

California Legislature  
Senate Committee on  
Environmental Quality

BOB WIECKOWSKI  
CHAIR



**OVERSIGHT HEARING OF THE SENATE ENVIRONMENTAL  
QUALITY COMMITTEE**

BOB WIECKOWSKI, CHAIR

Wednesday, April 11, 2018  
9:30 a.m.  
California State Capitol, Room 3191

**Implementation of California Climate Adaptation Policies**

**BACKGROUND INFORMATION**

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**Introduction**

Climate change is one of the foremost challenges of our time. Increases in carbon dioxide and other greenhouse gasses (GHGs), such as methane and black carbon, have led to increased average global temperatures, the increased geographic reach of vector-borne illnesses, diminished snow pack and sea ice, rising sea levels, decreased water quality and supply, reduced crop yields, and countless other impacts.

According to the United States Environmental Protection Agency (US EPA), every 2°F increase in global average temperature is expected to result in 5-15% reductions in crop yields, 3-10% increases in rainfall during heavy precipitation events, and 200-400% increases in areas burned by wildfires in the western U.S. In California, higher temperatures and more extreme events, including heat waves, wildfires, floods, and droughts, will have a range of consequences for public health, air and water quality, infrastructure, agriculture, natural resources, safety and security, and the economy.

California has been a leader on climate mitigation policy. However, mitigation policies alone cannot protect the state. The global climate system has already changed and will continue to change because it is not possible to completely halt the emissions of GHGs.

While science can now conclusively attribute individual extreme events to climate change, it is important to distinguish that such events are a symptom of climate change, not the cause. Two examples of the symptoms of climate change are the recent extreme wildfires and the five-year drought.

Preparing for these impacts will require that California strengthen, coordinate, and invest in our state's adaptation and resiliency efforts for the expected, and unexpected, impacts of climate change. Doing so will result in the state better understanding the symptoms of climate change and thereby policies that will prepare California for its new environment.

## **Impacts of Climate Change**

### *Higher Temperatures and Air Quality*

Climate change is already causing higher temperatures state-wide, and more frequent and hotter days will lead to worse air quality through increased amounts of ground-level pollutants such as ozone. An analysis of power plants in California showed a 3% increase in emissions of smog forming compounds per degree Fahrenheit increase in daily temperature (Drechsler et al., 2006). This is due to a variety of factors, including increased energy use to run indoor air conditioning systems.

Higher temperatures and heat waves also increase heat-related illness and death, including 650 deaths in California during heat wave in 2006. Heat waves also directly lead to immediate public health concerns, particularly for those people without either access to air conditioning or enough money to pay for running an air conditioner even if they have access to one.

Extreme events, such as wildfires, can affect air quality by leading to increased concentrations of Particulate Matter (PM), which has been linked to premature death in people with heart and lung disease, as well as aggravating asthma and respiratory symptoms. Scientific modeling has predicted 12-53% increase in large California wildfires by 2100 (Westerling and Bryant, 2006).

## *Water Quality*

In many regions, hydrological systems are being altered by changes in precipitation and snow pack. Reductions in the Sierra Nevada snowpack are expected from higher temperatures, leading to diminished water reserves. Because of these dwindling water reserves, groundwater pumping may continue to increase and result in an increased concentration of pollutants in drinking water.

For example, nitrate contamination of drinking water, already an acute problem in many areas in the Central Valley, may be further exacerbated, resulting in a much higher fraction of residents who are not able to drink water safely from their tap.

Though overall rain amounts will be reduced, rainfall events are expected to be more extreme, which can overwhelm sewage and water treatment facilities, resulting in decreased water quality.

In coastal areas, rising sea levels can lead to increased salinity in coastal aquifers. Higher salinity of water has reduced usability for both drinking water and agricultural purposes, and desalination procedures are energy-intensive and costly.

## *Infectious and Vector-borne Diseases and Public Health Impacts*

Climate change can further lead to public health impacts by facilitating disease spread and exacerbating chronic health conditions. Already, California has seen an increase in the length of the growing season and pollen production amounts of ragweed, a common cause of severe seasonal allergies.

Increased temperatures can promote bacterial contamination in foods and lead to increases in harmful algal blooms that have been tied to skin, gastrointestinal, respiratory, and neurological signs and symptoms.

Reductions in the number and sizes of recreational bodies of water due to decreased rainfall can further lead to increased concentration of pollutants and bacterial contaminants from more users in fewer and smaller areas.

There is concern about the spread of vector-borne diseases, as the distribution of vectors (e.g. ticks, mosquitoes) carrying pathogens spread into new habitats as regional climates change. Droughts, which will increase with climate change, can also favor mosquito breeding because streams that would normally be flowing become a series of stagnant pools in which mosquitoes breed. For example, previous research has shown that human outbreaks of the mosquito-transmitted

Saint Louis encephalitis are correlated with periods of several days when the temperature exceeds 30°C (95°F), as has been the case in previous California epidemics (Githeko et al. 2000).

In addition to expanding habitats, hot temperatures also facilitate the spread of West Nile Virus (WNV) by speeding up both the replication of the virus and the development of the mosquito that carries it. Mosquitoes digest blood meals more rapidly at higher temperatures, leading them to feed more often.

### *Agriculture*

In addition to the effects of drought and severe weather events, climate change can further threaten food production and quality by facilitating diseases spreading to crops from vectors and pests. Combating these threats to food security will likely require increased use of pesticides and fertilizers, which leads to increased GHG emissions and concerns about human health and water quality from runoff and drift. In times of food insecurity and rising prices, people turn to nutrient-poor, calorie-rich foods with health impacts including malnutrition and obesity.

### *Energy*

California's energy infrastructure is designed to cope with the state's highly variable conditions and frequent disruptions from wildfires, storms and floods, but climate change is bringing more frequent and intense natural disasters. Changes in precipitation patterns, extreme events and sea-level rise have the potential to render hydropower less reliable and put energy infrastructure at risk of flooding. Increased temperatures, on the other hand, will decrease the efficiency of thermal power plants, transformers, transmission and distribution lines while simultaneously increasing electricity demand.

### *Transportation and Infrastructure*

Climate change impacts from sea-level rise to storm surge and coastal erosion are imminent threats to highways, roads, bridge supports, airports at or near sea level, seaports, and some transit system and rail lines. Shifting precipitation patterns, higher temperatures, wildfire, and an increased frequency of extreme weather events threaten transportation assets at varying locations across the state.

Temperature extremes and increased precipitation can increase the risk of road and railroad track failure, decrease transportation safety, and create higher maintenance costs. Higher maintenance costs are also a result of changes in precipitation

patterns and extreme weather events that increase flood threats and require modernization of dam spillways. In the Delta, extreme weather events threaten the integrity of storm levies and the risk of seawater incursion into a critical element of California’s water system.

*Community Development and Land Stewardship*

The impacts of climate change on public health and our built environment are shaping community development towards walkable, mixed-use neighborhoods where people can access amenities and capitalize on cheaper forms of transportation. In addition, as climate change is exacerbating inland and coastal flooding, wildfires, droughts, extreme heat and other hazards, community development decisions are prioritizing long-term safety and resilience. Natural and working land stewardship is similarly placing more emphasis on the ecological services a region can offer, for ex. flood control, shoreline stabilization and storm protection.

**Climate Change Indicators**

Climate change impacts can be distilled down to an “indicator” and California has closely monitored and assessed indicators of climate change since 2009 when the first edition of the *Indicators of Climate Change in California* was released by the Office of Environmental Health Hazards and Assessment (OEHHA). The third edition of this report is anticipated to be released soon. The highlights listed below represent an overview of the many indicators that characterize the multiple facets of climate change in California. Considered as a whole they depict the interrelationships between climate and other physical and biological systems in our environment.

<b>Indicator of Climate Change</b>	<b>Impact on California’s Environment</b>
Annual air temperature	Temperatures have increased by about 1.8 °F
Extreme heat events	Intensity, frequency, duration and regional extent of heat extremes has increased since 1950
Vector-borne diseases	Abundance of vectors in time and space has changed
Winter chill	Extended period of cold temperatures is decreasing
Snowmelt runoff	Spring snowmelt from the Sierra Nevada has declined over the past century
Extreme storm events	Frequency and intensity of floods has increased
Sea level rise	Sea levels have risen 8 and 6 inches at measurement stations in San Francisco and La Jolla, respectively

## Climate Adaptation Metrics

While California is enacting an initial set of indicators intended to track climate change, the state is still in the initial stages of developing metrics of the state’s progress toward adapting to climate change. While these efforts are an encouraging and positive sign, the measures are spread across a variety of sectors and agencies, and encompass a wide range of initial strategies. As noted in the Little Hoover Commission’s 2014 “Governing California Through Climate Change” report, there is a need “for a more unified approach to climate adaptation on the part of state government.”

A first step forward in unifying California’s adaptation policy and projects will require the identification of adaptation metrics. While some individual projects and actions may have straightforward metrics by which success can be measured, only through a common set of metrics can cross-cutting problems involving multiple agencies be evaluated for true success. Ultimately, the adequacy of the responses taken to improve adaptation and resiliency can only be fairly judged with a common set of metrics.

The Safeguarding California Plan has already made some progress towards this goal by listing metrics for climate impacts and government response in Appendix E of the 2018 Update, highlights of which are listed in the table below.

<b>Indicator of Climate Change</b>	<b>Possible Metric for Climate Adaptation</b>
Annual air temperature	Gigawatt hours of energy saved by efficiency and conservation initiatives
Extreme heat events	Number of designated neighborhood cooling centers with public transportation options
Vector-borne diseases	Number of vector-borne disease surveillance, prevention and control programs
Winter chill	Amount of crop cover with plant types that have lower winter chill requirements and high heat and drought tolerance
Snowmelt runoff	Volume of water to be conserved through the State Water Efficiency and Enhancement Program
Extreme storm events	Percentage of state owned roads that have a climate change vulnerability assessment
Sea level rise	Percentage of coastal population living in areas with vulnerability assessment and local planning for sea level rise

The ability to reference state defined adaptation metrics will greatly facilitate the collaborative action of local, regional and state governments in the their work on

climate adaptation, but in order to do so California must first better understand how to measure the impacts of climate change that these metrics aim to measure.

To date, in Appendix E of the 2018 Safeguarding California Plan Update, the state has identified 34 “government response metrics” that are tied to resilience outcomes. Each of these 34 government response metrics is a starting point for the development of eventual metrics for climate adaptation, but more work needs to be done to ensure that higher temperatures, air quality, water quality, infectious diseases, public health, agriculture, energy, transportation, infrastructure, community development, and other natural and built systems are covered.

## **Translating Indicators and Metrics into State, Regional, and Local Action**

### *Highlights of State Actions*

The Integrated Climate Adaptation and Resiliency Program at the Governor’s Office of Planning and Research (OPR) was created by SB 246 (Wieckowski, Chapter 606, Statutes of 2015) and helps to organize a cohesive and coordinated response to the impacts of climate change across California. This program is developing holistic strategies to coordinate climate activities at the state, regional and local levels while advancing social equity. It pursues this mission through two components: the creation and maintenance of the State Adaptation Clearinghouse and the convening of the Technical Advisory Council.

The role of the Technical Advisory Council is to support coordinated adaptation responses through developing guidance and informing state initiatives on how to best address local issues. The TAC is made of up nearly two dozen members from state, local and tribal governments, non-profits and the private sector from across the state. Over the last year the TAC has met 12 times to develop central principles for adaptation policy, projects and financing that can be implemented throughout California.

The clearinghouse serves as a centralized source of information and resources to assist state, regional, and local decision-makers with planning adaptation projects. It aims to be a user-friendly database that is searchable using keywords and tags, as well as a map interface and topic pages to access information by area of interest. The types of resource in the clearinghouse include, but are not limited to: assessments, plans and strategies, communication or educational materials, planning and/or policy guidance, data, tools, and case studies. Importantly, the clearinghouse highlights connections to existing State tools and resources, such as: the Hazard Mitigation Plan, Climate Change and Health Vulnerability

Assessments, Sea Level Rise Guidance and Database, General Plan Guidelines and Cal-Adapt.

The clearinghouse serves to make the best use of the large number of informational and guidance documents the State has generated in addressing climate adaptation over the past decade. Chart 1 gives an overview of the key documents and the focus of their contents, whether target and plan oriented, quantifying inventories and trends, or summarizing ongoing adaptation actions. In contrast to the cross-agency content of documents summarized in Chart 1, 2017 and 2018 saw a significant increase in the number of agency specific reports that addressed adaptation, namely the Department of Public Health's Climate Change and Health Vulnerability Indicator for California, and Climate Change Vulnerability Assessments by the Department of Transportation.

The Strategic Growth Council (SGC) was created through SB 732 (Steinberg, Chapter 729, Statutes of 2008) is a cabinet level council of state agencies, including OPR (Chair), California State Transportation Agency (CalSTA), California Natural Resources Agency (CNRA), Business, Consumer Services and Housing Agency (BCSH), California Environmental Protection Agency (Cal/EPA), California Health and Human Services Agency (CHHS), and California Department of Food and Agriculture (CDFA). The SGC also has three public members, one each being appointed by the Speaker of the Assembly, the Senate Committee on Rules, and the Governor. SGC coordinates multiple adaptation programs including Transformative Climate Communities, Affordable Housing and Sustainable Communities, Sustainable Agricultural Lands Conservation, and Proposition 84 Programs that advance sustainable planning.

The Climate Action Team (CAT) (created by EO S-03-05) is comprised of 17 members from state agencies, boards, and departments, headed by the Secretary of Cal/EPA. The CAT is tasked with coordinating statewide efforts to implement GHG reduction programs, as well as the state's Climate Adaptation Strategy. Within CAT, there are 10 Working Groups, including Agriculture, Land Use and Infrastructure, Public Health, State Government, and Intergovernmental.

### *Highlights of Regional Actions*

The Local Government Commission (LGC) is a non-profit organization in Sacramento that has worked on issues of local environmental sustainability, economic prosperity, and social equity for over 35 years. The LGC is led by a board of fifteen elected California city and county elected officials; the total



membership includes over seven hundred local leaders from California and the greater U.S.

The LGC is involved in a number of projects that assist local elected officials and other dedicated community leaders in creating healthy, walkable and resource-efficient communities. Among these are the Local Government Sustainable Energy Coalition, the Water-Energy Community Action Network in the San Joaquin Valley, and the Alliance for Regional Climate Collaboratives (ARCCA).

ARCCA is a network of leading regional collaboratives from across California that work together to advance climate adaptation statewide and increase local capacity to build community resilience. Existing ARCCA collaboratives encompass 80% of the state's population, with OPR serving as an ex-officio member. As of March 2018, ARCCA has five established regional collaboratives covering the Capitol region, Bay Area, Los Angeles, San Diego, and Sierra CAMP. There are three emerging collaboratives in the Central Coast, North Coast and Inland Empire. ARCCA is also actively engaging with Central Valley and Imperial Valley stakeholders to establish collaboratives in these regions.

Each collaborative has an unique structure and works to enhance public health, protect natural systems, build economies, and create resilient, livable communities, with region specific efforts. Members of the Los Angeles Climate collaborative, for example, have put together “an action-oriented, cross-jurisdictional and innovative framework” that organizes all of their projects. This framework provides best practices that allow economically disadvantaged communities to benefit from coordinated planning, inclusion in strategy and project development, and reinvestment to meet sustainable community goals.

More tangibly, the Los Angeles Climate Collaborative is helping the LA County Department of Public Health and the County's Chief Sustainability Officer develop partnerships that lessen the impacts of climate change on health. Their strategy includes increasing surveillance on climate-related illnesses and deaths by establishing criteria and metrics for mandatory reporting.

In more rural regions by contrast, the Sierra Climate Adaptation and Mitigation Partnership (CAMP) is providing information about grant programs. Specifically, Rural Development Emergency Community Water Assistance Grants that fund water source infrastructure for low-income areas and communities facing imminent decline and shortage of water.

In the capitol region, collaborative members are working together with Sacramento

Regional Transit and multiple stakeholders to improve, expand and electrify the local transit system. This work is part of a broader initiative from the collaborative to make the Sacramento region carbon neutral.

Another set of regional actions on climate adaption are being directed by the California State Association of Counties (CSAC) which has established a Climate Change Task Force that is charged with acting as a sounding board for potential rules and regulations in response to the Global Warming Solutions Act of 2006 and supports local governments as they demonstrate leadership in reducing GHG emissions and supports a collaborative state, regional and local approach to the development of GHG reduction strategies.

### *Highlights of Local Actions*

The Transformative Climate Communities Program (TCC) was established by AB 2722 (Burke, Chapter 371, Statutes of 2016), which, among other things, tasks SGC with awarding competitive grants to eligible entities for the development and implementation of neighborhood-level projects. These plans include GHG emissions reduction projects that provide local economic, environmental, and health benefits to disadvantaged communities. Three community collaborative projects have been funded through the TCC program as of March 2018 with \$140M to complete climate adaptation projects in select neighborhoods in the cities of Fresno, Los Angeles, and Ontario.

The Institute for Local Government (ILG) has a Sustainability Best Practices Framework that offers options for local climate action in ten areas. They are drawn from practical experiences of cities and counties throughout California. The options vary in complexity and are adaptable to fit the unique needs and circumstances of individual communities. ILG provides Climate Adaptation and Resilience Resources to help local agencies in planning along with providing Local Climate Adaptation and Resilience Plans. The ILG is connected with the League of CA Cities, CA State Association of Counties, and CA Special Districts Association.

### **Conclusion**

As the indicators convey, California is changing and in order for the state to defend itself, its residents, environment and economies from potential climate change catastrophes, California must adapt and become resilient to its impending new environment.

This necessitates immediate, strong, coordinated investment-in, planning and execution of public health, safety and environmental policy across governments.

While much work has been initiated over the last several years at the different levels of government, as articulated by the Little Hoover Commission's 2014 "Governing California through Climate Change" report, there is a great need for strong, unified action in order to build a climate resilient California.

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