

Get a **deep dive** into your industry
from the Editors

THE WALL STREET JOURNAL
PROFESSIONAL EDITION


Download Reports: This copy is for your personal, non-commercial use only. To order promotional materials for your business, please contact your account manager. Use the order form below to request a copy of any report at www.wsj.com.

See a sample report - PDF format

Order a reprint of this publication

THE WALL STREET JOURNAL

WSJ.com

WSJ NEWS | OCTOBER 4, 2010 11:00 PM ET

Low Expectations Ahead of U.N. Summit

By SHAI OSTER

LANJIN, China—Negotiators warned that the United Nations framework for talks on climate change could lose international support if they failed to break a deadlock soon, and called on China to show leadership in the discussions.

"We need to show that we are not a bunch of bureaucrats who have lost the belief in action on climate change," the European Commission's chief negotiator Artur Runge-Metzger told reporters Monday at the start of six days of climate-change talks in the northeast Chinese port city of Tianjin.

Representatives from more than 190 nations gathered for the last round before a climate-change summit in Cancun, Mexico, in November. Expectations are low for a deal this year, but participants say they want to put down building blocks for a global agreement in time to replace the Kyoto Protocol on global warming, which expires in 2012.

"It is absolutely indispensable that China show leadership" and flexibility to reach the compromises necessary for agreement ahead of Cancun, Christiana Figueres, head of the U.N. Framework Convention on Climate Change, told reporters Monday at the Tianjin conference.

Negotiators' ambitions have been tempered after last year's climate talks in Copenhagen ended with only a last-minute, nonbinding accord reached in an atmosphere of recrimination. Nations remain divided on how to measure and verify carbon-emission cuts, and what obligations relatively poor but fast-growing countries such as China and India should take on.

After Copenhagen, China and the U.S. traded accusations over who had killed the chances for a binding global deal. China has since moved ahead on key planks in its global-warming platform, which included an energy-efficiency drive and a promise to slow—but not cap—how much carbon its growing economy emits. Meanwhile, climate change legislation has been sidelined in Washington.

China's chief negotiator, Xie Zhenhua, sounded an optimistic tone in his comments to reporters Monday. He said there was room for agreement on issues such as setting up a funding mechanism to aid transfer of clean-energy technology. China is willing to compromise on the divisive issue of verifying developing countries' carbon programs, he said.

But, the outcome at Copenhagen led some critics to question the viability of a U.N.-brokered mechanism on global warming. Some say the issue could be better addressed through independent national actions and bilateral deals.

"The window of opportunity is quite rapidly closing," Peter Wittzeck, Belgium's chief climate negotiator, said at a news conference. The issue is seen as a test of "the credibility of the multilateral system to deal with global problems."





 Powered by  Clickability

Global climate talks kick off in China

By the CNN Wire Staff

STORY HIGHLIGHTS

- About 200 countries are represented at the weeklong discussions
- The talks are the the last official ones before the U.N. climate summit in Mexico at year's end
- Activists want money to help developing countries and tough emission cuts by rich countries
- Skeptics say bad science and a liberal agenda are behind climate-change warnings

Beijing, China (CNN) — Representatives from about 200 countries start meeting on Monday in China to narrow differences on climate change and grapple with extreme weather such as rising temperatures and melting polar icecaps.

The weeklong talks in the northeastern city of Tianjin are the last official negotiations before the U.N. climate summit in Mexico at year's end.

"It's vital that progress is made in Tianjin on two main areas — new public money for developing countries and rich countries agreeing tough new emissions cuts under the Kyoto Protocol," said the international environmental organization, Friends of the Earth.

Under the Kyoto agreement, developed countries have committed to cutting emissions by an average of 5 percent to 1990 levels by 2012. The 1997 Kyoto Protocol is due to expire in 2012.

Ahead of the talks in China, Greenpeace said participating countries face a choice:

"Do they want more of the extreme weather events we have experienced this year to continue, to have their decisions result in warming of 3 degrees Celsius or more? Or do they want to set the rules that put us on track to a clean, renewable low-carbon society?"

Temperatures increases greater than 2 degrees Celsius (36 degrees Fahrenheit) would lead to climate disruption for the rest of the century and disproportionately affect poor nations, researchers have warned.

"Rich countries should also provide public funding on a sufficient scale — at least \$200 billion annually — to enable developing countries to adapt to the effects of climate change already wreaking havoc and to enable them to grow cleanly," Friends of the Earth said.

In December 2009, limited progress was made at key climate talks held in Copenhagen, Denmark.

"Since Copenhagen, the world has seen the type of climate impacts that we can expect to see in the future, with droughts, fires in Russia and floods in Pakistan," Greenpeace said. "And as the climate talks open in Tianjin this week, seven states in Mexico are underwater from severe flooding. Last week, Los Angeles suffered the highest temperatures in recorded history."

Climate change skeptics say that extreme weather and temperature fluctuations are part of normal weather patterns and are not caused by human activity. They also accuse climate-change activists of using bad science to pursue a liberal agenda.

The U.N. climate summit in Mexico is scheduled for November 29 to December 10.

Find this article at:

<http://www.cnn.com/2010/04/20/04-24-china-climate-talks/index.html>

Check the box to include the list of links referenced in the article.

© 2010 Click News Network



United Nations still seeks global climate treaty

Updated 1d 6h ago

By Tini Tran, Associated Press Writer



By Peter Parks. AP Photo Images

United Nations climate chief Christiana Figueres (left) speaks at the opening of the U.N. Climate Change Conference in Tianjin, China, on Monday. Thousands of environmentalists in China to protest against U.N. talks on climate change were warned they had to immediately end their picketing and bring a deal.

TIANJIN, China — The U.N. climate chief urged countries Monday to search faster for common ground on battling climate change so that a year-end meeting in Mexico can produce results that fight

Christiana Figueres told 3,000 delegates in China—the last conference before Cancun—that countries must identify achievable goals ahead of December's summit so progress can be made toward a global climate treaty.

"As governments, you can continue to stand still or move forward. Now is the time to make that choice," she told delegates in the northern port of Tianjin.

"If you want a tangible outcome in December, now is the time to clarify what could constitute an

achievable and politically balanced package for Cancun, and what could be subject to further work after Cancun," she said.

USA TODAY INTERACTIVE GRAPHIC: What causes global warming

With a binding global deal largely out of reach for this year, negotiators in Tianjin will focus on smaller initiatives that can lay the foundation for a legal framework that could be approved later, possibly in South Africa in 2011.

The scaled-down ambitions are largely due to the collapse of climate talks in Copenhagen last year, when political leaders failed to produce a global and legally binding treaty on curbing the greenhouse gases that cause global warming. Instead, nations agreed to a nonbinding political declaration on fighting climate change.

Expectations still are small because countries remain deadlocked over the same issues. Distrust has only deepened between industrialized and developing countries over how to cut greenhouse-gas emissions.

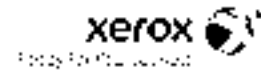
As the host, China will seek to reduce those differences, said State Counselor Dai Bingqiao, the country's top foreign policy official, who urged countries to renew efforts in order to "hammer out a binding agreement at an early date."

Since a single climate package deal is unlikely, the focus has turned to finding areas of agreement on essential components, including financing and transfer of clean technology and ways of reducing



We focus on automating Marriott® Hotels' global invoice process, so they don't have to.

Learn more at Red.Business.com



Print Powered By Dynamilis



deforestation

Ultimately, if talks in Cancun fail to produce concrete results, the entire U.N. process could be in jeopardy, said Artur Runge-Metzger, a negotiator with the European Commission.

"If Cancun does not produce a solid outcome ... then I think it risks becoming irrelevant in the eyes of the rest of the world," he said. "Decision-making will go to some other forum."

Much of what needs to happen in Tarragon is the less tangible task of restoring trust and some momentum in order to "set the stage for what's realistically possible in Cancun," said Jake Schmidt, international climate policy director for the U.S.-based Natural Resources Defense Council.

Two of the key pieces will be financing and transparency, he said. At Copenhagen, rich countries had pledged to give \$30 billion over three years in climate funding to poor nations, rising to a total of \$100 billion dollars annually by 2020, but little money has materialized.


"It's critical that countries move on really delivering the 'prompt-start' funding and show those commitments are real. We have a long history of developed countries promising a lot of money and not committing, so it's a chance for developed countries to prove it's time is different," he said.

With China playing host to the climate talks for the first time, it has the opportunity to highlight its own commitment to clean energy, said Deborah Seligsohn, a Beijing-based adviser with the World Resources Institute.

Last year, China pledged it would cut its carbon intensity — emissions per unit of GDP — by 40 to 45% by 2020 from the 2005 level. Nationwide efforts have also been made to reach the goal of improving energy efficiency by 20% from 2005 to 2010.

"They're serious and they chose something that's not easy," she said. "China has redoubled domestic efforts since Copenhagen. I don't think anyone can doubt that. China wants people to look at what they're doing on the ground. They'll use this as an opportunity to do that."


Copyright 2010 The Associated Press. All rights reserved. This material may not be published, broadcast, rewritten or redistributed.




Mom Dilemma #36:
Your daughter insists on wearing her princess costume to the grocery store. Allow it or not?

YES: (3083) (306) (195) (100)

NO: (have some relief here)

momSiDed 

Print Powered By  FormatDynamics

SCIENTIFIC AMERICAN

Permalink Address: <http://www.scientificamerican.com/article.cfm?id=how-automakers-can-meet-new-fuel>

How Automakers Can Meet New Fuel Efficiency Standards

The U.S. EPA and DOT argue that if automakers start using more batteries in cars, or make gasoline engines way more efficient, they can meet much higher fuel efficiency standards.

By Sarah Padden and Eric Lipton, Monday, October 4, 2010 14

Automakers face a weighty choice: They can devote their energy to cars that use batteries, or they can make the gasoline engine super-efficient.

If they do the first, it will cost consumers more in the early going. If they do the second, it will cost less, but the cars as we know it may have to radically change.

Those are the choices the Obama administration sees, according to its most recent documents on fuel economy.

Last week, U.S. EPA and the Department of Transportation kicked off the process of setting fuel economy standards for the 2017-2025 window. For now, they are envisioning cars in 2025 that get between 47 and 62 miles per gallon.

That's a considerable jump from today's cars. But in a technical report written with the California Air Resources Board, the agencies laid out two philosophies of getting there: Start using more batteries in cars, or make gasoline engines way more efficient.

No matter what automakers do, the agencies said, people will save money: In 2025, they will save between \$4,600 and \$7,400 over the lifetime of a car. That means even though the cars will cost more than today, the additional cost will be paid back in about four years, or less.

The gasoline-versus-electric approach might differ for another reason: appearance.

Americans drive some of the largest, heaviest cars in the world, and fuel economy gains have tended to be reduced by engines that are even more powerful.

Engineers have doubts about how fuel-efficient that kind of car can be if Americans aren't willing to compromise on size.

"There's an awful lot of people that think an Escalade is a gorgeous vehicle. But they don't care that it's like driving a brick through the air," said Steve Wesolowski, who spent two decades at General Motors Co. working on the Corvette and race cars.

'Downweighting' the SUV

Most recently, Wesolowski was technical director for the Progressive Automotive X Prize, a competition to build the most fuel-efficient vehicle that still met safety standards and could conceivably be bought by an auto consumer.

To get hundreds of miles to the gallon, contestants used designs that would seem bizarre to the average driver.

Yet Wesolowski said that's the point: Consumers have become so accustomed to cars with roomy interiors and enough space for once-a-year hauling trips that automakers can't really make the cars much crisper fuel efficient. "You're not just going to turbocharge a Camry and get to 80 miles per gallon," he said.

Andrew Frank, a professor at the University of California, Davis, has also found that big cars have their limit:

He and his students have converted many SUVs to hybrids, from large ones like the Chevy Suburban to smaller ones like Chevy's Equinox. "The best you can do while preserving performance is about double the current fuel economy," he said.

That got the Suburban from 15 mpg to 30 mpg and the Equinox from 18 to 36.

The public may have found its compromise in the "crossover," a vehicle that looks like an SUV, but is built on a car frame and therefore weighs much less. These vehicles have been stealing much of SUVs' market share, since they get much better fuel economy.

But the way fuel economy rules are written, such vehicles don't help automakers comply:

The fuel economy rules are size-based: The larger the vehicle, the lower the mpg target it is measured against. The smaller the vehicle, the higher the mpg target it has to meet.

Thus, an automaker can replace its largest SUV with a crossover, but then its crossover will have to face a higher mpg target than the SUV did.

Rather than "downsizing," the trend may become "downweighting."

Will Americans choose small?

Ed Cohen, Honda's vice president of government and industry relations, said Honda will focus on using lighter steel and aluminum parts. Then, it will squeeze more efficiency out of the gasoline drivetrain. Finally, it will keep improving its hybrid systems.

He said Honda is cautious about how quickly plug-in hybrids and all-electric cars will catch on with the public. Honda and Toyota have had hybrids available for 10 years, but they still only make up 2 or 3 percent of sales.

Today, electric cars run the gamut from tiny, one-person vehicles to small sedans. Major automakers have focused on the latter, since they resemble other cars. But to power a vehicle of that size requires stowing a lot of heavy batteries, and that drives up the cost of the car.

Despite their cost, environmentalists see another reason to emphasize electric vehicles -- competitiveness. Roland Hwang, who directs the transportation program at the Natural Resources Defense Council, said the United States consigns itself to last place, behind Germany, Japan and China, if it chooses a standard less than 62 mpg.

So will customers accept an electric or plug-in hybrid that looks like a regular car, but puts on a stop when its charge runs out? What if the car has to have a smaller trunk than average, or has to carry fewer than five passengers?

"If we had a magic ball, I think we'd be very successful as an auto company," Cohen said.

Reprinted from ClimateWire with permission from Environment & Energy Publishing, LLC, www.eenews.net, 202-628-6500

© 2010 Scientific American, a Division of Nature America, Inc.

All Rights Reserved.



Expert: Texas is getting hotter due to global warming

Posted 31m ago

LUBBOCK, Texas (AP) — Triple-digit temperatures will be the norm in Texas within a few decades, and a 15-degree heat won't be surprising, according to the state climatologist.

Texas A&M University atmospheric sciences professor John Nielsen-Gammon said recently that models he's analyzed show temperatures rising as much as 1 degree each decade, meaning that by 2050, temperatures around the state would be 5 degrees hotter than now.

Every region of the state will become warmer, although East Texas is expected to be less affected than the rest, he said. Temperatures have been rising since the 1970s, which was the coldest decade in Texas' recorded history, he said.

"Decade by decade it's been getting warmer," Nielsen-Gammon said. "From here going forward, if temperatures keep rising as the models project they will, it will certainly be in large part due to global warming."

Two unusually warm summers — in South Texas in 2009 and North Texas this year — are signs of what's ahead, he said.

A recent Texas A&M University news release said the heat could bring water shortages, more severe droughts, crop failures and more difficulty controlling air pollution. Farmers will need to irrigate more.

The good news is that Texas winters will be milder, which would cut down on heating bills. But the cost to cool buildings in scorching heat will more than offset that savings, Nielsen-Gammon said.

He called rain "pretty much a wild card," but said that even if there's enough of it, problems with drought will still probably increase.

Bruce McCarl, an agricultural economist at A&M who

shared the 2007 Nobel Peace Prize with former Vice President Al Gore and hundreds of other members of the United Nations' International Panel on Climate Change, said the higher temperatures in decades ahead could reduce the amount of land that can be used for farming. He predicted a 25% decrease in acres for crops and 10% loss for livestock.

The heat "reduces the grass growth so it reduces the number of animals you can graze," he said.

And the heat will further deplete Texas' aquifers, McCarl said.

"It would be pretty hard after 20 or 30 years to have enough (water) for agriculture," he said. "The issue is if it gets warmer you're likely to have increased irrigation needs to grow the same amount."

Copyright 2010 The Associated Press. All rights reserved. This material may not be published, broadcast, rewritten or redistributed.



We focus on automating Marriott® Hotels' global invoice process, so they don't have to.

Learn more at ReciBusiness.com



Print Powered By iPrint Dynamics



Office of the Governor

ARNOLD SCHWARZENEGGER
THE PEOPLE'S GOVERNOR**PRESS RELEASE**

11/14/2008 GAAS 779.08 FOR IMMEDIATE RELEASE

Gov. Schwarzenegger Issues Executive Order Directing State Agencies to Plan for Sea Level Rise and Climate Impacts

Given the serious threat of sea level rise to California's water supply and coastal resources and the impact it would have on our state's economy, population and natural resources, Governor Arnold Schwarzenegger today issued an Executive Order (EO) S-13-08 to enhance the state's management of climate impacts from sea level rise, increased temperatures, shifting precipitation and extreme weather events.

"We have to adapt the way we work and plan in order to manage the impacts and challenges that California and our entire planet face from climate change," Governor Schwarzenegger said. "Given the serious threat of sea level rise to California's water supply, population and our economy, it's critically important that we make sure the state is prepared when heavy rains cause flooding and the potential for sea level rise increases in future years."

There are four key actions in the EO including: (1) initiate California's first statewide climate change adaptation strategy that will assess the state's expected climate change impacts, identify where California is most vulnerable and recommend climate adaptation policies by early 2009; (2) request the National Academy of Science establish an expert panel to report on sea level rise impacts in California to inform state planning and development efforts; (3) issue interim guidance to state agencies for how to plan for sea level rise in designated coastal and floodplum areas for new projects, and (4) initiate a report on critical existing and planned infrastructure projects vulnerable to sea level rise.

One key benefit that the EO will facilitate is California's first comprehensive climate adaptation strategy. This effort will improve coordination within state government and adapt the way we work so that better planning can more effectively address climate impacts to human health, the environment, the state's water supply and the economy.

Another benefit from the EO includes providing consistency and clarity to state agencies on how to address sea level rise in current planning efforts, reducing time and resources unnecessarily spent on developing different policies using different scientific information.

The EO and its actions carry on the Governor's environmental leadership by continuing to address climate change adaptation in coordination with our climate change mitigation policies as outlined in AB 32. The states of Washington and Oregon, as well as Canada and Mexico, along with several global institutions have expressed interest in coordinating our climate change adaptation policies as outlined in this EO.

California's Energy Commission, the California Ocean Protection Council and Caltrans are conducting numerous scientific studies on the impact of climate change, including new sea level rise impact projections that are being used to develop the state's climate change adaptation strategy.

Full text of executive order

EXECUTIVE ORDER S-13-08
by the Governor of the State of California

WHEREAS climate change in California during the next century is expected to shift precipitation patterns, accelerate sea level rise and increase temperatures, thereby posing a serious threat to California's economy, to the health and welfare of its population and to its natural resources; and

WHEREAS California is a leader in mitigating and reducing its greenhouse gas emissions with the 2006 Global Warming Solutions Act (Assembly Bill 32), the Low Carbon Fuel Standard (Executive Order S-01-07), the 2008 Senate Bill 375 and the Renewable Portfolio Standard; and

WHEREAS these efforts, coupled with others around the world, will slow, but not stop all long-term climate impacts to California; and

WHEREAS California must begin now to adapt and build our resiliency to coming climate changes through a thoughtful and sensible approach with local, regional, state and federal government using the best available science; and

WHEREAS there is a need for statewide consistency in planning for sea level rise; and

WHEREAS California's water supply and coastal resources, including valuable natural habitat areas, are particularly vulnerable to sea level rise over the next century and could suffer devastating consequences if adaptive measures are not taken; and

WHEREAS the country's longest continuously operating gauge of sea level, at Fort Point in San Francisco Bay, recorded a seven-inch rise in sea level over the 20th century thereby demonstrating the vulnerability of infrastructure and resources within the Bay; and

WHEREAS global sea level rise for the next century is projected to rise faster than historical levels with the Intergovernmental Panel on Climate Change predicting that global sea levels will rise by between seven to 23 inches this century and some experts predicting even higher rises; and

WHEREAS while climate models predicting global sea level rise are generally understood and improving, less information is available for sea level rise projections specific to California that accounts for California's topography, coastal erosion rates, varying land subsidence levels and tidal variations; and

WHEREAS billions of dollars in state funding for infrastructure and resource management projects are currently being encumbered in areas that are potentially vulnerable to future sea level rise; and

WHEREAS safety, maintenance and operational effects on existing infrastructure projects are critical to public safety and the economy of the state; and

WHEREAS the longer that California delays planning and adapting to sea level rise the more expensive and difficult adaptation will be; and

WHEREAS the California Resources Agency is a member of the California Climate Action Team and is leading efforts to develop and implement policy solutions related to climate change adaptation regarding current and projected effects of climate change; and

WHEREAS the Department of Water Resources (DWR) is responsible for managing the state's water resources to benefit the people of California, and to protect, restore and enhance the natural and human environments; and

WHEREAS California's coastal management agencies such as the California Coastal Commission, the California Ocean Protection Council (OPC) and California State Parks are charged with managing and protecting the ocean and coastal resources of the state; and

WHEREAS the California Energy Commission's (CEC) Public Interest Energy Research Program has funded research on climate change since 2001 including funding the development of preliminary sea level rise projections for the San Francisco Bay area by the Scripps Institution of Oceanography/University of California at San Diego.

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power vested in me by the Constitution and statutes of the State of California, do hereby order effective immediately:

1. The California Resources Agency, in cooperation with DWR, CEC, California's coastal management agencies, and the OPC, shall request that the National Academy of Sciences (NAS) convene an independent panel to complete the first California Sea Level Rise Assessment Report and initiate, within 60 days after the signing of this Order, an independent sea level rise science and policy committee made up of state, national and international experts.

2. By March 31, 2009, the OPC, DWR and the CEC, in coordination with other state agencies, shall hold a public workshop to gather policy-relevant information specific to California for use in preparing the Sea Level Rise Assessment Report and to raise state awareness of sea level rise impacts.
3. The California Resources Agency shall request that the final Sea Level Rise Assessment Report be completed as soon as possible but no later than December 1, 2010. The final Sea Level Rise Assessment Report will advise how California should plan for future sea level rise. The report should include: (1) relative sea level rise projections specific to California, taking into account issues such as coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge and land subsidence rates; (2) the range of uncertainty in selected sea level rise projections; (3) a synthesis of existing information on projected sea level rise impacts to state infrastructure (such as roads, public facilities and beaches), natural areas, and coastal and marine ecosystems; and (4) a discussion of future research needs regarding sea level rise for California.
4. The OPC shall work with DWR, the CEC, California's coastal management agencies and the State Water Resources Control Board to conduct a review of the NAS assessment every two years or as necessary.
5. I direct that, prior to release of the final Sea Level Rise Assessment Report from the NAS, all state agencies within my administration that are planning construction projects in areas vulnerable to future sea level rise shall, for the purposes of planning, consider a range of sea level rise scenarios for the years 2050 and 2100 in order to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise. However, all projects that have filed a Notice of Preparation, and/or are programmed for construction funding the next five years, or are routine maintenance projects as of the date of this Order may, but are not required to, account for these planning guidelines. Sea level rise estimates should also be used in conjunction with appropriate local information regarding local uplift and subsidence, coastal erosion rates, predicted higher high water levels, storm surge and storm wave data.
6. The Business, Transportation, and Housing Agency shall work with the California Resources Agency and the Governor's Office of Planning and Research (OPR) to prepare a report within 90 days of release of this Order to assess vulnerability of transportation systems to sea level rise that will include provisions for investment critical to safety, maintenance and operational improvements of the system and economy of the state.
7. By June 30, 2009, the California Resources Agency, through the Climate Action Team, shall coordinate with local, regional, state and federal public and private entities to develop a state Climate Adaptation Strategy. The strategy will summarize the best known science on climate change impacts to California (led by CEC's PIER program), assess California's vulnerability to the identified impacts and then outline solutions that can be implemented within and across state agencies to promote resiliency. A water adaptation strategy will be coordinated by DWR with input from the State Water Resources Control Board, an ocean and coastal resources adaptation strategy will be coordinated by the OPC, an infrastructure adaptation strategy will be coordinated by the California Department of Transportation, a biodiversity adaptation strategy will be jointly coordinated by the California Department of Fish and Game and California State Parks, a working landscapes adaptation strategy will be jointly coordinated by the California Department of Forestry and Fire Protection and the California Department of Food and Agriculture, and a public health adaptation strategy will be jointly coordinated by the California Department of Public Health and the California Air Resources Board, all as part of the larger strategy. This strategy will be facilitated through the Climate Action Team and will be coordinated with California's climate change mitigation efforts.
8. By May 30, 2009, OPR, in cooperation with the California Resources Agency, shall provide state land-use planning guidance related to sea level rise and other climate change impacts.

This Order is not intended to, and does not, create any rights or benefits, substantive or procedural, enforceable at law or in equity, against the State of California, its agencies, departments, entities, officers, employees, or any other person.

I FURTHER DIRECT that as soon as hereafter possible, this Order shall be filed with the Office of the Secretary of State and that widespread publicity and notice be given to this Order.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 14th day of November 2008.

ARNOLD SCHWARZENEGGER

Governor of California

ATTEST:
Debra Bowen
Secretary of State

Official Voter Information Guide

**PROP
23**

SUSPENDS IMPLEMENTATION OF AIR POLLUTION CONTROL LAW (AB 32) REQUIRING MAJOR SOURCES OF EMISSIONS TO REPORT AND REDUCE GREENHOUSE GAS EMISSIONS THAT CAUSE GLOBAL WARMING, UNTIL UNEMPLOYMENT DROPS TO 5.5 PERCENT OR LESS FOR FULL YEAR. INITIATIVE STATUTE.

ANALYSIS BY THE LEGISLATIVE ANALYST**BACKGROUND**

Global Warming and Greenhouse Gases. Greenhouse gases (GHGs) are gases that trap heat from the sun within the earth's atmosphere, thereby warming the earth's temperature. Both natural phenomena (mainly the evaporation of water) and human activities (principally burning fossil fuels) produce GHGs. Scientific experts have voiced concerns that higher concentrations of GHGs resulting from human activities are increasing global temperatures, and that such global temperature rises could eventually cause significant problems. Such global temperature increases are commonly referred to as global warming, or climate change.

As a populous state with a large industrial economy, California is the second largest emitter of GHGs in the United States and one of the largest emitters of GHGs in the world. Climate change is a global issue necessitating an international approach. Actions in California regarding GHGs have been advocated on the basis that they will contribute to a solution and may act as a catalyst to the undertaking of GHG mitigation policies elsewhere in our nation and in other countries.

Assembly Bill 32 Enacted to Limit GHGs. In 2006, the state enacted the California Global Warming Solutions Act of 2006, commonly referred to as Assembly Bill 32 or "AB 32." This legislation established the target of reducing the state's emissions of GHGs by 2020 to the level that emissions were at in 1990. It is estimated that achieving this target would result in about a 30 percent reduction in GHGs in 2020 from where their level would otherwise be in the absence of AB 32.

Assembly Bill 32 requires the state Air Resources Board (ARB) to adopt rules and regulations to achieve this reduction. The law also directs ARB, in developing these rules and regulations, to take advantage of opportunities to improve air quality, thereby creating public health benefits from the state's GHG emission reduction activities.

Other Laws Would Reduce GHG Emissions. In addition to AB 32, a number of other state laws have been enacted by the Legislature that would reduce GHG emissions. In some cases, the main purpose of these other laws is specifically to reduce GHG emissions. For example, a 2002 law requires the ARB to adopt regulations to reduce GHG emissions from cars and smaller trucks. Other laws have authorized various energy efficiency programs that could have the effect of reducing GHG emissions, although this may not have been their principal

purpose.

"Scoping Plan" to Reach GHG Emission Reduction Target. As required by AB 32, the ARB in December 2008 released its plan on how AB 32's GHG emission reduction target for 2020 would be met. The plan—referred to as the AB 32 Scoping Plan—encompasses a number of different types of measures to reduce GHG emissions. Some are measures authorized by AB 32, while others are authorized by separately enacted laws. Some of these measures have as their primary objective something other than reducing GHGs, such as reducing the state's dependency on fossil fuels.

The plan includes a mix of traditional regulatory measures and market-based measures. Traditional regulations, such as energy efficiency standards for buildings, would require individuals and businesses to take specific actions to reduce emissions. Market-based measures provide those subject to them greater flexibility in how to achieve GHG emission reductions. The major market-based measure included in the Scoping Plan is a "cap-and-trade" program. Under such a program, the ARB would set a limit, or cap, on GHG emissions; issue a limited number of emission allowances to emitters related to the amount of GHGs they emit; and allow emitters covered by the program to buy, sell, or trade those emission allowances.

Some measures in the Scoping Plan have already been adopted in the form of regulations. Other regulations are either currently under development or will be developed in the near future. Assembly Bill 32 requires that all regulations for GHG emission reduction measures be adopted by January 1, 2011, and in effect by January 1, 2012.

Fee Assessed to Cover State's Administrative Costs. As allowed under AB 32, the ARB has adopted a regulation to recover the state's costs of administering the GHG emission reduction programs. Beginning in fall 2010, entities that emit a high amount of GHGs, such as power plants and refineries, must pay annual fees that will be used to offset these administrative costs. Fee revenues will also be used to repay various state special funds that have made loans totaling \$83 million to the AB 32 program. These loans have staggered repayment dates that run through 2014.

The Economic Impact of Implementing the Scoping Plan. The implementation of the AB 32 Scoping Plan will reduce levels of GHG emissions and related air pollutants by imposing various new requirements and costs on certain businesses and individuals. The reduced emissions and the new costs will both affect the California economy. There is currently a significant ongoing debate about the impacts to the California economy from implementing the Scoping Plan. Economists, environmentalists, and policy makers have voiced differing views about how the Scoping Plan will affect the gross state product, personal income, prices, and jobs. The considerable uncertainty about the Scoping Plan's "bottom-line" or net impact on the economy is due to a number of reasons. First, because a number of the Scoping Plan measures have yet to be fully developed, the economic impacts will depend heavily on how the measures are designed in the public regulatory process. Second, because a number of the Scoping Plan measures are phased in over time, the full economic impacts of some measures would not be felt for several years. Third, the implementation of the Scoping Plan has the potential to create both positive and negative impacts on the economy. This includes the fact that there will be both "winners" and "losers" under the implementation of the Scoping Plan for particular economic sectors, businesses, and individuals.

A number of studies have considered the economic impacts of the Scoping Plan implementation in 2020—the year when AB 32's GHG emission reduction target is to be met. Those studies that have looked at the economic impacts from a relatively broad perspective have, for the most part, found that there will be some modest reduction in California's gross state product, a comprehensive measure of economic activity for the state. These findings reflect how such things as more expensive energy, new investment requirements, and costs of regulatory compliance combine to increase the costs of producing materials, goods, and services that consumers and businesses buy. Given all of the uncertainties involved, however, the net economic impact of the Scoping Plan remains a matter of debate.

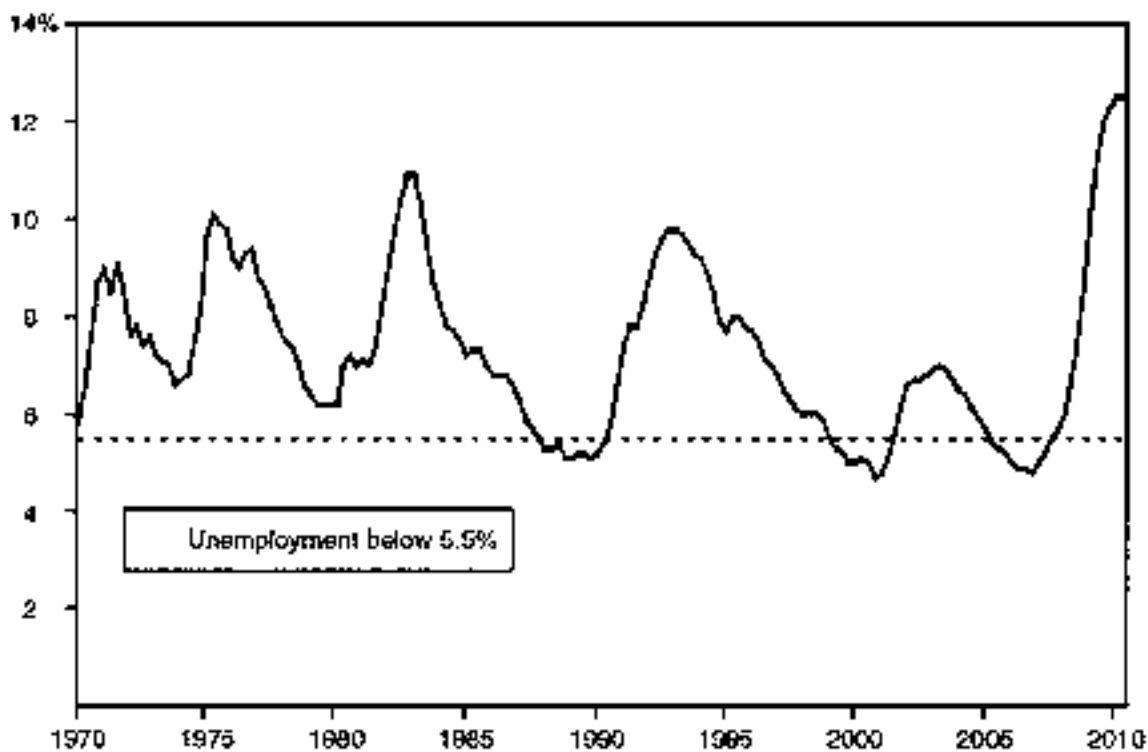
PROPOSAL

This proposition suspends the implementation of AB 32 until the unemployment rate in California is 5.5 percent or less for four consecutive quarters. During the suspension period, state agencies are prohibited from proposing or adopting new regulations, or enforcing previously adopted regulations, that would implement AB 32. (Once AB 32 went back into effect, this measure could not suspend it again.)

IMPACTS OF THIS PROPOSITION ON CLIMATE CHANGE REGULATION

Figure 1

Historical Unemployment Rate in California



Source: United States Bureau of Labor Statistics; seasonally adjusted data.

AB 32 Would Be Suspended, Likely for Many Years. Under this proposition, AB 32 would be suspended immediately. It would remain suspended until the state's unemployment rate was 5.5 percent or less for four consecutive quarters (a one-year period). We cannot estimate when the suspension of AB 32 might end. Figure 1 provides historical perspective on the state's unemployment rate. It shows that, since 1970, the state has had three periods (each about ten quarters long) when the unemployment rate was at or below 5.5 percent for four consecutive quarters or more. The unemployment rate in California for the first two quarters of 2010 was above 12 percent. Economic forecasts for the next five years have the state's unemployment rate remaining above 8 percent. Given these factors, it appears likely that AB 32 would remain suspended for many years.

Various Climate Change Regulatory Activities Would Be Suspended. This proposition would result in the suspension of a number of measures in the Scoping Plan for which regulations either have been adopted or are proposed for adoption. Specifically, this proposition would likely suspend:

- The proposed cap-and-trade regulation discussed above.
- The "low carbon fuel standard" regulation that requires providers of transportation fuel in California (such as refiners and importers) to change the mix of fuels to lower GHG emissions.
- The proposed ARB regulation that is intended to require privately and publicly owned utilities and others who sell electricity to obtain at least 33 percent of their supply from "renewable" sources, such as solar or wind power, by 2020. (The current requirement that 20 percent of the electricity obtained by privately owned utilities come from renewable sources by 2010 would not be suspended by this proposition.)
- The fee to recover state agency costs of administering AB 32.

Much Regulation in the Scoping Plan Would Likely Continue. Many current activities related to addressing climate change and reducing GHG emissions would probably not be suspended by this proposition. That is because certain Scoping Plan regulations implement laws other than AB 32. The regulations that would likely move forward, for example, include:

- New vehicle emission standards for cars and smaller trucks.
- A program to encourage homeowners to install solar panels on their roofs.
- Land-use policies to promote less reliance on vehicle use.
- Building and appliance energy efficiency requirements.

We estimate that more than one-half of the emission reductions from implementing the Scoping Plan would come because of laws enacted separately from AB 32.

FISCAL EFFECTS

Potential Impacts on California Economy and State and Local Revenues

There would likely be both positive and negative impacts on the California economy if AB 32 were suspended. These economic impacts, in turn, would affect state and local government revenues. We discuss these effects below.

Potential Positive Economic Impacts. The suspension of AB 32 would likely have several positive impacts on the California economy. Suspending AB 32 would reduce the need for new investments and other actions to comply with new regulations that would be an added cost to businesses. Energy prices—which also affect the state's economy—would be lower in 2020 than otherwise. This is because the proposed cap-and-trade regulation, as well as the requirement that electric utilities obtain a greater portion of their electricity supplies from renewable energy sources, would otherwise require utilities to make investments that would increase the costs of producing or delivering electricity. Such investments would be needed to comply with these regulations, such as by obtaining electricity from higher-priced sources than would otherwise be the case. The suspension of such measures by this proposition could therefore lower costs to businesses and avoid energy price increases that otherwise would largely be passed on to energy consumers.

Potential Negative Economic Impacts. The suspension of AB 32 could also have negative impacts on the California economy. For example, the suspension of some Scoping Plan measures could delay investments in clean technologies that might result in some cost savings to businesses and consumers. Investment in research and development and job creation in the energy efficiency and clean energy sectors that support or profit from the goals of AB 32 might also be discouraged by this proposition, resulting in less economic activity in certain sectors than would otherwise be the case. Suspending some Scoping Plan measures could halt air quality improvements that would have public health benefits, such as reduced respiratory illnesses. These public health benefits translate into economic benefits, such as increased worker productivity and reduced government and business costs for health care.

Net Economic Impact. As discussed previously, only a portion of the Scoping Plan measures would be suspended by the proposition. Those measures would have probably resulted in increased compliance costs to businesses and/or increased energy prices. On the other hand, those measures probably would have yielded public health-related economic benefits and increased profit opportunities for certain economic sectors. Considering both the potential positive and negative economic impacts of the proposition, we conclude that, on balance economic activity in the state would likely be modestly higher if this proposition were enacted than otherwise.

Economic Changes Would Affect State and Local Revenues. Revenues from taxes on personal and business income and on sales rise and fall because of changes in the level of economic activity in the state. To the extent that the suspension of AB 32 resulted in somewhat higher economic activity in the state, this would translate into an unknown but potentially significant increase in revenues to the state and local governments.

Other Fiscal Effects

Impacts of Suspension of the Cap-and-Trade Regulation. The suspension of ARB's proposed cap-and-trade regulation could have other fiscal effects depending on how this regulation would otherwise have been designed and implemented. One proposed approach provides for the auctioning of emission allowances by the state to emitters of GHGs. This approach would increase costs to affected firms doing business in the state, as they would have to pay for allowances. Such auctions could result in as much as several billion dollars of new revenues annually to the state that could be used for a variety of purposes. For example, depending on future actions of the Legislature, the auction revenues could be used to reduce

other state taxes or to increase state spending for purposes that may or may not be related to efforts to prevent global warming. Thus, the suspension of AB 32 could preclude the collection by the state of potentially billions of dollars in new allowance-related payments from businesses.

Potential Impacts on State and Local Government Energy Costs. As noted above, the suspension of certain AB 32 regulations would likely result in lower energy prices in California than would otherwise occur. Because state and local government agencies are large consumers of energy, the suspension of some AB 32-related regulations would reduce somewhat state and local government energy costs.

Impacts on State Administrative Costs and Fees. During the suspension of AB 32, state administrative costs to develop and enforce regulations pursuant to AB 32 would be reduced significantly, potentially by the low tens of millions of dollars annually. However, during a suspension, the state would not be able to collect the fee authorized under AB 32 to pay these administrative costs. As a result, there would no longer be a dedicated funding source to repay loans that have been made from certain state special funds to support the operation of the AB 32 program. This would mean that other sources of state funds, potentially including the General Fund, might have to be used instead to repay the loans. These potential one-time state costs could amount to tens of millions of dollars. Once AB 32 went back into effect, revenues from the AB 32 administrative fee could be used to pay back the General Fund or other state funding sources that were used to repay the loans.

In addition, once any suspension of AB 32 regulations ended, the state might incur some additional costs to reevaluate and update work to implement these measures that was under way prior to the suspension.

Boost your bottom line.

Start today with 
The Wall Street Journal
Online Small Business Channel.

THE WALL STREET JOURNAL

WSJ.com

06/06/10 9:20 AM EDT

Al Gore: Businesses Must 'Lead the Way' on Climate Change

Former Vice President Al Gore called climate change "the most dangerous crisis we have ever faced" and said businesses need to "lead the way" in tackling it.



Reuters

Speaking Wednesday at the World Business Forum in New York, Mr. Gore said pressure to meet quarterly earnings targets has dissuaded CFOs from investing in making their operations more efficient and eco-friendly steps he believes lead to pay off over time.

"It's functionally insane," he said. "They need to take the time to learn about climate change and make a commitment to be part of the solution."

Mr. Gore urged business leaders to suppress the "most irresponsible voices in the community [that] are undercutting the vast majority." He said business executives should get involved in politics to advocate climate reform. "For you as business leaders, it's important to change the light

bulbs, but it's way more important to change the laws," he said.

Mr. Gore also blasted corporations that are "large carbon polluters," saying they are standing in the way of climate change legislation for fear that it will hurt their bottom lines.

Mr. Gore equated global warming to the subprime crisis, implying that it's only a matter of time before disaster strikes.

He lauded countries like China, Spain and Germany for their advances in solar power, wind energy and light rail, saying that it's largely possible because of government support.

Copyright 2008 Dow Jones & Company, Inc. All Rights Reserved.

This copy is for your personal, non-commercial use only. Distribution and use of this material are governed by our Subscriber Agreement and by copyright law.

For non-personal use or to order multiple copies, please contact Dow Jones Reprints at 1-800-543-0005 or visit

www.djreprints.com

Climate science under attack

BY David A. Kaplan, contributor

October 8, 2010 9:15 AM ET

FORTUNE -- In the early 1990s, when Michael Mann was at Yale working on his Ph.D. in the geology and geophysics department, he became fascinated with theoretical climate modeling. By studying data inferred from ancient sources like tree rings and coral and ice cores, he could understand natural fluctuations in climate over the eons. Mann envisioned a quiet career in the halls of academia. In 1995 he made a big splash in paleoclimatology with his co-publication in *Nature* of -- wow! -- "Global Interdecadal and Century-Scale Climate Oscillations During the Past Five Centuries." So what's a nerd like him doing at the center of a raging debate over academic freedom? "I had absolutely no idea what I was bargaining for," Mann told *Fortune*.

Based on his research, Mann, 44, became a leading global-warming scholar, first at the University of Virginia and now at Penn State. The data, he declared, were irrefutable. Human activity has caused rising temperatures -- particularly in recent decades -- and could one day imperil life. Fossil-fuel companies and other doubters have long challenged the certitude of such conclusions, and global-warming deniers often single out Mann as a scientist with a political agenda.


The skepticism gained widespread media

attention last November when hackers publicized hundreds of e-mails among prominent climatologists, including Mann. Global-warming deniers said the stolen e-mails demonstrated climatologists were willing to manipulate evidence.

CLIMATEGATE! proclaimed uncreative headline writers. Yet despite the smug, petty opinions expressed in some e-mail, five review panels cleared the climatologists of unethical conduct. In Mann's case, the attorney general of Virginia had even charged that he'd defrauded taxpayers in obtaining nearly a half-million dollars in grants while at UVA. Several weeks ago a judge dismissed those civil charges, which the state plans to refile.

Mann says the AG's investigation represents a "witch hunt" that is the predictable culmination of efforts by "vested interests" to attack not only science but scientists. He says the threat to the academy isn't theoretical and knows of graduate students who've decided to steer clear of research in global studies for fear of controversy. Others in climatology never list their home addresses and have bodyguards at public-

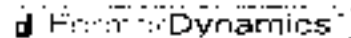
Advertisement



We focus on automating the way you work, so you don't have to.

Learn more at 2010.Xerox.com

xerox
SOLUTION PROVIDER

Print Powered By  Formal Dynamics

CNNMoney.com

speaking events. Mann himself says he's had to contact law enforcement over harassing e-mail and snail mail: read one: "I was hoping I would see the news that you'd committed suicide. Do it, freak."

There's no excuse for that kind of implicit threat. It's hard to forget that the acts of the Unabomber maimed professors. And McCarthyism proved that mere words could jeopardize academic freedom. But it's wise to remember that demonizing scientists is nothing new. Charles Darwin published *On the Origin of Species* 151 years ago. Six decades later the Scopes trial was a national spectacle and evolution remains a target for opportunists who can't distinguish between religion and fact. Even so, most of us are wise enough to recognize that creationism isn't a danger to science. "I used to believe that truth would prevail in the public discourse over climate change," says a frustrated Mann. He ought to have a bit more faith.


■


Advertisement



We focus on automating Marriott Hotels' global invoice process. So they don't have to.

Learn more at RedBusInvoice.com

xerox 
PowerSmart

Print Powered By  iDynamics

SCIENTIFIC AMERICAN

Permanent Address: <http://www.scientificamerican.com/article.cfm?id=the-missing-link-in-wider>

The Missing Link in Wider Adoption of Solar Power? Electricians

The biggest roadblock for the commercialization of solar power in the United States is not the technology but the mundane back-end issues of permitting and installation.

By Peter Dink and L. Imolewa J. Inyang, October 18, 2010

The biggest roadblock for the commercialization of solar power in the United States is not the technology of the modules but the mundane back-end issues of permitting, installation, electrical controls and business practices, according to a report by the Rocky Mountain Institute.

The report, summarizing the institute's design charrette in June, concludes that "balance of system" (BoS) costs -- everything other than the modules themselves -- could be cut in half through streamlined, standardized approaches.

"Although solar PV has reached grid parity in select markets, significant reductions are still required to make it a true 'game-changer.' Technology development and economies of scale have helped manufacturers of both crystalline silicon and thin film PV modules create aggressive yet credible cost-reduction roadmaps," the report says.

That makes BoS costs -- representing about half of typical commercial and utility project costs -- critical to overall cost reduction for solar, the report says.

Cutting the costs of solar, including modules and supporting systems, by half from \$3.50 or more per watt currently would establish solar as a viable option without subsidies, experts agree. "At \$1 per watt, everything becomes possible," said Energy Secretary Stephen Chu.

The institute's study concludes that back-end costs, now averaging \$1.60 to \$1.85 per watt, could be reduced to 60 to 90 cents. (The lower price is for ground-mounted systems; the higher, for units on rooftops.) Such a cost cut would offer "a pathway to bring photovoltaic electricity into the conventional electricity price range," the report concludes.

Increased solar installations, notably in California, have already helped reduce BoS expenses and total costs, said Thomas Rooney, president and CEO of SPG Solar, the second-largest solar installer in California.

No need for a technological 'miracle'

"Scale matters in this industry," Rooney said in an interview. A 3-megawatt solar project would have cost \$8 million and taken six months to install two or three years ago, he said -- requiring 14,000 worker hours. Today, it can be done for \$5 million, in six months, with 4,000 hours on the job, he added.

But cost reduction opportunities are fragmented and usually not coordinated, so gains are less likely to occur than with modules, the report authors said. At the most basic level, developers face community-by-community differences in structural and electrical codes. Coordinating the work of developers, installers, suppliers, regulators, utilities, and building owners with customers' demands is the challenge.

Robin Schaffer, senior vice president of sales and marketing for SunLink Corp., which has installed more than 150 megawatts of mounting systems, said his company is working on pre-assembly steps for systems to reduce costs. "We don't need technology breakthroughs," Schaffer said, speaking on a telephone conference call this week. "We just need the effort and cooperation among

industry participants to get there, and we're getting that."

There are no "silver bullet" solutions, the report says. Solar power systems must be individually designed for unique site conditions around the country. But given that, more standardized models are needed that can then be adapted to local needs. "To achieve economies of scale, mass customization will be required whereby common parts and approaches can be readily customized for different locations," the report says.

Opportunities include better module and array designs to withstand high winds; standardized permitting; streamlined manufacturing; more "tool-less" installation automation to limit on-site labor, and improved direct-to-alternating-current conversion instruments. "Ultimately, plug-and-play installation approaches that don't require specialized labor may be possible," the report says.

Stephen Doig, program director at the Rocky Mountain Institute, said in the phone conference that the solar pilot projects around the country funded by the Energy Department provide the laboratories for attacking the cost and systems issues.

There is "one clear message," he said. Getting to good economies of scale does not require a major technology breakthrough. The component pieces are there. "We need to drive out the waste in the system. . . . This is a matter of hard work now, not some miracle breakthrough."

Reprinted from *Climateline* with permission from *Environment & Energy Publishing, LLC*, www.enee.com, 202-628-5500

© 2010 Scientific American, a Division of Nature America, Inc.

All Rights Reserved.



California Energy Commission

Public Interest Energy Research
Climate Change Program



California Climate Change Center

1515 Center Street, Suite 400, Berkeley, CA 94702



The California Climate Change Center was the first state-funded climate change research program in the nation. Its goal is to enhance national and international studies, generating new information that can be used to shape California's climate change policy.

Shaping California's Climate Change Policy

Climate change is one of the most important long-term issues facing California. With wide-ranging impacts expected on the state's natural resources, public health, energy, air quality, agriculture, economy, environment, and infrastructure, the lives of all Californians will be affected by climate change in the decades ahead.

Although climate change is a global problem, it poses special risks to California. For example:

- Over the past century, the West (including California) has warmed more than any other region in the United States apart from Alaska.
- The state's water resources, already scarce, are highly vulnerable to changes in temperature and precipitation. The Sierra Nevada snowpack, which provides most of the state's drinking water, is currently shrinking as a result of climate warming already in progress.
- The risk of large wildfires in the state could increase substantially.
- California's diverse landscape hosts more plant and animal species than any other state. Climate change will affect many of these species directly as well as exacerbating existing environmental stressors such as land-use change, invasive species, and reductions in air and water quality.

To address these risks effectively, California requires detailed, state-specific information on how climate may change and the potential impacts associated with these changes. The California Climate Change Center is the main source of policy-relevant research on climate change in California. Created in 2003 as part of the California Energy Commission's Public Interest Energy Research (PIER) program, this virtual research center—operated in partnership with U.C. San Diego and U.C. Berkeley—provides information on emissions, impacts, adaptation, and mitigation strategies.

The Center was the first state-funded climate change research program in the nation. Its goal is to enhance national and international studies, generating new information that can be used to shape California's climate change policy. The Center also works very closely with state and local agencies to make sure its scientific results are relevant to their climate change activities.



Research funded by the Center has downscaled information from coarse-resolution global climate models to enable more detailed projections of future climate change in California.

The Center funds research in four areas:

- 1. Climate monitoring, analysis, and modeling:** This area of work targets the "how" and "why" of climate processes and climate change in California. This research includes developing the modeling capabilities to estimate how climate will change in the future, as well as integrating past data into the development of future climate projections for the state.
- 2. Improving inventory methods:** Some of the methods used to estimate greenhouse gas emissions, especially for methane, nitrous oxide, and other non-carbon-dioxide (CO₂) greenhouse gases, have significant uncertainties. Work in this area includes improving key methodologies to improve emission estimates and track emissions trends in California.
- 3. Options to reduce greenhouse gas emissions:** Research in this area identifies promising options to reduce net greenhouse gas emissions, and weighs the relative costs and benefits of each option.
- 4. Impacts and adaptations:** This area of work focuses on studying the potential impacts of climate change on different sectors of the economy, such as energy, water, and human health. As many of these impacts may be unavoidable, this research also involves investigating options to ameliorate these impacts.

The Center works with many of California's prestigious research institutions, and has to date produced more than 150 peer-reviewed reports—with many published in prominent scientific journals such as *Science* and the *Proceedings of the National Academy of Sciences*.

This brochure provides an overview of the Center's work and achievements in each of these areas.

Climate Monitoring, Analysis, and Modeling

To estimate future changes in California's climate, scientists first must understand both past and current climate behavior, and what factors are driving climate change.

Monitoring

California's current network of temperature and precipitation stations provides only a partial picture of how climate is changing in the state—with data especially scarce for high elevations, where warming is expected to be greatest. Collecting data from monitoring stations in mountains and other remote locations can be particularly expensive. With the Center's support, however, researchers have developed and field tested small, low cost monitoring systems that transmit data wirelessly to a Web-accessible database. These new systems are operating now in Yosemite National Park and the Santa Margarita Ecological Reserve (50 miles north of San Diego), and will be used to expand the climate monitoring network into areas that previously lacked coverage. The Center also maintains the California Climate Archive, which contains meteorological and hydrological data for the state for the last 100 years. With extensive records from individual stations and networks, the archive provides a historical context of present and past climate conditions.

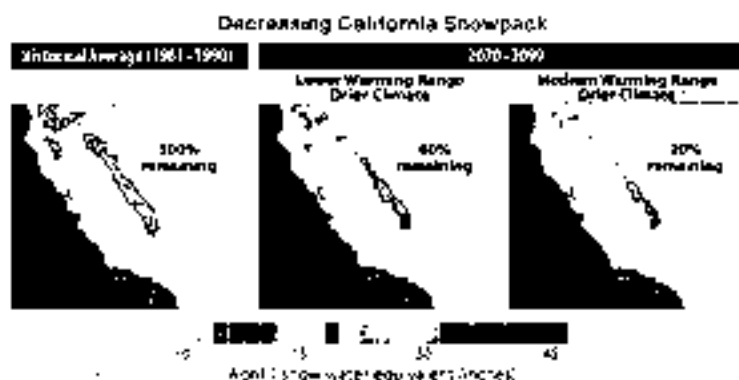
Analysis

By studying climate and related data collected over the past century, researchers can determine the extent that climate has already changed in California, as well as how much of that alteration is due to human versus natural causes.

Historical data can reveal important trends affecting California today. For example, a study funded by the Center documented a regional trend from 1949–2001 toward less snowfall and more winter run in the Sierra Nevada. California's mountain snowpack serves a vital function by storing wintertime precipitation until it is needed during the warmer and drier spring and summer months, so the discovery of this trend brings to light a serious risk to the state's water resources.

Another Center-funded study documented for the first time how changes in climate are affecting the frequency and severity of forest fires in the western United States. The study found that the longer, warmer summers occurring in the West since 1986 have led to a four-fold increase in the number of major wildfires compared with the average over the past two decades (1973–1986).

The number of major forest fires in California each year has quadrupled since 1986, due to longer and warmer summers.



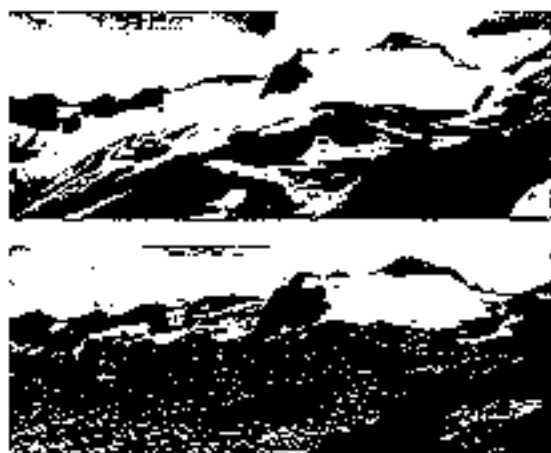
Changes in California's historical (1961–1990) and projected (2070–2099) snowpack

Source: California Climate Change Center



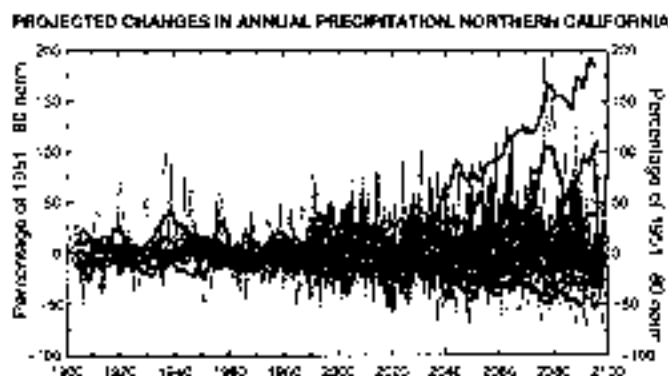
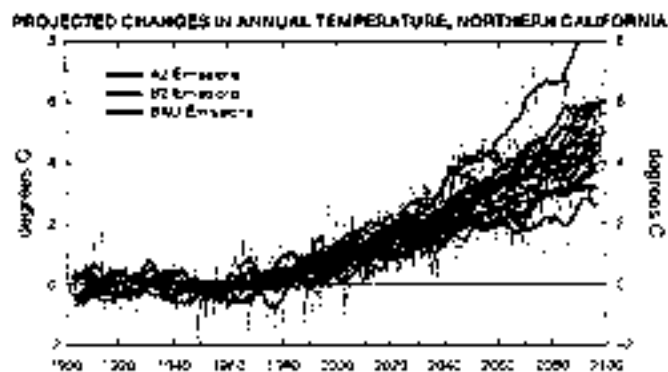
Electronic data loggers collect climate data in remote locations and transmit it wirelessly to a central database.

Source: Douglas Alden, Scripps Institution of Oceanography



Twentieth Century Glacier Change in the Sierra Nevada, California – A comparison of Lyle Glacier, Yosemite National Park, in 1903 (top) taken by G. K. Gilbert, and 2003 (bottom), taken by Hassan Basagiç.

Source: Geography Department, Portland State University



Ensembles of historical and future temperature and precipitation projections from six coupled ocean-atmosphere general circulation models, each forced by historical scenarios and three in the 21st century—by three scenarios developed by the Intergovernmental Panel on Climate Change. Projections are for grid cells from each model centered over northern California.

Source: California Climate Change Center

Other studies are examining the effects of atmospheric aerosols from pollution on precipitation over the Sierra Nevada mountains. Combining data from research aircraft, satellites, and stream flow measurements in Sierra Nevada rivers, the researchers discovered that airborne pollution is reducing the amount of precipitation in mountains downwind of major urban areas. This finding suggests that reducing urban aerosol pollution could counteract some of the expected impacts of climate change on the Sierra Nevada snowpack, and help protect the state's water resources.

Finally, two new studies have determined that increased concentrations of greenhouse gases represent the most likely cause for observed trends of increased temperatures and shorter winter seasons in California. In simple terms, the climate change signal is already detectable in our state.

Modeling

Building on the understanding gained from monitoring and analyzing California's past and present climate, researchers can develop regional-scale models to explore how the state's climate may change in the future.

One of the Center's most important modeling projects is the generation of regional climate change scenarios to inform research and decision making. The scenarios show the likelihood and severity of changes to weather and climate in California, including precipitation, average temperature, extreme heat days, and sea levels. The development of these scenarios involves creating and testing regional-scale climate models for California, which are informed by the California-specific climate data and analyses described above. For example, researchers at Scripps Institution of Oceanography enhanced their Regional Spectral Model, allowing them to simulate weather conditions in California for the past 57 years with unprecedented level of detail. Researchers have conducted extensive testing of this and other regional climate models for California. These highly computationally demanding models are now better able to project how climate may change in California. The Center expects the resulting climate scenarios to be available in the second quarter of 2010. Modeling outputs will be available at resolutions of grids with sizes of 10 by 10 kilometers (about 6.25 by 6.25 miles)—a much finer scale than those of global climate models (100 to 300 miles).

Models can also help researchers understand the reasons for past and current climate changes. A Center-funded study used regional climate models to estimate the cooling effect of irrigation, which is widespread in the Central Valley. The researchers found that irrigation appears to have been masking a portion of the warming caused by greenhouse gas emissions. If agricultural irrigation follows expected trends and does not increase, it will not be able to counterbalance the additional warming that is expected to occur in the years ahead. For this reason, the Central Valley may experience more pronounced warming in the near future.

Inventory Methods

To reduce its contribution to climate change, California must first understand from where its emissions are coming. The state performs periodic greenhouse gas inventories to identify and quantify its sources and sinks of greenhouse gases. However, while these inventories are conducted using the latest protocols, they still contain data gaps and uncertainties. The Center funds research to address these issues, allowing the state to more accurately track emissions trends and better inform efforts to reduce emissions. Current research focuses on compiling energy balances for California and developing new, improved methods to estimate non-CO₂ emissions.

California's Energy Balances

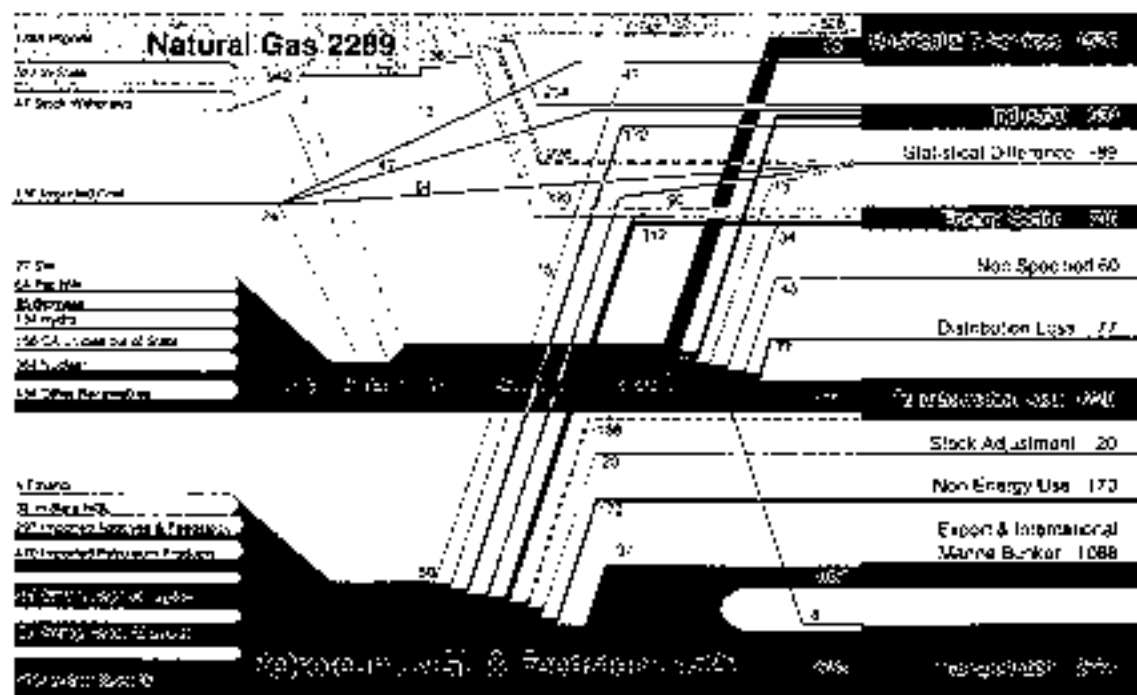
Energy production and use is the single largest human-generated source of greenhouse gas emissions in California. With support from the Center, Lawrence Berkeley National Laboratory has assembled a comprehensive database on energy production, transformation, and consumption in California from 1990 to the present, providing the foundation needed for accurate inventories and analysis of California's emissions. The California Energy Balances (CALEB) database allows researchers and policy makers to accurately track trends in energy use and energy-related greenhouse gas emissions in the state. The Air Resources Board used CALEB as the main source of energy data for its updated California greenhouse gas emissions inventory.

Estimating Non-CO₂ Greenhouse Gas Emissions

While emitted in smaller quantities than CO₂, other powerful greenhouse gases such as methane and nitrous oxide also contribute to climate change. Some key sources of these gases remain less well-quantified than those of CO₂, and contribute to uncertainty in greenhouse gas inventories. To help fill these information gaps, the Center supports a number of studies that improve the accuracy and efficiency with which researchers can estimate emissions from these sources.

For example, the Center is funding development of a sophisticated, field-calibrated model to accurately estimate manure-related greenhouse gas emissions from dairy farms. The project is further improving the accuracy of these estimates by developing a geographic information system to support regional simulations for California dairies. The Center also supports the advancement of methods to estimate methane emissions from landfills, which represent the largest human-caused methane source in California and the nation. Landfill methane recovery is also one of the most cost-effective measures for reducing greenhouse gases, so reducing uncertainties in this area is vitally important for effective policy making. To help address this need, the Center is funding a project to create a detailed landfill emission model and incorporate the results into an improved methane inventory methodology. The model is based on field data from individual landfills, and accounts for variation across different climates and landfill types, including different cover materials used to control emissions. It also accounts for oxidation in landfill cover soils, an area of major uncertainty.

CALEB Database — California Energy Flows in 2000, trillion Btu



This graph shows how energy is produced, transformed, and consumed in California, based on data in the California Energy Balances (CALEB) database.

The California Air Resources Board used CALEB to estimate carbon dioxide emissions for its official greenhouse gas emissions inventory.

Source: Lawrence Berkeley National Laboratory using data from U.S. Energy Information Administration and California Energy Commission



Options to Reduce Greenhouse Gas Emissions

Historically, greenhouse gas emission reduction strategies (also known as mitigation) have focused on increasing energy efficiency and renewable sources of energy, along with reducing fossil fuel consumption. To broaden the range of options, since 2003 the Center has focused on non-CO₂ greenhouse gases, carbon sequestration, and reducing emissions in other sectors of the economy.

Carbon Sequestration

Carbon sequestration—the removal and storage of CO₂ that otherwise would be released to the atmosphere—may play an important role in slowing the increase of CO₂ concentrations in the atmosphere. The Center has helped fund a number of studies on carbon sequestration, including the development of an online geographic information system, known as the West Coast Carbon Atlas, which identifies locations and estimated capacities of potential sites for CO₂ sequestration in six western states and one Canadian province. The U.S. Department of Energy provided most of the funds for this effort. The Center also funded the development of cost curves to determine sequestration potential of forest, range, and agricultural lands in California. The study will help stakeholders estimate the value of emissions reductions that might be available at various price points for different classes of sequestration projects.

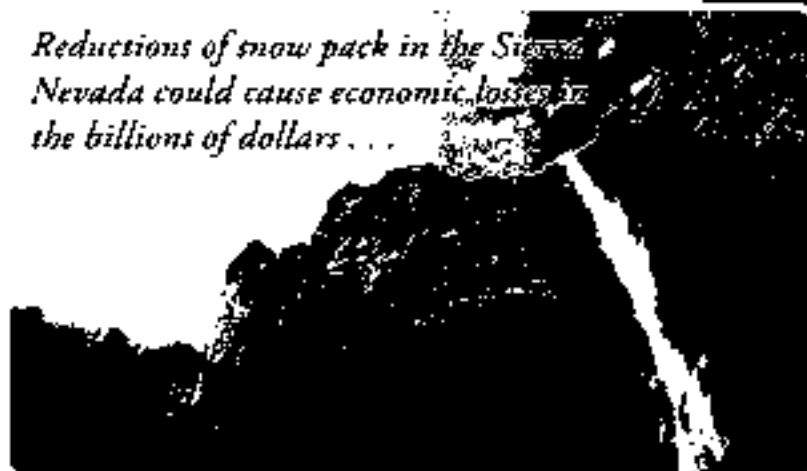
Non-CO₂ Greenhouse Gases

The Center funded an exploratory study to estimate the costs and benefits of 59 mitigation options for sources of non-CO₂ greenhouse gases, including natural gas and petroleum systems, landfills, manure management systems, electric power systems, refrigeration and air conditioning systems, and other sources. The analysis produced a set of cost curves, showing the estimated cost per metric ton of reducing a given quantity of greenhouse gases under various scenarios.

Long-term Options to Reduce Greenhouse Gas Emissions in California

The Center is investigating promising options to move California onto a path of significant greenhouse gas emissions reductions by 2050, to meet the goal adopted by the Governor on June 1, 2005. To pursue this plan, the Center is developing a new technology-rich model that will simulate the energy system in California as a region in a larger national and global model. Finally, the Center is exploring the potential for aggressive and extremely long-term energy efficiency programs as an important tool to reduce emissions in our state. This work is being closely coordinated with the work on energy technologies being undertaken at JPLR and at other research programs.

Reductions of snow pack in the Sierra Nevada could cause economic losses in the billions of dollars . . .



Impact and Adaptation Studies

The research areas described above focus on understanding climate change in California as well as its underlying causes. In addition to addressing those concerns, California needs to begin preparing for the expected impacts of climate change. A number of studies indicate that some level of warming is inevitable even if emissions are drastically reduced, due to the long life of greenhouse gases in the atmosphere and the slow release of stored heat from the oceans. The diversity of ecosystems and the scarcity of water in California make the state especially vulnerable to changes in climate. To prepare for the challenges ahead, planners need better information about the risks to vulnerable systems and what can be done to help them adapt to climate change.

The Center's research in this area identifies potential impacts in California and effective coping or adaptation strategies. The Center is conducting research in the following areas: energy, water resources, public health, coastal resources, forests, ecosystems, and agriculture. All of these studies are conducted in very close cooperation and coordination with the relevant federal, state, and local agencies.

Energy

The Center so far has conducted research on how climate change would change energy demand and hydropower generation. Electricity demand is expected to increase, with more pronounced impacts on peak electricity demand in the summer when, traditionally, our electricity system is stressed to satisfy demand. This negative impact would be exacerbated by a diminished capability to generate electricity from hydropower due to reduced snow pack storage. On the positive side, energy demand for space heating would go down.



Water Resources

Agriculture, electric power, industry, households, and natural systems in California all depend on reliable supplies of water. State decision makers need a better understanding of how water quality and supplies will be affected by climate change and other dynamic conditions (such as population growth). Managers must be able to identify which regions and sectors of the economy will be most affected and what steps can be taken to adapt to these challenges. The Center has published high-impact reports on the potential reductions of snow pack in the Sierra Nevada due to warming temperatures, with potential resulting economic losses in the billions of dollars by the end of this century. Center-affiliated researchers at UC Davis, UC Berkeley, and Scripps have substantially improved our scientific understanding of potential impacts. The Department of Water Resources (DWR) has used and will continue to use these study findings in the preparation of its State Water Plan. The Center is now investigating coping strategies for climate change, such as the feasibility of using underground aquifers to store water and the use of modern probabilistic hydrological forecasts and decision support systems to improve the management of water reservoirs in California. The Center, in collaboration with DWR, is investigating these options based on the promising results of preliminary studies.

Public Health and Welfare

Climate change carries a number of risks to health and safety, including shifts in the ranges of vector-borne diseases; increases in extreme weather-related events such as heat waves, flooding, and landslides; more frequent or intense wildfires; and impacts on important services and infrastructure, such as electricity supply. The Center funds research to identify risks, pinpoint the most vulnerable segments of the population, and develop strategies to reduce risk. A major effort in this area of work

Climate change will alter the fundamental character, production, and distribution of the ecosystems upon which the economy of California has been built.



More than 100 years of excluding fire has led to a heavy build-up of fuels such as dead vegetation, dense brush, and dense tree stands, with a potential for larger, more intense fires and more rapid spread than before the fire-exclusion era.

Source: U.S. Geological Survey

entails estimating the potential impacts of higher temperatures on human morbidity and mortality. The Center has also funded the development of sophisticated models to project the future risk of wildfires in the state. The modeling studies suggest that large wildfires could become more frequent over this century, although the risk will vary widely across the state and will be strongly influenced by changes in precipitation.

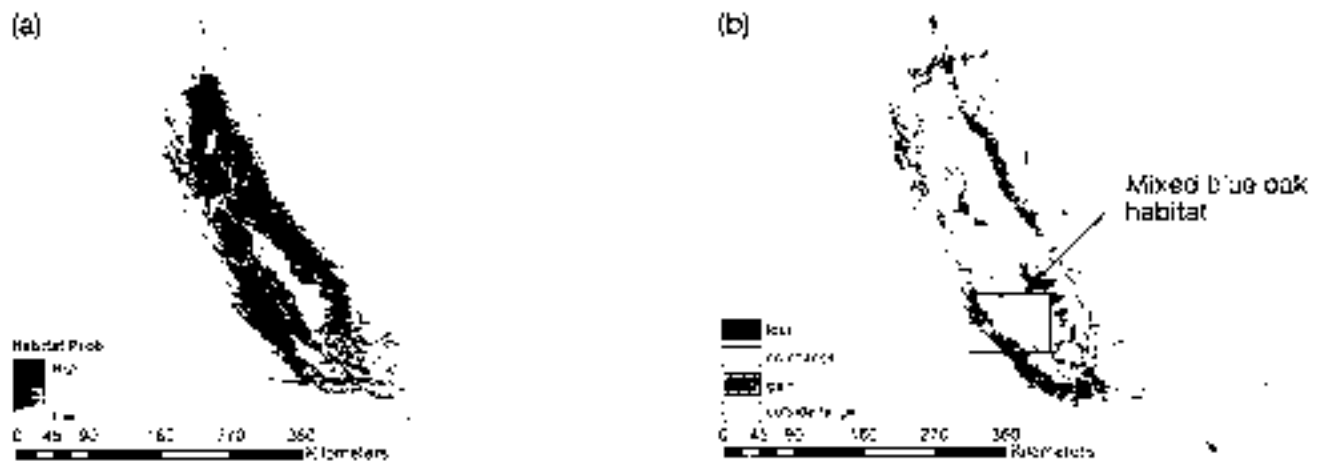
Agriculture and Forestry

Crops and natural vegetation are sensitive to changes in temperature, precipitation, and extreme weather events. The Center supports research to identify vulnerable species and early signs of stress, predict their response under a range of climate scenarios, and determine how farmers and resource managers can best prepare for these changes. Modeling studies funded by the Center show positive as well as negative effects of climate change and increasing CO₂ concentrations on crop production. While the growing season may be extended in a warmer climate, citrus fruit and olive production may decline due to reductions in winter chill periods. Other Center-funded studies show that pests such as the olive fly, Mediterranean fruit fly, and pink bollworm (which attacks cotton) would expand their range. The Center is currently engaged in preliminary studies designed to explore coping and adaptation strategies, with case studies for specific regions in California.

Ecological Changes

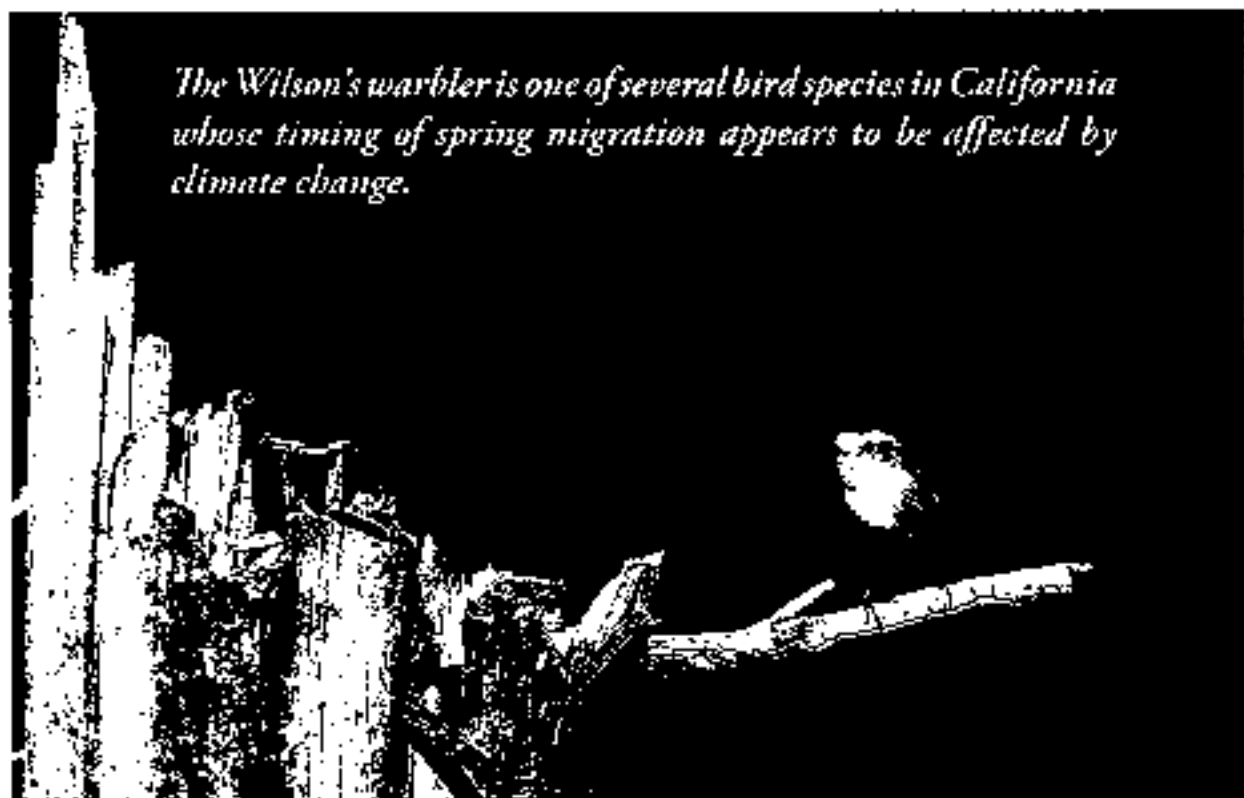
In addition to its effects on society and the economy, climate change is expected to have wide-ranging impacts on California's unique and rich array of ecosystems, affecting valuable ecosystem services upon which humans depend. The Center funds research in this area as well, including the first detailed analysis of changes in songbird migration timing through central and northern California. Using observational and banding data at multiple sites, the research team found that 15 species arrived earlier in spring, with 77 percent of those earlier arrivals being likely or highly likely to be associated with climate change. Other studies suggest that already detectable changes in vegetation patterns are also most likely due to a warming climate. A preliminary study suggests that the combined effect of warming and urbanization may decimate important ecosystems in California. To examine this phenomenon, the Center has developed a new dynamic ecological model for California (involving scientists from UC Santa Barbara, UC Davis, Conservation International, and Stanford University), which is being used to estimate how ecosystems would respond to changing climatic conditions. The Center is also collecting ecological data, re-sampling sites that were sampled for flora and fauna early in the 20th century to test the Center's ecological model and other promising models. Evaluating the models with historical data will increase our level of confidence in model predictions.

Urban and suburban expansion, agriculture and grazing threaten the persistence of blue oak woodlands. Climate change may exacerbate these current threats and must be considered when developing management strategies to help protect this unique community type endemic to California.



(a) Current predictions for current blue oak habitat probability. Low probabilities of occurrence are pictured in yellow and high probabilities in blue.
(b) Changes (loss=red, no change=beige, gain=green) in habitat suitability for blue oak based on model projections.

Source: California Climate Change Center



The Wilson's warbler is one of several bird species in California whose timing of spring migration appears to be affected by climate change.

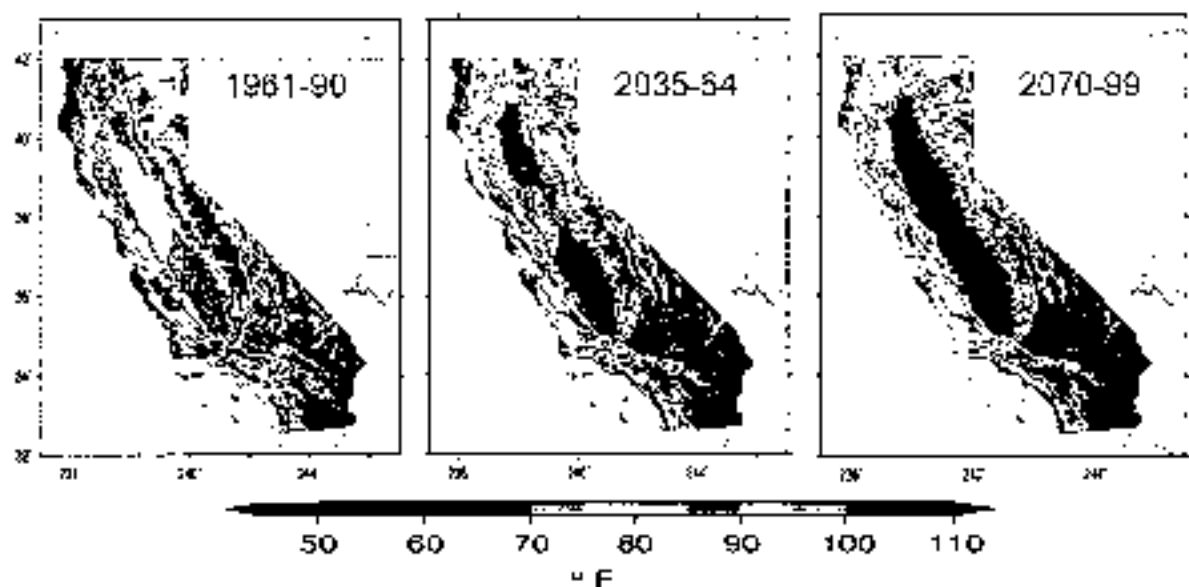
EXECUTIVE SUMMARY

2009 CALIFORNIA CLIMATE ADAPTATION STRATEGY

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



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



SOURCE: Dan Gochis et al. 2009

WWW.CLIMATECHANGE.CA.GOV/ADAPTATION

TABLE OF CONTENTS

List of Figures and Tables

Executive Summary

Part I – Planning for Climate Change

Page

I. Introduction	11
II. California's Climate Future	15
III. Comprehensive State Adaptation Strategies	22

Part II – Climate Change - Impacts, Risks and Strategies by Sector

IV. Public Health (Led by the Department of Public Health with assistance from the California Air Resources Board)	30
V. Biodiversity and Habitat (Led by the Department of Parks and Recreation and the Department of Fish and Game)	45
VI. Ocean and Coastal Resources (Led by the Ocean Protection Council) ..	65
VII. Water Management (Led by the Department of Water Resources).....	79
VIII. Agriculture (Led by the Department of Food and Agriculture and the Department of Conservation).....	92
IX. Forestry (Led by the Department of Forestry and Fire Protection and the Board of Forestry).....	107
X. Transportation and Energy Infrastructure (Led by the Department of Transportation and the California Energy Commission).....	122

Appendices

A. Acknowledgements.....	135
B. Governor's Executive Order S-13-08.....	137
C. Glossary.....	140
D. Acronyms.....	143
E. Table of Short Term Climate Adaptation Strategies.....	146

References

LIST OF FIGURES AND TABLES

Figure 1: California Historical and Projected July Temperature Increase 1961-2099

Figure 2: Replacement value of buildings and contents vulnerable to a 100-year coastal flood with a 1.4 meter sea level rise.

Figure 3: Governor Schwarzenegger assessing the site of a recent wildfire

Figure 4: Examples of complementary and conflicting actions between adaptation and mitigation efforts

Figure 5: Historical/projected annual average temperature for California

Figure 6: Predicted changes in Northern California precipitation levels show generally drier future

Figure 7: Projected changes in sea level rise over 21st Century

Figure 8: Extreme climate drivers and inter-sector interactions

Figure 9: Sample climate adaptation research needs (2009 CAT Report)

Figure 10: Flow diagram showing inter-relationships of climate impacts to public health

Figure 11: Increasing wildfire risk

Figure 12: Vulnerability of California coastal areas to sea level rise

Figure 13: Using mid-century climate projections to support water resources decision making in California

Figure 14: California historical and projected decrease in April snowpack (1961-2099)

Figure 15: View of Lake Oroville in 2005 and November 2008

Figure 16: California perennial crops in a changing climate

Figure 17: Modeled crop yields by 2100, shown in 25 year increments

Figures 18 and 19: Bark Beetle damage in California forests

Figure 20: Projected increase in household electricity consumption

Figure 21: Peak electricity demand June-September 2004

Figure 22: Trains can derail due to extreme heat warping railroad tracks

Figure 23: Projected sea level rise around San Francisco Airport (SFO)

EXECUTIVE SUMMARY

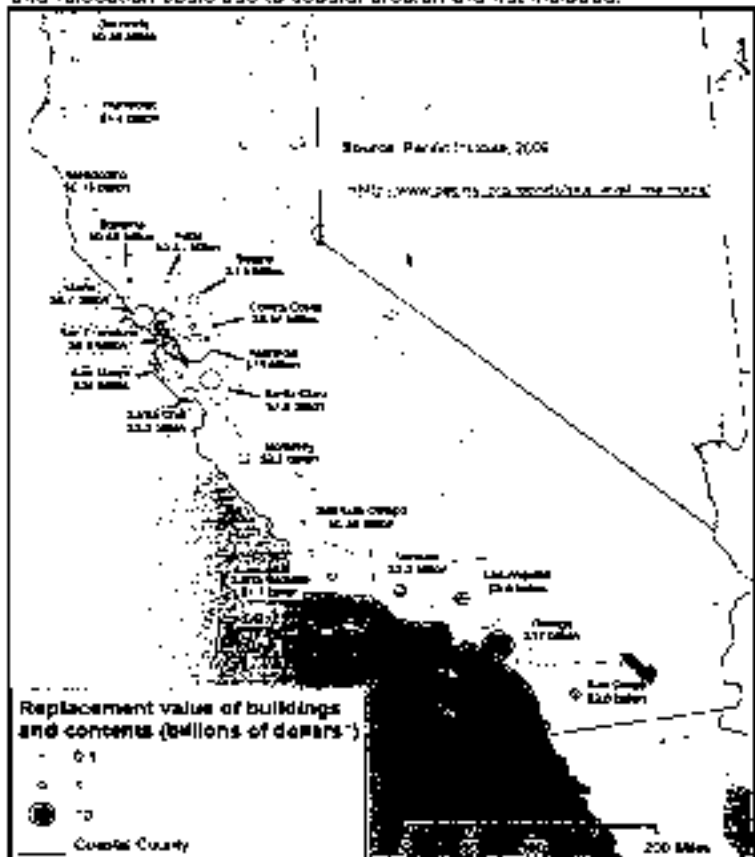
The Golden State at Risk

Climate change is already affecting California. Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The state has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and both snowmelt and rainwater running off sooner in the year.

These climate driven changes affect resources critical to the health and prosperity of California. For example, forest/wildland fires are becoming more frequent and intense due to dry seasons that start earlier and end later. The state's water supply, already stressed under current demands and expected population growth, will shrink under even the most conservative climate change scenario. Almost half a million Californians, many without the means to adjust to expected impacts, will be at risk from sea level rise along bay and coastal areas. California's infrastructure is already stressed and will face additional burdens from climate risks. And as the Central Valley becomes more urbanized, more people will be at risk from intense heat waves.

If the state were to take no action to reduce or minimize expected impacts from future climate change, the costs could be severe. A 2008 report by the University of California, Berkeley and the non-profit organization Next 10 estimates that if no such action is taken in California, damages across sectors would result in "tens of billions of dollars per year in direct costs" and "expose *trillions* of dollars of assets to collateral risk." More specifically, the report suggests that of the state's \$4 trillion in real estate assets "\$2.5 trillion is at risk from extreme weather events, sea level rise, and wildfires" with a projected annual price tag of up to \$3.9 billion over this century depending on climate scenarios (www.next10.org/research/research_occ.html). The figure at right, from a study by the Pacific Institute, shows coastal property at risk from projected sea level rise by county with replacement values as high as \$24 billion in San Mateo County.

Figure 2: Replacement value of buildings and contents vulnerable to a 100 year coastal flood with 1.4 meters of sea level rise. Land values and relocation costs due to coastal erosion are not included.



California understands the importance of addressing climate impacts today. The state strengthened its commitment to managing the impacts from sea level rise, increased temperatures, shifting precipitation and extreme weather events when Governor Arnold Schwarzenegger signed Executive Order (EO) S-13-08 on November 14, 2008. The order called on state agencies to develop California's first strategy to identify and prepare for these expected climate impacts.

The *2009 California Climate Adaptation Strategy (CAS)* report summarizes the best known science on climate change impacts in the state to assess vulnerability and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. This is the first step in an ongoing, evolving process to reduce California's vulnerability to climate impacts.

The California Natural Resources Agency (CNRA) has taken the lead in developing this adaptation strategy, working through the Climate Action Team (CAT). Seven sector-specific working groups led by 12 state agencies, boards and commissions, and numerous stakeholders were convened for this effort. The strategy proposes a comprehensive set of recommendations designed to inform and guide California decision makers as they begin to develop policies that will protect the state, its residents and its resources from a range of climate change impacts. Following a 45-day public comment period since its release as a Discussion Draft in August 2009, the CNRA and sector working groups have revised the strategy incorporating public stakeholder input. All public comments can be seen on the adaptation Web site at www.climatechange.ca.gov. Not all material has been incorporated at this time, but will potentially be added later to accommodate additional information and expand upon as strategies are implemented and more organizations and processes become involved. This document will be updated approximately every two years to incorporate progress in strategies and changing climate science.

California's Climate Adaptation Strategy

As the climate changes, so must California. To effectively address the challenges that a changing climate will bring, climate adaptation and mitigation (i.e., reducing state greenhouse gas (GHG) emissions) policies must complement each other, and efforts within and across sectors must be coordinated. For years, the two approaches have been viewed as alternatives, rather than as complementary and equally necessary approaches.

Adaptation is a relatively new concept in California policy. The term generally refers to efforts that 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, including its baseline and projected economic resources, technologies, 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. In December 2008, the California Air Resources Board released the state's *Climate Change Scoping Plan*, which outlines a range of strategies necessary for the state to reduce its GHG emissions to 1990 levels by 2020. Many climate mitigation strategies, like promoting water and energy efficiency, are also climate adaptation strategies. By building an adaptation strategy on existing climate science and frameworks like the Scoping Plan, California has begun to effectively anticipate future challenges and change actions that will ultimately reduce the vulnerability of residents, resources and industries to the consequences of a variable and changing climate. Now that the state has produced plans for climate mitigation and adaptation, closer coordination is needed to implement both approaches. The strategies included in this report were approved by the CAT Team, which represents all of state government. Now, the CAT will lead in the coordination of measures and push to develop the necessary tools to effect adaptation protocols. California's mitigation (CAT) and adaptation (CAS) processes will be further integrated through extensive information exchange and consolidation of working groups from both efforts.

To ensure a coordinated effort in adapting to the unavoidable impacts of climate change, the *2009 California Climate Adaptation Strategy* was developed using a set of guiding principles.

- Use the best available science in identifying climate change risks and adaptation strategies.
- Understand that data continues to be collected and that knowledge about climate change is still evolving. As such, an effective adaptation strategy is "living" and will itself 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, tribes, private business and 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 enough for circumstances that may not yet be fully predictable.
- Ensure that climate change adaptation strategies are coordinated with the California Air Resources Board's AB 32 Scoping Plan process when appropriate, as well as with other local, state, national and international efforts to reduce GHG emissions.

The *2009 California Climate Adaptation Strategy* takes into account the long-term, complex, and uncertain nature of climate change and establishes a proactive foundation for an ongoing adaptation process. Rather than address the detailed impacts, vulnerabilities, and adaptation needs of every sector, those determined to be at greatest risk are prioritized.

The development of the adaptation strategies presented within this report was spearheaded by the state's resource management agencies. CNRA staff worked with seven sector-based Climate Adaptation Working Groups (CAWGs) focused on the following areas: public health; ocean and coastal resources; water supply and flood protection; agriculture; forestry; biodiversity and habitat; and transportation and energy infrastructure.

Working group experts have an intimate knowledge of California's resources, environments, and communities, and also of the state's existing policy framework and management capabilities. This understanding informs the adaptation strategy and ensures a realistic assessment of adaptive capacities, current limitations, and future needs.

A Collaborative Approach

This adaptation strategy could not have been developed without the involvement of numerous stakeholders. Converging missions, common interests, inherent needs for cooperation, and the fact that climate change impacts cut across jurisdictional boundaries will require governments, businesses, non-governmental organizations, and individuals to minimize risks and take advantage of potential planning opportunities.

Throughout the development of this report, it became increasingly clear that overlapping missions and goals will require agencies and organizations at all levels to work together to develop close partnerships with regard to climate adaptation. This is the only means by which the far-reaching effects of climate impacts can be addressed efficiently and effectively while avoiding potential conflicts. The Comprehensive State Adaptation Strategies chapter underscores the need for collaboration and identifies where cross-sector relationships are necessary.

To further enhance stakeholder participation the CAWGs initiated a process that allowed for consultation with stakeholders through public workshops and review opportunities. This input has considerably shaped the content and refinement of this report. However, future updates of the adaptation strategy will require ongoing input through active stakeholder engagement and an even closer integration of state agency efforts.

In order to best analyze climate change risks, the *2009 California Climate Adaptation Strategy* draws on years of state-specific science and impacts research, largely funded through the California Energy Commission's Public Interest Energy Research (PIER) Program and an engaged research community. The research provides for an understanding of the climate-related risks California will face and has significantly contributed to greater public awareness of climate change. As data continues to be developed and collected, the state's adaptation strategy will be updated to reflect current findings.

All participating agencies prepared this report with existing resources amidst a serious state financial crisis. It is clear that more funding will be needed to address all aspects of climate adaptation and that potential sources will need to be sought from agencies and organizations at all levels to address the full scope of the problem. At this time CNRA is currently seeking additional funding for climate adaptation work.

Preliminary Recommendations

The preliminary recommendations outlined in the adaptation strategy were developed by CNRA staff, CAWGs, the CAT, and from public comments. Public comments were sought beginning August 3, 2009 when the CAS was released as a discussion draft. During the ensuing 45-day public comment period 83 comments were received, totaling over 400 pages of suggested revisions to the strategy. These comments provided substantive feedback, drawing on the expertise of many organizations and countless individuals offering different perspectives on effective approaches to climate adaptation. Stakeholder comments covered many topics, with the most common being the need for more coordination and guidance, funding, and outreach. Many comments offered excellent ideas supported by the working groups and were incorporated into this report where possible. Others will be better addressed once additional information comes in through the implementation of key strategies outlined in the report or when supporting information, resources and funding issues change. All comments will be kept on record as consideration for future updates of this strategy, complemented by additional opportunities for public input. All public input on the CAS Discussion Draft can be viewed on the web at: www.climatechange.ca.gov/adaptation/.

It is recognized that implementation of the following strategies will require significant collaboration among multiple stakeholders to ensure they are carried out in a rational, yet progressive manner over the long term. These strategies distinguish between near-term actions that will be completed by the end of 2010 and long-term actions to be developed over time, and are covered in more detail in the sector chapters in Part II of this report as well as in initial efforts.¹

Key recommendations include:

1. A Climate Adaptation Advisory Panel (CAAP) will be appointed to assess the greatest risks to California from climate change and recommend strategies to reduce those risks building on California's Climate Adaptation Strategy. This panel will be convened by the California Natural Resources Agency, in coordination with the Governor's Climate Action Team, to complete a report by December 2010. The state will partner with the Pacific Council on International Policy to assemble this panel. A list of panel members can be found on the California adaptation Web site. (CS-1).
2. California must change its water management and uses because climate change will likely create greater competition for limited water supplies needed by the environment, agriculture, and cities. As directed by the recently signed water legislation (Senate Bil. X71), state agencies must implement strategies to achieve a statewide 20 percent reduction in per capita water use by 2020, expand surface and groundwater storage, implement efforts to fix Delta water supply, quality, and ecosystem conditions, support agricultural water use efficiency,

¹ Each of the twelve Executive Summary strategies is drawn from multiple strategies within the subsequent sector-specific and cross-sector adaptation strategy chapters. The recommendations here may not reflect exact wording of individual sector recommendations but relate to their core message. Each Executive Summary recommendation here lists the sector and recommendation number using the following acronyms to identify the sector: Public Health (PH), Biodiversity and Habitat (BH), Ocean and Coastal Resources (OCR), Water Management (W), Agriculture (A), Forestry (F), Transportation and Energy Infrastructure (TEI), and Cross-Sector (CS).

improve state-wide water quality, and improve Delta ecosystem conditions and stabilize water supplies as developed in the Bay Delta Conservation Plan. (BH-2, W-3, 6, and 7; A-1; TEI-3).

3. Consider project alternatives that avoid significant new development in areas that cannot be adequately protected (planning, permitting, development, and building) from flooding, wildfire and erosion due to climate change. The most risk-averse approach for minimizing the adverse effects of sea level rise and storm activities is to carefully consider new development within areas vulnerable to inundation and erosion. State agencies should generally not plan, develop, or build any new significant structure in a place where that structure will require significant protection from sea level rise, storm surges, or coastal erosion during the expected life of the structure. However, vulnerable shoreline areas containing existing development that have regionally significant economic, cultural, or social value may have to be protected, and in-fill development in these areas may be accommodated. State agencies should incorporate this policy into their decisions and other levels of government are also encouraged to do so. (CS-2; OCR-1 and 2; W-4 and 9; TEI-2 and 7).
4. All state agencies responsible for the management and regulation of public health, infrastructure or habitat subject to significant climate change should prepare as appropriate agency-specific adaptation plans, guidance, or criteria by September 2010. (PH-3 and 5; BH-1, 2, and 6; OCR-3; F-1 and 2; TEI-2 and 5).
5. To the extent required by CEQA Guidelines Section 15126.2, all significant state projects, including infrastructure projects, must consider the potential impacts of locating such projects in areas susceptible to hazards resulting from climate change. Section 15126.2 is currently being proposed for revision by CNRA to direct lead agencies to evaluate the impacts of locating development in areas susceptible to hazardous conditions, including hazards potentially exacerbated by climate change. Locating state projects in such areas may require additional guidance that in part depends on planning tools that the CAS recommendations call for (see key recommendations 3, 6, 8, 9, and 10; BH-3; OCR-1; TEI-2).
6. The California Emergency Management Agency (Cal EMA) will collaborate with CNRA, the CAL, the Energy Commission, and the CAAP to assess California's vulnerability to climate change, identify impacts to state assets, and promote climate adaptation/mitigation awareness through the Hazard Mitigation Web Portal and My Hazards Website as well as other appropriate sites. The transportation sector CAWG, led by Caltrans, will specifically assess how transportation nodes are vulnerable and the type of information that will be necessary to assist response to district emergencies. Special attention will be paid to the most vulnerable communities impacted by climate change in all studies. (CS-3 and 4; PH-4 and 5; OCR-5; W-4; F-2 and 3; TEI-2, 5, 6 and 8).
7. Using existing research the state should identify key California land and aquatic habitats that could change significantly during this century due to climate change. Based on this identification, the state should develop a plan for expanding existing protected areas or altering land and water management practices to minimize adverse effects from climate change induced phenomena. (BH-1; W-5; F-5).

8. The best long-term strategy to avoid increased health impacts associated with climate change is to ensure communities are healthy to build resilience to increased spread of disease and temperature increases. The California Department of Public Health will develop guidance by September 2010 for use by local health departments and other agencies to assess mitigation and adaptation strategies, which include impacts on vulnerable populations and communities and assessment of cumulative health impacts. This includes assessments of land use, housing and transportation proposals that could impact health, GHG emissions, and community resilience for climate change, such as in the 2008 Senate Bill 375 regarding Sustainable Communities. (PH-3).
9. The most effective adaptation strategies relate to short and long-term decisions. Most of these decisions are the responsibility of local community planning entities. As a result communities with General Plans and Local Coastal Plans should begin, when possible, to amend their plans to assess climate change impacts, identify areas most vulnerable to these impacts, and develop reasonable and rational risk reduction strategies using the CAS as guidance. Every effort will be made to provide tools, such as interactive climate impact maps, to assist in these efforts. (BH-1; OCR- 2 and 4; CS-2).
10. State firefighting agencies should begin immediately to include climate change impact information into fire program planning to inform future planning efforts. Enhanced wildfire risk from climate change will likely increase public health and safety risks, property damage, fire suppression and emergency response costs to government, watershed and water quality impacts, and vegetation conversions and habitat fragmentation. (PH-4 and 5; F-1; TEI-2).
11. State agencies should meet projected population growth and increased energy demand with greater energy conservation and an increased use of renewable energy. Renewable energy supplies should be enhanced through the Desert Renewable Energy Conservation Plan that will protect sensitive habitat that will while helping to reach the state goal of having 33 percent of California's energy supply from renewable sources by 2020. (TEI-2).
12. Existing and planned climate change research can and should be used for state planning and public outreach purposes; new climate change impact research should be broadened and funded. By September 2010, the California Energy Commission will develop the CalAdapt Web site that will synthesize existing California climate change scenarios and climate impact research and to encourage its use in a way that is beneficial for local decision-makers. Every effort will be made to increase funding for climate change research, focusing on three areas: linkages with federal funding resources; developing Energy Commission-led vulnerability studies; and synthesizing the latest climate information into useable information for local needs through the CalAdapt tool. (CS-4; PH-7; BH-4; OCR-6; W-8, 9, and 10; A - 8; F-4 and 5; TEI-3 and 9).

