

SCAG Climate Adaptation Framework

Principles and Metrics for Metropolitan Planning Organizations

prepared for

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1.0 Climate Adaptation Indicators for Metropolitan Planning Organizations

The Southern California Association of Governments (SCAG) is in the process of developing a Climate Adaptation Planning Guide for the Southern California region. In support of this effort, this document outlines a framework for Metropolitan Planning Organizations (MPOs) to track climate impacts in their region and their region's progress towards advancing climate adaptation strategies and achieving desired outcomes. The document presents several types of indicators and metrics in three separate tables. These include:

- **Climate Change Indicators:** These indicators track changes to the climate and the associated impacts of climate events
- **Vulnerability Indicators:** These indicators track the region's exposure to climate threats, the sensitivity of the region to those events, and how suited a region is to adapt to climate threats.
- **Climate Adaptation Metrics:** These metrics track the region's progress towards planning for and mitigating climate threats.

Monitoring climate adaptation efforts can be difficult because the baseline is continually shifting. MPOs should incorporate each of the three layers of indicators (climate change, exposure, sensitivity) together to account for changing climate threats, changes in levels of exposure, and changing demographics. Note that this is not an exhaustive list of all indicators that a given region may want to track, and as every region is different, some indicators on this list may not be applicable for all regions. Regions should use this as a starting point to begin identifying appropriate indicators for the communities in their area.

1.1 Climate Change Indicators

Climate change indicators track the pace of climate change and quantify the impacts of climate change on the region. These indicators, listed in Table 1.1, are related to four risk categories: Extreme Heat, Fire, Sea Level Rise, and Extreme Precipitation.

Table 1.1 Climate Change Indicators

Risk Categories		Climate Change Indicators
• Extreme Heat	1	Mean monthly temperature
	2	Number of extreme heat days
• Wildfire	3	Hospital visits due to heat exposure per capita
• Sea Level Rise / Coastal Flooding	4	Acres of productive farm land lost from extreme weather event
	5	Acres burned in wildfires
• Inland Flooding	6	Change in annual precipitation
	7	Number of extreme precipitation events
	8	Number of land slides

Risk Categories	Climate Change Indicators	
	9	Sea level rise relative to baseline
	10	Coastal ocean temperature
	11	Number of severe wind storms
	12	Weather-related disruption of electricity supply
	13	Property damages from extreme weather events
	14	Number of critical infrastructure disruptions
	15	Miles of transportation network impacted by extreme weather events
	16	Insurance claims from extreme weather events
	17	Air pollutant concentrations
	18	Days with unhealthy air quality
	19	Number of water supply shortages and occurrences of contamination

1.2 Vulnerability Indicators

Vulnerability indicators quantify how vulnerable a region may be to the threat of severe weather and climate events. The vulnerability is measured by overlaying three factors: a region's exposure, sensitivity, and adaptive capacity.

1. Exposure: The exposure indicators identify areas with elevated risk of climate change events. The definition of high, medium, and low concern varies based on the risk category and will change over time. The current definition for SCAG's Regional Climate Adaptation Framework includes:

Risk Category	High Risk	Medium Risk	Low Risk
Extreme Heat	More than 30 heat event days in 2030	More than 30 heat event days in 2050	More than 30 heat event days in 2070
Wildfire	Very high	High	Moderate
Sea Level Rise	0.5 meter sea level rise	1 meter sea level rise	1.5 meter sea level rise
Inland Flooding	Base flood plain	100 year flood plain	500 year flood plain

Note: The definition of high, medium, and low risk will vary between regions. The exposure indicators below refer to "area of identified risk." Some MPOs may choose to track population or jobs in high and medium risk areas, while other MPOs may choose to track the most at risk areas.

2. Sensitivity: Sensitivity indicators help quantify how vulnerable a population might be to a climate threat. These include socioeconomic and demographic factors that could make a given population disproportionately susceptible to climate threats.

3. Adaptive Capacity: Adaptive capacity quantifies the ability of a community to adapt to climate threats. These include indicators that have the ability to reduce the area's exposure or sensitivity to climate change.

Table 1.2 Climate Change Vulnerability Indicators

Indicator	
Exposure Indicators	
1	Number and percent of population in area of identified risk (high, medium, or low extreme heat, wildfire sea level rise, and inland flooding risk), including communities of color and low-income populations
2	Number and percent of jobs in area of identified risk
3	Number and percent of structures in area of identified risk
4	Number and percent of critical facilities in area of identified risk
5	Number and percent of infrastructure and utilities in area of identified risk
6	Acreage and percent of farm land or other managed resources in area of identified risk
7	Number and percent of SB 535 disadvantaged populations in area of identified risk
8	Percent of wildlife habitat in area of identified risk
9	Number and percent of tribal community population in area of identified risk
10	Number of toxic or contaminated sites in areas of identified risk
Sensitivity Indicators	
11	Percent of population that is 65 years or older
12	Percent of population that is 5 years or younger
13	Percent of occupied households with no vehicle ownership
14	Percent of workers in outdoor industries
15	Percent of population living in poverty
16	Percent of population of color
17	Percent of households with no one aged greater than 14 years speaking English
18	Percent of population living with physical or mental disability
19	Percent of buildings built after 1979
20	Percent of population without health insurance

Indicator	
21	Percent of population over age 18 that is unemployed
22	Percent of over age of 25 without high school diploma or equivalent
23	Sensitive habitat in areas of high, medium, and low concern
24	Percent of population residing in mobile homes
25	Percent of population without redundant roadways
26	Percent of reservoir capacity filled at June 1st
27	Percent of population with pre-existing or chronic health conditions
28	Percent of population without access to stable, affordable housing
Adaptive Capacity	
29	Percent of area, including in communities of color and low-income populations, not covered by tree canopy
30	Percent of area covered by impervious surfaces
31	Percent of population not residing within 0.5 mile of transit stop with <15 minutes waiting time during peak commute hours
32	Number of transit stops providing service to vulnerable or low-income populations
33	Number of emergency centers and shelters per capita, including in communities of color and low-income populations
34	Percent of households, including in communities of color and low-income populations, without air conditioning
35	Percent of population living in communities without an early warning system for wildfires
36	Number of acute care hospital beds available per 1,000 residents
37	Percent of population, including communities of color and low-income populations, within 5 miles of cooling site

1.3 Climate Adaptation Metrics

Adaptation metrics track the region's efforts to address climate threats. These include metrics that measure or track the specific activities undertaken; the planning, coordination, implementation and investments related to climate adaptation.

Table 1.3 Climate Adaptation Metrics

Adaptation Metrics	
Plans and Policies	
1	Percent of population living in city or county with completed vulnerability assessment
2	Percent of population living in city or county with hazard mitigation plan that addresses climate threats
3	Percent of population and farm land area with drought management plan that addresses climate threats
4	Percent of population living in flood prone area with flood control plan that addresses climate threats
5	Percent of population and forest acres in areas prone to fires with fire management plan that addresses climate threats
6	Number and percent of MPO member agencies with general plan that address climate, health, and equity for vulnerable populations
7	Number and percent of MPO member agencies with updated safety elements in compliance with Senate Bill 379
8	Number and percent of MPO member agencies with stand-alone climate adaptation plans that address climate, health, and equity for vulnerable populations, including communities of color and low-income populations
9	Number and percent of MPO member agencies with 5-year climate adaptation implementation plan created
10	Number of MPO member agencies with climate adaptation integrated into agency processes (e.g., capital improvement plans)
11	Consideration of climate change in MPO's Regional Transportation Plan/Sustainable Communities Strategy
12	Consideration of climate change in MPOs' Regional Comprehensive Plan
13	Consideration of climate change in MPO's Regional Housing Needs Assessment allocations
14	Percentage of conservation plans that include climate adaptation strategies for fish, wildlife, plants, ecosystems, or cultural resources
15	Number of MPO agency staff enrolled in climate-related education courses and other trainings
16	Report prepared identifying disproportionately vulnerable populations, including communities of color and low-income communities, to climate change
Regional Coordination and Outreach	
17	MPO climate adaptation working group established and number and breadth of unique stakeholders served
18	Number of webinars and trainings on climate threats hosted by MPO
19	Percent of member agencies surveyed with an understanding of their communities vulnerability to climate change
20	Number of climate collaboratives in-place
21	Number of MPO outreach events that address climate threats

Adaptation Metrics	
22	Percent of MPO outreach budget targeting disproportionately vulnerable communities, including communities of color and low-income populations
23	Number of MPO committees with climate resilience objectives
24	Number of partnerships established between MPO and local public health departments, health providers, academic institutions, and community-based organizations
25	Percent of MPO outreach events and materials provided in different forms (print, online, in person) and in multiple languages
26	Percent of member agencies surveyed that have community engagement plans for disproportionately vulnerable communities, including communities of color and low-income populations
Implementation and Investment	
27	Dollars invested in mitigation or adaptation strategy
28	Number of projects in Federal Transportation Improvement Program (FTIP) that improve resiliency
29	Number of adaptation projects completed
30	Number of bridges rehabilitated or made resilient
31	Lane miles of roadways rehabilitated or made resilient
32	Track miles of transit systems rehabilitated or made resilient
33	Acres of forested land treated to reduce fire risk
34	Acres of terrestrial and aquatic habitat restored or protected in perpetuity
35	Acres of farmland conserved through agricultural conservation easement
36	Percent increase in tree canopy within urbanized areas, including in communities of color and low-income populations
37	Percent reduction in rate of new residential units approved in climate-change related hazard zones
38	Percent of mitigation or adaptation investments directly benefiting communities of color and low-income populations
39	Percent of adaptation projects completed in communities of color and low-income populations
40	Consideration of racial and environmental equity in grant programs that fund climate adaptation projects