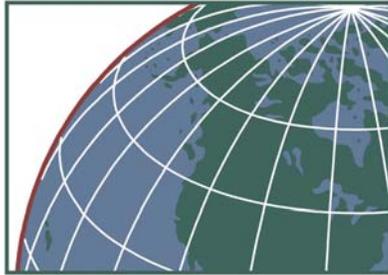




C A L I F O R N I A



Climate

ACTION TEAM

**Climate Action Team Report to
Governor Schwarzenegger and
the California Legislature**

December 2010



CALIFORNIA ENVIRONMENTAL
PROTECTION AGENCY

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2010 Climate Action Team Report

Executive Summary

As the United States and international leaders work to agree on the proper policy responses to climate change, California has assembled a comprehensive strategy to address the risks climate change poses to the state's people and resources. California's approaches are motivated by state-specific scientific assessments that conclude that the impacts of climate change are and will be acutely felt in California. By providing leadership on climate policy, the state is influencing policymaking and promoting solutions to the global challenge of reducing greenhouse gas emissions. California is also positioned to take full advantage of economic opportunities in the emerging global green economy.

California's climate programs include the following primary initiatives:

- **Research:** State-specific research supports our understanding of the impacts of climate change in California and informs policymaking.
- **Mitigation:** The California Global Warming Solutions Act of 2006 establishes a limit on state greenhouse gas emissions in 2020, and recognizes the importance of substantial emission reductions by 2050. The state has a comprehensive set of policies and programs to cost effectively reduce emissions, while advancing new clean energy industries and green jobs.
- **Adaptation:** The state Adaptation Strategy is designed to reduce California's vulnerability to climate impacts and enhance the resiliency of the state's communities, infrastructure, resources, and people.
- **Joint Action:** California is leveraging its efforts through regional and international initiatives to expand emission reduction programs and to enable effective adaptation.

The Climate Action Team, under the leadership of the Secretary for Environmental Protection, coordinates these activities. California pioneered many of these policies and programs, establishing itself as a global leader. This report is the third biennial report in a series required by Executive Order S-3-05, which created the Climate Action Team and established the state's first greenhouse gas emission reduction targets in 2005.

Climate Action Milestones

California's first policy directive for addressing climate change came in 1988, with a law requiring the first state-level study of global warming's impacts, and requiring recommendations for "avoiding, reducing, and addressing" these impacts. Since that time, among other efforts, the state has initiated, the following:

- Voluntary reporting of greenhouse gas emissions through the California Climate Action Registry, contributing to the development of emission reporting standards that have since become mandatory.

The California climate program has evolved through a series of statutory requirements and executive orders over more than 10 years. The design of the primary components may be instructive for subnational governments with similarly evolving programs. For example, state-specific research to understand climate change risks can be a valuable tool for policy design. Also, the manner in which mitigation and adaptation strategies can be mutually supportive should be recognized. Finally, promoting action regionally and internationally that reduces climate change risks and expands clean energy industries and green jobs is a high priority.

- Greenhouse gas standards for passenger vehicles, since adopted by the United States and Canadian federal governments;
- A Low Carbon Fuel Standard, requiring a 10 percent reduction in the carbon intensity of transportation fuels by 2020.
- A renewable electricity standard, requiring utilities to use renewable resources such as wind and solar for 33 percent of the electricity they deliver by 2020.
- An economy-wide cap-and-trade program for reducing greenhouse gas emissions.

Research

California has a long history of state-sponsored, state-specific research on climate change. Research has been critical to understanding the impacts of climate change in California, motivating action, and informing policy decisions. Global climate models have been downscaled to predict climate changes specific to California. This work has then been extended to predict physical and economic impacts on the state's economic and natural resources. Coordination among state agency research efforts is crucial to both extending limited funding resources and to maximizing the value of the research. Cataloging research projects sponsored by state agencies has led to a searchable database of climate research reports.

Mitigation and Adaptation

California is protecting its people and resources by reducing greenhouse gas emissions that cause climate change and by developing adaptation strategies to reduce the negative impacts of climate change. The Scoping Plan, developed by the Air Resources Board as directed by the Global Warming Solutions Act, and the Adaptation Strategy provide the framework for these activities. The Climate Action Team, in its coordinating role for state climate policy, has nine working groups focusing on the major sectors of the state's resources and economy, and a tenth working group dedicated to research. The working groups have developed "Near-term Implementation Plans" for over 50 mitigation and adaptation strategies; a sample of which is listed in the table below.

Promoting Action Regionally, Nationally and Globally

Reducing the risks of climate change requires effective action among all the world's major greenhouse gas emitters. While global efforts are necessary, local governments have critical roles in reducing climate change risks. In the United States and other countries, state, provincial, and local governments have oversight and regulatory responsibility for key aspects of energy production and delivery. Similarly, community and transportation planning are often under the purview of state, provincial, and local authorities. Therefore, achieving the necessary global emission reductions depends, in part, on effective action at the state, provincial and local levels.

Although climate change is driven by global atmospheric conditions, climate change impacts are felt locally. State, provincial, and local authorities will be the first to respond to dislocations due to climate change. Consequently, adaptation efforts will evolve at the local level to take into consideration local impacts, resources, and conditions.

Recognizing the interconnected nature of both mitigation and adaptation, California promoting

The leadership and coordination provided by the Climate Action Team is integral to the effectiveness of California's climate program. Because the solutions to climate change are multi-sectoral and multi-jurisdictional, expertise from many disciplines is required. The Team ensures that state agencies work together on the complex technical and policy issues associated with climate change. Linkages with other governments in North America and internationally are also crucial to solving the global challenges presented by climate change.

action regionally, nationally, and internationally through policy development, information exchange, capacity and institution building, and joint action. For example, the Western Climate Initiative Partner jurisdictions are developing and implementing a portfolio of climate programs. Members of the Governors' Climate and Forests Task Force: California; Chiapas, Mexico; and Acre, Brazil, have formed a working group to accelerate the use of forestry offset credits to prevent tropical deforestation. Participating in, and building capacity for global action is a necessary component of California's response to this global problem. Protecting the state requires regional and global engagement. These efforts also drive forward clean energy and economic development based on green jobs, enhancing the competitiveness of the state's businesses, workers, and economy.

Selected Mitigation and Adaptation Strategies Undertaken by the Climate Action Team

Agriculture

Alternative Energy Projects: anaerobic digesters at dairies, solar installations at processing facilities.
Research on nitrous oxide emissions

Biodiversity

Identifying and protecting sustainable habitat reserves
Management of watersheds and habitats to account for changing climate conditions

Electricity and Natural Gas

Augmenting long-standing efforts on energy efficiency
Renewable electricity standard

Forestry

Developing provisions for harnessing energy from sustainable, woody biomass
Improvements to the state's greenhouse gas inventory

Land Use Planning

Guidance to local planners on policies that will influence community sustainability, public health, greenhouse gas emissions, and resilience to climate change
Incentive programs to encourage sustainable land use decisions

Ocean and Coastal Resources

Guidance to state agencies on the use of sea-level rise predictions
Vulnerability assessments on sea-level rise and shoreline erosion

Public Health

Assessment of impacts of mitigation and adaptation strategies
Improving preparedness for extreme heat events

State Operations

Retrofitting and better management of state buildings for reduced energy use
Consistent reporting of greenhouse gas emissions from state operations

Water

20 percent statewide reduction in per capita urban water use by 2020
Adaptive water management strategies that consider climate change impacts

Outlook

The future of California climate change programs is being coordinated by the Climate Action Team with focused efforts on several fronts, including:

- reducing greenhouse gas emissions through cost-effective policies and programs that promote clean energy industries and green jobs;
- preparing guidance for adapting to climate change in California, including linking adaptation and emission mitigation efforts;

- improving interagency collaboration on research projects;
- conducting outreach to business, local governments and other stakeholders;
- expanding efforts to combat climate change through partnerships such as the Western Climate Initiative, R20, and related regional and national initiatives; and
- supporting progress internationally, including work on potential emission reductions through Reduced Emissions from forest Degradation and Deforestation (REDD).

The state climate program requires effective multi-agency and multi-sectoral coordination that is the hallmark of the Climate Action Team. The future success of the state's climate action program requires linkages and collaborations leading to greenhouse gas mitigation and climate change adaptation solutions that span the globe.

Chapter 1: Introduction

As the United States and international leaders work to agree on the proper policy responses to climate change, California has assembled a comprehensive strategy to address the risks climate change poses to the state's people and resources. California's approaches are motivated by state-specific scientific assessments that conclude that the impacts of climate change are and will be acutely felt in California. By providing leadership on climate policy, the state is influencing policymaking and promoting solutions to the global challenge of reducing greenhouse gas emissions. California is also positioned to take full advantage of economic opportunities in the emerging global green economy.

In 2004, Senate Bill 1107 directed the Secretary of Environmental Protection to coordinate all climate change activities in the state. The Secretary chairs the Climate Action Team, which is made up of agency secretaries and department directors from throughout state government. This interagency, collaborative approach has been critical to addressing the multi-faceted, multi-sector challenges presented by climate change. Numerous agencies have been mandated to work on various aspects of climate change through statute, executive order and other policy direction.

California's first statute on climate change was enacted in 1988 when the state legislature ordered a report on the impacts of climate change and recommendations to avoid, reduce, and address them. In 2002 the state led the United States by becoming the first jurisdiction to require standards for greenhouse gas emissions from cars. With the landmark California Global Warming Solutions Act of 2006, also known as Assembly Bill (AB) 32, California became the first state to set a binding, economy-wide target for greenhouse gas emissions.

Executive Order S-3-05, signed in June 2005 by Governor Arnold Schwarzenegger, established the state's first greenhouse gas emissions targets. The Executive Order also requires biennial reports on progress toward meeting those targets and updates on the impacts of global warming on California. This first chapter introduces California's climate program and lists milestones of state climate action. Following this chapter, the report is organized as follows:

- Chapter 2, Protecting the State's People and Resources through Mitigation and Adaptation, describes the state's mitigation and adaptation programs and policies. The chapter first introduces the *Scoping Plan* and the *2009 California Climate Adaptation Strategy* which provide the framework for these activities. Then, the Climate Action Team activities are summarized for each of nine working groups.
- Chapter 3, California's Climate Change Research Program, describes the state climate research program that supports effective implementation of emission reduction policies and programs and the development of adaptation strategies.
- Chapter 4, Promoting Action Regionally, Nationally and Globally, presents state initiatives that help expand action to other jurisdictions through policy development, information exchange, capacity and institution building, and joint action.
- Chapter 5, Outlook and Future Efforts, identifies the priorities for the state climate program in the coming year.

The California climate program has evolved during a period of more than 10 years through a series of statutory requirements and executive orders. The next section describes the major milestones, which are shown in Figure 1. The design of the primary components of the program, and the cross-agency coordination achieved through the Climate Action Team, may be instructive for subnational governments with similarly evolving climate programs. For example, the use of state-specific research to understand climate change risks and inform adaptation strategies can be a valuable tool for policy design. Also, the

manner in which mitigation and adaptation strategies can be mutually supportive should be recognized. Finally, promoting action regionally and internationally that reduces climate change risks and expands clean energy industries and green jobs is a high priority.

California Climate Action Milestones

This section presents the key milestones that shaped the California climate program. In 1988, Assembly Bill 4420 directed the California Energy Commission to report on “how global warming trends may affect California’s energy supply and demand, economy, environment, agriculture, and water supplies” and offer “recommendations for avoiding, reducing and addressing the impacts.” This marked the first statutory direction to a California state agency to address climate change.

The California Climate Action Registry was created to encourage voluntary reporting and early reductions of greenhouse gas emissions with the adoption of Senate Bill 1771 in 2000. The California Energy Commission was directed to assist by developing metrics and identifying and qualifying third-party organizations to provide technical assistance and advice to greenhouse gas emission reporters. The next year, Senate Bill 527 amended Senate Bill 1771 to emphasize third-party verification.

Senate Bill 1711 also contained several additional requirements for the California Energy Commission including: updating the state’s greenhouse gas inventory from an existing 1998 report, and continuing to update it every five years; acquiring, developing and distributing information on global climate change to agencies and businesses; establishing a state interagency task force to ensure policy coordination; and establishing a climate change advisory committee to make recommendations on the most equitable and efficient ways to implement climate change requirements. In 2006, Assembly Bill 1803 transferred preparation of the inventory from the California Energy Commission to the Air Resources Board by Assembly Bill 1803. The Air Resources Board updates the inventory annually.

Assembly Bill 1493, authored by Assembly Member Fran Pavley in 2002, directed the Air Resources Board to adopt regulations to achieve the maximum feasible and cost effective reduction of greenhouse gas emissions from motor vehicles. The so-called “Pavley” regulations, or Clean Car regulations, were approved by the Board in 2004. The Air Resources Board submitted a request to the United States Environmental Protection Agency to implement the regulations in December 2005. After several years of requests to the federal government, and accompanying litigation, this waiver request was granted on June 30, 2009. The Air Resources Board has since combined the control of smog-causing pollutants and greenhouse gas emissions to develop a single coordinated package of standards known as Low Emission Vehicles III. It is expected that these regulations will reduce greenhouse gas emissions from California passenger vehicles by about 22 percent in 2012 and about 30 percent in 2016, all while improving fuel efficiency and reducing motorists’ costs. Assembly Bill 1493 also directed the California Climate Action Registry to adopt protocols for reporting reductions in greenhouse emissions from mobile sources prior to the operative date of the regulations.

Senate Bill 812 added forest management practices to the California Climate Action Registry members’ reportable emissions actions. It also directed the Registry to adopt forestry procedures and protocols to monitor, estimate, calculate, report, and certify carbon stores and carbon dioxide emissions that resulted from the conservation and conservation-based management of forests in California.

The California Renewable Portfolio Standard Program, which requires electric utilities and other entities under the jurisdiction of the California Public Utilities Commission to meet 20 percent of their retail sales with renewable power by 2017, was established by Senate Bill 1078 in 2002. The renewable portfolio standard was accelerated to 20 percent by 2010 by Senate Bill 107 in 2006. The program was subsequently expanded by the renewable electricity standard approved by the Air Resources Board in September 2010, requiring all utilities to meet a 33 percent target by 2020. The renewable electricity standard is projected to reduce greenhouse gas emissions from the electricity sector by at least 12 million metric tons of carbon dioxide equivalent in 2020.

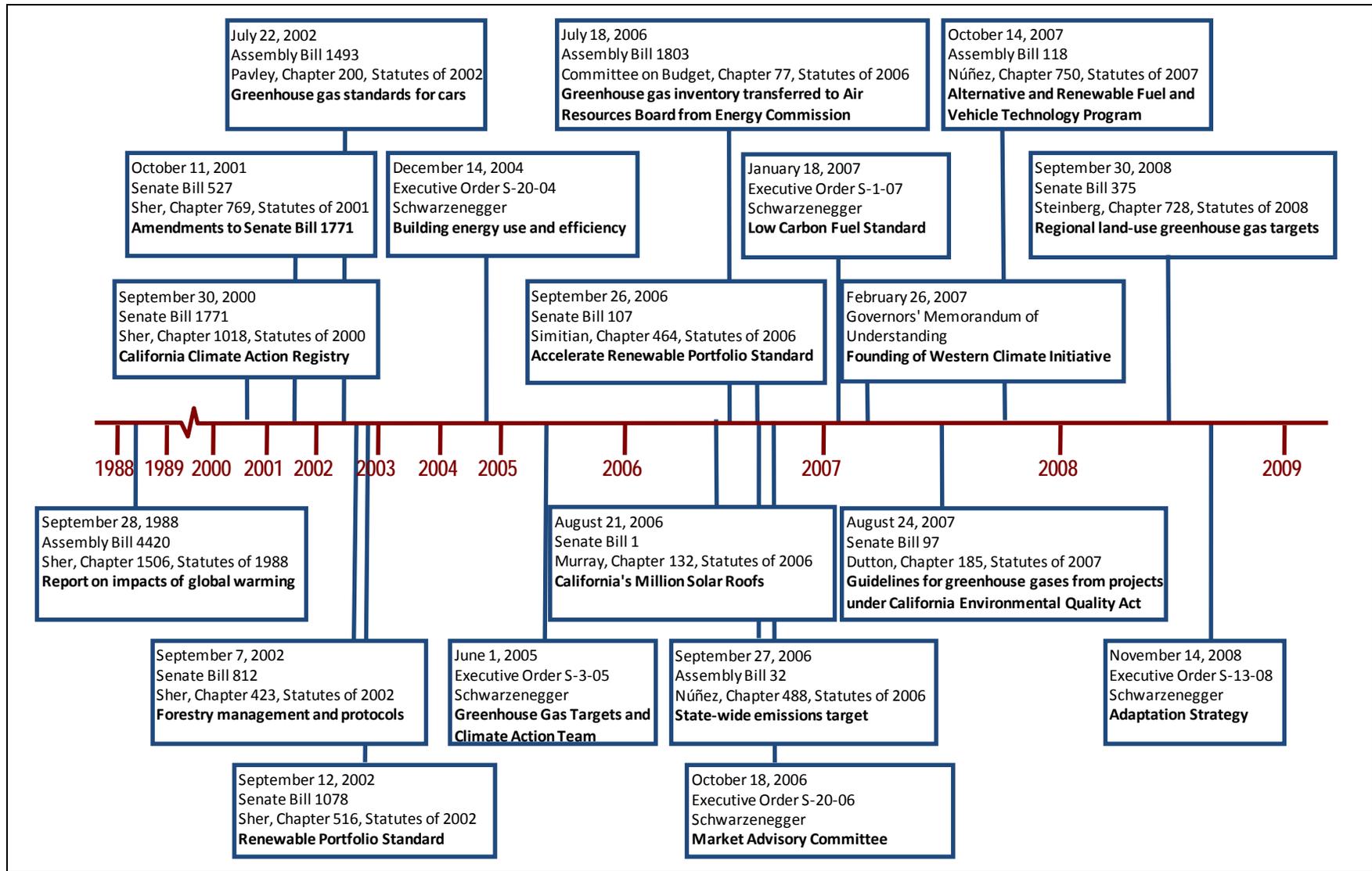


Figure 1: California Climate Action Milestone Timeline

In December 2004 Governor Arnold Schwarzenegger signed Executive Order S-20-04, which set a goal of reducing energy use in state-owned buildings by 20 percent by 2015 (from a 2003 baseline) and encouraged cities, counties, schools, and the private sector to take all cost-effective measures to reduce building electricity use. This action built upon the state's strong history of energy efficiency efforts that have saved Californians and California businesses energy and money for decades. They are a cornerstone of greenhouse gas reduction efforts.

Executive Order S-3-05 (June 2005) established greenhouse gas targets for the state such as: returning to year 2000 emission levels by 2010; 1990 levels by 2020; and 80 percent below 1990 levels by 2050. It directed the Secretary of the California Environmental Protection Agency to coordinate efforts to meet the targets with the heads of other state agencies. This group became the Climate Action Team.

California's Million Solar Roofs plan was boosted by the passage of Senate Bill 1 in 2006. The plan is estimated to result in 3,000 megawatts of new electricity generating capacity and avoidance of 2.1 million metric tons of carbon dioxide equivalent emissions. The main components of the bill included expanding the program to more customers, requiring the state's municipal utilities to create their own solar rebate programs, and making solar panels a standard option on new homes.

The California Global Warming Solutions Act of 2006, best known by its bill number AB 32, created a first-in-the country comprehensive program to achieve real, quantifiable and cost-effective reductions in greenhouse gases. The law set an economy-wide cap on California greenhouse gas emissions at 1990 levels by 2020. It directed the Air Resources Board to prepare, approve, and implement a Scoping Plan for achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions. Executive Order S-20-06, signed in October 2006, directed the Secretary for Environmental Protection to establish a Market Advisory Committee of national and international experts. The committee made recommendations to the Air Resources Board on the design of a market-based program for greenhouse gas emissions reduction. The Air Resources Board adopted the Scoping Plan, describing a portfolio of measures to achieve the target, in December 2008. All of the major regulatory measures necessary for meeting the 2020 emissions target were adopted by December 2010.

The governors of California, Arizona, New Mexico, Oregon, and Washington entered into a memorandum of understanding in February 2007 establishing the Western Climate Initiative. The governors agreed to set a regional goal for emissions reductions consistent with state-by-state goals; develop a design for a regional market-based multi-sector mechanism to achieve the goal; and participate in a multi-state greenhouse gas registry. The Initiative has since grown to include Montana, Utah and the Canadian provinces of British Columbia, Manitoba, Ontario, and Québec.

California is implementing the world's first Low Carbon Fuel Standard for transportation fuels, pursuant to both Executive Order S-01-07, signed January 2007, and AB 32. The standard requires a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. This reduction is expected to reduce greenhouse gas emissions in 2020 by 17.6 million metric tons of carbon dioxide equivalent. Also in 2007, Assembly Bill 118 created the Alternative and Renewable Fuel and Vehicle Technology Program. The California Energy Commission and the Air Resources Board administer the program. This act provides funding for alternative fuel and vehicle technology research, development, and deployment in order to attain the state's climate change goals, achieve the state's petroleum reduction objectives and clean air and greenhouse gas emission reduction standards, develop public-private partnerships, and ensure a secure and reliable fuel supply.

In addition to vehicle emissions regulations and the low carbon fuel standard, the third effort reducing greenhouse gas emissions from transportation, is the reduction in the demand for personal vehicle travel (i.e., vehicle miles traveled or VMT). This measure was addressed in September 2008 through the Sustainable Communities and Climate Protection Act of 2008, or Senate Bill 375. The enactment of Senate Bill 375 initiated an important new regional land use planning process to mitigate greenhouse gas emissions by integrating and aligning planning for housing, land use, and transportation for California's

18 Metropolitan Planning Organizations. The bill directed the Air Resources Board to set regional greenhouse gas emission reduction targets for most areas of the state. It also contained important elements related to federally mandated regional transportation plans and the alignment of state transportation and housing planning processes.

Also codified in 2008, Senate Bill 97 required the Governor's Office of Planning and Research to develop greenhouse gas emissions criteria to be used in determining project impacts under the California Environmental Quality Act. These criteria were developed in 2009 and went into effect in 2010.

Executive Order S-13-08 launched a major initiative for improving the state's adaptation to climate impacts from sea level rise, increased temperatures, shifting precipitation, and extreme weather events. It ordered a California Sea Level Rise Assessment Report to be requested from the National Academy of Sciences. It also ordered the development of a Climate Adaptation Strategy. The strategy, published in December 2009, assesses the state's vulnerability to climate change impacts, and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. The Strategy focused on seven areas: public health, biodiversity and habitat, ocean and coastal resources, water management, agriculture, forestry, and transportation and energy infrastructure.

The initiatives, executive orders, and statutes outlined above comprise the major milestones in California's efforts to address climate change through coordinated action on climate research, greenhouse gas mitigation, and climate change adaptation. There are numerous other related efforts that have been undertaken by state agencies and departments to address specific questions and programmatic needs. The Climate Action Team coordinates these efforts and others which comprise the state's climate program. The rest of the report describes these efforts.

The California Climate Action Team

California's Climate Action Team originated as a coordinating council organized by the Secretary for Environmental Protection. It included the Secretaries of the Natural Resources Agency, and the Department of Food and Agriculture, and the Chairs of the Air Resources Board, Energy Commission, and Public Utilities Commission. The original council was an informal collaboration between the agencies to develop potential mechanisms for reductions in greenhouse gas emissions in the state. The council was given formal recognition in Executive Order S-3-05 and became the Climate Action Team.

The original mandate for the Team was to develop proposed measures to meet the emission reduction targets set forth in the executive order. The Climate Action Team has since expanded and currently has members from 18 state agencies and departments (see Figure 2). The Team also has 10 working groups which coordinate policies among their members. The working groups and their major areas of focus are:

- Agriculture: Focusing on opportunities for agriculture to reduce greenhouse gas emissions through efficiency improvements and alternative energy projects, while adapting agricultural systems to climate change;
- Biodiversity: Designing policies to protect species and natural habitats from the effects of climate change;
- Energy: Reducing greenhouse gas emissions through extensive energy efficiency policies and renewable energy generation;
- Forestry: Coupling greenhouse gas mitigation efforts with climate change adaptation related to forest preservation and resilience, waste to energy programs and forest offset protocols;
- Land Use and Infrastructure: Linking land use and infrastructure planning to efforts to reduce greenhouse gas emissions from vehicles and adaptation to changing climatic conditions;

- Oceans and Coastal: Evaluating the effects sea level rise and changes in coastal storm patterns on human and natural systems in California;
- Public Health: Evaluating the effects of greenhouse gas mitigation policies on public health and adapting public health systems to cope with changing climatic conditions;
- Research: Coordinating research concerning impacts of and responses to climate change in California;
- State Government: Evaluating and implementing strategies to reduce greenhouse gas emissions resulting from state government operations;
- Water: Reducing greenhouse gas impacts associated with the state’s water systems and exploring strategies to protect water distribution and flood protection infrastructure;

Descriptions of the work of each of the working groups are presented in Chapter 2.

Figure 2: Member Agencies, Departments, Commissions, Boards, and Offices of the Climate Action Team

California Environmental Protection Agency	Governor’s Office of Planning and Research
Business Transportation and Housing Agency	Department of Fish and Game
Health and Human Services Agency	Department of Forestry and Fire Protection
Natural Resources Agency	Department of Parks and Recreation
State and Consumer Services Agency	Department of Public Health
Department of Food and Agriculture	Department of Resources Recycling and Recovery
Air Resources Board	Department of Toxic Substances Control
Energy Commission	Department of Water Resources
Public Utilities Commission	State Water Resources Control Board

Chapter 2: Protecting the State's People and Resources through Mitigation and Adaptation

The State of California protects its people and resources by reducing greenhouse gas emissions that cause climate change and by developing adaptation strategies to reduce the negative impacts of climate change. The Climate Action Team,¹ led by the Secretary of the California Environmental Protection Agency, coordinates the climate policies and programs across state agencies. The Team is responsible for developing multi-sectoral policies for meeting the greenhouse gas emission reduction goals of AB32 and coordinating with the Air Resources Board on their implementation. The Team has also adopted the measures of California's Adaptation Strategy. The working groups of the Team have provided the technical and policy development of many of the specific mitigation and adaptation measures that make up the state's response to climate change. The working groups have developed strategies ranging from alternative energy programs to water recycling and reuse to outreach to local government land use planners. Adaptation and mitigation efforts are integrated together to provide a comprehensive and mutually supportive approach to protecting each sector of the state's economy and natural resources.

The AB 32 Scoping Plan and the Adaptation Strategy have provided the framework for these activities. This chapter introduces these two reports and then summarizes the Climate Action Team activities for each working group: Agriculture, Biodiversity, Electricity and Natural Gas, Forestry, Climate Change and Land Use, Ocean and Coastal Resources, Public Health, State Operations, and Water. A complete list and description of the Climate Action Team's ongoing mitigation and adaptation activities are available at: http://www.climatechange.ca.gov/climate_action_team/reports/index.html#catnip.

Scoping Plan

Assembly Bill 32 (AB32), the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006), requires that greenhouse gas emissions be reduced to 1990 levels by 2020. It also required the Air Resources Board developed the Scoping Plan,² in coordination with the Climate Action Team. The Scoping Plan, defines a comprehensive set of actions to achieve the mandated emissions level. Key approaches for reducing greenhouse gas emissions to 1990 levels by 2020 include:

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards.
- Achieving a statewide renewable electricity standard of 33 percent.
- Developing a California cap-and-trade program that links with other Western Climate Initiative³ partner programs to create a regional market system.
- Establishing targets for transportation-related greenhouse gas emissions for regions throughout California, and pursuing policies and incentives to achieve those targets.
- Adopting and implementing measures to reduce transportation sector emissions, including California's Clean Car Standards, goods movement measures, and the Low Carbon Fuel Standard.

¹ The organization of the Climate Action Team is presented in Chapter 1.

² The Scoping Plan can be accessed at: <http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm>.

³ The Western Climate Initiative is described in Chapter 4.

Figure 3: Major Programs Included in the Scoping Plan

Clean Car Standards for Passenger Vehicles: In September 2004, the Air Resources Board approved regulations to reduce greenhouse gas emissions from new motor vehicles. The standards phase in during the 2009 through 2016 model years. Compared to the 2002 fleet, the standards will result in about a 30 percent emission reduction by 2016. Following legal challenges, the United States Environmental Protection Agency granted California the authority to enforce the standards on June 30, 2009. Subsequently, the standards were amended to prepare for harmonization with upcoming federal rules, providing vehicle manufacturers with additional compliance flexibility. The standards are estimated to reduce greenhouse gas emissions by about 28 million metric tons of carbon dioxide equivalent per year statewide in 2020.

Low Carbon Fuel Standard: The Low Carbon Fuel Standard, approved by the Air Resources Board in April 2009, is designed to reduce the carbon intensity of California's transportation fuels by 10 percent by 2020. "Carbon intensity" is defined as the lifecycle greenhouse gas emissions, per unit of energy of fuel delivered. Fuel producers and importers are required to reduce the average carbon intensity for their fuel starting in 2011 through 2020. Anticipated compliance options include lower-emitting fuels such as electricity for electric vehicles, biofuels, and natural gas. This program is estimated to achieve reductions of about 16 million metric tons of carbon dioxide equivalent per year in 2020.

Sustainable Communities: The *Sustainable Communities and Climate Protection Act of 2008* (Senate Bill 375, Steinberg, Statutes of 2008), enhances California's ability to reach its long-term greenhouse gas emissions goals by promoting planning for more sustainable communities. Under the law, the Air Resources Board approved targets for the reduction of greenhouse gas emissions from passenger vehicles for each of the state's 18 Metropolitan Planning Organizations (MPOs). Using these targets, each MPO prepares a "Sustainable Communities Strategy" that demonstrates how the region will meet its target through actions that integrate land use, housing and transportation planning. The Sustainable Communities Strategy will then be incorporated into that region's federally enforceable regional transportation plan. New residential and/or mixed-use projects can get relief from certain environmental review requirements under the California Environmental Quality Act if they are consistent with the region's approved strategy.

Renewable Electricity Standard: In September 2010, the Air Resources Board approved the Renewable Electricity Standard. The Standard requires all entities that deliver electricity to phase in the use of qualifying renewable electricity, reaching 33 percent by 2020. The standard builds on of existing requirements to achieve 20 percent renewable electricity by 2010. The 33 percent standard is expected to reduce greenhouse gas emissions by about 13 million metric tons of carbon dioxide equivalent per year in 2020, in addition to the approximately 8 million metric tons of reductions from the 20 percent requirement. The regulation will also result in hundreds of tons of reductions in smog-forming and toxic air pollutants statewide, which provides a range of health benefits.

Cap and Trade: In December 2010 the Air Resources Board approved the Cap-and-Trade Program, which establishes an overall limit on about 85 percent of state greenhouse gas emissions. The emissions limit declines over time to ensure that the state achieves its 2020 emissions goal. The trading provisions enable emitters to minimize costs across facilities. Facilities can also cover up to 8 percent of their emissions with offsets issued by the state under strict guidelines. California is working closely with the partner jurisdictions in the Western Climate Initiative (WCI) to link cap-and-trade programs in order to deliver larger emission reductions at lower costs than could be realized through a California-only program.

The implementation status of the full set of Scoping Plan measures is available at:
<http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>.

In addition to reducing greenhouse gas emissions, these actions provide substantial co-benefits, including improving air quality, reducing dependence on oil, diversifying energy sources, saving energy, promoting economic development, and protecting public health.

Several of the major programs included in the Scoping Plan are summarized in Figure 3.⁴ Because the transportation sector is the largest source of greenhouse gas emissions in the state, several major measures focus on this sector. These measures include: reducing vehicle emissions through the Clean Car Standards; reducing the carbon intensity of fuel through the Low Carbon Fuel Standard; and reducing the need for private vehicle travel through improved planning for Sustainable Communities. The Renewable Electricity Standard builds on the previously adopted Renewable Portfolio Standard, increasing the reliance on renewable electricity sources to 33 percent by 2020. The Cap-and-Trade Program, approved in December 2010, covers about 85 percent of statewide emissions, ensuring that total emissions will decline to achieve the 2020 emissions target established in the Global Warming Solutions Act. The Cap-and-Trade Program also provides a foundational policy that can be used to achieve substantial additional emission reductions by 2050.

Although the Air Resources Board has primary responsibility for achieving the state emissions target by 2020, significant mitigation activities are underway in multiple agencies, including: the Public Utilities Commission, the California Energy Commission, the Department of Forestry and Fire Protection, the Department of Water Resources, and others. These activities are summarized below under each of the Climate Action Team subgroups.

2009 California Climate Adaptation Strategy

Climate change is already affecting California. Average temperatures have increased, leading to more extreme hot days and fewer cold nights. Shifts in the water cycle have been observed, with less winter precipitation falling as snow, and both snowmelt and rainwater running off earlier in the year. Sea levels have risen. Wildland fires are becoming more frequent and intense due to dry seasons that start earlier and end later. These climate driven changes affect resources critical to the health and prosperity of California.

If the state takes no action to reduce or minimize expected impacts from future climate change, the costs could be severe. In November 2008, Governor Schwarzenegger directed the California Natural Resources Agency to develop a climate adaptation strategy for California. The Natural Resources Agency coordinated with ten state agencies, multiple scientists, a consulting team, and stakeholders to develop the first statewide, multi-sector adaptation strategy in the country. The resulting report, *2009 California Climate Adaptation Strategy*,⁵ summarizes the best-known science to assess the vulnerability of the state to climate change impacts, and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. This strategy is the first step in an evolving process to reduce California's vulnerability to climate change impacts.

Adaptation refers to efforts that prepare the state to respond to the impacts of climate change – adjustments in natural or human systems to actual or expected climate changes to minimize harm or take advantage of beneficial opportunities. California's ability to manage its climate risks through adaptation depends on a number of critical factors. These include its baseline and projected economic resources, technology, infrastructure, institutional support and effective governance, public awareness, access to the best available scientific information, sustainably-managed natural resources, and equity in access to these resources. As the *2009 California Climate Adaptation Strategy* illustrates, the state has the ability to strengthen its capacity in all of these areas. The Adaptation Strategy is organized into seven sectors: public health, biodiversity and habitat, oceans and coastal resources, water management, agriculture, forestry, and transportation and energy infrastructure. Figure 4 lists the principles that guided the development of the Adaptation Strategy. As with the mitigation activities in the Scoping Plan, the

⁴ The implementation status of the full set of Scoping Plan measures is reported in *Scoping Plan Measures Implementation Timeline*, October 28, 2010, Air Resources Board, available at: <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>.

⁵ The Adaptation Strategy can be accessed at: <http://www.climatechange.ca.gov/adaptation/index.html>.

adaptation activities are the responsibility of multiple state agencies, and are summarized under each of the Climate Action Team subgroups.

Figure 4: Adaptation Strategy Guiding Principles

- Use the best available science to identify climate change risks and adaptation strategies.
- Understand that data continue to be collected and that knowledge about climate change is still evolving. As such, an effective adaptation strategy is a “living” document and will be adapted to account for new science.
- Involve all relevant stakeholders in identifying, reviewing, and refining the state’s adaptation strategy.
- Establish and retain strong partnerships with federal, state, and local governments, as well as tribes, private businesses, landowners, and non-governmental organizations to develop and implement adaptation strategy recommendations over time.
- Give priority to adaptation strategies that initiate, foster, and enhance existing efforts that improve economic and social well-being, public safety and security, public health, environmental justice, species and habitat protection, and ecological function.
- When possible, give priority to adaptation strategies that modify and enhance existing policies rather than solutions that require new funding and new staffing.
- Understand the need for adaptation policies that are effective and flexible for circumstances that may not yet be fully predictable.
- Ensure that climate change adaptation strategies are coordinated with the California Air Resources Board’s Assembly Bill 32 Scoping Plan process when appropriate, as well as with other local, state, national and international efforts to reduce greenhouse gas emissions.

2009 *California Adaptation Strategy*, p. 5, accessible at:

<http://www.climatechange.ca.gov/adaptation/index.html>.

Agriculture

California’s agricultural sector is a multi-billion dollar segment of the state’s economy. The sector interacts with climate change in multiple ways:

- Agriculture in California is vulnerable to predicted impacts of climate change, including less reliable water supplies, increased temperatures, and increased pests.
- The agriculture sector is a source of greenhouse gas emissions as a result of both biological processes and the use of fossil fuels.
- Sustainably-produced biomass from the agriculture sector can be substituted for fossil fuels, helping to reduce greenhouse gas emissions.
- Agricultural lands can remove greenhouse gases from the atmosphere.
- Agricultural lands are suitable for the siting of some renewable energy technologies.

Addressing climate change in agriculture therefore encompasses both reducing vulnerability through adaptation strategies and exploiting opportunities to help mitigate greenhouse gas emissions.

The California Department of Food and Agriculture in conjunction with the State Board of Food and Agriculture is working to promote the adoption and installation of alternative energy throughout California’s agricultural lands. For example, the Department of Food and Agriculture, the Department of Toxic Substances Control, the Central Valley Regional Water Quality Control Board, the Air Resources

Board, and the Department of Resources, Recycling and Recovery are working together to address regulatory, permitting, and financial barriers to a widespread voluntary adoption of anaerobic digesters by California dairies.

To improve California's greenhouse gas emissions inventory, the Air Resources Board, the California Energy Commission, and the Department of Food and Agriculture are sponsoring research to better understand nitrous oxide (N₂O) emissions from agricultural ecosystems under California-specific conditions. This data may be used to develop California-specific baseline emissions and improve fertilizer management practices.

As part of its Cap-and-Trade Program, the Air Resources Board is examining opportunities to issue offset credits for voluntary emission reduction and sequestration projects from sources, including agriculture, that are not capped by the program. Stakeholders and project developers can develop quantification methods for review and consideration by the Air Resources Board.

The response to climate change builds upon efforts to improve efficiency of agricultural machinery (and reduce criteria air pollutants from engines), improve irrigation efficiency, and make better and more efficient use of chemical fertilizers. These existing efforts have been driven by economic considerations and resource constraints which will continue to guide future decision making. Ranchers and farmers have also pursued sustainability improvements as part of a commitment to long-term economic and environmental stewardship. Recent efforts include the establishment of solar and wind electricity generation to power farming and processing equipment.

Additional resources and program information can be found at:

Agriculture Near Term Implementation Plans:

http://climatechange.ca.gov/climate_action_team/reports/catnip/agriculture/

California Department of Food and Agriculture climate change page:

http://www.cdfa.ca.gov/AHFSS/Emergency_Preparedness/Climate_Change.html

Biodiversity

California is one of the most biologically diverse regions of the world, with the most unique plant and animal species, as well as the greatest number of endangered species, of all 50 states.⁶ The state's biodiversity stems from its varied climate and geography, with numerous habitats where species have evolved and adapted over time. These species and ecosystems provide numerous goods and services including: food and timber production, medicines, water and water purification, fuels, carbon sequestration and climate regulation, cultural resources, as well as aesthetic value.

The preservation of California's unique biological heritage is of ever-increasing importance given the forecasted impacts associated with climate change. Existing stressors such as urban growth and development, water management conflicts, and invasive species will be amplified by climate change. Climate adaptation strategies are needed to increase the state's capacity to deal with uncertainty and ensure that California's natural resources are maintained for generations to come.

The state is protecting ecological assets through:

- Sustainable habitat reserves that protect representative animal and plant species.
- Management of watersheds and habitat, including accounting altered conditions due to climate change.

⁶ 2009 *California Climate Adaptation Strategy*, p. 45, accessible at: <http://www.climatechange.ca.gov/adaptation/index.html>.

- Education and outreach that fosters greater understanding of the effect of climate change on biodiversity.
- Statewide strategies to improve water and flood management systems and, simultaneously, enhance and sustain ecosystems.

The Department of Fish and Game leads a stakeholder group to identify and preserve a statewide system of conservation areas. The Department of Water Resources along with the Department of Fish and Game are implementing adaptation strategies. These include: expanding the habitat range for tidal wetlands to adapt to sea level rise at the San Francisco Bay/Delta boundary; expanding Delta island subsidence reversal and land accretion projects; protecting, enhancing, and restoring upper watershed forests and meadow systems that act as natural water and snow storage; and reestablishing natural hydrologic connectivity between rivers and their historic floodplains in flood management systems.

Additional resources and program information can be found at:

Biodiversity Near Term Implementation Plans:

http://www.climatechange.ca.gov/climate_action_team/reports/catnip/biodiversity/

Bay/Delta Conservation Plan: <http://baydeltaconservationplan.com/default.aspx>

California Wildlife Action Plan: <http://www.dfg.ca.gov/wildlife/WAP/report.html>

Electricity and Natural Gas

The generation of electricity with fossil fuels and the use of natural gas in industrial, commercial, and residential applications are the second largest source of greenhouse gas emissions in the state. Substantial demands have been and are continuing to be placed on electric and natural gas utilities to realize environmental and energy security goals for California:

- Energy efficiency and demand response are the top priority for meeting future energy needs.
- Renewable energy is the preferred source of electricity supply and is being promoted as a substitute for fossil-based gaseous fuels.
- Combined heat and power and distributed generation are included in a number of policy efforts.
- Reductions in the impacts of power plants on air quality and coastal and estuarine environments will be achieved with plant efficiency and control improvements.
- Electrification of transportation contributes to energy security as well as environmental goals.

Utilities are committing substantial resources to achieve these policy goals, most of which also help to reduce greenhouse gas emissions. The state's energy and environmental agencies work closely together to achieve these energy sector policy objectives within the timeframes established by statute and regulation. In meeting these goals, the state must also continue to ensure that its residents are provided with safe, reliable electricity at just and reasonable rates. In September 2010, the agencies formalized their inter-agency collaboration with the publication of *California's Clean Energy Future*.⁷

Improving the energy efficiency of industrial, commercial, and residential consumers has been a long-standing policy objective for the state. Programs and standards have kept per capita electricity use largely constant since 1974:

⁷ *California's Clean Energy Future. An Overview on Meeting California's Energy and Environmental Goals in the Electric Power Sector in 2020 and Beyond*. California Energy Commission Report CEC-100-2010-002, September 2010. Available at: <http://www.climatechange.ca.gov/energy/index.html>.

- The Public Utilities Commission requires investor-owned utilities to have energy efficiency programs that target seven sectors: Residential, Commercial, Industrial, Agricultural, New Construction, HVAC (Heating, Ventilating, Air Conditioning), and Lighting.
- The California Energy Commission requires publicly-owned utilities to have similar energy efficiency programs.
- The California Energy Commission adopts and enforces stringent energy efficiency standards for appliances and buildings.

Among the policies that support the energy efficiency programs is the “decoupling” of utility sales and revenue. California policymakers initiated decoupling in 1982 to remove utility disincentives for energy efficiency and energy conservation. The policy has been refined so that utilities are indifferent to, rather than financially harmed by, customer-side efficiency improvements. The planned energy efficiency programs are expected to be one of the most important emissions mitigation measures in the Scoping Plan, contributing about 15 million metric tons of emission reductions in 2020.⁸

De-carbonizing the electricity supply is also a key strategy for achieving the state’s greenhouse gas emission reduction goal. The Renewable Portfolio Standard requires that 20 percent of the electricity delivered in the state comes from qualified renewable sources. In September 2010, the Air Resources Board adopted the Renewable Electricity Standard, increasing the requirement to 33 percent by 2020. These two programs are expected to reduce emissions by 20 million metric tons in 2020.

In addition to these two major efforts, state agencies are pursuing other strategies for mitigation and adaptation.

- In 2007 the Public Utilities Commission and the California Energy Commission adopted the Emission Performance Standard of 1,100 pounds of carbon dioxide per megawatt hour for new power plants and long-term power contracts.
- The Public Utilities Commission is developing approaches for encouraging combined heat and power facilities (cogeneration), which enhance energy use efficiency.
- The California Energy Commission is developing an updated Bioenergy Action Plan to increase the sustainable use of biomass resources, with a target for bioenergy to provide 20 percent of the state goals for renewable generation for 2020.
- The California Energy Commission administers the Alternative and Renewable Fuel and Vehicle Technology Program, which has several ambitious goals, including reducing petroleum fuel use to 15 percent below 2003 levels by 2020.
- The California Energy Commission will assess climate change impacts during power plant siting cases, and considers the potential impacts of sea-level rise, temperature increases, precipitation changes and extreme weather events, where relevant. As discussed in the next chapter, the California Energy Commission’s Public Interest Energy Research program supports research on potential climate change impacts and adaptation options for hydropower generation and other sources of renewable energy.

The impacts of climate change pose challenges to the energy infrastructure. Changes in hydrological patterns will affect the reliability of the region’s hydropower generation, which accounts for 12 to 20 percent of the state’s total annual electricity generation. One climate adaptation strategy involves research into whether an improved decision support system, designed to better manage water reservoirs in California under current climatic conditions, could also reduce energy impacts in a changing climate.

⁸ *Scoping Plan Measures Implementation Timeline*, Air Resources Board, October 28, 2010, available at: <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>.

Another adaptation issue concerns the reduction of electricity transmission efficiency during hotter periods. If this issue is not addressed it could potentially lead to electricity deficits especially during periods of peak demand.

Additional resources and program descriptions can be found at:

Energy Near Term Implementation Plans:

http://www.climatechange.ca.gov/climate_action_team/reports/catnip/energy/

California's Clean Energy Future:

<http://www.climatechange.ca.gov/energy/>

Forestry

Forests and woodlands are important parts of California's landscape and economy. They also form unique challenges and opportunities in California's response to climate change. Adaptation to climate change in the forest sector includes responding to changes to ecosystems linked to concerns over habitat disappearance and wildfire risk, and insect, and disease prevalence. These responses are a substantial concern in a sector where planning and forecasting timelines are often decades long. The forest sector is also the only inventoried sector in the state with net negative greenhouse gas emissions: emissions from wildfires, land conversion, and wood decomposition are currently smaller than the amount absorbed as trees and other plants grow.

The longstanding recognition of the multiple benefits of sustainable forest management has allowed for the incorporation of climate change considerations—both mitigation and adaptation—into existing frameworks. For example:

- The 2010 Forest and Range Assessment has a climate change subtheme analyzing threats from wildfire, insects, disease, and development out to the year 2100.
- Proposition 40, passed in 2002, provides \$10 million in grants to local governments and nonprofit organizations for urban forestry, simultaneously offering climate, habitat, and water quality co-benefits.
- Policies and programs such as the Vegetation Management Program to remove brush and “ladder fuels” reduce the risk of intense wildfires. Reducing intense wildfires provides multiple benefits including avoided greenhouse gas emissions and the preservation of habitat. Fuels management programs can also provide sources of woody biomass for energy.
- The state's Interagency Forestry Working Group is developing scientific, empirically-based provisions for sustainable use of woody biomass for energy projects, including low-carbon transportation fuels. This supports the implementation of the Low Carbon Fuel Standard and Assembly Bill 118 (Núñez, Statutes of 2007).

The state continues to evaluate its policies, and the Forestry Working Group will report in 2011 with a review of state and federal regulations regarding forest management. The report will assess improvements to forest sector information and policies.

Additional resources and program information can be found at:

Forestry Near Term Implementation Plans:

http://www.climatechange.ca.gov/climate_action_team/reports/catnip/forestry/

Climate Change and Land Use Planning

The planning and development of communities and their supporting transportation infrastructure are large investments with long-lasting impacts. The manner in which these investments are made will have significant impacts on greenhouse gas emissions, particularly in the long term. Community development

decisions will also determine the vulnerability of communities to future climate changes. Recognizing the importance of effective planning to create economically affordable, livable, and environmentally sustainable communities, has resulted in a strong focus on improved community planning for state and local policymakers.

In California, as is the case throughout the United States, cities and counties are responsible for community planning and development decisions. As a result, state policy is focused on providing incentives and resources to local decision makers. This will enhance their ability to consider the implications of planning decisions on greenhouse gas emissions and vulnerability to climate change.

With so many levels of government involved, a collaborative approach to sustainable land use planning between and among governments is essential. In September 2010, under the authority of Senate Bill 375, the Air Resources Board adopted regional greenhouse gas emission reduction targets for California's Metropolitan Planning Organizations. Local governments working with neighboring jurisdictions and regional agencies can reduce local transportation related greenhouse gas emissions, through a combination of policies. These could include regional transit, local parking policies, and a workable and inviting bike/walk infrastructure. The state plays an important additional role developing and disseminating information for local agencies that supports their assessments of land use, housing, and transportation policies that might impact sustainability, greenhouse gas emissions, and community resilience to climate change.

Grants and other incentives encourage cities, counties and regions to improve their plans. In December the state's Strategic Growth Council approved over 20 million dollars in planning grants for local and regional governments throughout California. In addition, the Climate Change Land Use and Infrastructure working group is developing an interactive list of planning resources provided by state government. In the future these may evolve into a set of general plan guidance recommendations. Some examples include:

- **Energy Aware Planning Guide:** Produced by the California Energy Commission the Guide is designed to assist local governments in preparing comprehensive Energy Elements and integrating energy conservation policies into all General Plan elements. The Guide has been updated to more fully address the link between local government action, energy consumption and greenhouse gas and emission reduction options. It also has new sections describing the role of regional transportation analysis and planning in local government energy efficient land use.
- **Heritage Lands Valuation Model:** This open source modeling tool allows relative valuation for working lands. It assesses mineral and natural resources, wildlife, open space, environmental hazards, and agricultural resources in order to avoid inappropriate development of highest value parcels. The model can be used for planning and creating incentive programs directed at targeted land preservation.
- **Monitoring Health Status and Impacts of Land Use Planning and Implementation:** The California Department of Public Health is developing indicators for measuring elements of the Healthy Community Framework, and creating an implementation strategy to make the relevant data available to cities, counties, and regional partners. This will help them better incorporate health issues into land use plans.

Additional resources and program information can be found at:

Climate Change Land Use and Infrastructure Near Term Implementation Plans:
http://www.climatechange.ca.gov/climate_action_team/reports/catnip/land_use/

Strategic Growth Council: <http://sgc.ca.gov/>

"Cool California" local government resources: <http://coolcalifornia.org/local-government>

California Energy Commission land use resources: <http://energy.ca.gov/landuse/index.html>

Ocean and Coastal Resources

California has significant public and private infrastructure at risk from sea level rise, related storm surge, and salt water intrusion into fresh water aquifers. Activities are underway to better understand these risks and minimize damage to critical coastal habitat:

- The Adaptation Strategy calls for a coastal and ocean vulnerability assessment every five years.
- The California Ocean Protection Council has taken actions to create framework to address sea-level rise, coastal erosion hazard avoidance and habitat protection, in accordance with the Adaptation Strategy.
- Research is being performed and data are being collected to update vulnerability assessments related to sea level rise and shoreline erosion.

The Ocean Protection Council has been working to share information and tools with local planning agencies as they update their local land use plans. To understand the potential long-term tidal impacts on a regional basis, considerable efforts have been made to collect, analyze and share tidal data. The California Energy Commission is leading assessments of sea level rise impacts on California's natural resources, habitats and infrastructure. Continued improvements in information-sharing between the many state, local, and regional planning authorities is needed to ensure informed decision-making that minimizes climate change risk.

Additional resources and program descriptions can be found at:

Oceans and Coastal Near Term Implementation Plans:

http://www.climatechange.ca.gov/climate_action_team/reports/catnip/coastal/

Public Health

Climate change has the potential to significantly impact public health, linked to increases in illness and injury associated with several factors. These include: more frequent and more severe extreme heat and other extreme weather events, declining air quality, increases in allergenic plant pollen, more frequent wildfires, altered environmental conditions that foster the spread of communicable and vector-borne diseases, and impacts on food supply and water quality. The California Department of Public Health is leading efforts to prepare for these risks. The initial focus is on extreme heat events by improving surveillance of heat-related morbidity and mortality, and working with emergency response agencies to refine emergency preparedness plans. The Department is also maintaining its operation of the California Environmental Health Tracking Program, and incorporating the climate health indicators recommended by the Council of State and Territorial Epidemiologists.⁹

Because public health professionals work extensively with low income and diverse communities, the public health community is also working to ensure that greenhouse gas mitigation efforts improve health outcomes for vulnerable and disadvantaged communities. For example, the Department of Public Health is assessing the health benefits of sustainable community planning that promotes walking and bicycling while decreasing motor vehicle greenhouse gas and criteria pollutant emissions.

Additional resources and program descriptions can be found at:

Public Health Near Term Implementation Plan

http://www.climatechange.ca.gov/climate_action_team/reports/catnip/public_health/

⁹ The indicators are described at:

<http://www.cste.org/dnn/ProgramsandActivities/EnvironmentalHealth/EnvironmentalHealthIndicators/tabid/339/Default.aspx>.

State Operations

In carrying out its operations and delivering services to the residents of California, the state emits greenhouse gases directly through the use of fuel and indirectly through the use of electricity. The state owns and leases office buildings, warehouses, laboratories, and other properties. In addition, the state owns and operates passenger vehicles, SUVs, trucks and other vehicles. State employees also travel in the course of their duties, using rental vehicles, common carrier aircraft and various forms of public transportation.

The state also provides specialized services, including fire protection, corrections, law enforcement, and other functions that require the use of dedicated facilities and specialized equipment. Unique to the State of California is the management of the California State Water Project by the Department of Water Resources. The State Water Project is the nation's largest state-built water and power development and conveyance system.¹⁰ It includes facilities—pumping and power plants; reservoirs, lakes, storage tanks, canals, tunnels, and pipelines—that capture, store, and convey water to 29 water agencies. The State Water Project provides drinking water for over 23 million people and generates an average 6.5 million MWh of hydroelectricity annually. However, its net usage of electricity is 5.1 million MWh, making it the largest single user of electricity in the state.

Each state agency is responsible for reporting its greenhouse gas emissions inventory for its operations. The Climate Action Team is developing guidance with the assistance of The Climate Registry to ensure that these emissions inventories are consistent and comparable. Because the Department of General Services manages most of the state government's buildings and vehicles, it is developing data systems to support the emissions reporting by the various agencies.

Each agency is also responsible for reducing its greenhouse gas emissions, building on the many efforts undertaken in recent years in the pursuit of environmental stewardship and sustainability. By bringing together technical experts and resource managers from a broad range of state agencies, the Climate Action Team is identifying and implementing strategies to reduce emissions. Additionally, the group is reviewing the many efforts underway at individual agencies to identify those that could be models for state-wide implementation. For example, the Department of General Services is developing a fleet asset management system to track and measure key state fleet metrics, such as: composition, average miles per gallon, miles driven, and types and quantities of fuels consumed.

The Department of Water Resources working to reduce electricity requirements and operating costs by improving pumping efficiencies. The Department is also shifting its electricity supply away from higher-emitting, coal-fired generation to natural gas and renewable electricity supplies. These efforts will substantially reduce the Department's greenhouse gas emissions and, consequently, the overall state emissions as well.

Additional resources and program descriptions can be found at:

State Operations Near Term Implementation Plans:

http://climatechange.ca.gov/climate_action_team/reports/catnip/state_operations/

Water

Changes in snowpack, river flow and sea levels indicate that climate change is already affecting California's water resources. Water resources are essential to support both agricultural and urban areas of the state, while also protecting ecosystems and the environment. Satisfying these water needs requires substantial energy resources. The California Energy Commission estimates that conveyance, storage, treatment, distribution, use, wastewater collection, wastewater treatment, and discharge account for

¹⁰ A summary of the State Water Project is available at: <http://www.water.ca.gov/swp/swptoday.cfm>.

approximately 19 percent of the state's use of electricity.¹¹ Consequently, improved efficiency in water supply and use can both improve resiliency to climate changes and mitigate the emission of greenhouse gases. Efforts include:

- The Department of Water Resources and other water authorities will implement the 20x2020 Water Conservation Plan to reduce per-capita urban water use 20 percent statewide by 2020, and implement measures promoting agricultural water use efficiency.
- The State Water Resources Control Board and other agencies are developing policies to promote the recycling of water, reducing both the need for new supply and reducing the energy requirements to deliver water to customers.
- The use of low impact development techniques are being encouraged to either infiltrate storm water flows or to capture, store and use storm water onsite. Infiltration and/or onsite use of stored storm water is expected to offset the need to import water from remote locations, thus saving energy and reducing emissions.
- Improved water use and water diversion measurement reporting systems are being developed, including systems for tracking conservation, water recycling, storm water and water rights diversion.

An array of adaptive water management strategies must be implemented to better address the risks and uncertainties of changing climate patterns. Coupled water and energy strategies must focus on both greenhouse gas emission reductions and adaptation actions. Both are needed to ensure a sufficient supply of water and the necessary energy for the storage, transport and delivery of water for cities and farms, and to maintain healthy ecosystems.

Additional resources and program descriptions can be found at

Water Near Term Implementation Plans:

http://www.climatechange.ca.gov/climate_action_team/reports/catnip/water_energy/

California Water Plan - <http://www.waterplan.water.ca.gov/cwpu2009/index.cfm>

Integrated Regional Water Management Program - <http://www.water.ca.gov/irwm/>

Low Impact Development - http://www.waterboards.ca.gov/water_issues/programs/stormwater/

Water Recycling -

http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/index.shtml

¹¹ California Energy Commission, *California's Water – Energy Relationship*, November 2005, CEC-700-2005-011-SF, and *Refining Estimate of Water Related Energy Use in California*, December 2006, CEC-500-2006-118; available at: http://www.energy.ca.gov/pier/project_reports/CEC-500-2006-118.html.

Chapter 3: California's Climate Change Research Program

California has, for over 20 years, relied on a state climate change research program to inform policy decisions by providing state-specific data on climate change impacts, responses to those impacts, and strategies to reduce greenhouse gas emissions. By focusing on the regional aspects of climate change critical to California, this state research supplements national and international efforts.

California state government has a long history of support for regional climate change science. For example, a 1987 analysis¹² by the chief hydrologist for the California Department of Water Resources showed that in some rivers a slow shift in runoff from the spring and summer months to the winter season was taking place. This study influenced the California Legislature's 1988 adoption of Assembly Bill 4420 (see Chapter 1), which directed the Energy Commission to assess the potential impacts of climate change on California and to identify options for reducing greenhouse gas emissions in the state.¹³ In 2003, the California Energy Commission formed the California Climate Change Center to implement a multi-sector, regional climate change research plan. Many other state agencies now fund climate change science through awards to independent researchers.

Ongoing state research supports effective implementation of emission reduction strategies identified in the Assembly Bill 32 Scoping Plan. Scientific assessments are also needed for consideration of climate change in the development of long-term resource management plans such as the State Forestry Plan and the California Water Plan; and to design strategies to adapt to current and future impacts of climate change, such as those contained in the *2009 California Climate Adaptation Strategy*. State-sponsored research is made publicly available on the sponsoring agency's website, and through efforts like CalADAPT,¹⁴ which uses Google Earth to display locally-relevant climate impact information for the public and local decision makers.

The state also coordinates with research centers sponsored by the U.S. federal government, which has pledged to prepare periodic national assessments that include evaluation of practical regional climate impacts. Federally sponsored research efforts include the California Nevada Applications Program at Scripps Institution of Oceanography/University of California at San Diego (jointly funded with the California Energy Commission), which been instrumental in advancing climate change science in California. Federal funding for climate change research presents opportunities for California universities, national laboratories, and other research institutions to further advance knowledge concerning the effects of climate change in California. The state will continue to support climate change science that supplements national efforts, while at the same time positioning California to gain from an expanding national research portfolio.

Climate Change Research Catalog

To make climate research results and projects more easily accessible, the Climate Action Team Research working group created a Climate Change Research Catalog. The catalog contains information about research projects supported by state government, including the project name and year, budget, principal

¹² "Possible changes in California snowmelt runoff patterns," M. Roos, Proceedings of the 4th Annual PACLIM Workshop, Pacific Grove, CA., 22–31, 1987.

¹³ The reports are "The impacts of global warming in California," California Energy Commission, publication number P500-89-004, 1989.; and "Global climate change: potential impacts and policy recommendations," California Energy Commission, 1991, publication number P500-91-007.

¹⁴ "CalADAPT – The Project to Visualize Climate Change Risk and Adaptation Options in California Using Google Earth," <http://www.climatechange.ca.gov/visualization/index.html> (Accessed December 3, 2010).

investigators, sponsoring agencies, and a pointer to the final research report. It is available online at <http://www.climatechange.ca.gov> as a searchable and downloadable database.

The catalog includes research projects that advance science and contribute peer-reviewed studies to the ever expanding body of knowledge about climate change in California. To date, it contains more than 250 projects, and state agencies have committed to continuing to expand and update it. Each agency will provide updates annually to reflect new and completed projects.

Since 2000, state agencies have invested \$75 million in climate change science, distributed among a half-dozen major categories as shown in Figure 5. Three areas have each accounted for approximately one-quarter of the funding: impact and adaptation studies, regional climate modeling to determine how climate is changing in California and how it may change throughout the rest of this century, and the identification of options to reduce greenhouse gas emissions. Studies concerning the economic effects of climate change or climate change policies constituted about 8 percent, and improvements to methods of inventorying statewide emissions accounted for about 11 percent. Interactions between human activity and climate change (the "human dimension") have represented a smaller but growing percentage. State agency investment in climate change science is presented in Figure 6. Funding for collaborations appear in this figure under the lead agency only, so that projects appear only once. In-kind and other contributions from multiple agencies are not represented.

Collaborative Project Case Studies

Climate change policy issues and strategies to address them are often interdisciplinary and cross the traditional boundaries of individual state agencies' responsibility. State agencies have found multiple benefits to collaboration and comprehensive research approaches. Five case studies of coordination and collaboration among agencies on research projects are described in detail in separate attachments to this report. These examples illustrate some of the advantages found when research projects lend themselves to cross-agency collaboration.

Figure 5: Project Funding by Category (%)

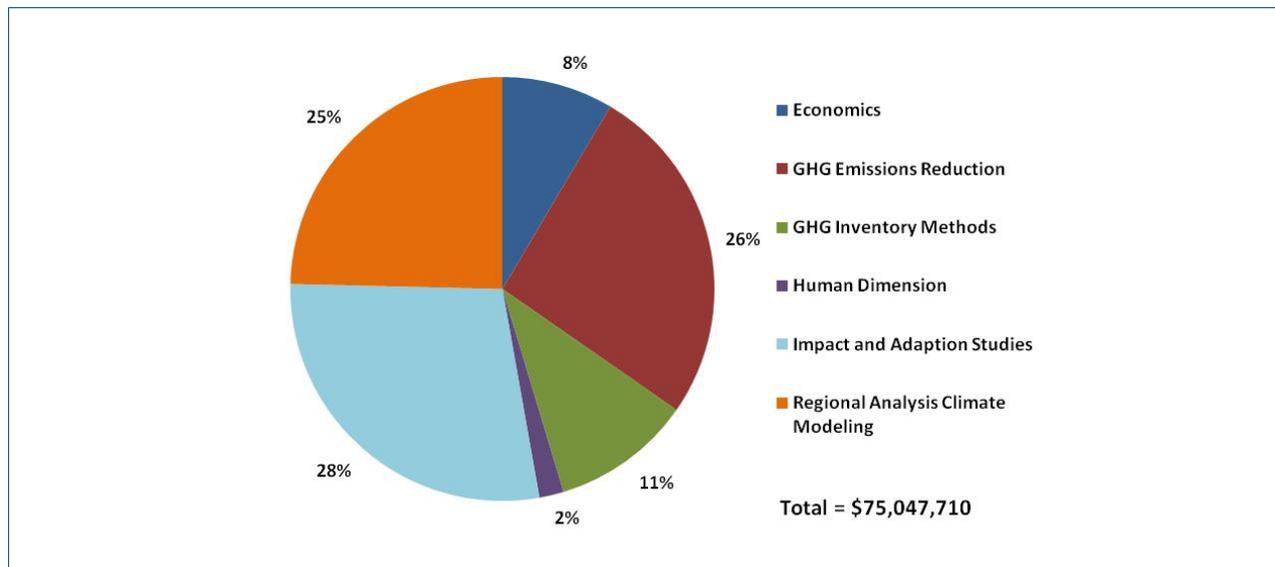
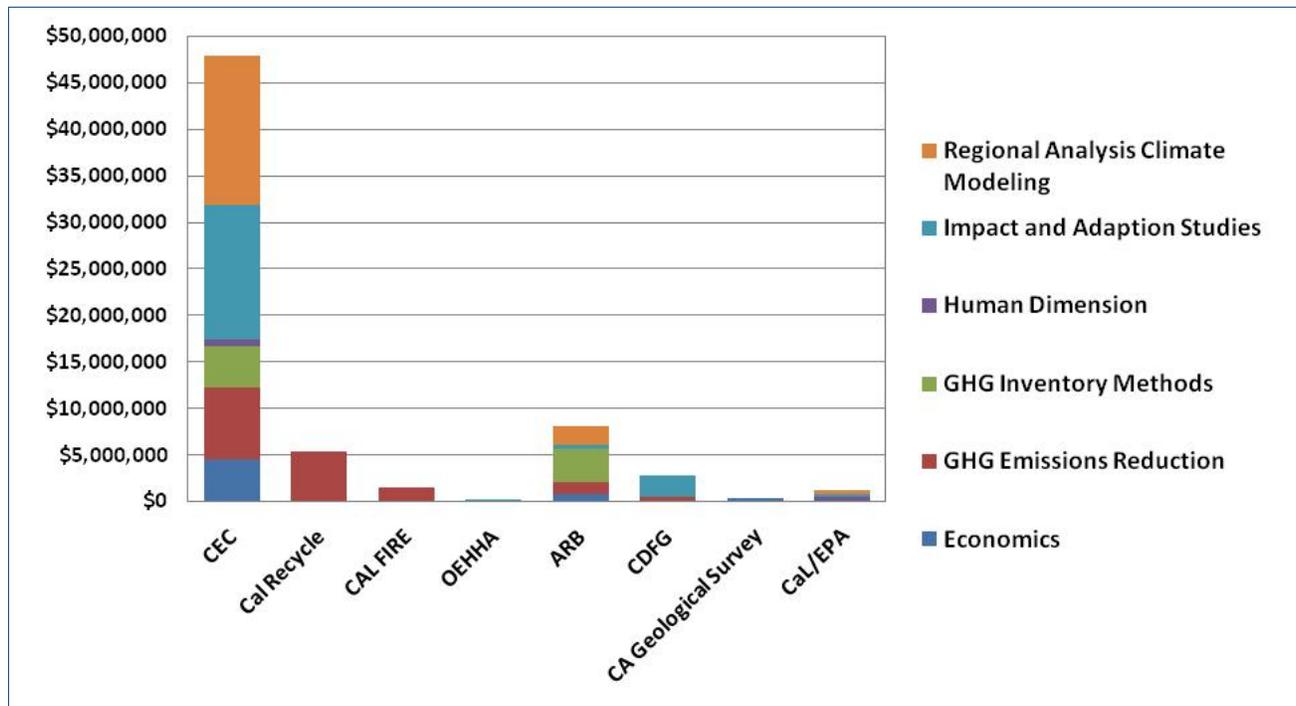


Figure 6: Project Funding by Agency (\$)



One benefit identified in several case studies is the ability to leverage funding. The West Coast Regional Carbon Sequestration Partnership, or WESTCARB, is a joint endeavor of the US Department of Energy, seven Western states, and one Canadian province. It explores opportunities to capture and store carbon dioxide. California is represented in the partnership by the Air Resources Board, California Department of Forestry and Fire Protection, the Department of Water Resources, the Division of Oil, Gas and Geothermal Resources, the California Energy Commission, the California Environmental Protection Agency, and the California Geological Survey. A California contribution of less than \$10 million leverages federal and industrial match funding of approximately \$110 million to support research, development, and demonstration into carbon sequestration, which may play a major role in achieving state goals of 80 percent emissions reductions by 2050.

Sea level rise will have significant impacts on California’s coastal infrastructure and ecosystems. A sea level rise report commissioned from the National Research Council provides another example of the advantages of cooperation. Four state agencies (the State Water Resources Control Board, California Energy Commission, Ocean Protection Council, and the California Department of Transportation) spread the cost of the report among themselves, and leveraged additional funding from three federal agencies, the Oregon Water Enhancement Board, and the Washington Department of Ecology. The California Department of Water Resources is providing in-kind support. The five state agencies involved all have adaptation policy decisions to make in the coming years and decades that need similar information on sea level rise. Commissioning a single study is an efficient use of resources.

This National Research Council report will offer the best estimates of the amount of sea level rise and associated uncertainties, considering global and local factors including geology and ocean currents. An interim sea-level rise guidance document¹⁵ was developed by the Sea-Level Rise Task Force of the Coastal and Ocean working group of the California Climate Action Team, with science support provided

¹⁵ <http://www.opc.ca.gov/2010/12/climate-adaptation-and-sea-level-rise/>

by the Ocean Protection Council's Science Advisory Team and the California Ocean Science Trust and input from sixteen state agencies. The interim guidance document is intended to provide information for incorporating sea-level rise projections into planning and decision making for projects in California until the more comprehensive report is available. The final report from the National Research Council is likely to be released in 2012.

Another case study of complementary research avoiding duplication is a set of coordinated studies on nitrous oxide emissions from agriculture. The Air Resources Board, the Department of Food and Agriculture, and the California Energy Commission have commissioned a series of studies that collectively measure and model baseline nitrous oxide emissions from ten crops plus dairy farms in various regions throughout the state. . Additionally, the Department of Resources, Recycling and Recovery has commissioned a project on changes to baseline nitrous oxide emissions by use of compost, with and without synthetic fertilizers. Coordinating this suite of projects provides a comprehensive and comparable data set of field measurements and model calibration and verification.

The nitrous oxide studies also demonstrate another potential benefit of agency collaboration. The agencies have coordinated with the San Joaquin Valley Agricultural Technical Committee, made up of growers, researchers, fertilizer industry representatives, and federal, state, and local government agencies. Consolidating essential stakeholder outreach and consultation can reduce the burden of participation, including time and travel, for all participants.

California conducts a biennial climate impact assessment, a primary purpose of which is public and stakeholder interaction and outreach. The projects sponsored under this work focus on California-specific impacts and economics assessments. Each assessment includes both peer-reviewed technical reports and a summary written to be accessible to the public. The assessment is led by the California Energy Commission and the California Environmental Protection Agency, with advice from a multi-agency steering committee.¹⁶ The steering committee's advice illuminates statewide research priorities, as well as providing a range of technical and policy expertise.

Sharing expertise and experience that exists in multiple agencies can also be a benefit of agency coordination of research. An example is a project to improve the inventory of fugitive methane emissions from landfills. The California Energy Commission and Public Utilities Commission sponsored this project, which produced a model that can be used by state agencies for calculation of methane emissions for the statewide greenhouse gas inventory. Landfill operators can also use it to estimate the effects of options to reduce emissions. The Department of Resources, Recycling and Recovery and the Air Resources Board were integral to the project, as part of the team that reviewed proposals, selected a contractor, and guided the project execution. The Department offered access to their data from landfills in California to determine what information was already available, and periodically conveyed new information that could be used as input to the new model as it was being developed.

Enhancing Climate Change Research Coordination in California

When projects are amenable to agency collaboration, multiple benefits can accrue, as illustrated with the examples above. To reap those benefits whenever possible, California state agencies have committed themselves to continuing, increasing, and improving collaboration.

Interagency coordination of climate research maximizes State resources in several important ways: by leveraging funding; fostering research projects that support multiple policy objectives; finding

¹⁶ Natural Resources Agency, Air Resources Board, Ocean Protection Council, Department of Public Health, Department of Food and Agriculture, Department of Water Resources, Department of Transportation, San Francisco Bay Conservation and Development Commission, Department of Forestry, and California Department of Parks and Recreation.

opportunities to leverage extant expertise, data, and ongoing studies; avoiding unnecessary duplication of efforts; and improving stakeholder outreach. While each agency has individual legal and regulatory mandates for its research program, the agencies will continue to work to identify opportunities for collaboration.

The Climate Action Team's Research working group provides a forum for agencies to comment on each others' research plans, draft scopes of work, and draft products before they are finalized. It organizes annual public meetings to share completed, ongoing, and proposed research programs and projects and invites collaboration and staff-level networking. It collects and makes publicly available research plans, gap analyses, and discussion papers on California climate research. The group maintains and will update the climate change research catalog, described above, as a resource for the public, researchers, and agency staff. It will also hold internal and public workshops to assist agencies in coordinating work on topics of cross-cutting interest.

Vulnerability and Adaptation Study for California

The 2009 California Climate Adaptation Strategy mandates the preparation of a vulnerability assessment study for California. The main goals of the study are to identify vulnerabilities to climate change in selected sectors of the economy and articulate robust adaptation strategies.

The overall approach for the vulnerability study is a combination of: 1) state-wide vulnerability assessments for selected sectors that build upon the studies already conducted for the 2009 Assessment, and 2) several in-depth local/regional case studies. The study will consider, as much as possible, both physical vulnerability and socio-economic vulnerability (the human dimension). The human dimension of vulnerability will identify barriers to adaptation, including regulatory, legal, cultural, financial, and other barriers to successful implementation of adaptation measures.

All the studies will use a common set of climate and sea level scenarios and urban growth projections. The state-wide sectoral vulnerability studies will cover: 1) agricultural production, 2) coastal resources, 3) water resources, 4) electricity generation and demand, 5) public health, and 6) ecosystems and forestry. The following paragraph briefly describes the scope of work for the agricultural sector.

The local/regional vulnerability studies are coordinated with the state-wide studies and involve the following: 1) public health (Alameda and Fresno counties), 2) coastal resources at the city level (Santa Cruz and a city in Southern California) and Port of Los Angeles, 3) agricultural sector (Yolo County), 4) water resources at the water district level (El Dorado Irrigation District), and 5) vulnerability study for the San Francisco Bay Region. The latter study will cover multiple sectors of the San Francisco region's economy and an in-depth study for the city of Oakland.

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Chapter 4: Promoting Action Regionally, Nationally and Globally

Reducing the risks of climate change requires effective action among all the world's major greenhouse gas emitters. One country, or even a few countries, cannot stabilize the climate system alone. And, lack of cooperation by even one or two large emitters can substantially frustrate efforts by others. Therefore, action is required across countries that in total is consistent with the emission reduction that the science indicates is needed to prevent human-induced disruption to the climate system.

While global efforts are necessary, local governments also have critical roles in reducing climate change risks. In the United States and other countries, state, provincial, and local governments have oversight and regulatory responsibility for key aspects of energy production and delivery. Similarly, community and transportation planning are often under the purview of state, provincial, and local authorities. Therefore, achieving the necessary global emission reductions depends, in part, on effective action at the state, provincial and local levels.

Although climate change is driven by global atmospheric conditions, climate change impacts are felt locally. Consequently, state, provincial, and local authorities will be the first to respond to dislocations due to climate change. Even as adaptation efforts evolve at the local level to take into consideration local resources and conditions, robust larger scale adaptation strategies will also be highly valued. Therefore, it is crucial to link national and international actions on climate change to those at the local and regional level

Recognizing this interconnected and multi-jurisdictional nature of both mitigation and adaptation, California is using several approaches to promote action regionally, nationally, and internationally:

- **Policy Development:** California is working in multiple venues to promote policies that support effective action at the regional, national and international levels.
- **Information Exchange:** California is participating in information exchanges, primarily with subnational governments, to learn from others and to share the state's experience.
- **Capacity and Institution Building:** California is supporting capacity building, primarily with subnational governments, to enable them to take effective action to reduce climate change risks.
- **Joint Action:** California is taking action in conjunction with other subnational governments to expand emission reduction programs and to enable effective adaptation.

Efforts in these areas are consistent with the state's longstanding leadership in environmental protection and stewardship. Expanding action regionally, nationally, and internationally benefits the state by helping to protect the climate system, and consequently California's people and resources. These efforts also expand the promise of clean energy and economic development based on green jobs, enhancing the competitiveness of the state's businesses, workers, and economy. This chapter highlights California's work in these areas.

Policy Development

California is working in multiple venues to develop and promote policies that support effective action at the regional, national and international levels. California supports the objective in the 1992 United Nations Framework Convention on Climate Change: "...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate

system.”¹⁷ The science currently indicates that greenhouse gas reductions of approximately 80 percent are required to achieve this objective. California supports policies to reduce emissions to these levels in a cost effective and equitable manner.

For three consecutive years (2008 to 2010), the Governor has hosted, along with governors and premiers from other states and provinces, the Governors’ Global Climate Summit. These events focused attention on specific policy and technical solutions to climate change, including both emissions mitigation and adaptation. The Summits have produced several critical initiatives, described below, that are building capacity and resulting in concrete actions by subnational governments.

California has joined with others to define and promote effective policies at all levels of government, including:

- Policy statement by The Environmental Council of the States on the need for state involvement in federal climate action, urging: “...Congress and the Executive Branch to work closely with the states to develop a strong national climate plan.”¹⁸
- Policy position by the National Governors Association on the need for national and international action, including a recommendation that: “...the federal government begin to curtail the emissions of greenhouse gases through a program covering multiple sectors of our economy.” Regarding international action, they said: “...The United States should establish itself as a leader in achieving emission reductions by engaging in international discussions and better demonstrating successes achieved within the United States.”¹⁹
- Policy Resolution by the Western Governors’ Association that includes: “...Western Governors urge Congress and the President to act decisively to create a national policy to reduce greenhouse gas emissions...The Western Governors urge Congress and the President to form national strategies that enhance state authority and leverage partnerships between national, state, tribal, and local governments, build on states’ expertise, and encourage states to continue development and implementation of a range of policies.”²⁰
- A series of policy letters by the State Voice group coordinated under the auspices of the Northeastern States for Coordinated Air Use Management, supporting national action to reduce greenhouse gas emissions through effective federal-state partnership.²¹

In addition to working through established organizations, in May 2009, Governor Schwarzenegger joined 30 fellow Governors to call on Congress to pass comprehensive federal energy and climate policy built on state solutions (see Figure 7).

California is also working internationally to develop and promote opportunities for cooperation to reduce greenhouse gas emissions. At the 2009 United Nations Climate Change Conference in Copenhagen, Denmark, Governor Schwarzenegger built on California’s past participation in the United Nations climate change effort by addressing delegates from around the world and encouraging them to commit to action. California created and is participating in multiple subnational initiatives (described below) that help

¹⁷ The 1992 United Nations Framework Convention on Climate Change has been ratified by 193 countries including the United States. The Convention’s objective is found in Article 2, available at: http://unfccc.int/essential_background/convention/background/items/1353.php.

¹⁸ The policy statement is available at: <http://www.ecos.org/content/policy/detail/3122/>.

¹⁹ National Governors Association, Natural Resources Committee, Policy Position NR.11, July 11, 2010, available at: www.nga.org.

²⁰ Western Governors Association, Policy Resolution 09-3, 2009, available at: www.westgov.org.

²¹ The letters are available at: <http://www.nescaum.org/topics/state-voice/>.

national governments enter into international agreements by creating local conditions and institutions to facilitate action.

Figure 7: Governors' Climate Coalition Statement of Principles

**Governors' Climate Coalition
Statement of Principles**
May 21, 2009

We, the undersigned Governors, agree to the following Principles, and agree to publicly support and seek the implementation of these principles in public policy at every opportunity.

- The United States urgently needs a comprehensive energy strategy that will generate millions of clean energy jobs, break our dependence on foreign oil, and reduce the threat of global warming. Therefore we support and will lend our voice to Congress to pass legislation that invests in using energy more efficiently and producing more clean energy at home, and sets a cap on greenhouse gases to reduce emissions to levels guided by science to avoid dangerous global warming.
- States are where the green economy is being built. States are critical to implementing the clean energy policies necessary to help workers, consumers, businesses, and manufacturers prosper in this new economy by accelerating the deployment of energy-efficient and low-emission technologies, assisting industry to retool and workers to retrain, mitigating costs to consumers and businesses, engaging natural solutions from farms and forests, and preparing for the unavoidable impacts of climate change. Therefore we pledge to work with Congress and the Administration to develop a strong state-federal partnership to create and preserve our jobs and industry, keep the United States competitive abroad, and at the same time address climate change threats.

Signers include the Governors of Arkansas, California, Colorado, Connecticut, Delaware, Florida, Guam, Illinois, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Montana, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Oregon, Pennsylvania, Puerto Rico, Rhode Island, Tennessee, Utah, Vermont, Virgin Islands, Virginia, Washington and Wisconsin.

Available at: <http://www.georgetownclimate.org/state/gov-energy-climate-coalition.php>

Information Exchange

Information exchange enables California to be well informed regarding strategies and policies for reducing climate change risks most cost effectively. Also, California can assist others in developing their understanding, thereby broadening action regionally and internationally. Several California partnerships focus on the exchange of best practices.

International Carbon Action Partnership

Recognizing that multiple efforts were under way around the world to use market forces to motivate greenhouse gas emission reductions, California worked with more than 15 other governments to establish the International Carbon Action Partnership in 2007. Now a partnership of 29 member countries, states, and provinces (see Figure 8), the International Carbon Action Partnership provides an open forum for governments and public authorities to share experiences, knowledge, and best practice on the development and use of carbon markets to reduce emissions. Through information sharing, the Partnership enhances the design of carbon markets by ensuring that compatibility issues are recognized at an early stage, thereby also enabling possible future linking of market programs. California was the first

Chair of International Carbon Action Partnership, and continues to participate as a steering committee member.

Figure 8: International Carbon Action Partnership Members (December 2010)

<p>European Union: Denmark European Commission France Germany Greece Ireland Italy Netherlands Portugal Spain United Kingdom</p>
<p>Regional Greenhouse Gas Initiative: Maine Maryland Massachusetts New Jersey New York</p>
<p>Western Climate Initiative: Arizona British Columbia California Manitoba New Mexico Ontario Oregon Quebec Washington</p>
<p>Others: Australia New Zealand Norway Tokyo Metropolitan Government</p>
<p>Observers: Japan South Korea Ukraine</p>

More information available at: <http://www.icapcarbonaction.com/>

California-Mexico Information Exchange

California has a long history of working with Mexico and its border states on environmental protection through the California-Mexico Border Program. The California Environmental Protection Agency and Mexico's Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)²² developed a memorandum of understanding on environmental cooperation, which was entered into on February 13, 2008. The memorandum is designed to promote cooperation in environmental management, technical and scientific research, and capacity building in various topic areas, including cooperation on climate change activities. These activities include:

- **Information Exchange.** Exchange of recent research related to climate change, develop common research plans, and information exchange workshops on local and regional impacts of climate change.²³ The six Mexican states²⁴ that border the US are observers to the Western Climate Initiative and members of The Climate Registry.
- **Capacity Building.**²⁵ Work with Mexican authorities to develop climate action plans and emissions inventories.

²² SEMARNAT is the Cabinet level department of the Executive branch responsible for developing environmental policy and legislation. More information is available at: <http://www.semarnat.gob.mx/Pages/Inicio.aspx>.

²³ Workshop for Development of State Programs on Climate Change and Use of Climate Change Scenarios. Tijuana, Baja California, December 2008.

Second Workshop for Development of State Programs on Climate Change and Use of Climate Change Scenarios. Tijuana, Baja California, February 2009.

Bi-national Workshop on Drought Sciences, San Diego, California, March 2009.

²⁴ The six Mexican border states with the United States are: Baja California, Chihuahua, Coahuila, Nuevo Leon, Sonora, and Tamaulipas.

²⁵ Mexican Border State Workshop on the Capability for developing State Programs on Climate Change. Monterrey, Nuevo Leon, Mexico, August 2008.

[footnote continues on next page]

The California Energy Commission is working with Baja California for development of wind farm data and the software to help the Baja Energy Commission to implement wind farm site selection. Discussions are underway between Mexico's Secretaria de Energía, the Baja Energy Commission, U.S. Department of Energy and U.S. Trade and Development Agency about cross border transport of renewable energy, including criteria for interconnection with the California power grid.

Joint Activities with Indian Authorities

In 2009, the California Energy Commission, the California Public Utilities Commission, Lawrence Berkeley National Laboratory, and The Indian Forum of Regulators and Delhi Regulatory Commission signed two memoranda of understanding to promote information exchanges and future joint research activities in the areas of energy efficiency and demand-side management, renewable energy development, integrated resource planning, electricity regulation, and transmission pricing. The goal of this collaboration is to spark innovation in policy as well as energy efficiency and renewable energy technologies that could transform the path India and the United States adopt in the future.

Capacity and Institution Building

California is supporting capacity building, primarily with subnational governments, to enable them to take effective action to reduce climate change risks. To leverage resources, the initiatives also involve private sector and non-governmental organizations. Building up the capacity of emerging economies to be more resilient to climate change risks is also a critical element of international cooperation. The following are several key initiatives in which California is active.

R20 – Regions of Climate Action

In an effort to tackle climate change and grow the global green economy, Governor Schwarzenegger organized the R20 – Regions of Climate Action, an innovative subnational public-private alliance. The R20 will include a globally diverse group of subnational government members from developed and developing countries that are committed to taking effective action on climate change. They will partner with organizations and individuals from the private sector, academia, national governments, international organizations, and civil society to build momentum for international climate action.

The mission of the R20 is to develop and implement low-carbon and climate-resilient projects through cooperation between developed and developing country subnational governments. The organization will use demonstration projects in developing countries to facilitate the development of low-carbon, green economies, and to mobilize and leverage clean technology and private sector finance. Subnational leaders will share their collective expertise through the R20. In so doing they will help accelerate the implementation of climate programs across the developed and developing worlds.

Greenhouse Gas Accounting and Credits

Through SB 1771 (Sher, 2000), California created the California Climate Action Registry to establish the foundation for rigorous measurement and reporting of greenhouse gas emissions from major sources in the state. Through a public stakeholder process, the Climate Action Registry developed a system of protocols and data systems that enabled companies, governments, and non-governmental organizations to produce and report high-quality emissions inventories. This work subsequently evolved into The Climate

Border State Climate Change Workshop, Monterrey, Nuevo Leon, Mexico, April 2009.

Workshop on Reforestation and Adaptation to Climate Change, sponsored by the Moore Foundation, Estado de Para, Brazil.

Forum on Energy, Environment and Climate Change Policy, organized by the University of California at Berkeley. Mexico City, August 24 and 25, 2009.

Workshop on reforestation and adaptation, with special invitations to the states of Baja California, Nuevo Leon and Chiapas. Los Angeles, California, September 27 and 28, 2009

Registry, which expanded emissions reporting throughout North America. The Climate Registry is now an independent organization with 41 participating states, the District of Columbia, all Canadian provinces, the Mexican border states and four Native Sovereign Nations.²⁶

Building on the efforts to create uniform and rigorous emissions reporting capabilities, California helped promote early action to reduce emissions by supporting the creation of the Climate Action Reserve, a private, nonprofit organization. Again using an open stakeholder process, the Reserve developed criteria and protocols for verifying high quality greenhouse emission reduction projects. The Climate Action Reserve also developed a system for issuing emission reduction credits, and tracking the use of the credits in the voluntary market.

Although initiated in California, the Reserve is active throughout North America, and has been influential in the development of emission reduction standards in the voluntary market. A total of 253 projects have been listed by the reserve through December 2010, with 72 projects reaching the stage of being issued emission reduction credits. More than 10 million metric tons of emission reductions have been verified through the Reserve program. Figure 9 shows the portion of the credits associated with each project type included in the Reserve program. In December 2010, the Air Resources Board adopted four emission offset protocols and quantification methods that are derived substantially from the work by the Climate Action Reserve: Forestry, Ozone Depleting Substances (US); Livestock Gas Capture/Combustion; and Urban Forestry.

Offset Protocols for Mexico

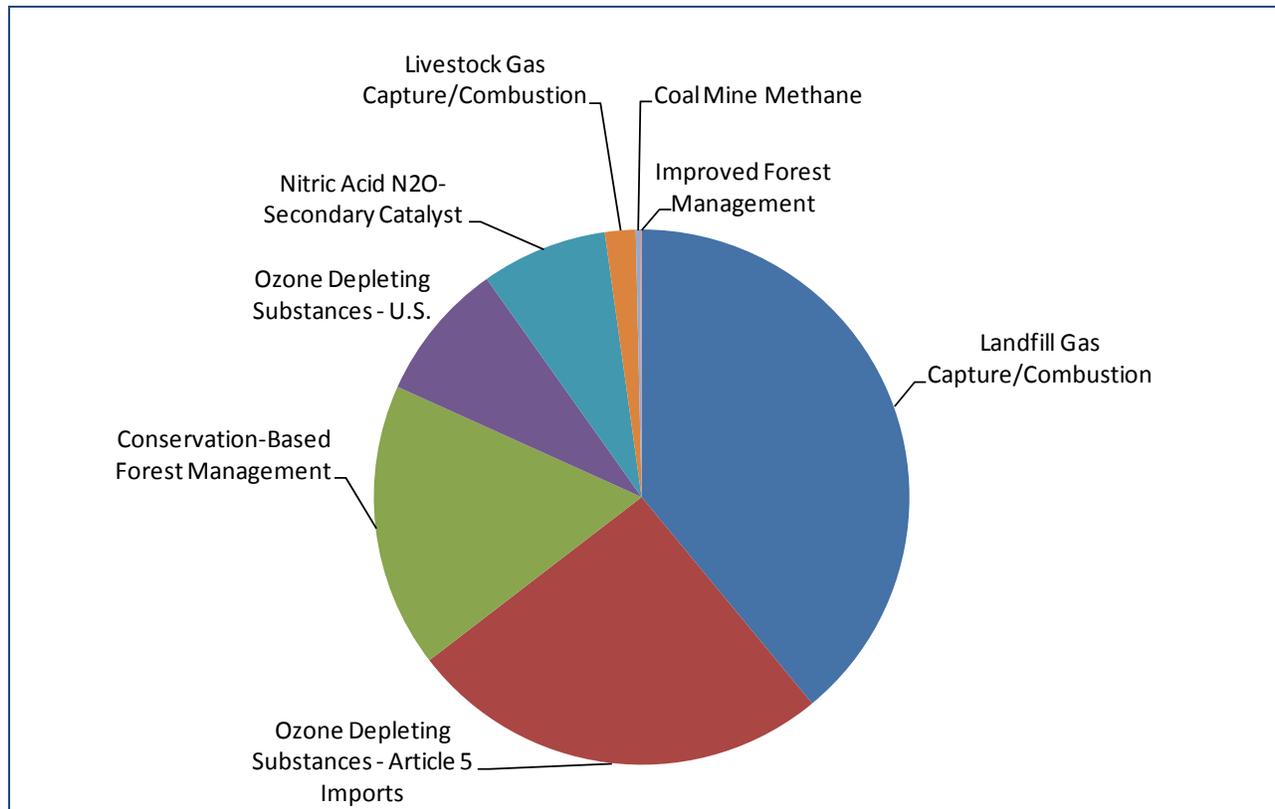
The Border Governors Conference, one of the key venues through which California works with Mexico, is an organization of the ten United States-Mexico Border state governors created to enhance joint border efforts addressing agriculture, border crossings, education, economic development, energy, environment, health, tourism, and border security issues. At the XXVI Border Governors' Conference in August 2008, California as chair focused on establishing carbon offset protocols for use in Mexico. In supporting the design of these protocols, California has been helping Mexico build their capacity to participate in the growing carbon market by offering carbon reductions that are real, additional, verifiable, and enforceable. The state signed a memorandum of understanding with the six Mexican border states, Pacific Gas and Electric Company, and the Climate Action Reserve to develop protocols in the areas of livestock manure management, landfill gas, and forestry.

To aid in the development of an emission reduction protocol for reforestation, the California Environmental Protection Agency, SEMARNAT, EcoLife Foundation and the Climate Action Reserve signed a letter of intent in October 2009 to establish a pilot project in the Michoacan Monarch Butterfly Reserve. The pilot project, planting and monitoring three hundred thousand trees in the Butterfly Reserve, is helping to strengthen the development of a protocol which can be used to quantify and certify carbon sequestration from the restoration, protection, and sustainable management of forest lands.

Capacity Building in China

At the second Governors' Global Climate Summit, on October 2, 2009, Governor Schwarzenegger signed a memorandum of understanding with the governor of Jiangsu Province of the People's Republic of China. This state-to-province partnership is China's first-ever subnational agreement to address climate change, and supports an agreement reached by the United States and China in July 2009 to cooperate on climate change, energy, and the environment. The California-Jiangsu partnership promotes sharing of policies to reduce greenhouse gas emissions, strengthen government support for clean and renewable energy technology, increase energy security, expand green economic activity, and advance environmental sustainability.

²⁶ Information on The Climate Registry is available at: <http://www.theclimateregistry.org/>.

Figure 9: Emission Reduction Credits Issued by the Climate Action Reserve

Data as of December 2010. See: <http://www.climateactionreserve.org/>.

California has also signed a memorandum of understanding with the Beijing Municipal Government to cooperate on environmental issues. Last year, California helped China launch its first voluntary carbon emissions registry, which will help companies measure and better manage their greenhouse gas emissions. The state is continuing to help build capacity by organizing and contributing to workshops in China on topics that include environmental enforcement issues.

In addition to its work in China, California is working with other developing countries to help them grow more sustainably. Also at the second Governors' Global Climate Summit, on October 2, 2009, California signed a Statement of Intent with the United Nations Development Programme to work with African nations to share successful policies on energy efficiency, low carbon fuels, and other clean technology.

Joint Action

California is taking action with other subnational governments to expand emission reduction programs and to enable effective adaptation. The following are several examples of ongoing California initiatives.

Western Climate Initiative

An important element in California's greenhouse gas mitigation Scoping Plan is an economy wide Cap-and-Trade Program. In the absence of a federal program, California recognizes that linking with other subnational governments will increase emission reductions and improve the cost-effectiveness of the programs for all participating jurisdictions. California helped create the Western Climate Initiative to

realize these benefits, and to leverage other effective policies and programs that reduce the risks of climate change.²⁷

The Western Climate Initiative, established in 2007, is a collaboration of seven United States states and four Canadian provinces to develop and implement a regional strategy to reduce greenhouse gas emissions to 15 percent below 2005 levels by 2020 (see Figure 10). The partnership represents an unprecedented international effort by subnational governments to meet the challenge presented by climate change.

The partner jurisdictions have developed a portfolio of approaches for addressing climate change risks, including:

- Using market forces: Creating a market-based system that caps greenhouse gas emissions and uses tradable permits to incentivize development of renewable and lower-polluting energy sources.
- Encouraging reductions throughout the economy: To reduce compliance costs and encourage emissions reductions. Offsets reward emissions reductions in sectors such as forestry and agriculture that are not covered by emissions caps.
- Promoting a clean-energy economy: Advancing policies that expand energy efficiency and renewable energy programs, reduce vehicle emissions through clean car standards and low-carbon fuel standards, encourage energy innovation in high-emitting industries, and help individuals transition to new jobs in the clean-energy economy.

The Partner jurisdictions have developed a common framework for a Cap-and-Trade program that is scheduled to begin in 2012 in five jurisdictions, creating the first North American multi-sector program to reduce greenhouse gas emissions.

The Western Climate Initiative Partner jurisdictions recognize the value in broad collaborative action to reduce greenhouse gas emissions. The Partner jurisdictions are also in discussions with other regional greenhouse gas programs, the Regional Greenhouse Gas Initiative and the Midwestern Greenhouse Gas Reduction Accord, to further broaden the geographic coverage of coordinated mitigation activities. The governors and premiers of the Partner jurisdictions continue to invite their colleagues across North America to work jointly to reduce greenhouse gas emissions and limit the impacts of a changing climate.

Governors' Climate and Forests Task Force

The Governors' Climate and Forests Task Force (GCF) is a unique subnational collaboration among states and provinces from the United States, Brazil, Indonesia, Nigeria, and Mexico that seeks to integrate Reducing Emissions from Deforestation and Forest Degradation (REDD) and other forest carbon activities into climate policies, including emerging greenhouse gas compliance programs.²⁸ Deforestation accounts for 15 to 20 percent of global anthropogenic greenhouse gas emissions, making the loss of global forestland a key focus of climate change efforts. This Task Force grew out of memoranda of understanding signed at the first Governors' Global Climate Summit in November 2008.

The Task Force has developed a Joint Action Plan to guide its activities, and three Working Groups focused on developing:

- Standards and criteria for compliance-grade REDD activities at the project- or site-specific level.
- Accounting frameworks and coordination mechanisms for ensuring that REDD activities are properly accounted for and credited at state/province and/or national levels, coordinated with

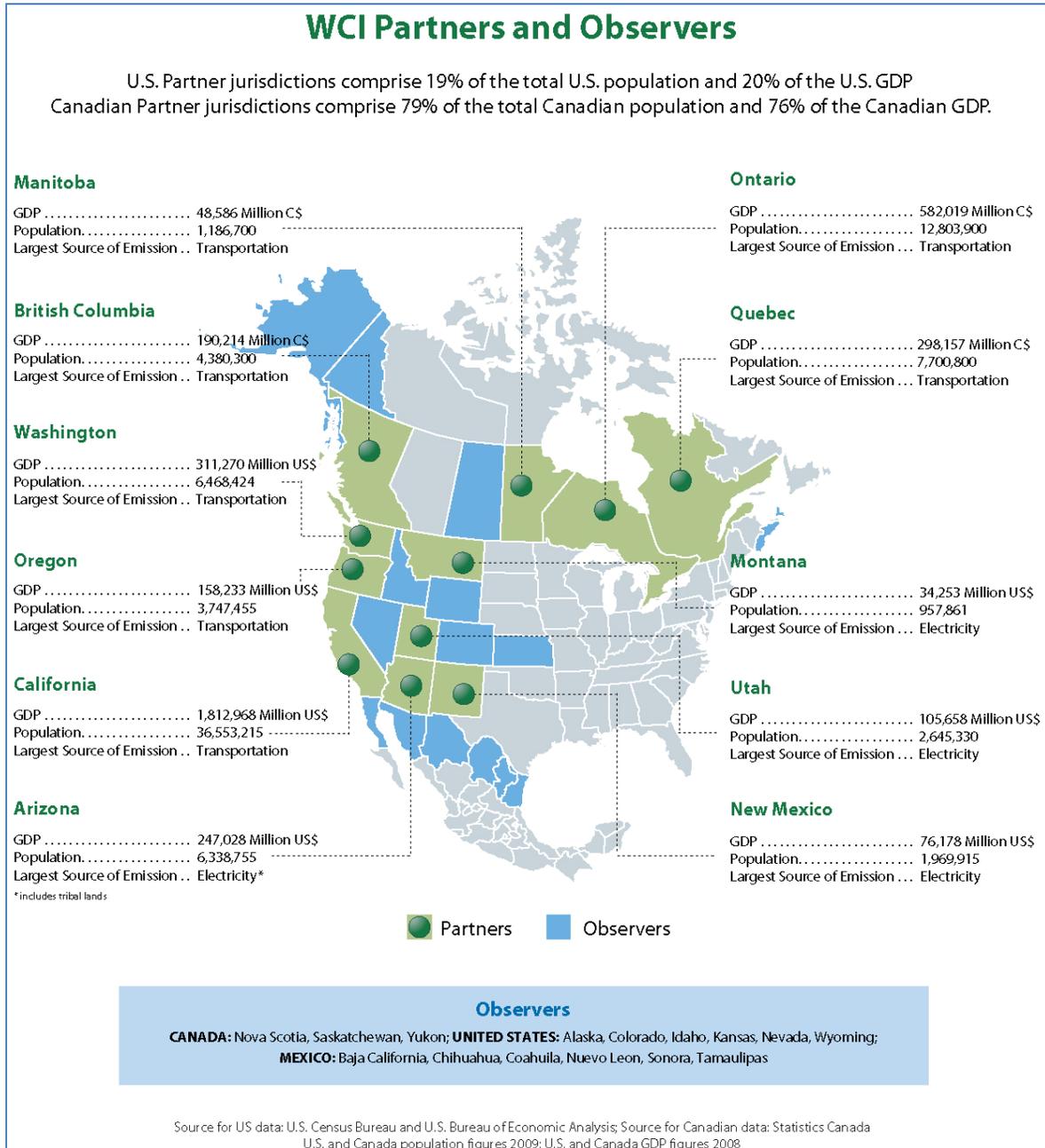
²⁷ For more information regarding the Western Climate Initiative, see: www.westernclimateinitiative.org.

²⁸ More information is available on the Task Force at: <http://www.gcftaskforce.org/>.

state/province and national REDD strategies, and consistent with requirements for local participation and benefit-sharing.

- An assessment of the technical, institutional, and legal needs for generating compliance-grade REDD activities in the participating states and provinces.

Figure 10: Partner and Observer Jurisdictions of the Western Climate Initiative



These collective efforts are the first at any level of governance to move into the “proof of concept” stage. This effort seeks to bring REDD into existing and emerging greenhouse gas compliance systems and markets, including a California cap-and-trade program.²⁹

Pacific Coast Collaborative

On June 30, 2008, the leaders of Alaska, British Columbia, Washington, Oregon and California signed the Pacific Coast Collaborative Agreement to develop a formal basis for cooperative action, a forum for leadership and information sharing, and a common voice on issues faced by the region, with the goal of positioning the region as the center of innovation and sustainable living. At the Collaborative’s first annual Leaders’ Forum in February 2010 in Vancouver, British Columbia, the leaders of British Columbia, California, Oregon and Washington agreed to two action plans:

The action plan on Innovation, the Environment and the Economy includes:

- Renewable and Low Carbon Energy;
- Energy Conservation;
- High-Speed Rail;
- Green Highway;
- Green Ports; and
- Economic Stimulus and Infrastructure.

The action plan on Ocean Conservation and Coastal Climate Change Adaptation includes:

- Ocean Health and Conservation;
- Coastal Climate Change Adaptation; and
- Ocean Research and Innovation.

Working with the Federal Government

For more than 50 years, California environmental policies and programs have been models used by other states and the federal government. California is continuing in this role, and is working in partnership with the federal government to further common climate protection and economic development goals. The following are two recent examples of successful collaboration between California and the federal government.

California Clean Car Standards: Under the Clean Air Act, California is the only state granted authority to develop vehicle emissions standards. California used that authority to develop ground-breaking greenhouse gas emissions standards for cars, known as the “Pavley” rule. Following a long legal battle, and with the support of 13 other states and the District of Columbia, California is now working in partnership with the federal government to design and expand these standards nationally. In May 2009, President Obama announced a landmark agreement between California, the federal government, the auto industry, and other stakeholders that would not only allow California to go forward with its standards but also establish equally stringent standards at the federal level. California can enforce its rules starting with

²⁹ See: *Options for Inclusion of REDD in a California Compliance Market from GCF workshop in Sacramento, February 2010*, <http://www.gcftaskforce.org/documents/Workshop%20Options%20Paper%20-%20REDD%20Reg%20Design.pdf>.

See also: *Public Workshop to Discuss Sector-Based Crediting and Subnational Reducing Emissions from Deforestation and Degradation (REDD) as part of a California Cap-and-Trade Program, July 30, 2010*, <http://www.arb.ca.gov/cc/capandtrade/meetings/meetings.htm>.

the 2009 model vehicles. The federal program phases in from 2012 to 2016, and will achieve an overall 30 percent reduction in greenhouse gas emissions from new passenger vehicles and light trucks by 2016, while saving consumers several thousands of dollars on the lifetime cost of driving these new, more efficient vehicles.

In May 2010, this relationship was strengthened and expanded by an announcement that the United States Environmental Protection Agency and Department of Transportation would work closely with California in studying the technical potential for efficiency and emissions reductions in medium- and heavy-duty trucks for Model Years 2014-2018. Additionally, California is working with the United States Environmental Protection Agency and Department of Transportation to develop the technical basis for passenger vehicle standards for 2017 to 2025 model years.

Renewable Energy: In October 2009, Governor Schwarzenegger signed a memorandum of understanding with US Department of Interior Secretary Ken Salazar,³⁰ committing the state to work with the Department of Interior on the planning and permitting of renewable energy facilities, as well as the necessary electricity transmission. Target projects are in areas in California identified as having the highest renewable energy potential, and the lowest environmental impacts. This partnership resulted in the Renewable Energy Policy Group, since joined by representatives from the United States Department of Energy and Department of Defense, to work through state and federal permitting issues. As a result, as of the end of November 2010, six solar projects totaling 3,000 megawatts had received siting approval by the California Energy Commission and Bureau of Land Management. This cooperative model has helped maximize the potential for economic stimulus and environmental and energy benefits, and is being duplicated in state-federal partnerships around the country.

³⁰ The memorandum of understanding is at: <http://www.doi.gov/archive/documents/CAMOUsigned.pdf>.

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Chapter 5: Outlook and Future Efforts

The Climate Action Team, under the leadership of the Secretary of the California Environmental Protection Agency, coordinates state climate policy. The Team is focused on:

- reducing greenhouse gas emissions through cost-effective policies and programs that promote clean energy industries and green jobs;
- preparing guidance for adapting to climate change in California, including linking adaptation and emission mitigation efforts;
- improving interagency collaboration on research projects;
- conducting outreach to businesses, local governments, and other stakeholders;
- expanding efforts to combat climate change through partnerships such as the Western Climate Initiative, R20, and related regional and national initiatives; and
- supporting progress internationally, including work on potential emission reductions through Reduced Emissions from forest Degradation and Deforestation (REDD).

The state climate program requires effective multi-agency and multi-sectoral coordination that is the hallmark of the Climate Action Team.

Mitigation and Adaptation

The Climate Action Team will continue coordinating the state climate mitigation and adaptation programs, focusing on ensuring that statutory objectives are achieved and furthering the state's interests in protecting its people and resources from the risks of climate change.

To reduce the impact of climate change on the state, the Climate Action Team will continue developing California's Adaptation Strategy, focusing on actionable guidance in several crucial sectors.

- **Infrastructure:** The Climate Change and Land Use working group will develop planning guidance to account for risk to crucial infrastructure including transportation and water treatment facilities.
- **Public Health:** The Public Health working group will propose measures for the state's health infrastructure to deal with increasing extreme heat events, vector borne diseases, and other impacts of climate change.
- **Forestry:** The Forestry working group will propose management strategies for forested lands to both preserve species and reduce risks associated with increasing wildfire occurrence.
- **Water:** The Water working group will develop guidance to ensure the state water distribution and flood management systems are adaptable to changing precipitation patterns.
- **Natural Ecosystems:** The Biodiversity working group, in conjunction with the water and forestry working groups, will propose strategies for preserving habitat and species as climatic changes alter existing natural conditions.

Additionally, the Climate Action Team will develop guidance for state, local and regional planners related to specific climate change risks, including sea level rise, water supply disruptions, flood risk, and fire hazards. This guidance will follow the approach taken with draft guidance for sea level rise, released in 2010. It will include, where available, specific numeric estimates of future environmental and economic impacts that can be used for planning by the state, regional and local governments.

As discussed in the preceding chapters, significant policies and programs have been initiated to reduce greenhouse gas emissions in the state to 1990 levels by 2020. The emphasis for the Climate Action Team is shifting to implementing the mitigation programs. Particular attention is directed to the cap-and-trade program to ensure that it can link with programs in the Western Climate Initiative Partner jurisdictions and deliver its promise of cost-effective emission reductions and compliance flexibility. The Air Resources Board, with assistance from the California Energy Commission, Public Utilities Commission, and others, will be finalizing these linkage arrangements so that they can be brought to the Board for approval in 2011. The effective use of this market-based program in California and the Western Climate Initiative will demonstrate its promise as a long-term policy instrument, enabling it to be the cornerstone of efforts to achieve the emission reductions needed to stabilize the climate system. Additionally, The Climate Action Team will take the lead in working with other Western Climate Initiative Partner jurisdictions to develop additional emission reduction measures that complement California's cap-and-trade program.

Coordinating electricity sector policies across the relevant state energy agencies also remains a top priority. The electricity sector is being asked to achieve significant environmental and energy security objectives as it transitions to low-carbon resources. Continued coordination by the Air Resources Board, California Energy Commission, Public Utilities Commission, and others is necessary to implement the substantial investments that are planned in energy efficiency, transmission capacity, renewable resources, and more efficient use of fossil resources. This coordination will ensure that electricity service remains affordable, reliable, and safe.

Maximizing co-benefits of the state's climate policies and linking them with other environmental and economic priorities will be a key aspect of future efforts. The Air Resources Board, for example, has adopted a new approach to passenger vehicles – cars and light trucks – by combining the control of smog-causing pollutants and greenhouse gas emissions into a single coordinated package of standards known as Low Emission Vehicles III. In addition the Climate Action Team will develop linkages with other state initiatives, such as the Green Chemistry Initiative. Two new working groups will be created to incorporate efforts on green jobs and green technology and to examine the potential environmental effects of particular mitigation strategies. Each of these groups will produce reports with their preliminary policy recommendations during 2011.

The Climate Action Team will more closely link policy efforts on adaptation and mitigation with the goal of realizing synergies and mutually supportive approaches. Each of the Team's working groups will develop recommendations for these linkages which will be brought before the Team for adoption. Important sectors include: agriculture, where numerous voluntary mitigation programs have been undertaken and where adaptation will take on increased importance; energy generation and distribution, where clean energy efforts will need to account for the potential effects of increasing heat and diminishing water supplies; and forestry, where carbon sequestration and other related mitigation strategies need to be linked to efforts to protect forests from changing climatic conditions.

Research

Research into the impacts of climate change on California, and into the solutions to reducing greenhouse gas emissions, will continue to be vital for informing policy decisions. The Research working group will enhance its coordination of state agencies performing climate research. Building upon the efforts described in this report, it will be crucial to provide the full spectrum of data needed for evaluating climate policies. The working group will hold interagency workshops on specific climate change research topics, such as: forest inventory, water supply, and land use planning.

The working group will continue to expand and update the state's existing climate change research catalog. Part of the expansion will include incorporating California focused research that is not funded by

the state. The online catalog will continue to be refined so it can serve as a portal for locating California-specific climate research findings.

Of particular importance to continuing the development of the adaptation strategy is the vulnerability assessment. The California Energy Commission, in coordination with other members of the Climate Action Team, will complete the climate change vulnerability assessment by the end of 2011. This work will provide valuable information to enable planners to incorporate the consideration of risk associated with climate change into their work.

Regional and International Collaborative Efforts

California will continue to promote action regionally, nationally and internationally. The state can leverage its position as a leader in environmental protection and stewardship, thereby helping to protect the climate system and reducing risks to California's people and resources. The Climate Action Team will coordinate the state's external relationships related to climate policy including the following.

- Policy development and program execution with the Partner jurisdictions of the Western Climate Initiative will promote action throughout North America.
- Policy development with the governors of the Western Governors Association, reflecting the vulnerability of western states to climate change risks, will emphasize common interests in promoting clean energy and adapting to changing climate conditions.
- Program development through the Governors' Climate and Forests Task Force, and related workgroups, with Acre, Brazil, and Chiapas, Mexico, will focus on mechanisms for mobilizing resources to reduce emissions from deforestation and degradation in tropical forests.
- The Border Governors Conference will continue to provide a forum for addressing cross-border issues, including strengthening climate action.
- Demonstrating programs and technologies through R20 will focus technology transfer and capacity building between developed and developing countries.

Following the example of the federal transportation policy document developed by the Strategic Growth Council,³¹ the Climate Action Team will coordinate recommendations on federal climate policies through its working groups. Close collaboration with the United States federal government is a top priority. For example, ongoing collaboration on vehicle emissions will help ensure that the national program expands to trucks, and that passenger vehicle requirements continue to improve past the 2016 model year. Also, California will continue to work in close partnership with the United States Environmental Protection Agency as it develops its greenhouse gas emissions programs under the Clean Air Act. The Climate Action Team will work with federal partners to ensure that the federal approach is consistent with California's policies and programs, as well as the programs in other states that have been leaders in climate protection.

The state will also build on its growing relationship with China and its provinces to strengthen economic ties, promote clean energy, and address environmental challenges. The memoranda of understanding with Jiangsu Province and the Beijing Municipal Government provide a basis for building this collaboration.

Outreach

In order to meet California's climate goals it is crucial to engage with, and provide meaningful information and guidance to, all levels of government, stakeholders, and the public. Coordination and

³¹ *Consensus of the California Strategic Growth Council on Federal Transportation Policy*, available at: http://sgc.ca.gov/docs/workgroups/2010_03_04_SGC_Consensus_on_Federal_Policy_FINAL.pdf.

expansion of existing outreach and data dissemination efforts will become increasingly important as the state implements climate policies and programs.

The Climate Action Team will reinstate its communications coordination group. This group will coordinate the dissemination of climate change information from its member departments and will collaborate with existing efforts which are providing data and policy guidance to stakeholders and the public. Target audiences for enhanced outreach include local governments, public health officials and small businesses. Public meetings and other outreach activities will be publicized through the California Climate Change Portal (www.climatechange.ca.gov). Technical data and policy guidance will be made available to practitioners and other target audiences. Each of the Team's working groups will develop plans for disseminating policy guidance and data to their appropriate stakeholders.