PPIC

Climate Change

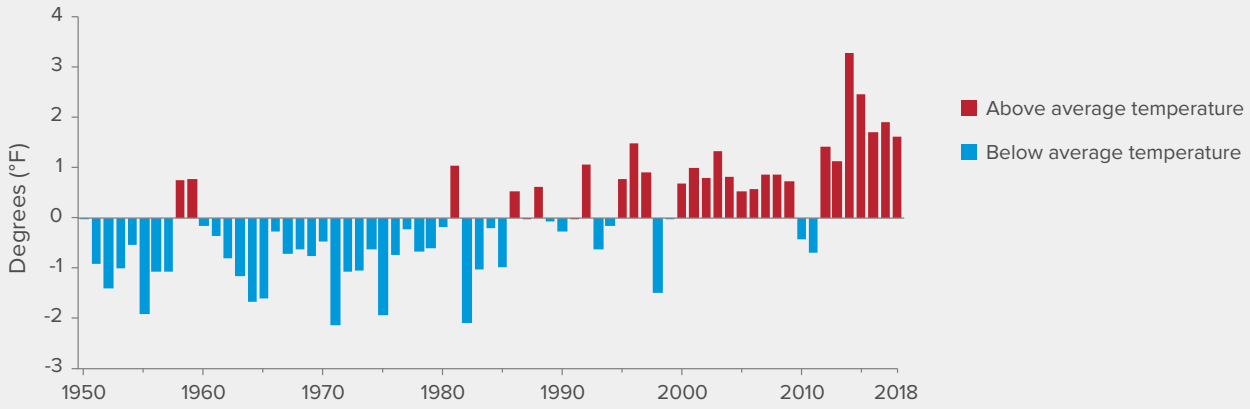
CALIFORNIA'S FUTURE

JANUARY 2020

Climate change threatens California's future

California faces a twofold climate challenge: finding cost-effective ways to reduce emissions of greenhouse gases (GHGs) and preparing for the changes that are expected even if global emissions fall. Greenhouse gas emissions pose a serious threat. The state experienced 7 of its 10 warmest years on record from 2012 to 2018, and warming is expected to continue. Sea level is predicted to rise 2 to 7 feet on California's coast by 2100, and the frequency of extreme events such as droughts, heat waves, wildfires, and floods is expected to increase. Higher temperatures result in more precipitation falling as rain (and less as snow), which will increase both the frequency and magnitude of flooding and diminish water reserves in the Sierra snowpack.

CALIFORNIA IS GETTING WARMER



SOURCE: Western Regional Climate Center.

NOTE: The figure reports degrees above or below the average statewide temperature for 1981–2000 (57.8°F).

Starting in 2006 with AB 32 (the Global Warming Solutions Act), the state has set increasingly ambitious emission reduction goals. In 2018, then-governor Jerry Brown issued an executive order calling for California to become carbon neutral by 2045, and Governor Newsom signed an executive order in 2019 to leverage $700 billion in investments to increase climate resilience.

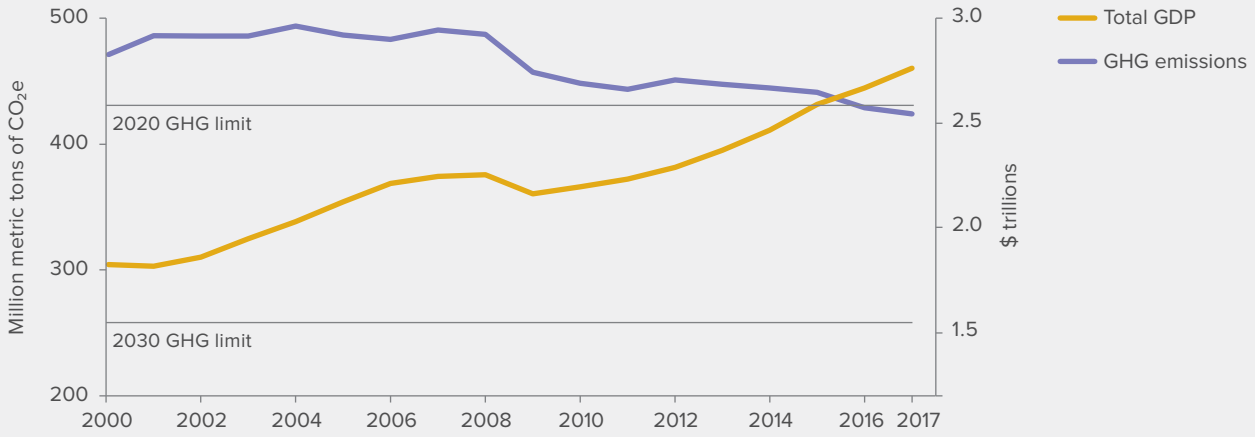
California's efforts to reduce GHG emissions have brought the state into conflict with the federal government, which has rolled back several federal climate-related regulations, attempted to block state climate initiatives, and begun to withdraw the United States from the Paris Climate Agreement. The PPIC Statewide Survey has found that about two in three Californians favor the state's emission reduction goals, and most see California's global leadership on climate change as important.

California is using a multifaceted approach to reduce emissions

The California Air Resources Board (CARB), which is responsible for implementing the Global Warming Solutions Act, reported in 2017 that the state's emissions were already below the 2020 target. CARB has established a framework for meeting the 2030 emissions target, which will require significant new efforts.

- **Reducing transportation emissions is key.**
  Transportation is the state's largest source of GHG emissions (41% in 2017). Emissions from this sector have been on the rise since 2013, after declining significantly from 2007 to 2013. Policies to reduce GHGs include low-carbon standards that aim to lower the carbon intensity of fuels by 10 percent by 2020; a plan to add 1.5 million zero-emission vehicles to roadways by 2025; a law that aims to reduce vehicle miles traveled by integrating land use with transportation investments; and a plan to reduce emissions from public transit and freight vehicles.

CALIFORNIA'S ECONOMY IS GROWING DESPITE REDUCTIONS IN GHG EMISSIONS



SOURCES: California Air Resources Board (emissions) and US Bureau of Economic Analysis (GDP).

NOTES: Gross domestic product (GDP) is expressed in 2017 dollars. GHG emissions are in millions of metric tons of CO_2 equivalent (CO_2e), a measure used to compare the relative contribution to global warming of various greenhouse gases. The CO_2e of CO_2 is 1, while the CO_2e of methane is 25.

- **The state is increasing its reliance on cleaner energy.**
  California is committed to providing all of its electricity from renewable and carbon-free sources by 2045 and has increased its 2030 target for renewable energy to 60 percent. The state met its 2020 goal of providing one-third of electricity from renewable sources ahead of schedule—34 percent of retail electricity sales were served by renewable facilities in 2018. Achieving goals for 2030 and 2045 will require additional shifts away from natural gas.
- **A statewide cap-and-trade program brings flexibility to reducing emissions.**
  California was the first state to enact a GHG cap-and-trade program. By allowing businesses to trade emissions permits, cap and trade allows market forces to help determine the cost of reducing emissions. Permit auctions began in 2012 with electric utilities and large industrial emitters; transportation and heating fuels were added in 2015. The auctions now cover 85 percent of the state's GHG emissions.
- **New policies target methane and other potent GHGs.**
  Short-lived climate pollutants—methane, black carbon, and most fluorinated gases—are powerful climate-warming gases and harmful air pollutants. Together, they account for 14 percent of all GHG emissions, with methane the largest source at 9 percent. SB 1383 (enacted in 2016) mandates cutting methane and hydrofluorocarbons by 40 percent and black carbon by 50 percent below 2013 levels by 2030, following a strategy proposed by CARB. The proposal could significantly affect California's dairy industry, which is responsible for more than half of the state's methane emissions.
- **Natural and working lands provide opportunities to capture and store carbon.**
  More than 90 percent of the state is covered by natural or working lands such as forests, farmland, rangeland, and urban green space. The state has drafted the California 2030 Natural and Working Lands Climate Change Implementation Plan to conserve, restore, and manage these lands as resilient carbon sinks—removing carbon dioxide from the atmosphere and storing it in vegetation and soils. This would have a number of benefits, such as improving air and water quality, wildlife habitat, and recreational opportunities.

California needs to address climate change effects

The effects of climate change are already evident and will worsen over time. California is ahead of other states in developing information on these effects, but more work is needed.

- **Sea level rise threatens coastal infrastructure, homes, and habitat.**
  Seventy-five percent of California's population lives in coastal counties. By 2040, more than 1,500 miles of roads and 100 miles of railroads will be at risk of flooding. Seaports, airports, power plants, and sewage treatment plants have already experienced climate-driven flooding. Coastal habitat is highly vulnerable to rising sea level.

SEA LEVEL RISE THREATENS THE BAY AREA

SOURCES: Map from San Francisco Bay Conservation and Development Commission; inundation data from N. Knowles, "Potential Inundation Due to Rising Sea Levels in the San Francisco Bay Region" (California Climate Change Center, 2009).

NOTE: The map illustrates the potential inundation with 16 inches and 55 inches of sea level rise, within the likely range expected by 2050 and 2100, respectively.

- **Wildfire risks are increasing.**
  The scale of wildfires—and the length of the wildfire season—has been growing, with three-quarters of California's 20 largest wildfires occurring since 2000. Warming temperatures and drier conditions are expected to increase this risk. Wildfires that kill large numbers of trees eliminate a valuable carbon sink and emit carbon dioxide and short-lived climate pollutants.
- **Native biodiversity is under threat.**
  Climate change places added burdens on many of the state's plants and animals. Many species will need to migrate to suitable habitat as temperatures rise, but development patterns could hinder this movement. Hot, dry conditions during the latest drought—similar to those expected in future droughts—put 18 native fish species at high risk of extinction.
- **Public health threats will increase.**
  As rising temperatures increase the intensity and spread of smog, the state will probably need additional pollution controls to meet air quality standards. An increase in extreme events—heat waves, wildfires, and floods—will also threaten public health and challenge the state's health care and emergency preparedness systems.
- **Water management faces challenges.**
  Climate pressures will make it harder to simultaneously store water for droughts, manage flood risk, and protect freshwater ecosystems. Warming causes the mountain snowpack to melt earlier and reduces snowpack water, while also making drought more severe. More intense winter storms put flood-control structures at risk. Sea level rise threatens the fragile levees of the Sacramento–San Joaquin Delta, which are important for the state's water supply. The 2017 crisis at Oroville Dam highlighted the risks from aging infrastructure.
- **Agriculture will have to adapt to changing conditions.**
  Reduced water supply reliability and higher temperatures will pose challenges for crop management. Research on heat- and drought-tolerant crops and tools such as localized climate information can help farmers adapt.
- **Readiness to cope is variable.**
  Water and electric utilities have begun to factor climate change into their long-range planning. The state has developed an adaptation strategy for its agencies, and some local governments are developing adaptation plans. But in areas such as ecosystem and flood management, institutional and legal frameworks are ill-equipped to prepare for change.
- **The state is providing information and adaptation tools for local governments.**
  The Fourth Climate Change Assessment (2018) provides the scientific foundation for understanding climate-related vulnerability. Cal-Adapt, the California Adaptation Planning Guide, and the California Local Energy Assurance Planning Tool can help local governments identify vulnerabilities and prepare for change.

Looking ahead

California hit its 2020 emission reduction targets ahead of schedule and is working toward more ambitious goals. But the state only produces about 1 percent of global emissions. Recent federal policy shifts on energy and climate change have heightened international uncertainty. Even if efforts such as the Paris Agreement prove successful, California faces some inevitable effects of climate change.

Achieve near-term greenhouse emission reductions. Large reductions are needed soon to avoid the most severe effects of climate change. Efforts to accelerate clean energy and transportation can make the greatest impact.

Align state actions. The state's many agencies should identify multi-benefit, multi-agency projects that can provide higher returns on investments. Examples of interagency coordination include the California 2030 Natural and Working Lands Climate Change Implementation Plan and Governor Newsom's executive order directing the administration to develop a comprehensive strategy to build a climate-resilient water system.

Use land-use planning to reduce potential impacts. For example, considering climate change in current land-use planning could facilitate migrations of species. Limiting development in flood risk areas will avoid future costs.

Review adaptation plans for critical infrastructure. For infrastructure such as dams, aqueducts, power plants, roadways, and airports, response plans and upgrades are required to protect public safety and maintain reliable services.

Spend cap-and-trade revenues in priority areas. Cap-and-trade auctions have made large sums available for programs to reduce GHG emissions. In the 2018–19 fiscal year alone, cap and trade generated more than $3 billion. Some of these funds are earmarked for programs in poor communities, which are often more vulnerable to climate effects. And some support innovative but harder-to-fund projects, such as managing forests to store carbon and helping dairies transform methane into electricity with biodigesters.

Continue to play a leadership role. California's efforts to reduce GHG emissions and increase carbon-free electricity reinforce the state's commitment to combating climate change and encourage other governments to take action. California is also helping global efforts by sharing information on successful emission-reducing innovations.

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