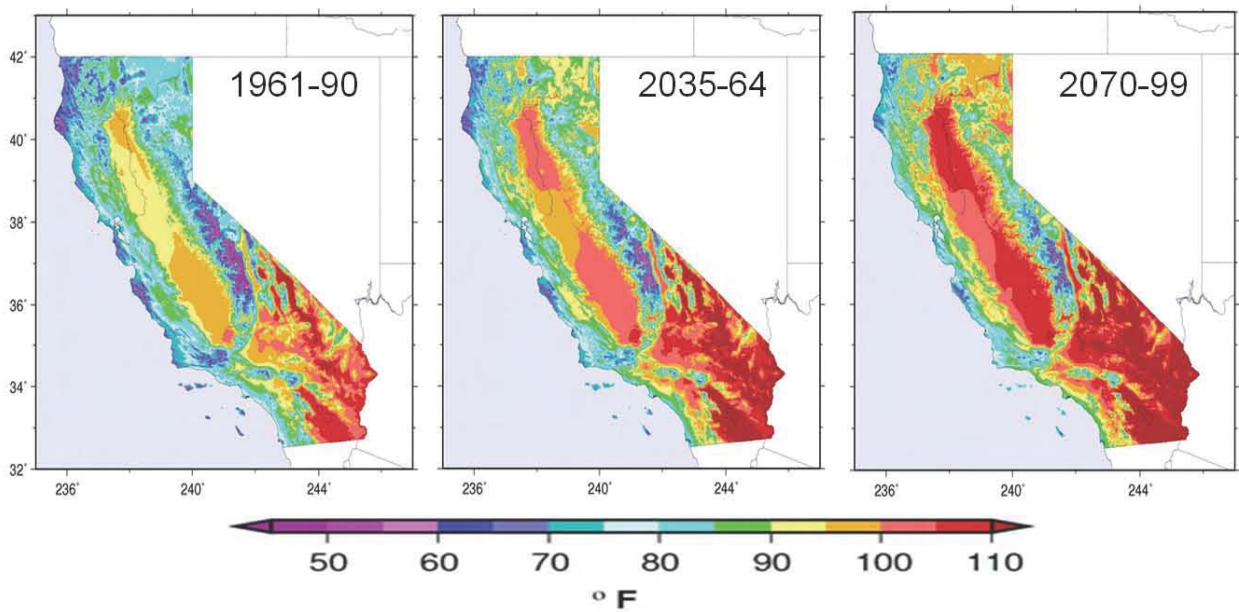


2009 CALIFORNIA CLIMATE ADAPTATION STRATEGY

A Report to the Governor of the State of California
in Response to Executive Order S-13-2008



Figure 1. California Historical & Projected July Temperature Increase 1961-2099



Source: Dan Cayan et al. 2009.

WWW.CLIMATECHANGE.CA.GOV/ADAPTATION

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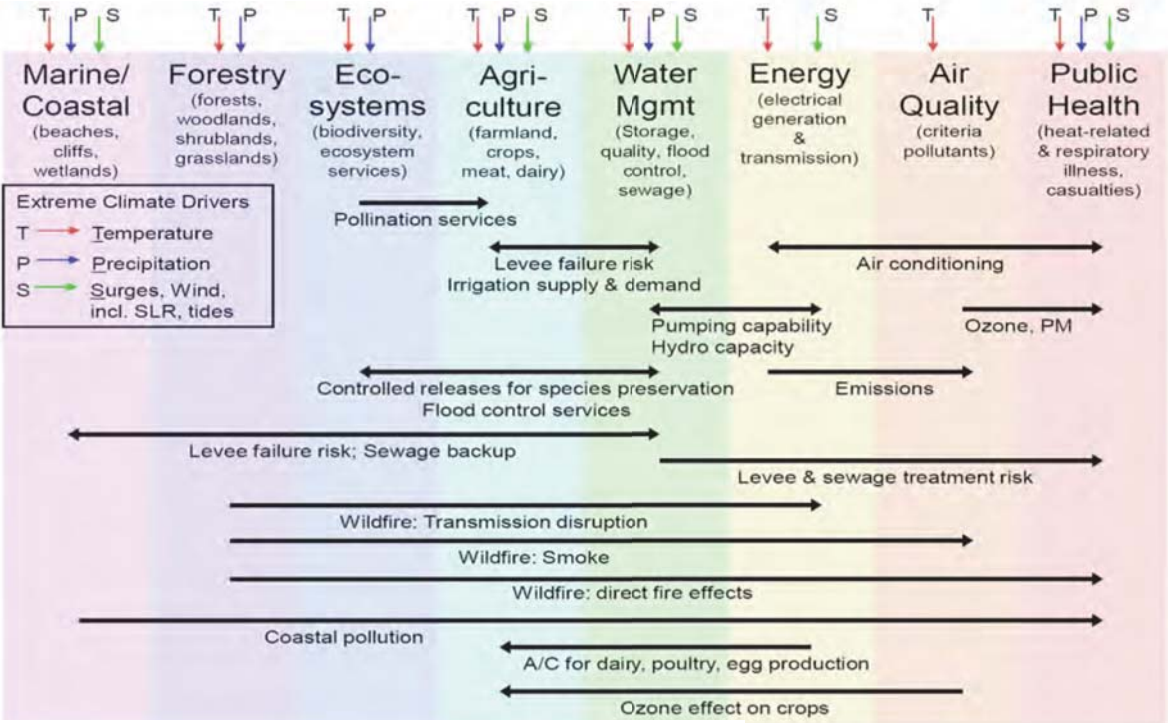
III. COMPREHENSIVE STATE ADAPTATION STRATEGIES

Cross Sector Collaboration

Navigating the complex science and policy needs to reduce California’s vulnerability to future climate impacts will require an unprecedented level of collaboration and leadership. Most state sectors and departments leading climate adaptation strategy development share management responsibilities, have overlapping jurisdictions, and in many instances, depend upon one another to accomplish their organizational mandates. Through the development of the *2009 California Climate Adaptation Strategy* the primary need identified by all sectors and most stakeholders is to improve coordination within and across state government.

Reducing sea level rise risks provides one example of the need for cross-sector collaboration. The state, recognizing this as a global issue, prefers that all agencies work together from an agreed upon reference point from which to coordinate their approaches to sea level rise impacts. Currently, various state agencies have different policies and regulations requiring consideration of and adaptation to sea-level rise. These agencies are working with best available scientific information to continue executing their ongoing responsibilities, but the lack of coordinated state-wide estimates of future sea-level rise can create confusion and uncertainty among stakeholders, waste money through duplicative efforts, and potentially reduce attention toward more vulnerable locations. Policy coordination for sea level rise, and all climate impacts, is necessary to increase overall awareness of climate change, to encourage the efficient use of resources and expertise, to streamline interagency permitting processes and prevent or reduce the possibility of unintended consequences. Figure 8 shows how sea level rise, temperature and precipitation change spread impacts across a range of sectors requiring multiple adaptation measures.

Figure 8: Extreme climate drivers and inter-sector interactions



Source: Mastrandrea et al 2009.

This chapter identifies comprehensive state adaptation planning strategies that were identified by all climate adaptation sectors in Section II. The four strategies identified here are expected to be in place or completed by the end of 2010 and will increase efficiencies across all climate adaptation strategies when complete. Subsequent chapters of this report focus on sector specific climate adaptation strategies.

Strategy 1) Promote Comprehensive State Agency Adaptation Planning

Adapting to climate change and reducing greenhouse gas emissions must be institutionalized into state planning processes, budgets, and policy development to ensure efficiencies are realized and impacts are minimized. This institutionalization requires state leadership and coordination with the climate science community to ensure the best research is utilized for policy making.

Many agencies have already made climate change a central focus of their policies and plans, while others have just begun to implement plans or actions. For example, water agencies are required to plan for climate variability inherent to California's Mediterranean, semi-arid and drought-prone precipitation patterns. Coastal agencies consider sea level rise in their planning processes but are now grappling with ways to address the accelerating rates of climate change and uncertainty of future conditions that are now anticipated. All agencies responsible for the management of California's natural resources have an opportunity to mainstream adaptation given current climate-related hazards and the sensitivities that they currently face. The state should eventually provide support and funding for comprehensive adaptation planning by all state agencies where significant vulnerabilities and hazards are identified.

Without new additional support, the state is promoting comprehensive adaptation planning and policy efforts through three efforts. The first is through the implementation and tracking of the sector-specific strategies outlined in Section II that require new climate adaptation planning in twelve state agencies responsible for completing these strategies. The second is coordination of strategy implementation across state agencies by CNRA and through the development of tools to promote collaboration. Finally, the CAT will be responsible for coordinating climate mitigation and adaptation policies to ensure all climate policies are coordinated to reduce inefficiencies and maximize success.

The Energy Commission's Climate Change Center has provided, and will continue to provide, state agencies with world-class climate change science. Greater collaboration will occur between the Climate Change Center and the CAT through the CAT research group. There will also be a strong need for state agencies to increase collaboration with the growing number of adaptation centers beginning at Stanford University; the University of California, San Diego; and the University of California, Berkeley. Using the information and strategies identified in this report, these centers should coordinate to rapidly build the state's scientific foundation to adapt to climate change.

The state of California is currently in a budget crisis, and therefore most of the strategies within the CAS are being implemented using existing resources. However, successful implementation of all measures will surely require additional funding in the future. Local communities will also be challenged in implementing many adaptation measures since many of the strategies can only be implemented at the local level such as updating general plans and incorporating new policies.

Near-Term Actions:

- a. *Establish a framework for promoting collaboration within and among state agencies to implement climate change adaptation strategies. Three different levels of coordination will be established to promote comprehensive state adaptation planning. First, individual agencies are responsible for implementing the short-term climate adaptation strategies identified in this report. Second, the CNRA will be responsible for monitoring overall progress on implementing adaptation measures in this report and to develop cross-sector strategies. Finally, the CAT will monitor progress on climate adaptation measures through the CNRA and will coordinate state integration of mitigation and adaptation measures within the CAT working groups.*

- b. *Develop a Climate Adaptation Advisory Panel (CAAP) made up of world class science, business and government leaders to recommend improved opportunities for collaboration across state government on climate adaptation. The CAAP will also identify climate adaptation strategies outside the scope of California's climate adaptation strategy that identify near term priority strategies that will reduce California's vulnerability to climate change in the shortest time at the lowest long-term cost.*

Strategy 2) Integrate Land Use Planning and Climate Adaptation Planning

Land use decisions are a central component of preparing for and minimizing climate change impacts. In order for California to succeed with its adaptation strategies, local and regional governments and planning efforts must be integral parts of the adaptation process.

Many, if not most, land use decisions in California are made at the local level and increasingly at the regional level. Decisions made by cities and counties through general plan and local planning processes direct local land uses. Given the long-range view of general plans, cities and counties should consider how a changing climate and environment will affect nearly all aspects of general plans and long-term development.

Through the implementation of Senate Bill 375 (Steinberg; Chapter 728, Statutes 2008) Metropolitan Planning Organizations (MPOs) will have greater influence on planning efforts and outcomes at the regional and local level. Regional Transportation Plans, due to SB 375, developed through a "Sustainable Communities Strategy" will have to take into account GHG reduction measures related to land use and transportation, identify the general location of uses, residential densities, and building intensities within the region, and identify areas within the region sufficient to house all the population of the region. The state plays a role in local development patterns through the development and funding of the state transportation system, the siting requirements for school facilities and other infrastructure projects and funding mechanisms.

Development decisions along the coast, in floodplains or at the wildland-urban interface will impact the ability of the state to adapt to climate change impacts. Decisions related to urban forestry, the connectivity of biological reserves, and the routing of roads and other infrastructure also play a role in implementing state adaptation strategies. Local land use planning should be cognizant of the growing risks from climate change as well as the land-use related needs to implement effective adaptation strategies. To the extent local land use is coordinated with regional, state and federal adaptation strategies, impacts from climate change are likely to be minimized, and in turn have less significant effects on local communities. The long-term vision and development goals of general plans should therefore address climate change as soon as possible. Coordination and consultation mechanisms need to be established or strengthened to ensure local, state, and other jurisdictions do not work at cross-purposes (see cross-jurisdictional coordination above).

In order to accurately address the vulnerability, resilience, and future growth of areas prone to climate change impacts, a city or county should take three distinct steps: First, cities and counties should use information provided by state and federal agencies about where climate change could impact the human and natural systems including risks affecting public safety and emergency response. The *CalAdapt* mapping tools will offer a preliminary review of impacts by specific location. This could be used to focus local planning on areas vulnerable to climate change impacts such as floodplains, coastal areas, and fire hazard areas. Critical infrastructure such as roads, power lines, and water/wastewater pipelines that may be affected by climate change should be identified. Second, planning organizations should recognize climate impacts that may affect federal, state or local parks, as these systems offer valuable recreational opportunities critical to the well being of all communities. Third, sources of water that may be reduced by increased temperatures and decreased Sierra snowpack-dependent reservoir storage should be identified.

Once these potential areas have been identified, cities and counties should focus, when appropriate, on areas that are particularly vulnerable to climate change. Using the best available resources, local governments should note which areas can or cannot withstand changes in sea level, water use, temperature, and other climate change impacts. Areas that cannot withstand changes can be prioritized

by potential safety risks, potential biological or natural impacts, or other factors. The local government should determine which areas will need the most attention to avert these risks. The *2009 California Climate Adaptation Strategy* can be a valuable resource in making these determinations if effective adaptation planning tools are continually developed.

There are a number of ways to address climate change impacts. For future land use decisions, general plan amendments may be needed. Safety risks may be outlined and mitigated in a Local Hazard Mitigation Plan. To address public infrastructure, a public works plan may be needed. A climate action plan may be used to prioritize actions that are immediately needed and which actions can be implemented over time.

One tool that has been successful in helping to bring together many levels of government to look at long range planning on the regional and local scale is the California Regional Blueprints Program. Through the development of scenario-based integrated plans, regions and local governments can develop different planning scenarios that achieve a variety of objectives and goals, including GHG reduction and climate change adaptation. Further, the blueprint planning process can help identify areas vulnerable to climate change and identify ways to address those vulnerabilities in an integrated and comprehensive manner. Another tool that can regionally integrate different levels of government around climate adaptation is through the Department of Conservation's Statewide Watershed Program.

As the state works to meet its GHG reduction goals, adapt and plan for climate change impacts, and restore the economy, the entire state, including all levels of government, non-profits, businesses, private property owners and the general population should, when appropriate, evaluate how and where critical infrastructure is developed, what types of structures are allowed to be built in certain locations, and how to best protect natural resources.

Finally, more and more infrastructure projects will need to account for climate change impacts to the project. Currently, to the extent required by CEQA Guidelines Section 15126.2, all significant state projects, including infrastructure projects, must consider the potential impacts of locating such projects in areas susceptible to hazards resulting from climate change. Section 15126.2 is currently being proposed for revision by CNRA to direct lead agencies to evaluate the impacts of locating development in areas susceptible to hazardous conditions, including hazards potentially exacerbated by climate change. Locating state projects in such areas may require additional guidance that in part depends on planning tools that the CAS recommendations call for.

Near-Term Actions:

- a. *Revise Section 15126.2 of the CEQA guidelines to direct lead agencies to evaluate the impacts of locating development in areas susceptible to hazardous conditions, including hazards potentially exacerbated by climate change.*
- b. *Incorporate climate adaptation considerations into the Strategic Growth Council and Sustainable Community Strategy processes to ensure incentives are provided to communities that are most vulnerable and are preparing for climate change impacts.*

Strategy 3) Improve Emergency Preparedness and Response Capacity for Climate Change Impacts

Even with the best adaptation efforts, not all risks are preventable. As climate change is likely to increase the frequency and in some instances the intensity of extreme events (i.e. heat, drought, flooding, or fires), agencies must periodically review their changing capacity needs. As catastrophic events become more frequent and each draws heavily on private and public resources, every effort must be made to avoid or minimize exposure to these extremes, so as not to overwhelm emergency response capacity.

While it is more effective and less costly to engage in anticipatory planning (prevention and preparation), it is also important to limit the consequences of unforeseen yet inevitable extremes (response, hazard mitigation). Additionally, all sectors with resources or operational processes at risk from climatic extremes

will need to build their level of preparedness, emergency response capacity, and ability to facilitate rapid and climate-cognizant recovery.

Contingency and emergency planning provides an enhanced capacity to respond to the immediate impacts of extreme weather events at an accelerated rate. When coupled with long-term planning, enhanced emergency preparedness can build adaptive capacity. Further, a sustained hazard mitigation effort will reduce the impacts of these climate change impacts. This constitutes a proactive strategy for addressing impacts and forms a strong foundation for all phases of adaptation planning (mitigate, prepare, respond, recover).

Effective emergency response to climate impacts will require unprecedented coordination across all service levels. Strategic planning efforts will need to include contingencies for tiered responses to a given impact, depending on level of severity. A flood or heat wave with only local impacts, for example, would be handled by municipal emergency response services. Responses to more serious events would trigger county, state or even federal-level assistance. While emergency systems are already coordinated under the Standardized Emergency Management System (SEMS), there are no comprehensive emergency response planning efforts that consider the widespread and recurring nature of climate-driven impacts.

An equally important component needed to support this level of coordination during emergencies is access to easily accessible information required for inter-organizational real-time planning. With the potential scale of impacts resulting from climate change, informational tools and new technologies for immediate, accurate and accessible situational awareness will be essential. This requires improving information systems as well as developing planning tools to better manage the increased frequency of emergencies under climate change.

The need to plan for climate impacts before they happen is important; not only with effective and coordinated response, but also proactively when making land use planning decisions. Examples include avoiding development in potential flood zones, core habitat reserve areas, and areas prone to wildfires that will occur as a result of these climate changes. The increase in hazard areas due to climate change will put a strain on emergency services as the impacts become more commonplace in these expanded hazard areas.

Near-Term Actions:

- a. *CNRA will coordinate with OPR, Cal EMA, CEC, and Cal Poly SLO to update the State Emergency Plan, the State Hazard Mitigation Plan (SHMP), and to strengthen consideration of climate impacts to hazard assessment planning, implementation priorities, and emergency response. This effort will be directly linked with the Climate Change Center vulnerability report identified in Strategy Four and the Climate Change Advisory Panel identified in Strategy One of this Chapter.*

Strategy 4) Expand California's Climate Change Research and Science Programs and Expand Public Outreach of Research to Policy-Makers and General Public

California has, arguably, the world's best downscaled climate change research program. The research funded over the last decade within Energy Commission's Public Interest Energy Research (PIER) Program is the foundation for Chapter 2 in this report, and serves as the scientific foundation for this adaptation strategy and most climate change programs across the state. Despite the significant progress in climate research in California, the state will need significantly more research in the future funded and supported by a much broader list of partnerships. Figure 9 provides a list of climate adaptation research questions highlighted in the 2009 CAT report showing the depth of topics needing immediate research.

Future research will need to identify what, where, when, and how climate impacts either will, or are, increasing the state's vulnerability to climate change. More importantly, researchers will need to better communicate this information in a way that is useful for policy-makers while having to make decisions in a world with increasing uncertainty regarding climate changes.

Vulnerability Assessment: A key research need is to develop a statewide climate impact vulnerability assessment. California's adaptation strategy was developed using the "hazard-based assessment approach" (explained in Chapter 2), which is useful but limited in the information it can provide to inform policy direction. Now, California should move toward developing a "vulnerability assessment approach" that quantifies the probability that certain consequences under different future climate scenarios will occur, and identifies the resulting vulnerabilities. PIER is currently prepared to develop such research now through 2011.

A vulnerability assessment integrates the risk with the likely sensitivity and response capacity of natural and human systems that are at risk of experiencing these consequences. This requires several steps beyond what is presented in this report including: (1) further research to identify the probability and resulting risks of the existing climate scenarios and resulting consequences; (2) link policy-makers with climate scientists to identify adaptation policy options and barriers, along with costs and benefits, to best reduce and manage the identified risks; and (3) a broad public stakeholder process to communicate the options available to reduce climate risks and to work toward a prioritization of where the state should focus its limited resources in implementing priority strategies.

A key motivation for completing a vulnerability assessment is to identify and help the most vulnerable communities, populations, sectors, and natural systems. For example, Gleick et al. (2008) reports that up to 500,000 low-income individuals in "communities of color" are vulnerable to future sea level rise in the San Francisco Bay Area. This raises important political and economic questions regarding how the state plans to mitigate future climate change impacts. Answers will require difficult trade-offs and require significant input from stakeholders ensuring environmental justice concerns are adequately addressed.

All sectors engaged in the development of the 2009 California Climate Adaptation Strategy recognize their obligation to work closely with all stakeholders and that environmental justice concerns should be incorporated and mainstreamed into all strategies where it is possible. It is also necessary to ensure climate adaptation strategies can assist toward the greater goal of ensuring all California residents have the opportunity to live, learn, and work without regard to race, age, culture, income, or geographic locations. State agencies will also interact with California Indian Tribes respectfully and on a government-to-government basis. Because traditional knowledge will have a role in combating climate change, indigenous communities should be involved in climate change adaptation actions that will directly impact their people, waterways, cultural resources, or lands; all of which are intimately associated.

There is growing understanding that climate change is happening now and that human induced GHG emissions are to blame. Unfortunately, there is less public knowledge of current and projected climate impacts, who and what systems are at greatest risk, and the actions necessary to reduce these risks. This is partly due to the rapidly changing information, but also about the lack of a state-coordinated public outreach effort to inform the public about *how* to reduce climate-related risks. The CNRA has taken steps to increase public outreach and stakeholder participation with regard to climate adaptation strategies. The California Climate Change Portal (www.climatechange.ca.gov/adaptation) provides a readily accessible tool for communicating the state's work to tackle climate change. California will increase use of this site as it develops this adaptation strategy so that stakeholders have the ability to track development and integration of climate policies. The ultimate success of an outreach campaign is based on providing information and tools to the public that can be used to reduce the state's vulnerability to climate change.

The state will work towards improving public outreach of both climate impact research and adaptation strategies in the Beta version of the Caladapt website released with the state adaptation strategy. The Caladapt website will allow individuals to view climate change temperature, sea level and precipitation projections at a scale of seven by seven kilometers anywhere in the state of California. Ideally, this information will be linked with the state natural hazard interactive map (myhazards.calema.ca.gov) with the goal of localizing all natural hazard information.

Monitoring: Vulnerability assessments and PIER's research efforts largely focus on modeling future changes. Monitoring existing climate changes is as important as modelling future changes. Unfortunately, California's existing monitoring network was not established with climate change in mind. Temperature monitoring states are based on areas where people and resources exist instead of locations that could act as an "early warning system" of greater climate change to social, environmental and economic systems. For example, expanded surveillance of pests, invasive species, or disease vectors could identify where crops or populations that are most vulnerable and provide lead times to develop new pesticides or vaccines.

Near-Term Actions:

- a. *The State Climate Action Team Research Group will develop a strategic plan by September 2010 that will identify: priority state climate adaptation research and monitoring needs; proposed resources and timeframes to implement the plan; and potential for research co-funding and collaboration with local, state, and national agencies, universities and other research institutions. The CAT Sub-Group should develop a comprehensive research project catalog and continue to biannually publish key state sponsored climate research on the California Climate Change web-portal.*
- b. *Develop a California Climate Vulnerability Assessment (CCVA) to ensure the best available science informs climate adaptation decision making. State agencies will work through the CNRA to develop the state's first CCVA focused on sharing information, providing opportunities for public discussion on climate risk research and policies, and developing cross-sector strategies. The development of a CCVA will include public outreach to prioritize risk reduction strategies and will be completed by January 1, 2011 (depending on contracting and funding this study by January 1, 2010). The final CCVA will allow policy-makers the ability to develop a more systematic approach to funding risk reduction efforts. Every effort will be paid to identify and assist those communities expected to be most at risk from future climate change.*
- c. *Develop the "CalAdapt" web-based portal that uses Google Earth to show state supported research (and other research) in a way most relevant and useful to policy-makers and local communities as a public outreach tool for the California climate adaptation strategy. The tool will show basic climate impact information at a scale that allows local communities to develop their own climate adaptation strategies based on this information. CNRA will coordinate with CEC and the State Chief Information Officer to develop the CalAdapt Tool and outreach in a way that ensures the portal will be used and developed over time and integrated with other state programs.*