California @ 50 Million

California's Climate Future

The Governor's Environmental Goals and Policy Report

Draft for Discussion - September 2013

"By the time today's children reach middle age, it is extremely likely that Earth's life-support systems, critical for human prosperity and existence will be irretrievably damaged by the magnitude, global extent, and combination of these human-caused environmental stressors, unless we take concrete, immediate actions to ensure a sustainable, high-quality future."

- Scientists' Consensus on Maintaining Humanity's Life Support Systems for the 21st Century
  May 2013

"There is *high confidence* that neither adaptation nor mitigation alone can avoid all climate change impacts; however, they can complement each other and together can significantly reduce the risks of climate change."

- Intergovernmental Panel on Climate Change
  Synthesis Report 4, Summary for Policymakers

"The idea that somebody could just walk! He can jog perhaps in the morning, but he can't walk anywhere! The world has become inaccessible because we drive there."

- Ivan Illich

"Information is a difference that makes a difference."

- Gregory Bateson

LETTER FROM THE DIRECTOR

The Governor's Office of Planning and Research is pleased to provide the discussion draft of the 2013 Governor's Environmental Goals and Policy Report. This report considers California's future as home to 50 million people, a milestone the state is projected to hit by the middle of this century.

The Report focuses on the state's sustainability efforts across California as part of our multi-faceted response to climate change, which includes reducing greenhouse gas emissions and safeguarding the state from inevitable changes. Looking ahead, the state is poised to grow its population and economy, while protecting the environment for current and future generations. This document helps to guide that course. In addition, we are developing an extensive array of indicators of many aspects of environmental health for the state that will help us evaluate progress to our goals.

This is, first and foremost, a *discussion draft.* We seek input from all parts of California and all aspects of our economy, population, and environment. We'd like your views on the Report, the goals, policies, and indicators of environmental health.

Please let us know what you think. Send comments to: ca.50m@opr.ca.gov

We look forward to hearing from you.

Ken Alex
Director

CALIFORNIA @ 50 MILLION: CALIFORNIA'S CLIMATE FUTURE

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Introduction

Assembly Bill (AB) 2070, passed in 1970, created the Governor's Office of Planning and Research (OPR) and called for OPR to prepare and maintain an Environmental Goals and Policy Report (EGPR). The EGPR views California through a 20-30 year perspective and provides a statement of environmental goals and objectives for the state. Goals and objectives focus on land use, population growth and distribution, conservation of natural resources, and air and water quality. The EGPR also includes a statement of programs and policies required to implement the state's environmental goals. Finally, the EGPR must work in conjunction with the state's planning priorities, which were established in 2002 to guide land use decisions. They prioritize efficient infill development, preservation of the state's natural and working lands and lands of significant cultural value, and efficient development patterns that take advantage of existing infrastructure and minimize costs to taxpayers.[1] State law requires that all state agency functional plans be consistent with the EGPR and that the EGPR inform state budgeting and infrastructure investment.

Governor Brown's 1978 *Urban Strategy for California* was the last EGPR prepared and adopted.[2] The Urban Strategy set forth an action plan for revitalizing and preserving the state's urban areas, with a broad suite of strategies focused on housing, education, health, safety, and infrastructure. Many of the issues addressed in the Urban Strategy resonate today with our efforts to address climate change and build sustainable communities. The Urban Strategy first called out several of the key policy goals that shape today's planning. Perhaps most importantly, the Urban Strategy identified the state's planning priorities. These priorities were adopted into law in 2002.

The 2013 EGPR – California's Climate Future – builds on the model of *The Urban Strategy* and provides a vision for the state and articulates a path that continues and expands the state's efforts toward long-term sustainability. The document is looks at the state's future in the context of California with 50 million residents, a milestone that the state is projected to hit by the middle of this century. As the state continues to grow, we must do so in a way that is in harmony with the state's environment and natural resources.

This document also considers growth in the context of climate change – undoubtedly the biggest environmental challenge of our time. Climate change and the state's efforts to confront it will touch nearly every aspect of the state's planning and investment for the future. California is already tackling these issues. Continuing to reduce greenhouse gas emissions will be critical for minimizing the impacts of climate change. At the same time, the state must escalate its efforts to safeguard the state from the climate change already underway and the larger changes that will be unavoidable in the future.

[1] California Government Code Section 65041.1

[2] The Urban Strategy for California remains a highly relevant document, reflecting many of the sustainability concepts that shape current policies and goals for the state and its communities. It is available here: http://www.opr.ca.gov/docs/urban_strategy.pdf

This EGPR is intended to provide the broad overview of state efforts to confront these challenges over the next several decades. More than simply an inventory of the state's goals, the EGPR is a holistic view that evaluates and articulates how they work together to achieve long-term sustainability. These goals work together to identify pathways for the state to build a strong future. While this document is intended to provide the broad overview and key pathways forward, other state planning documents will serve to further lay out many of the programs that will support realizing the state's long-term goals.

Looking ahead, the state is poised to grow its population and economy, while protecting the environment for current and future generations. This document helps to guide that course.

Chapter 1 - A Vision for California's Future

As the guiding vision for this document, we see a vibrant state with a robust economy that functions in harmony with the environment and provides a high quality of life for all Californians. California's future will be built around:

A strong economy A vibrant economy provides opportunities for all Californians, attracts investment to the state, and is fueled by a skilled workforce and the state's world-class education system.

Thriving urban areas Urban areas are thriving and growing, attracting residents with employment opportunities, strong schools, and cultural and social opportunities. Compact, infill and redevelopment is the first priority for new development, coupled with a goal to preserve natural and working lands.

Prosperous rural regions The state's rural regions prosper and grow creating harmony with the state's environmental, economic, and social well-being. The value of natural resource systems, landscapes, and species diversity is reflected in state and local decision-making. Intact natural systems and prime agricultural land provide resilience for the natural and built environment.

A clean environment All Californians enjoy clean air, clean water, access to healthy foods, and open space for recreation. Pollution prevention is a guiding principal in development of consumer products and commercial and industrial practices.

Clean and efficient energy system Businesses and households are powered by clean, efficient renewable energy sources. Energy efficiency remains the energy source of first priority for meeting new energy demand, followed by clean, renewable energy. Distributed energy generation systems contribute to energy system resilience and energy independence.

Efficient and sound infrastructure Modern infrastructure investments facilitate easy mobility within communities and connectedness across the state. The state's regions are connected through a state-of-the-art high-speed rail system that integrates with local and regional transit, enabling people to easily traverse the state for work and pleasure. High-speed broadband connects the state's regions and brings much-needed services to the state's rural regions.

Chapter 2 – California's Climate Future

How we address climate change will be a major factor shaping the state's future. Currently, the state and the world are at a critical juncture for addressing the largest environmental challenge of our time. Earlier this year, atmospheric concentrations of carbon dioxide surpassed 400 parts per million (ppm) in a daily measurement at the Mauna Loa Observatory in Hawaii, a level not seen in 2-3 million years.[3] The most recent international assessment of climate change finds increasing evidence of climate change and finds that it is "extremely likely" that human influence has been the dominant cause of observed warming.[4] Climate change is already affecting the state's infrastructure, natural resources, agriculture and communities, with even larger impacts projected in the future. The actions we take in response to climate change will impact the state's citizens, economy, and the natural and built environments.

Even with successful reductions of emissions globally, some amount of climate change is inevitable (Figure 1). Rising temperatures will be accompanied by rising sea levels and increases in the frequency and severity of extreme weather events including heat waves, wildfires, and flooding. Working to avoid the worst of these impacts, and adapting to those that are inevitable will shape many of the state's future decisions. The consensus among scientists is that the changes underway are dramatically altering the planet, resulting in climate disruption, mass extinctions, and transformation of ecosystems. Failure to address these changes will result in a planet that is irreversibly damaged for future generations.[5]

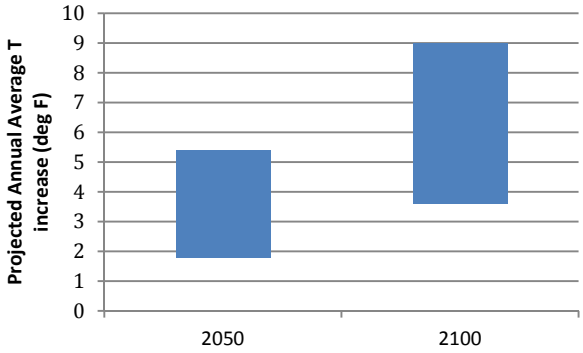

Figure 1: Some amount of climate change is inevitable, even with successful efforts to reduce GHG emissions[6]

Rising temperatures and sea level will have important consequences for the state's natural and built environments. More precipitation is likely to fall as rain than as snow, which will affect snowpack levels,

[3] http://www.esrl.noaa.gov/gmd/ccgg/trends/mlo.html
[4] Intergovernmental Panel on Climate Change. 5th Assessment: Summary for Policymakers. Available here: http://www.climatechange2013.org/images/uploads/WGIAR5-SPM_Approved27Sep2013.pdf
[5] Scientific Consensus on Maintaining Humanity's Life Support Systems in the 21st Century. Available at: http://mahb.stanford.edu/wp-content/uploads/2013/05/Consensus-Statement.pdf
[6] Temperature projection data from Cayan et al., 2012 (http://www.energy.ca.gov/2012publications/CEC-500-2012-008/CEC-500-2012-008.pdf).

and therefore stream runoff timing and volume, posing greater flood risks and risks to species adapted to current conditions. Reduced snowpack will also have important consequences for the state's water supply. Snowpack in the mountains is a critical water storage resource for the state's water system. Under high warming scenarios, it is estimated that snowpack in the Sierra Nevada could decrease by as much as 90%.[7]

Increasing levels of carbon dioxide in the atmosphere are mirrored by higher carbon dioxide concentrations in ocean waters off the coast of California. This increase in carbon dioxide in the water results in higher acidity in marine environments. Ocean acidification threatens marine animals, and erodes shells of shellfish such as oysters, lobsters, and abalone. After the recent completion of the nation's first statewide coastal system of marine protected areas (MPAs), the coastal portion of the network now covers approximately 16 percent of all open coast state waters.[8] Efforts are underway through the Marine Protected Area Monitoring Enterprise to monitor the impacts of climate change, including ocean acidification, on the marine environment.[9]

Meeting the Climate Challenge

California is already on the way to charting a strong climate future through its policies, research, and partnerships. Programs are in place that are achieving emission reductions and putting the state on the path to meeting its 2020 goal to reduce greenhouse gas (GHG) emissions to 1990 levels. The state is also developing tools, guidance, and strategies to safeguard California from the inevitable impacts of a changing climate. Over the next several decades, the state needs to maintain the momentum it has established and set its sights on future milestones and targets. There are four key pieces to the state's climate future:

Meet AB 32 Emission Reduction Target

California is well on its way to reduce GHG emissions to 1990 levels by 2020, the goal established through Assembly Bill (AB) 32, the Global Warming Solutions Act of 2006. These reductions are being achieved predominantly through increased renewable energy development, energy efficiency, vehicle GHG emission standards, and a robust cap and trade program. The success of these programs to reduce emissions is proof that California can harness creativity and entrepreneurship to tackle these challenges, maintain a strong economy, and develop programs that are models for other states, the nation, and international partners.

Reduce GHG Emissions 80% Below 1990 Levels by 2050

Achieving the 2020 target is just one step toward long-term stabilization of the climate. To limit the amount of warming experienced, significant additional GHG emission reductions are needed. Therefore, the state is committed to reduce economy-wide GHG emissions 80% below 1990 levels by the middle of

[7] Knowles, Noah and Daniel R. Cayan, 2002. Potential Effects of Global Warming on the Sacramento/San Joaquin Watershed and the San Francisco Estuary. *Geophysical Research Letters*, 29(18).

[8] California Department of Fish and Wildlife Marine Protected Areas Update dated May 7, 2013

[9] Information on the Marine Protected Area Monitoring Enterprise is available here: http://monitoringenterprise.org/role.php

this century. The scientific community has acknowledged that reductions of this order will be necessary, on a global scale, to avoid the worst climate impacts.

Establish a Mid-Term Emission Reduction Target

The state has already shown progress in reducing GHG emissions. However, achieving deep emission reductions by 2050 will require that the pace of reductions increase over the coming decades. Decisions made today are critical in shaping these conditions for the future. Therefore, the state needs a mid-term emission reduction target to provide a goalpost to guide near-term investment and policy development. A mid-term target will allow us to gauge current actions relative to our climate goals and serve to provide a clear sign of the state's commitment to achieving long-term climate stabilization. This commitment will send a strong signal of support for the innovators and entrepreneurs to drive technology and development to tackle the challenge of climate change.

Invest in Climate Readiness and Adaptation to Safeguard California

Even as the state is successfully reducing GHG emissions, some amount of climate change is inevitable. In fact, the state is experiencing effects of climate change today. Therefore, investments and policies must be in place to protect existing high value infrastructure and natural systems and to avoid making investments in high-risk areas. These actions can take many forms, but must include boosting resilience of natural systems to recover from climate impacts, protection of critical infrastructure, and being mindful of future climate change in decisions being made today.

Realizing California's Climate Future

California has adopted a comprehensive approach to addressing climate change that is built on three interconnected elements:

1. **GHG emission reduction to reduce the impacts of climate change**

   The AB 32 Scoping Plan provides a comprehensive overview of the broad suite of state policies and programs to reduce GHG emissions. Prepared by the California Air Resources Board in 2008 and updated in 2013, Scoping Plan is the guiding document for the state's emission reduction goals.[10]

2. **Increasing preparedness and resilience to safeguard California from a changing climate**

   In 2009, the California Natural Resources Agency adopted a Climate Adaptation Strategy. The Climate Adaptation Strategy provides overarching guidance to all state agencies on how to prepare for climate change and safeguard California's people, resources, and infrastructure. It has informed the development of further guidance and tools for to aid in adaptation planning. A forthcoming update further refines the state's strategy to safeguard California.[11]

3. **A strong program of research to understand the risks of climate change and the effectiveness of tools to reduce emissions and increase preparedness.**

[10] http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm
[11] http://climatechange.ca.gov/adaptation/strategy/index.html

> California has invested significant resources to understand the impacts of climate change on California's natural and built environment, public health, and key economic sectors. The state's Third Assessment of Climate Change provides the most up-to-date research that informs and responds to the state's policy needs.[12]

These three elements of the state's climate strategy inform one another and guide actions across state agencies to meet the state's climate goals. Updated research drives the state's climate actions and policy needs help to define research directions. Together these elements help the state design a sound course of action and make adjustments as needed to meet the state's climate goals.

[12] http://climatechange.ca.gov/climate_action_team/reports/climate_assessments.html

Chapter 3 - California @ 50 Million

Addressing the climate challenge will occur as California's economy and population continues to grow. The State is projected to be home to 50 million residents by the middle of this century (Figure 2a). Over the next several decades, the state has tremendous opportunities to shape the direction of this growth. Construction of the nation's first high-speed rail system will build connectivity throughout the state and provide opportunities for planning growth and development in a more sustainable way. Investments in the state's water system, transportation networks, and communities will present similar opportunities. Investment of new revenue sources, including those from the state's carbon cap and trade market, also present new and exciting opportunities.

While the rate of population growth in California is moderating (Figure 2b), some important demographic shifts are underway that will affect the state's future and how we plan for it. Population projections from the State's Department of Finance[13] show that the state's population is aging, with a much larger share of the population projected to be over age 70 by 2035 and 2050. As a share of the population, this age bracket is projected to double by the middle of this century (Figure 2c). In addition, these same projections show that population growth is projected to be much higher in the inland parts of the state as opposed to the more urbanized coastal areas (Figure 2d). These demographic shifts point to important challenges and opportunities for future planning, including changing market demands for housing and services.

[13] Population projection data by age and county from Department of Finance, Interim Population Projections (http://www.dof.ca.gov/research/demographic/reports/projections/interim/view.php)

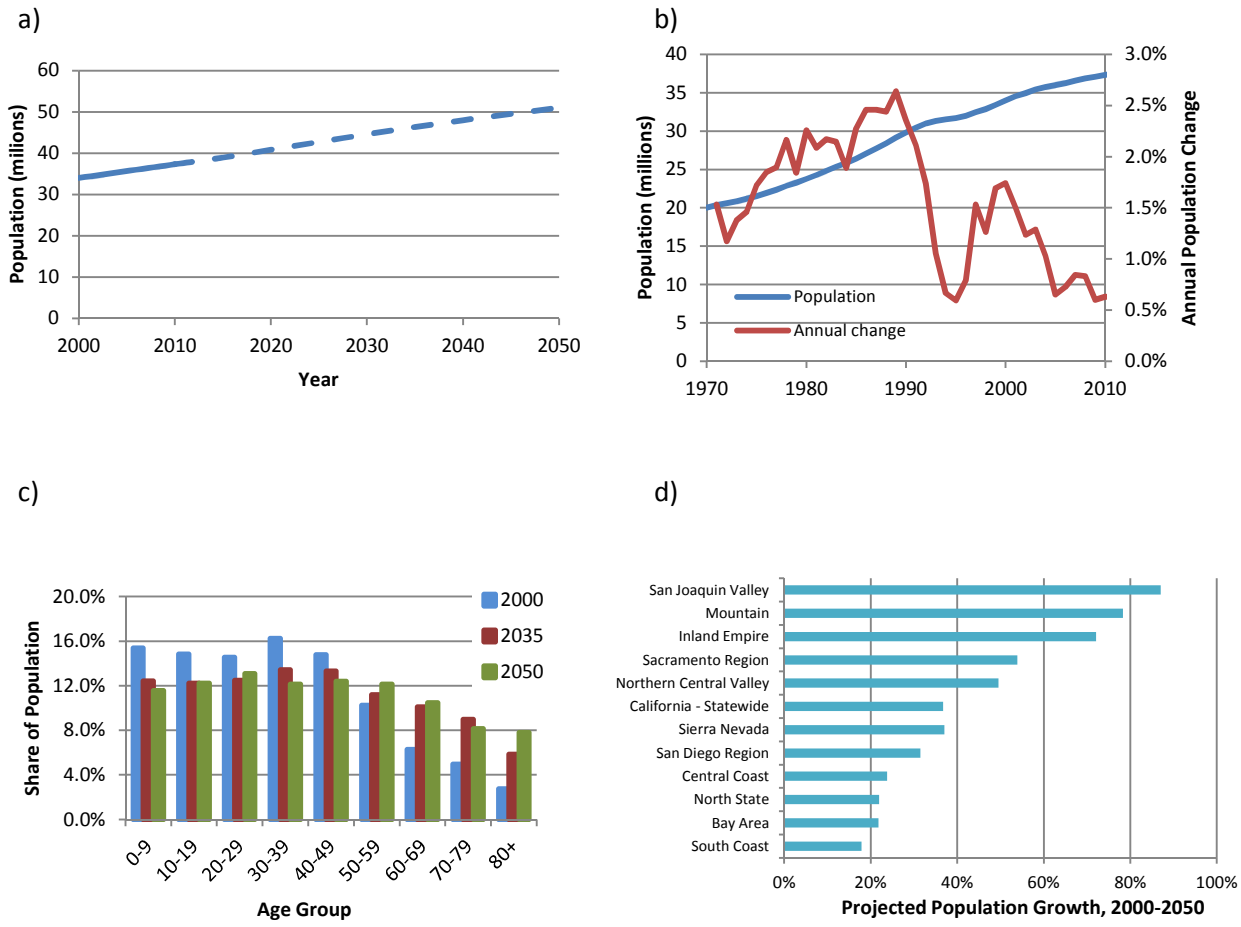

Figure 2: California's population growth rate has slowed (a), but population is projected to hit 50 million by 2050 (b). The population is aging (c) and the greatest growth is projected to occur in the state's inland regions (d)

Over the next several decades, the state is confronting several large environmental challenges, including meeting state and federal air quality standards, managing the state's complex water system, and protecting the state's rich agricultural and working lands and diverse natural habitats. Chief among these challenges is climate change. Reducing climate-related impacts will require, among other things, significant reductions in greenhouse gas emissions achieved through transformation of the state's energy and transportation systems. Alongside these reductions, the state will need to continue taking steps to prepare for the inevitable impacts of a changing climate.

California's Environment and Economy – Partners for the Future

California's long-standing commitment to environmental stewardship and its abundant natural resources have provided significant economic benefits to the state. From its burgeoning clean economy, to its productive agricultural lands, to the natural attractions that fuel tourism and recreation, California's commitment to its environment is a key element of a balanced and prosperous economy.

While this document focuses on the state's environmental goals, it is important to note that our climate, natural resources, and clean environment are key contributors to the state's economy through job creation, driving large economic sectors, and attracting a productive workforce.

California's leadership on environmental and energy issues has provided significant economic benefits. The state's energy efficiency standards have saved Californians more than $74 billion in reduced electricity bills since 1975.[14] Almost all analyses show that California is home to the largest number of green jobs in the country. The estimated number of jobs in the clean economy in California ranges from just over 125,000 (2007, Pew), to 174,000 (2009, Next10), to just over 318,000 (2010, Brookings) – the variation arising from how one defines a "green job."[15] At he higher end of that range, green jobs account for just over 2 percent of all jobs in California. California companies have earned the largest number of patents in the clean economy sector than any other state and have attracted more venture capital investment.[16] When comparing energy projects, analysis shows that renewable energy and low-carbon fuel sectors provide more jobs per unit energy than the fossil fuel sector (Figure 3).[17]

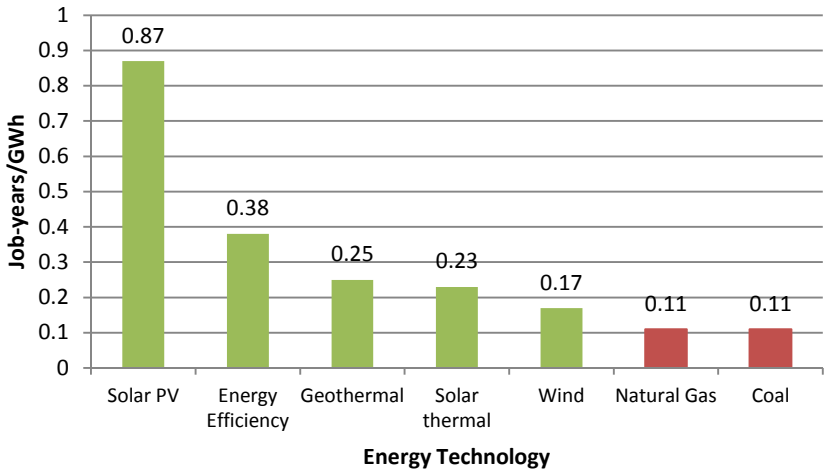

Figure 3: Renewable energy technologies provide more jobs per unit energy than fossil-fuel generation technologies[18]

A sound environment also serves as a foundation for several of the state's defining industries – tourism, agriculture, and forestry. The state's agricultural areas rely on fertile soils and temperate climate.

[14] Roland-Holst, D. 2006. Energy Efficiency, Innovation and Job Creation in California, Next 10, San Francisco, CA. Available: http://next10.org/sites/next10.huang.radicaldesigns.org/files/UCB_Energy_Innovation_and_Job_Creation_10-20-08.pdf

[15] These estimates are for different years, so some variation is accounted for by growth. However, the difference in the estimates is too large to be accounted for by this growth alone. One difference is that the Brookings analysis includes jobs related to public mass transit while the Pew analysis does not.

[16] Next10, 2012. *Many Shades of Green: California's Shift to a Cleaner, More Productive Economy*. San Francisco: Next10.

[17] Wei, Max, Patadia, Shana, and Kammen, 2010. Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?. *Energy Policy* 38: 919-931.

[18] Green bars show renewable energy and energy efficiency technologies, red bars show fossil fuel generation projects

Preserving agricultural land is important economically for many of the state's regions, and socially by supporting local, healthy food systems for Californians. MPAs support the state's fishing industries. The state's tremendous forest areas are the foundation for a robust timber industry. California's natural resources are also a key attraction that drives the state's tourism industry. In 2012, travel in California resulted in over $105 billion in direct spending and supported over 900,000 jobs.[19]

California's natural infrastructure provides clean drinking water, fertile soils, and protection from storms, floods, and other extreme events. Much of the state's water flows from mountain stream systems. Healthy, intact watersheds provide natural filtration and storage for the state's drinking water. Nearly two-thirds of the state's rain falls in the sparsely populated northern and mountain regions of the state, while most of the demand occurs in the more populated coastal and southern parts of the state.[20] Preservation of these watersheds, therefore, is a critical component of the state's water system. Furthermore, wetlands on the coast provide natural buffers against storms and erosion and provide natural cleaning systems for water that flows to the state's coast. Protecting these resources is critical under current conditions, and is likely to be even more important under a changing climate, where they will face additional stresses.

Envisioning Our Choices

Looking ahead, the policy choices made today and over the next several years will have large impacts on the state's environment and economy. These choices include the policies and programs that shape technology development, but also decisions about how cities and regions grow and develop.

For example, we can reduce the amount of land that is developed to accommodate the state's population growing to 50 million people by nearly 75% by implementing aggressive smart growth policies. This includes higher density, mixed-use development, better access to transit, and other policies that facilitate reductions in driving (Figure 4). This reduction in land consumption can reduce pressures on agricultural and working lands, forests, and other important land resources. It can also help to facilitate more efficient transportation, housing, and business location choices.

[19] Data from VisitCalifornia.com: http://industry.visitcalifornia.com/Research/California-Statistics-and-Trends/

[20] Hanak, Ellen et al. 2011. *Managing California's Water: From Conflict to Reconciliation*. San Francisco: Public Policy Institute of California.

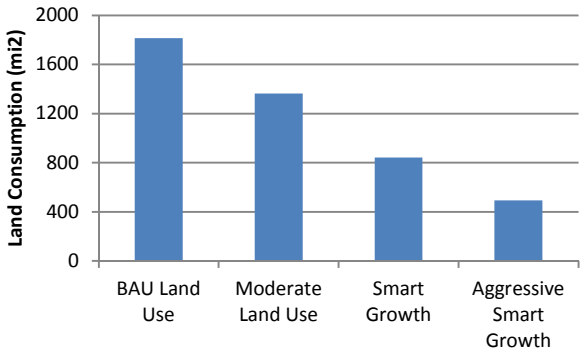

Figure 4: Close to 75% less land can be developed under aggressive smart growth policies than continuing traditional development patterns[21]

These policy choices also have important impacts on public health, GHG emissions, cumulative infrastructure costs, and household utility costs (Figure 5a-d). Coupling smart land use with policies that push energy and transportation technologies and fuels, the benefits can be even larger.

[21] Analysis based on modeling prepared by Calthorpe Associates for a set of four land use and three policy scenarios.

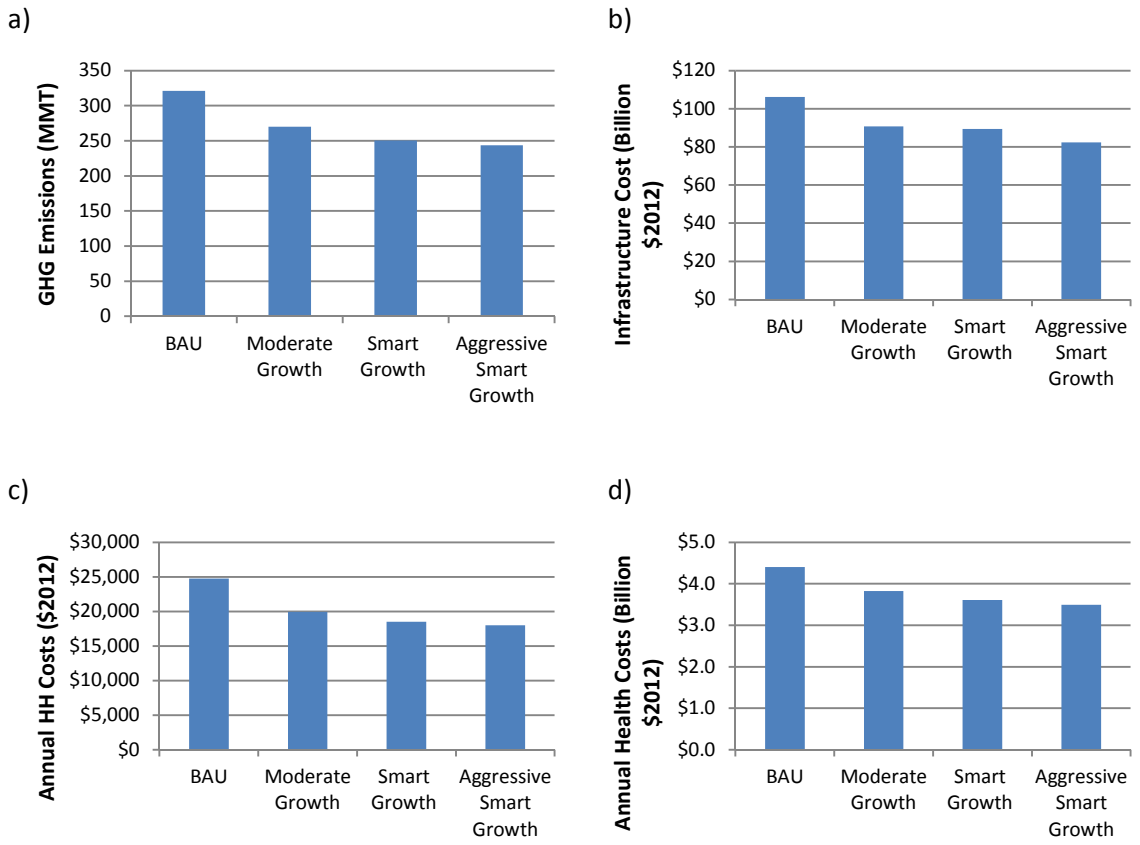

Figure 5: More compact growth results in lower GHG emissions (a), lower cumulative infrastructure costs (b), lower household costs for energy and water (c), and reduce health costs (d)[22]

The Role of Metrics

The state's future is guided by a broad set of specific metrics that include benchmarks, targets, or aspirational goals. It is critical to track progress and gauge success moving forward. Throughout this report, key metrics are identified that will improve our understanding of our progress. These metrics not only track environmental progress, but also encompass health, economy, innovation, and equity. These metrics will be incorporated into planning at the state, regional, and local level. They will also be made available through an online indicator portal being developed by the Governor's Office of Planning and Research, available here: http://www.opr.ca.gov/s_ca50m.php.

[22] Analysis of future land use and policy scenarios prepared for OPR by Calthorpe and Associates using the RapidFire model.

Chapter 4 – Goals for California's Future

Comprehensive policy approaches are needed to achieve the state's climate change emission reduction and readiness goals. Five key elements will make up the state's plan to meet the challenge of climate change. Together these five actions will help to reduce the emissions that cause global warming and build resilience to respond to a changing climate:

1. Decarbonize the State's Energy and Transportation Systems
2. Preserve and Steward the State's Lands and Natural Resources
3. Build Sustainable Regions that Support Healthy, Livable Communities
4. Build Climate Resilience into All Policies
5. Improve Coordination Between Agencies and Improve Data Availability

Decarbonize the State's Energy and Transportation Systems

As the largest sources of both GHG and air pollution emissions, the state's energy and transportation systems are key to achieving long-term GHG emission reductions. Significant technological improvements are needed in electricity generation and storage, vehicles, and fuels, along with reductions in demand through energy efficiency programs, smart land use, and investments in better infrastructure. Cleaning up the state's energy and transportation systems is a critical element of not only meeting the state's climate change goals, but also meeting federal air quality standards.

This transformation of the state's energy and transportation systems will be shaped by the following goals:

- Renewable Portfolio Standard: 33% of electricity from renewable sources by 2020
- Increasing energy efficiency, including that all new construction be zero net energy (ZNE) in the residential sector by 2020 and in the commercial sector by 2030.
- Zero-emission vehicles and advanced clean cars: 1.5 million zero-emission vehicles by 2025
- Clean transportation fuels
- Efficient land use and transportation planning through regional sustainable community strategies
- Improved water efficiency: Reducing per capita water use 20% by 2020
- Achieving state and federal air quality standards

To reduce greenhouse gas (GHG) emissions, the state needs to largely decarbonize the state's electricity supply. This means increasing the amount of clean and renewable sources of energy and drastically reducing the use of carbon-emitting fossil fuels. At the same time, the state must reduce energy demand through efficiency measures and shifting as many direct fuel uses from fossil fuels to electricity

as possible. This will require a shift to electric vehicles. To meet the long-term GHG emission reduction target of 80% below 1990 levels by 2050, the state will need for nearly three-quarters of its electricity to be generated from non-GHG producing sources – meaning renewable sources or, potentially, nuclear power or fossil fuel combined with carbon capture and sequestration.[23]

Efficiency measures are also critical for transforming the energy and transportation systems. To meet the state's long-term GHG emission reduction goal, tremendous sustained improvements in energy efficiency are needed – amounting to a 1.3%/year improvement in energy efficiency.[24] Achieving energy efficiency improvements in the existing building stock will be critical for achieving energy efficiency goals. Furthermore, nearly 20% of California's electricity consumption is devoted to water-related energy use.[25] Therefore, improvements in water use efficiency are a key element of reducing the state's energy use.

Efficiencies in transportation infrastructure and land use planning will also be important for reducing emissions. Investments in public transit and safe, walkable communities are needed to provide viable alternatives to driving. Diversifying land use, designing neighborhoods that are easier to walk in, and creating closer proximity between housing and jobs all have a significant effect on travel behavior and can result in decreases in the amount people drive.[26]

In addition to building communities that make it easier for people to use alternatives to single-occupant vehicles, major investments are also needed in how we move between the state's regions. Investment in the state's high-speed rail system combined with advancements in vehicle technology and efficiency will reduce the environmental impact of the state's transportation system. The state's high-speed rail will connect the state's regions, providing alternatives to highway travel and interregional air trips. Tying these investments to robust local transportation networks will be key for realizing their maximum environmental benefits. However, realizing these environmental benefits is contingent upon efforts to ensure clean electricity generation to power the high-speed rail system.[27]

The order in which the state makes these investments and transforms the energy and transportation systems is important from both an economic and environmental perspective. Setting in place goals for energy and water efficiency improvements will help to avoid an over-investment in new, clean electricity generation to meet energy demands. Cleaning up the state's energy generation mix is key for insuring that increased electrification, especially in the transportation sector, does not result in an increase in GHG or air pollution emissions.

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[23] Williams, et al., 2011, The Technology Path to Deep Greenhouse Gas Emissions Cuts by 2050: The Pivotal Role of Electricity. *Science*. November 24.
[24] *Ibid*.
[25] http://www.energy.ca.gov/research/iaw/water.html
[26] Ewing, Reid, and Robert Cervero. 2001. "Travel and the Built Environment: A Synthesis." *Transportation Research Record* 1780. 87–114.
[27] Chester and Hovarth, 2012. High-Speed Rail with Emerging Automobiles and Aircraft Can Reduce Environmental Impacts in California's Future. *Environmental Research Letters* 7: 1-11.

Transforming the electricity and transportation sectors is not only necessary for reducing GHG emissions, but also for meeting federal air quality standards. Both the South Coast Air Basin and the San Joaquin Valley must attain the current eight hour ozone standard by 2032. Meeting this deadline will require accelerating some programs to reduce GHG emissions. Attaining air quality standards will require consideration of the air quality impacts of all actions for reduction of GHG emissions and to undertake actions that can address both issues as much as possible.

Many of the steps to reduce GHG emissions from the electricity sector will also help to build resilience in the system. Lower overall energy demand, locally distributed energy systems, and demand response programs will make it easier to weather extreme heat events and increases in peak energy demand. Similarly, water-use efficiency will help water consumers successfully navigate water supply challenges under a changing climate.

Land use policies that support active transport, development of parks and open space, and mixed-use development can also build resilience in urban settings. Trees, parks, and vegetation can reduce energy demand in buildings through shading and also serve to provide relief from urban heat island effects.

Key Actions to Decarbonize Energy and Transportation

Clean energy and transportation systems are critical for reducing GHG emissions, achieving air quality goals, and improving overall health. The transformation that is needed is radical, not incremental. To achieve this, the state needs new approaches for assessing needed technological and institutional changes and to develop a strategy to initiate and sustain this transition.

1. **Integrate transportation and energy planning through a process led a group that includes representatives from the state's energy, air quality, and water agencies.**
   As the transportation sector is electrified, distributed generation is incorporated into the electricity grid, and increased energy efficiency and demand response are built into the energy system, the state's existing institutional structure for managing the state's energy policy will be challenged to coordinate to meet the state's goals. The order in which these events take place have environmental, public health, and economic considerations. Therefore, it is imperative that the state have a robust process for coordinating implementation. Increased collaboration, joint planning, and integration across agencies and goals will be required. Furthermore, the water-energy nexus needs to be better incorporated into energy planning.

2. **Build stronger connections between energy and water in planning and analysis.**
   More analysis is needed to better understand the water-energy nexus, including regional variation and opportunities to jointly reduce water and energy use. In addition to the technical dimensions of this overlap, work is needed to identify and exploit opportunities to jointly plan for energy and water management. Water efficiency needs to be incorporated into the state's Energy Efficiency Strategic Plan, a document prepared by the California Public Utilities Commission that has traditionally focused solely on electricity.

3. **Fully integrate renewable generation sources into the electrical grid without building of additional fossil fuel back-up generating capacity.**
   To reap fully the environmental and economic benefits of renewable energy generation, plans need to be made to most effectively incorporate these resources and minimize the need for additional back-up generation capacity, especially from fossil fuel powered sources.

4. **Develop a strategy for retrofitting and improving the energy efficiency of the existing residential, commercial, and state-owned building stock.**
   Sustained energy efficiency improvements are needed to meet GHG emission reductions goals, but also to minimize the necessary investment in renewable generation capacity. Improvements in the existing building stock will be required to reduce energy and water demand, but also to convert as many direct fuel uses as possible to electricity. Developing appropriate mechanisms and incentives to insure this transition will be critical for achieving necessary energy savings.

5. **Invest in technologies and support to reduce emissions from goods movement and freight in California.**
   California is home to several critical gateways for international trade, and the state's freight system is important for the movement of goods within CA, throughout the USA and internationally.

6. **Implement and support creative financing mechanisms to support the deployment of distributed renewable energy generation systems and energy efficiency projects.**
   Tools are needed that decrease the financial barrier to small-scale distributed energy development. These include the use of on-bill repayment options and property-assessed clean energy (PACE) programs.

7. **Align state transportation investments with goals set forth in sustainable community strategies and projects that reflect broader state sustainability goals.**
   Transportation investments are one of the largest portions of the state's infrastructure budget and these investments have long lives and far-reaching impacts on travel patterns and land use. Therefore, it is critical that these decisions be made in a manner that is consistent with the state's planning priorities and regional sustainable community strategies.

Measuring Progress

To track the state's progress in transforming the energy and transportation systems we need to track a broad set of indicators to understand energy demand, energy efficiency, travel trends, environmental impacts, and water use. Key metrics include:

- Renewable energy generation capacity in megawatts (MW)
- Energy demand
- Energy efficiency and energy productivity
- Vehicle miles traveled

- Clean energy investment – patenting activity and private investment
- GHG emissions
- Criteria air pollutant emissions
- Exceedances of federal air quality standards

Below are some recent trends in some of these metrics.

With the state's leading energy efficiency standards for buildings and appliances, the state's per capita energy use has remained nearly constant for decades (Figure 6). These energy savings have resulted in billions in savings for California residents and businesses.[28]

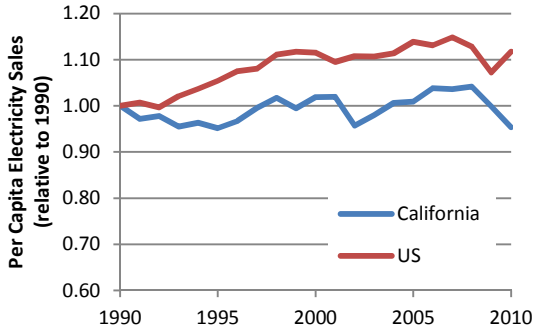

Figure 6: Even as California's population has grown, per capita energy use has stayed nearly constant as a result of energy efficiency standards for buildings and appliances[29]

California has also had tremendous success in reducing emissions from transportation sources, with the state's standards often serving as a model for the other states and, ultimately, the nation. This has been especially important in the passenger vehicle sector. As a result of the state's vehicle tailpipe standards for passenger vehicles, smog-forming emissions from passenger vehicles have declined dramatically, even as the number of cars and the number of miles driven have increased (Figure 7).

[28] Roland-Holst/Next10 reference
[29] Data from the Energy Information Administration via the California Energy Commission (http://www.energyalmanac.ca.gov/electricity/per_capita_electricity_sales_1990-2010.html#19902010)

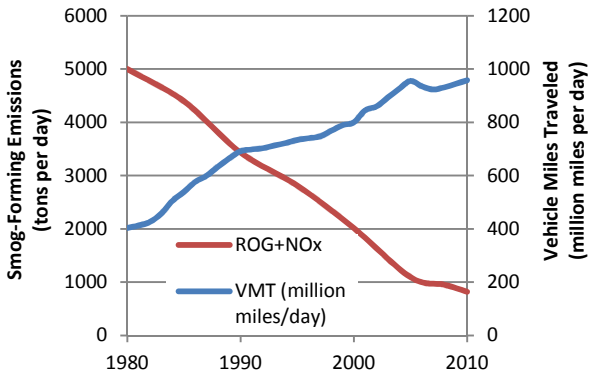

Figure 7: California's tailpipe regulations have greatly reduced smog-forming emissions from passenger vehicles, even as vehicle population and vehicle miles traveled have increased greatly[30]

Looking to the future, California needs to continue to make improvements in air and water quality, protect and preserve the state's natural resources and landscapes, and foster healthy and sustainable communities. The dramatic reductions in passenger vehicle and other emission sources have resulted in considerable progress in reducing the number of days violating federal air quality standards. However, a significant challenge still remains, with the South Coast and San Joaquin Valley air basins continuing to violate the federal ozone standard a significant portion of the year (Figure 8).

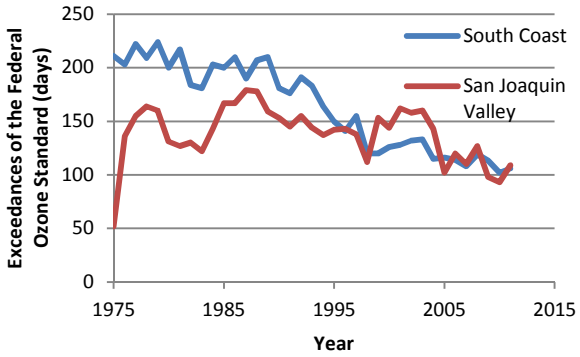

Figure 8: The South Coast and San Joaquin Valley air basins continue to violate air quality standards more than one hundred days per year[31]

[30] Data from the California Air Resources Board
[31] Air quality data from the California Air Resources Board.

Preserve and Steward State Lands and Natural Resources

California is rich in natural resources – abundant biodiversity, spectacular coasts and mountains, the most productive agricultural land in the country, diverse forests and timberlands, and many other natural treasures. Natural resources including land, water, plants and animals provide significant value to the state in many ways, including economic, cultural, recreational, and through ecosystem services, such as carbon sequestration, water filtration, and other environmental benefits. Furthermore, natural lands play an important role in maintaining climate stability and building resilience to climate change.

Looking ahead, the state needs to take steps to preserve natural systems, working landscapes, and natural resources, with the goals of:

- Work to increase ecosystem services and biodiversity,
- Ensuring resilience of natural systems to recover from disruption,
- Promoting the use of "green infrastructure" to lessen environmental impacts of development and to provide protection from natural disturbances,
- Ensuring the preservation of agricultural lands and working landscapes to support the state's agriculture and forestry industries in the most sustainable manner.
- Manage commercial and recreational fish stocks in the face of changing ocean chemistry.

Key Actions to Preserve and Steward State Lands and Natural Resources

1. **Streamline land acquisition and management**

   Several departments and other entities within the Natural Resources Agency are engaged in land acquisition and/or land management, including the Department of Parks and Recreation, Department of Conservation, Department of Fish and Wildlife, Department of Forestry and Fire Protection, Department of Water Resources, Wildlife Conservation Board, and the Coastal Conservancy. Better coordination is needed to ensure consistency and maximum benefits from the state's land acquisition and management.

   Consolidating land acquisition functions would:

   - Enable the state to better identify and implement the state's strategic land acquisition goals.
   - Establish procedures that place the state in a better position to conduct negotiations to achieve the lowest price possible.
   - Eliminate procedures that are disadvantageous.
   - Better leverage the state's large purchasing power.
   - Reduce administrative costs by eliminating unnecessary processes and produce greater efficiencies.

   Effectively leveraging these resources to meet common goals under the leadership of the Office of the Secretary for Natural Resources, combined with increased staffing flexibility, would maximize the benefits yielded from public expenditures to protect and conserve California's natural resources and biodiversity.

2. **Provide resources for long-term stewardship of lands**
   For many years, general obligation bonds have funded the acquisition of land, but not its long-term stewardship. The lack of viable and sustainable funding for ongoing management puts at risk the protection of resource lands. In addition, the loss of state funding used to support the California Land Conservation (Williamson) Act, has jeopardized the preservation of agricultural and working landscapes. Funding resources are needed for management and stewardship of key lands across the state – parks, wildlife habitat, coastal lands, and working lands – to protect them for the benefit of future generations.

3. **Build resilience in natural systems**
   The state's natural lands and working landscapes are critical elements of the efforts to address climate change. Forests, wetlands, grasslands, and other landscapes provide important carbon sequestration opportunities for the state. Proper management of natural systems is also a key for weathering changes that occur under a changing climate. For instance, responsibly managed forests can mitigate risks from wildfire and well-maintained watersheds and floodplains can lessen flood risks resulting from variations in stream flow and timing of runoff.

   Certain ecosystems also provide necessary habitat for the state's native species and provide migration corridors and access to necessary habitat and food. With a changing climate, it becomes even more critical that these ecosystems remain intact and that pathways are available for species to migrate as the climate changes. Movement of some species has already been noted in California – with some species moving to higher latitudes and elevations as temperatures have increased.[32]

   Ocean resources are also at risk. Commercial and recreational fisheries will be affected with some commercial stocks moving and others disappearing. Migration patterns will be disrupted, fishing grounds will be altered, and the very chemistry of the sea will change. The shellfish industry is already seeing the impact of rising ocean acidity.

4. **Innovative land use planning to balance multiple objectives**
   Cooperation between state, federal, and local governments is necessary to optimize land use planning to balance multiple state environmental objectives especially in light of projected population growth and climate stresses.

   California has already undertaken complex planning processes that may serve as models for innovative land use planning efforts that balance multiple objectives.

[32] Reference needed

- The Bay Delta Conservation Plan

The Bay Delta Conservation Plan is also being developed to support the co-equal goals of enhancing state water reliability and the ecological health of the Sacramento-San Joaquin Delta.[33]

The Sacramento-San Joaquin Delta is a critical element of the state's water system. The Bay Delta Conservation Plan seeks to improve the health of the ecological system as a whole. The plan also aims to provide for a more reliable water supply for California by modifying conveyance facilities to create a more natural flow pattern. The BDCP attempts to balance these goals in a way that is feasible given the variety of important uses in the Delta including flood protection, agriculture and recreation.

- The Desert Renewable Energy Conservation Plan

The Desert Renewable Energy Conservation Plan (DRECP) being developed to support programmatic development of large-scale renewable energy and the co-equal objective of conservation of the California desert.[34]

The primary driver for renewable energy development in the DRECP area is the state's long term greenhouse gas reduction goals. The DRECP will streamline permitting under the California Natural Community Conservation Planning Act, the federal Endangered Species Act, and the Federal Land Policy Management Act for utility-scale renewable energy development for solar, wind, and geothermal generation within development focus areas, while providing for the conservation of species and natural communities in a landscape-scale conservation plan.

5. Build a strong, sustainable water system

It takes sophisticated use of water to make California the most populous state in the nation, with the most productive farm economy, and a rich abundance of wildlife and natural beauty. However, Californians must get even smarter about how they use water. Over the next several decades, the state's population will grow to reach 50 million. As those decades unfold, climate change -- its effects already being felt -- will raise temperatures, shift precipitation patterns, and shrink the Sierra Nevada snowpack, which provides a significant share of California's water supply.

No quick or singular fix will satisfy California's future water demand. It will take a multitude of diverse projects, most of them local or regional. It will require cooperation across boundaries and disciplines so that water supply projects provide multiple benefits, such as managing floodwaters, saving on water treatment costs, and enhancing the environment.

This integrated approach requires first, that we reduce water waste wherever possible. We must also capture and store water when streams run high; recycle wastewater; strip salts and chemicals

[33] http://baydeltaconservationplan.com
[34] www.drecp.org

from ocean, brackish, and polluted water; bank more water in aquifers; and transfer water between willing buyers and sellers. It will take the widespread use of efficient faucets, showers, toilets, and washing machines; the lining of canals and installation of farm micro-irrigation systems; the replacement of thousands of front lawns with drought-tolerant and native plants; and vigilant action by property owners to fix leaks and adjust sprinklers based on the weather.

In the last decade, the state has invested at least $1.43 billion in general obligation bond funds to develop new local water supply projects. Collectively, these projects have enhanced the state's water supply by an estimated two million acre-feet a year – enough to supply 4 million households. On the federal side, the U.S. Bureau of Reclamation has awarded $556 million to date for 116 California projects. Together, those projects are expected to eventually save 883,000 acre-feet a year.

6. **Reflect the value of natural resources to promote stewardship and the economy**
   Reflecting the range of values that ecosystems and natural resources provide is essential for preserving the economic, environmental, and societal benefits that they provide. Appropriate valuation of ecosystems and natural resources will enable the state to allocate investments and reflect the benefits of these resources in future planning and decision-making.

   Develop models for development/streamlining that are relevant for rural regions – e.g., timber management plans that prioritize watershed protection.

7. **Harness the potential for bioenergy to ensure environmental and economic benefits to the state's rural regions**
   Increased use of biomass-based sources of energy, which include crop residues, crops grown specifically for energy, and forest waste have the potential to provide GHG emission reductions and other environmental benefits. Development of these resources can also provide important economic support to rural regions and encourage responsible management of natural systems. The state needs a comprehensive policy to develop these resources and support rural economies.

Measuring Progress

Key for understanding the preservation and stewardship of natural resources is monitoring and mapping of these resources. Metrics include:

- Land conversion
- Land protection status
- Water consumption
- Use of recycled and reclaimed water
- Bioenergy development and use

Some current measurements are shown below.

The state continues to lose prime working lands and natural landscapes. Maintaining intact ecosystems is critical for protecting biodiversity in California, maintaining ecosystem services, and boosting the resilience of ecosystems – something that is especially important as the climate changes. California is made up of 15 primary land cover types, with forests accounting for the largest share of the state's land cover, followed by deserts (Figure 9).

Figure 9: Forests are the primary land cover in California, followed by deserts[35]

Pressures on the state's agricultural land point to the need for a similar process for the state's agricultural lands. To date, most of the loss of agricultural land is accounted through conversion to urban and built-up areas in the state (Figure 10). As high-speed rail planning and development gets

[35] Data from the Forest and Rangelend Assessment Program (http://frap.fire.ca.gov/)

underway, a similar comprehensive planning effort needs to be taken to balance the demands and mitigate the impacts of development on agricultural lands.

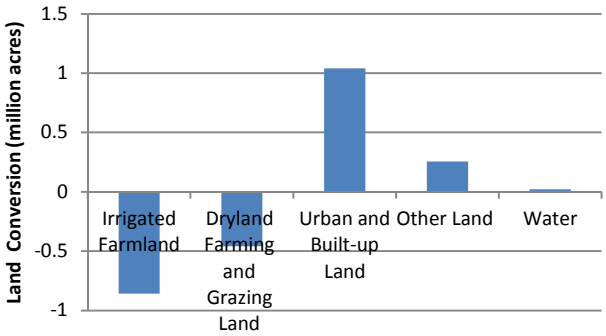

Figure 10: Increases in urban areas in California resulted in the loss of agricultural lands, 1984-2008[36]

[36] Land use conversion data from the Department of Conservation Farmland Mapping and Monitoring Program.

Build Sustainable Regions that Support Healthy and Livable Communities

Healthy and sustainable communities are necessary to provide a livable state and one in which the previous initiatives can take root and flourish. Healthy and sustainable communities are the cornerstones of the state's long-term goals. A sustainable community is one that that promotes equity, strengthens the economy, protects the environment, and promotes public health and safety (California Government Code, Section 65041.1). The Health in All Policies Task Force, created under the auspices of the Strategic Growth Council (SGC) further defined a healthy community (see Box).

What is a Healthy Community?

A Healthy Community provides for the following through all stages of life:

- Meets the basics needs of all, including safe and sustainable transportation options; safe food and water; affordable housing and health care; safe options for physical activity; arts, music, and culture; and is adaptable and prepared for emergencies.
- Provides quality and sustainability of environment, including clean air and water; a smoke-free environment; open spaces; minimizes exposure to toxics; and is aesthetically pleasing.
- Has adequate levels of economic and social development, including job opportunities for all that provide a living wage and safe, healthy work conditions; healthy development options for children and adolescents; and access to high quality education.
- Provides health and social equity.
- Sustains social relationships that are supportive and respectful, including options for civic engagement; cohesive neighborhoods; and communities free of crime and violence.

Summarized from The Healthy Community Framework developed by the Health in All Policies Task Force

As the primary holders of land use authority, cities and counties are key partners for realizing these priorities. Land use planning decisions need to be made to foster compact, walkable communities and access to public transit and biking as alternatives to driving. Furthermore, infrastructure investment and planning decisions should be made in consideration of future climate conditions. Cities and counties should avoid placing infrastructure, housing, and other amenities in harms way without careful consideration of alternatives and co-benefits associated with the choices. Healthy communities will foster behavior to reduce emissions, but also to ensure that communities are ready to respond to changes as they arise.

Counties, cities, and neighborhoods are also key providers of services that foster sustainable communities. These services include transportation, open space, waste management, and, in some cases, the provision of utilities. Aligning these roles with long-term sustainability will be key for fostering the state's sustainable growth. For rural areas, these services include the ecological benefits provided by intact watersheds, forests, and other natural systems.

Local and regional plans should support healthy and sustainable community development reinforced by state investments. For the state's rural regions, this includes recognition of the economic benefits provided by rural industry, as well as through ecosystem services, in resource allocation and investment. The state should leverage investments in planning through to construction and implementation of projects to ensure that benefits are realized.

In several areas, local governments provide a model for innovative and creative approaches for addressing climate change, financing investments in new technologies, and working across agencies to address complex problems.

Key Actions to Build Healthy and Sustainable Communities

1. **Invest in sound infrastructure that is consistent with the state's long-term environmental goals**
   To maintain the state's economy, California and its local and regional partners must invest in its critical infrastructure. California faces significant infrastructure needs due to increasing demands on the systems and under-spending over the past several decades. California is home to 50,000 lane miles of highway and 12,000 bridges. But infrastructure is more than roads and bridges. It includes the state's network of university campuses, K-12 schools, state parks, prisons, health facilities, water system, and other state buildings. Since 2000, California has invested over $100 billion in infrastructure and over three-quarters of that money has been spent on education and transportation investments. However, the cost of servicing the debt for the bonds to fund this investment has nearly doubled over the last decade.[37] Future investments need to be made in a manner consistent with the state's long-term environmental goals and the state planning priorities.

2. **Build a redevelopment program that allocates funds in alignment with environmental goals as evidenced through some of the following activities:**
   - Alignment of local General Plan with regional sustainable communities strategy (where applicable).
   - Coordination with school districts on long-term planning issues.
   - Natural resource protection plans that reflect long-term environmental goals.
   - Adoption of climate change or sustainability plans that address emission reduction as well as steps to build climate resilience.
   - Develop plans to help communities manage planned retreat from rising sea levels.

3. **Support and invest in active transportation projects, such as walking and biking infrastructure, including safe-routes- to schools.**

[37] Legislative Analyst's Office, 2011. A Ten-Year Perspective: California Infrastructure Spending. August. Available online: http://www.lao.ca.gov/reports/2011/stadm/infrastructure/infrastructure_082511.aspx

Local and regional agencies including cities, counties, school districts, and others are key partners in providing infrastructure to support active transportation such as walking and biking.

4. **Invest in education for the future, including skill-building and workforce training in higher education and strong community schools for K-12.**
   Education is a key for preparing for the future. Training workers for jobs in the growing and changing economy is imperative for building and sustaining a strong workforce. A growing clean technology sector demands new skills from workers from the trades through to the service industry. Investment in the state's higher education systems is essential for training workers to meet demands of new industries and also for attracting businesses to the state.

   Strong schools are also central to building strong communities. Better school environments also relate to higher academic performance by students and schools, which can be an important attractor of families to neighborhoods.[38] As the state prioritizes efficient, infill development, K-12 schools have to be integrated into planning. Strong schools can attract and keep families in communities rather than moving out to suburbs. Schools also provide community services including play space, community-gathering spots, and, in some cases, wrap-around services including health and childcare for students. Investing in strong K-12 schools provide tremendous benefits to local communities.

Measuring Progress

Measuring community health and sustainability is a multi-faceted process. It includes understanding progress in the following areas:

- Environmental quality
- Transportation
- Community resilience
- Health
- Social cohesion and civic engagement
- Economic vitality

Below are some snapshots of current indicators.

Using the Human Development Index, which combines health, access to knowledge, and standard of living, as a metric, *A Portrait of California* finds large inequities across the state's regions (Figure 11). The inequity in the Human Development Index arises from disparities in life expectancy, income, and education.

[38] Information from CA Department of Education research summary

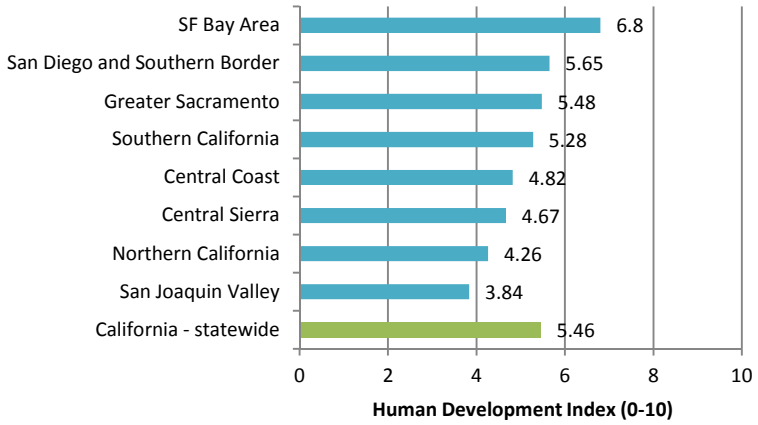

Figure 11: Measurement of the Human Development Index shows large disparities across regions[39]

These inequities are not only geographic, but also relate to other factors, including education, income, and race and ethnicity. For instance, the rate of ill-health of adults is much higher among Californians with lower educational attainment (Figure 12).[40] Similar disparities are seen for race and ethnicity. Of particular concern is the growing income gap in California. Since the 1980s, the incomes of the highest earners have grown substantially while the lowest income Californians' incomes have stagnated or declined.[41]

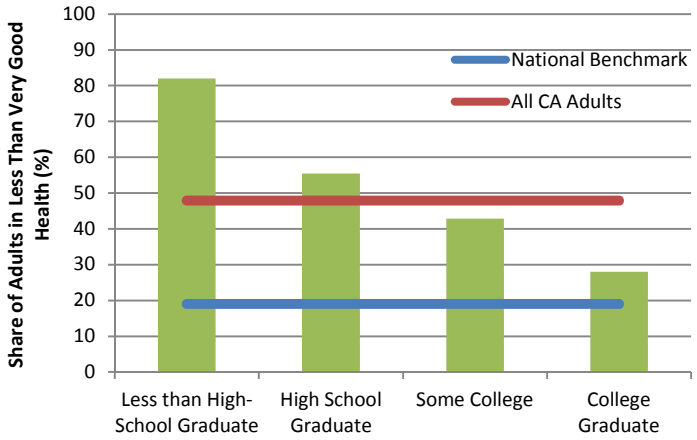

Figure 12: Health status is related to educational attainment, but rates are high across all groups

[39] Burd-Sharps, Sarah and Kristen Lewis. 2011. *A Portrait of California: California Human Development Report 2011*. American Human Development Project.
[40] Data from Robert Woods Johnson Foundation Commission on Health (http://www.commissiononhealth.org/PDF/CA_ahs.pdf)
[41] Bohn, Sarah and Eric Schiff. 2011. The Great Recession and the Distribution of Income in California. San Francisco: Public Policy Institute of California.

As we look ahead, California needs to take steps to improve health status for all of its citizens and minimize disparities across socio-economic groups and geographic regions. Strong policies coupled with thoughtful implementation can help to improve health and address inequities across the state.

Build Climate Resilience and Preparedness into All Policies

Looking to the future, it is essential that the state is taking steps to prepare for the impacts of climate change. Preparing for the impacts of climate change includes both taking steps to reduce vulnerability and increasing resilience, or the ability to recover after extreme events.[42] Taking steps to promote preparedness need to be incorporated into existing plans, but also into plans for new investments and infrastructure.

Building climate resilience into planning will require consideration of current and future conditions, the impacts of climate change, and system vulnerability. Preparedness and consideration needs to be built into new planning processes, but also incorporated into ongoing planning efforts. Similarly, with infrastructure new decisions need to consider future climate conditions, but impacts of climate on existing infrastructure must also be evaluated to guide resilience and preparedness planning.

Key Actions

1. **Support research to understand current conditions, trends and changes, and the projected impacts of climate change**
   Building resilience and preparedness depends on a solid understanding of the natural and built environments. California has a strong scientific foundation to understand the impacts of climate change through its series of three assessments of climate impacts. This research needs to continue and be coupled with robust monitoring networks to track changes underway and relationships to climate change.

   Two key areas of research needs are:

   Vulnerability assessment
   Tools are needed to identify populations, ecosystems, and infrastructure at risk under a changing climate.

   Extreme weather events
   Increases in the frequency and severity of extreme weather events including heat waves, wildfire, and severe storms are likely to be one of the earliest impacts of climate change that is experienced. More information on the scale and frequency of such events is needed to aid in designing and implementing preparedness actions.

2. **Make monitoring information and climate projections available to decision makers and planners at all geographic scales.**
   Planning for climate preparedness and resilience has to take place at the state, regional, and local level. Information to inform that planning needs to be available to inform actions at different geographic scales (e.g., state, regional, local) and in different contexts.

[42] Bedsworth, L. and E. Hanak. 2010. Adaptation to Climate Change: A Review of Challenges and Tradeoffs in Six Areas. *Journal of the American Planning Association* 76(4): 477-495.

3. **Develop and test adaptation tools and approaches**
   In some cases, building resilience and preparedness will require analysis of and experimentation with different tools and approaches. In cases where expected changes are more gradual, such as sea-level rise, the state needs to invest and/or partner with others to research and test, through pilot programs, adaptation tools and approaches.

4. **Partnerships with local and regional governments**
   Local and regional governments will likely be the front-line responders to the impacts of climate change. In many areas, local and regional governments are already leading on adaptation and preparedness research and planning. Developing partnerships with local and regional governments will be important for identifying research and information needs.

5. **Financing for adaptation and planning**
   Accounting for a changing climate in planning and development requires new tools and resources. Sustainable and durable sources of funding are needed to insure that future investments are made in a manner that is cognizant of a changing climate.

6. **Develop a framework to consider the risks of climate change in development of new infrastructure projects**
   The state's planning priorities provide guidelines to inform land use planning decisions. However, rising sea levels, increase in the frequency and severity of extreme events, including storms, wildfires, and heat, pose potential risks to new and existing infrastructure. Up front consideration of these risks is important to avoid higher costs in the future. In some cases, the risks are worth bearing because of the other benefits afforded by a project (i.e., co-benefits). In other cases, careful evaluation is needed to understand the implications of these risks. Below is a potential decision model for infrastructure planning to be used in conjunction with the state's planning priorities:

		Climate Risk		
		High	**Medium**	**Low**
Co-Benefits	**High**	Evaluate tradeoffs	Evaluate tradeoffs	Develop
	Medium	Evaluate tradeoffs	Evaluate tradeoffs	Develop
	High	No development	No development	No development

Measuring Progress

Understanding progress in preparedness planning is cross-cutting and should be an element of indicators to track progress across the state's goals and policies.

To track progress in climate preparation and readiness, the state and other planning entities needs to track indicators of climate change to understand rates of change to inform planning. It is also important to understand the capacity to respond to these changes, which requires an understanding of planning capacity. These metrics include:

- Key indicators of climate change:
  - Temperature
  - Sea level
  - Precipitation
- Adaptive capacity:
  - Adaptation plan status
  - Emergency plan status (e.g., heat emergency, flood, etc.)

Improve Cross Agency Coordination and Data Availability

Planning for California's climate future requires integration across all sectors of the economy. As California's problems and approaches to solving them evolve , we must better organize strategies and leverage investments to address them, and build on this collaboration to use the state's resources in the most efficient and effective way.

Taking actions to meet the state's long-term goals requires transparent, accessible information to access system status, track progress, and evaluate the effectiveness of policy interventions. Sharing data and data systems across state agencies is key to creating this transparency and accessibility and will also create savings by cutting down on redundancies and duplication.

Key Actions

1. **Create a culture of collaboration through institutional and procedural means, including:**
   - Coordination of long-term planning process
   - Building cross-agency collaboration and associated responsibilities into job descriptions,
   - Leveraging outreach for planning processes to cut across sectors,
   - Capitalizing on the Climate Action Team and Strategic Growth Council to foster collaboration.
   - Create and maintain a master planning calendar to track and coordinate state planning processes.

2. **Leverage and link state funding opportunities**
   State agencies invest in a number of programs to build on success and investment to see projects through to implementation and to link funding to state goals. One place to start is through the Strategic Growth Council.

3. **Improve and inform decision-making by making data accessible and compatible across state agencies, departments, and to the public. Key issues include:**
   - Build on existing efforts to develop data on water use and quality across California, in order to get a full picture of water use in the state
   - Building data to understand groundwater location, extent, and drawdown/recharge
   - Support the farmland monitoring and mapping program to continue to track land conversion rates
   - Use metrics and indicators to track progress toward meeting statewide and agency-specific goals.
   - Build transparent, accessible systems for sharing data across state agencies and with the public.

Chapter 5 – Looking to the Future

California and, indeed the world, are at an important juncture in thinking about the future. Population continues to grow, technology is advancing by leaps and bounds, and worldwide economies are developing. At the same time, we are facing tremendous environmental pressures. Taking steps now to address these concerns, while continuing to foster a strong economy and a sustainable state will be a guiding challenge for the next several generations.

Climate change is real and happening now. California has shown leadership and progress is reducing emissions and designing programs to respond to the impacts of climate change. Through partnerships, innovation, and commitment, California has demonstrated the ability to confront climate change while maintaining a strong economy and quality of life. California's leadership is a model for other states, the nation, and other countries.

As we look ahead, the state needs to continue to undertake aggressive programs to reduce GHG emissions and prepare for a changing climate. Accommodating future growth must be done in a manner that is consistent with the state's environmental goals. The state needs to be taking transformative steps to reduce emissions. This transformation does not only apply to technological changes, which are absolutely necessary, but also to the approaches we take to tackling these issues.

Some cross-cutting opportunities for the state as it works toward its goals include:

- Fostering strong collaboration across state agencies, levels of governments, and the public and private sectors to develop solutions.
- Developing creative financing tools and leveraging investments to reap the largest benefits to the state and to insure that investments and long-term management of those investments align with the state's long-term goals.
- Building and making available tools and data that allow the state and its citizens to track progress toward achieving our goals.

This plan lays out the next steps for California's leadership on climate change. Meeting our 2020 emission reduction goals and setting a clear path toward long-term emission reductions will reinforce the state's leadership on the issue and maintain the culture of innovation and creativity that has enabled the state to address complex environmental challenges. Meeting this goal will also ensure a strong California for many more generations to come.