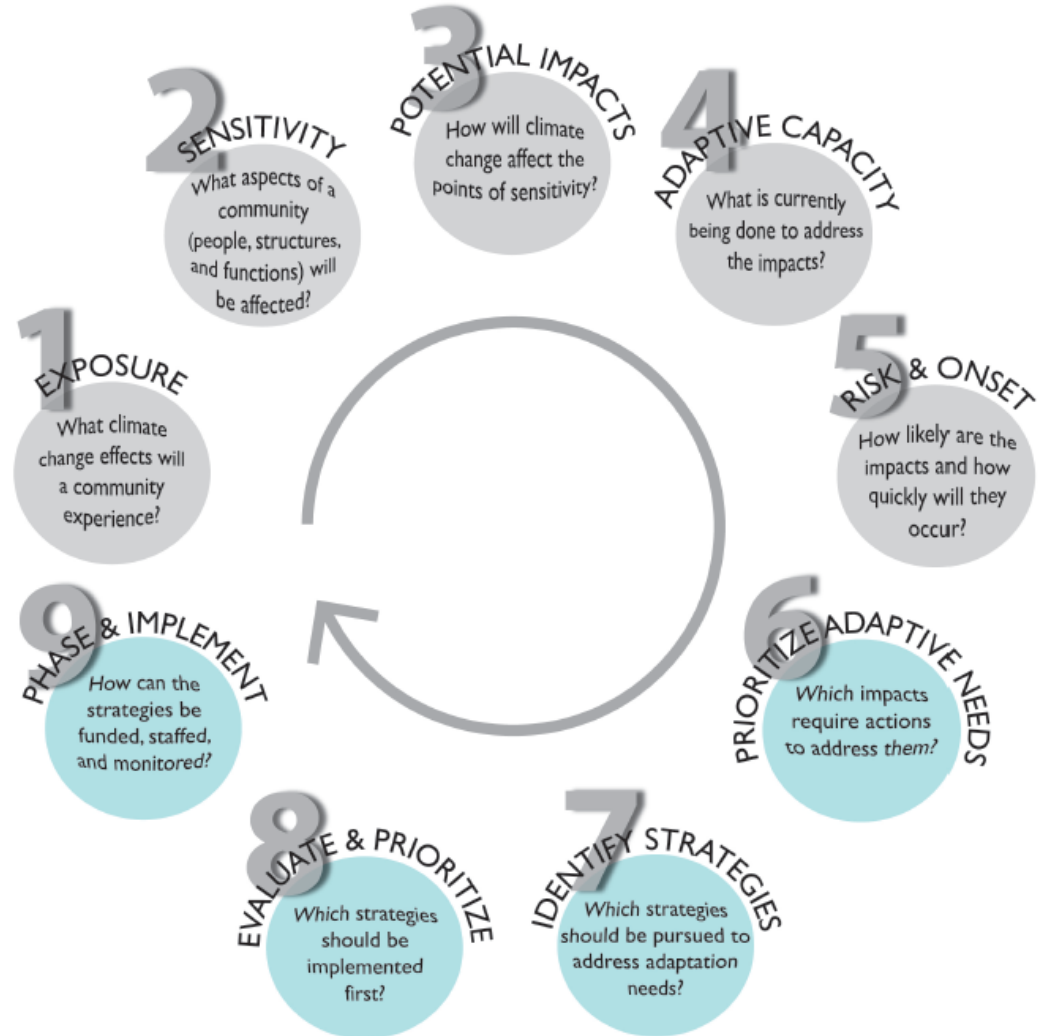


# Purpose

- Step-by-Step Process for Climate Adaptation Planning

## Two Primary Elements:

- Vulnerability Assessment
- Adaptation Strategy Development





# Vulnerability Assessment

## Step 1: Exposure

- Projected change
- Difference between current conditions and projections?
- How soon?
- How extensive?
- Data sources: Cal-Adapt, California 4<sup>th</sup> assessment, USGS modeling, data collected for other local plans

PRIMARY IMPACT	ASSOCIATED SECONDARY IMPACTS
Sea level rise	Inundation or long-term waterline change
	Extreme high tide*
	Coastal erosion*
	Saltwater intrusion*
Changed temperature and/or precipitation patterns	Changed seasonal patterns*
Increased temperature	Heat wave
Increased temperature and/or changed precipitation	Intense rainstorms*
Wildfire and/or increased precipitation	Landslide*
Increased temperature and/or reduced precipitation	Drought*
	Wildfire
	Reduced snowpack



# Vulnerability Assessment

## Step 2: Sensitivity

- Community structures, functions, populations that may be affected.
- E.g. Essential facilities, transportation systems, utilities, vulnerable populations, historic/cultural/natural resources

### Functions

- Government continuity
- Water/sewer/solid waste
- Energy delivery
- Emergency services
- Public safety
- Public health
- Emotional and mental health
- Business continuity
- Housing access
- Employment and job access
- Food security
- Mobility/transportation/access
- Quality of life
- Social services
- Ecological function
- Tourism
- Recreation
- Agriculture, forest, and fishery productivity
- Industrial operations

### Structures

- Residential
- Commercial
- Industrial
- Government
- Institutional (schools, churches, hospitals, prisons, etc.)
- Parks and open space
- Recreational facilities
- Transportation facilities and infrastructure
- Marine facilities
- Communication infrastructure
- Dikes and levees
- Water treatment plant and delivery infrastructure
- Wastewater treatment plant and collection infrastructure

### Populations

- Seniors
- Children
- Individuals with disabilities
- Individuals with compromised immune systems
- Individuals who are chronically ill
- Individuals without access lifelines (e.g. car or transit, telephones)
- Non-white communities
- Low-income, unemployed, or underemployed communities
- Individuals with limited English skills
- Renters
- Students
- Seasonal residents
- Individuals uncertain about available resources because of citizenship status



# Vulnerability Assessment

## Step 3/4: Potential Impacts and Adaptive Capacity

- How a point of sensitivity can affect the community
- Existing tools to address the impact

Table 2. Sample assessment of potential sea level rise impact on Marine Safety Building in San Clemente, CA

POTENTIAL IMPACTS	SENSITIVITY	TEMPORAL EXTENT	SPATIAL EXTENT	RATING
Water damage and destruction of marine safety building	Marine safety building	4 years+	One area (MS)	high
Service level impacts				
Loss of on-site offices—staff less available to respond to public emergencies	Potential impact on any of 2.5 million annual visitors to beach	4 years+	Entire beach	high
Loss of on-site supervision and reduced oversight	Potential impact on any of 2.5 million annual visitors to beach	4 years+	Entire beach	high
Loss of advanced first aid facilities for public	Impact on injured citizens	4 years+	One area (MS)	high
Loss of hot showers for hypothermic patients and lifeguards	Impact on public and employees	4 years+	One area (MS)	high
Loss of building providing public walk-in assistance	Impact on public and employees	4 years+	One area (MS)	medium
Loss of training facility/classroom for junior lifeguards	Impact on 650 students annually	4 years+	One area (MS)	medium
Loss of swimmer observation facility	Impact on approximately 30% of beach population	4 years+	One area (MS)	high
Loss of public clock visible to 50% of beach	Impact on approximately 50% of beach population	4 years+	50% of beach	low



# Vulnerability Assessment

## Step 5: Risk and Onset

- Likelihood of potential impact combined with the likelihood of sensitivity to it
- Timeframe of impact

PRIMARY IMPACT	ASSOCIATED SECONDARY IMPACTS	CERTAINTY RATING
Sea level rise	Inundation or long-term waterline change	High
	Extreme high tide	High
	Coastal erosion	High
	Saltwater intrusion	High
Changed temperature and/or precipitation patterns	Changed seasonal patterns	Medium
Increased temperature	Heat wave	High
Increased temperature and/or changed precipitation	Intense rainstorms	Medium
Wildfire and/or increased precipitation	Landslide	Medium
Increased temperature and/or reduced precipitation	Drought	Medium
	Wildfire	Medium
	Reduced snowpack	High



# Adaptation Strategy Development

- Prioritize Adaptive Needs
- Identify Strategies
- Evaluate and Prioritize Strategies

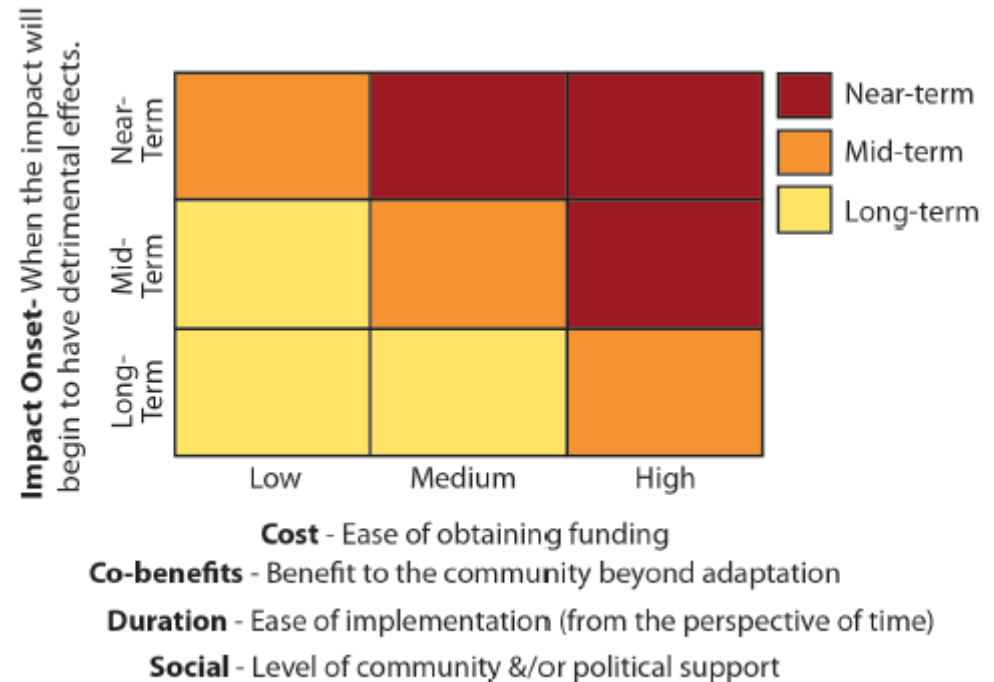


Figure 7. A sample decision matrix.





# Adaptation Strategy Development

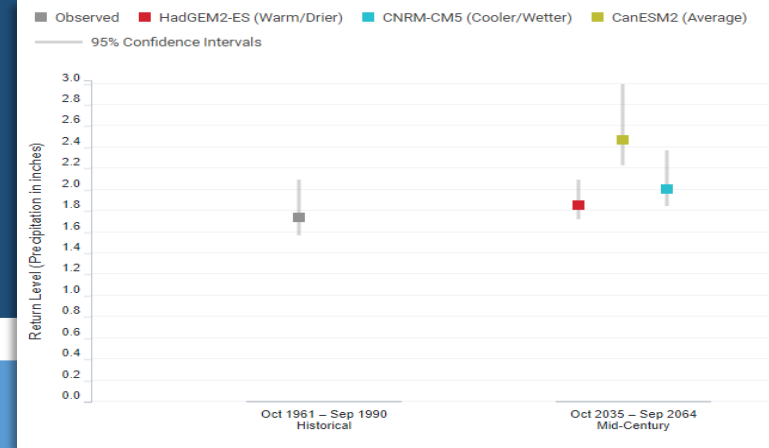
Table I (Cont'd). Climate Change Adaptation Strategies with Sector Overlap identified.

STRATEGY NUMBER	STRATEGY	PUBLIC HEALTH, SOCIO-ECONOMIC, & EQUITY	OCEAN & COASTAL RESOURCES	WATER MANAGEMENT	FOREST & RANGELAND	BIODIVERSITY & HABITAT	AGRICULTURE	INFRASTRUCTURE
WM 7	Develop a water recycling program.			X				
WM 8	Implement tiered pricing to reduce water consumption and demand.			X				
WM 9	Increase "above-the-dam" regional natural water storage systems.			X	X	X		
FR 1	Establish a management program to track forest and rangeland health.			X	X	X		
FR 2	Develop, adopt, and implement integrated plans for mitigating wildfire impacts in wildland-urban interface (WUI) areas				X			X
FR 3	Design homes, neighborhoods, and streets to minimize vulnerability to fire hazards in WUI areas	X			X			X
FR 4	Encourage compliance with statutory requirements for vegetation management around structures, and promote fuel breaks to slow fire spread in WUI areas.				X			X





# Carmel Example



Step	Example	Detail
Exposure	Extreme rainfall	10-year 24-hour storm: Historic average of 1.74 inches 2035-2064 projection: average could be up to 2.47 inches
Sensitivity	Extreme rainfall	Structures: Storm drainage system, Parks, Sanitary sewer, Roadways Functions: Drainage, Energy delivery, Emergency services, Public safety
Potential Impacts	Extreme rainfall / Storm drains	- Damage to drainage structures from large debris in larger flows – 4 <sup>th</sup> Avenue drainage, Mission Trail stream - Compromised storm drain capacity and flooding
Adaptive Capacity	Extreme rainfall / Storm drains	2019 Storm Drain Master Plan to map out system and ID issue areas Mission Trail Nature Preserve Stream Stability Study
Risk and Onset	Extreme rainfall / Storm drains	High
Strategies	Extreme rainfall / Storm drains	Incorporate Climate modeling in infrastructure planning Prioritize Low-Impact Development to reduce runoff



Thank you - Questions?