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## California's Comprehensive Approach to Climate Change: The Pivotal Role of

# RESEARCH

Since the late 1980s, California has designed research to complement federal research efforts and to produce California-specific climate information to inform both policy formulation and long-term planning. This article describes the central role played by scientific research and its role in the state's overall climate strategy.



The low water level due to drought conditions is evident in the Don Pedro Reservoir in the Stanislaus National Forest of Tuolumne County, California. Dry conditions in the southern part of California may become more frequent with climate change.

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California has demonstrated strong leadership on climate change for several decades. The adoption of the first-ever greenhouse gas (GHG) emission standards for new passenger vehicles followed closely by the adoption of an economy-wide GHG emission reduction target for 2020 have demonstrated California's commitment to reducing GHG emissions. These requirements, which are often the programs that grab headlines, are part of a comprehensive approach to climate change that California began piecing together in the late 1980s.

### A Comprehensive Approach to Climate Change

California is implementing a comprehensive climate change program integrating across three fundamental components: reducing GHG emissions (i.e., mitigation), preparing for the impacts of climate change already underway (i.e., preparedness or safeguarding), and a strong, comprehensive research program. The integration of these three elements has been key to California's success in adopting and implementing climate change programs.

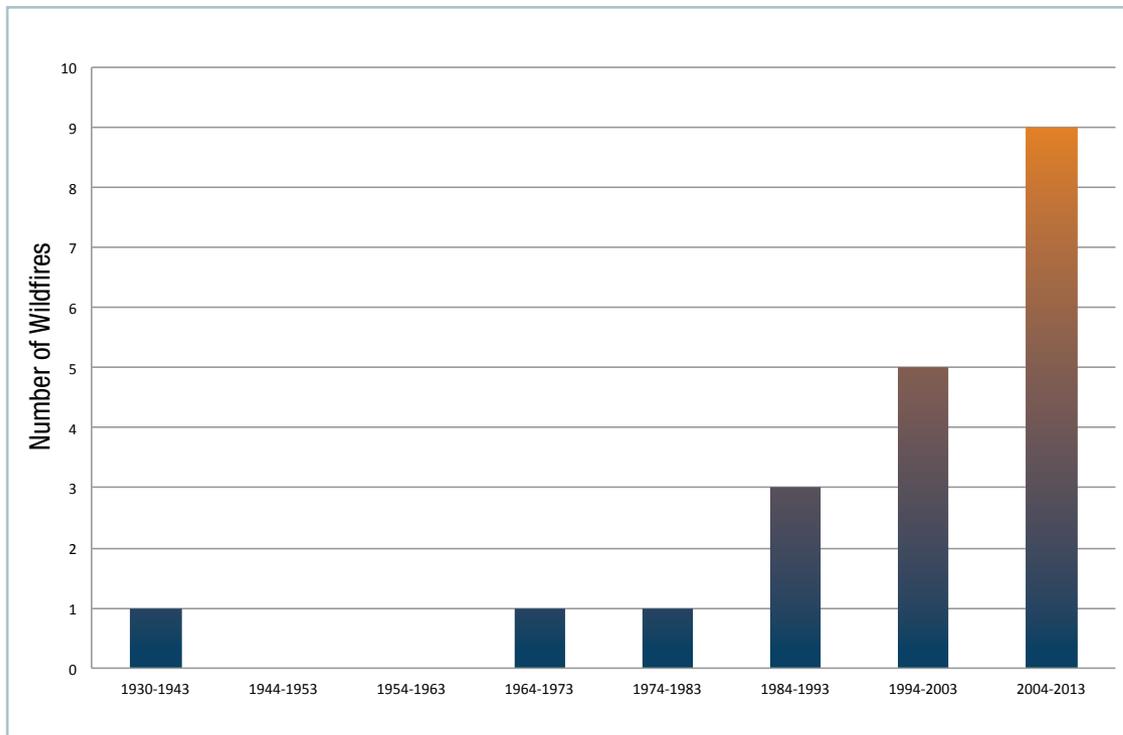


Figure 1. Twenty of the largest wildfires in California. The trend is consistent with scientific evidence suggesting an increase in wildfire activities with a warming climate that will accelerate in the future.

Source: Top 20 Largest California Wildfires. CAL FIRE. Accessed on February 15, 2014.

California’s approach began to take shape in 1988, when the State Legislature passed a law requiring the preparation of an assessment of the potential impacts of climate change on California. The California Energy Commission (Energy Commission), in consultation with other state agencies and the scientific community, produced the first California climate assessment that recommended that California begin to reduce GHG emissions to prepare for a changing climate.<sup>1</sup> That was the start of a long and sustained dialogue on climate change between policy-makers and the scientific community in California facilitated by state governmental agencies and non-governmental organizations.<sup>2</sup>

This on-going dialogue has been an integral part of the California’s policy achievements and was a major contributing factor to the passage of California’s Global Warming Solutions Act (AB 32) in 2006,<sup>3</sup> a law that mandates reducing GHG emissions to 1990 levels by 2020, and continuing reductions beyond 2020 to achieve California’s long-term climate goals. More recently, this dialogue has focused on adaptation as a necessary complement to mitigation efforts to reduce or eliminate the impacts that are in “the pipeline” given the accumulation of GHG in our atmosphere and the inertia of the climate system. In the area of mitigation, preliminary discussions are under way

on potential post-2020 GHG emission targets.

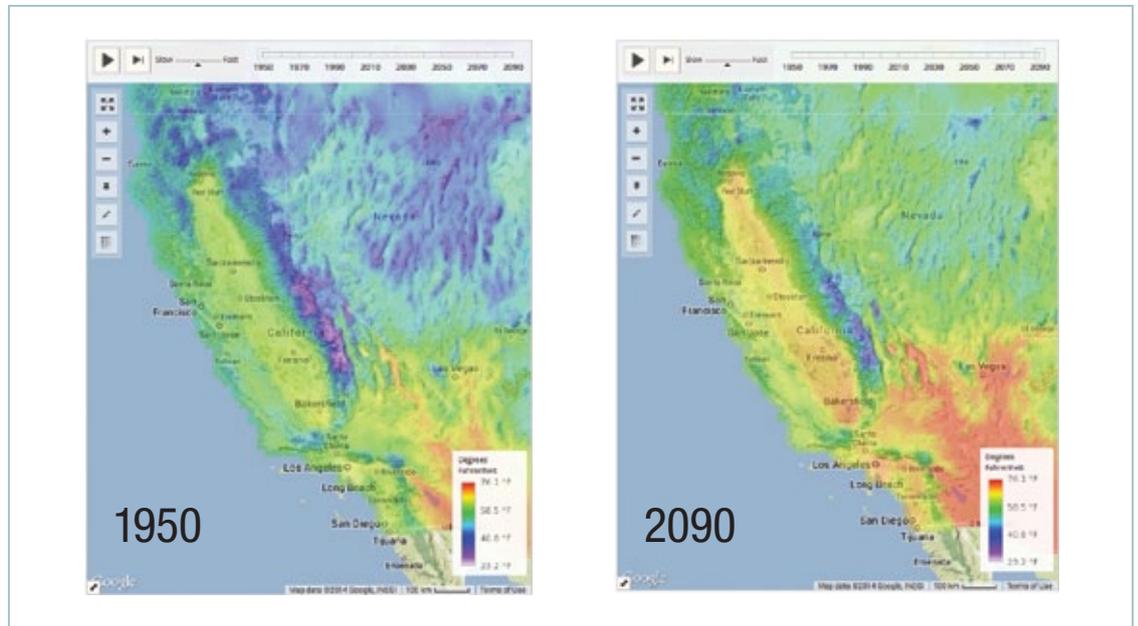
A somewhat unique feature of California’s program is the integrated role that California-sponsored research has played in its success. From the beginning, California has designed research to complement federal research efforts and to produce California-specific climate information to inform both policy formulation and long-term planning. This article describes the central role played by scientific research and its role in the overall climate strategy that California has adopted. (A companion paper in this issue focuses on California’s mitigation efforts.)

### California-Sponsored Regional Climate Science

In the early 2000s, the State of California commissioned the second climate change assessment about potential impacts of climate change on energy, water resources, forestry, agriculture, coastal properties, public health, and ecosystems.<sup>4</sup> This assessment contributed to the realization that California needed a well-coordinated and integrated climate change research program, which resulted in the preparation of a long-term research plan<sup>5</sup> and the creation of a virtual research organization known as the California Climate Change Research Center.<sup>6</sup> This was the first state-sponsored

Figure 2. Average annual temperature in 1950 vs. 2090 under a high emissions scenario.

Source: Cal-Adapt, a Web site that makes accessible research products using Google Maps. Local agencies are using Cal-Adapt for climate change studies and plans. <http://cal-adapt.org>.



climate research program in the United States, encompassing research activities at many of the major research institutions in California. Under the umbrella of this virtual center, California-supported research has produced more than 200 peer-reviewed publications covering various aspects of climate science from GHG inventory methods to mitigation and adaptation.

The center has also overseen the preparation of three recent California Climate Change Assessments.<sup>7</sup> The first of these, released in 2006, was instrumental in the passage of AB 32.<sup>8</sup> The 2009 assessment suggested that economic impacts would be less severe if adaptation measures were implemented. This contributed substantially to the realization that preparing for the effects that are no longer avoidable must be a priority,<sup>9</sup> which was not a widely accepted concept in policy circles in California before the release of the 2009 assessment. The most recent assessment, released in July 2012, explored vulnerability and adaptation options at the local and regional scales and started to explore potential barriers to adaptation.<sup>10</sup> One example is the current water laws that are not designed for substantial changes in hydrologic conditions as expected from a changing climate.<sup>11</sup>

In the past few years, an increasing number of California state agencies are supporting climate research in different ways. To facilitate integration and minimize potential overlap, California state

agencies have coordinated their research activities via the Climate Action Team Research Working Group. In spring 2014, this group prepared a Climate Change Research Plan for California. This is an unprecedented effort in California involving 15 state agencies and more than 40 research managers and scientists. This plan delineates how research will continue to contribute to the overall climate strategy in California in the next three to five years.

### Research Informing Mitigation and Adaptation Activities

Research has and continues to inform mitigation and adaptation regulatory and planning efforts. In the area of adaptation, California prepared one of the nation's first comprehensive climate adaptation strategies in 2009 at the request of an Executive Order (S-13-08). This plan has since been updated in 2014.<sup>12</sup> The 2009 strategy and its 2014 update, *Safeguarding California: Reducing Climate Risks*, rely heavily on the climate information produced through the California's Climate Assessments.

An important component of California's climate adaptation effort is to prepare local and regional governments to incorporate climate change into local planning. To this end, California's research has informed the development of Cal-Adapt (<http://cal-adapt.org/>), which provides climate impacts information at a locally-relevant scale and the Adaptation Planning Guide, a step-by-step guide

on how to undertake the development of a climate adaptation plan focused on local government. Similarly, the California Ocean Protection Council has developed statewide guidance for addressing rising sea levels and the Department of Water Resources requires the preparation of integrated water management plans addressing adaptation from local and regional water districts.

### Linkages with National Efforts

Research at the national level has provided a strong foundation for the research activities supported by California. At the same time, California has also contributed to the national effort. For example, the 2009 National Climate Assessment,<sup>13</sup> prepared in compliance with the Global Change Research Act of 1990, included a chapter covering the Southwest region (six states in the southwest corner of the country). Over one quarter of the papers cited in the chapter originated from California-sponsored research. California also contributed in a substantial way to the 2014 National Assessment and conversations are on-going about the coordination of the 2017 California assessment and the 2018 national climate assessment.

### Moving Forward

As we move forward, California's continued leadership and commitment to developing and implementing policies and actions that are informed by a robust research effort are critical to California's success. California's commitment to research has resulted in policies that are based on sound science and has built a legacy of actions that have put California in a leadership position on climate action. California's leadership brings great opportunities, but also a responsibility to continue to

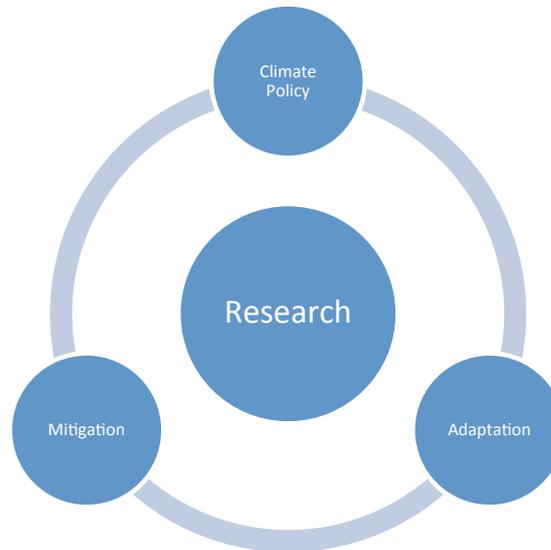


Figure 3. Regional climate research has played a central role in California.

work collaboratively and contribute to coordinated approaches to address climate change, both in California and with our external partners.

California agencies are working closely to leverage resources and align current and future research activities and tool development with our federal counterparts particularly, as the President's Climate Action Plan is implemented. These partnerships are informing the development of regional and national tools modeled after California's initiatives. This bodes well in a time when we need common methodologies and shared strategies to align efforts and ensure that the science that informs our policy is comparable across our borders. California is part of a regional, national, and international dialogue on these efforts. California needs to continue working collaboratively for innovative and creative solutions that will help guide actions moving forward in coordination and support of national and international actions. **em**

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