

CALIFORNIA  
ENERGY  
COMMISSION

**THE ROLE OF LAND USE IN MEETING  
CALIFORNIA'S ENERGY AND  
CLIMATE CHANGE GOALS**

**FINAL STAFF REPORT**

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**CALIFORNIA  
ENERGY  
COMMISSION**

Panama Bartholomy  
Gina Barkalow  
Gerry Bemis  
Nancy McKeever  
Suzanne Phinney, D.Env.  
Julia Silvas  
Joanne Vinton  
***Principal Authors***

Lorraine White  
***Manager, 2007 Integrated  
Energy Policy Report***

Pat Perez  
***Manager***  
**SPECIAL PROJECTS  
OFFICE**

Rosella Shapiro  
***Deputy Director***  
**FUELS AND  
TRANSPORTATION  
DIVISION**

B.B. Blevins  
***Executive Director***

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## Abstract

Land use profoundly affects energy use in this state. The configuration of California's towns, cities and rural areas affects how Californians use energy in their homes, the sources of that energy, the energy used in transportation, and even the amount and sources of energy that the state uses to provide water. Because energy use is so closely tied to greenhouse gas production, the passage of California landmark climate change laws and policies have prompted state, regional and local planners to incorporate energy considerations into land use and transportation planning. The first efforts in this direction suggest that the planning process itself is key to success, but more work needs to be done to quantify both how land use planning decisions can affect energy use, how the planning process itself affects the outcome, and how plans are actually implemented. New land use/transportation policies, initiatives, and actions at all levels of government in California could provide major energy and greenhouse gas emissions reductions.

The passage of the Governor's Strategic Growth Infrastructure Bond package represents an opportunity to influence the energy efficiency and environmental friendliness of communities through project funding criteria. Blueprint planning efforts underway by regional governments are identifying new growth scenarios that would, if adopted, change future land use patterns and reduce the levels of vehicle miles traveled by California residents. Local governments are stepping up to the climate change challenge and developing plans to support state goals. Utilities are playing a small but growing role in collaborative planning efforts with local governments. Efforts like the above need a variety of regulatory changes, tools, incentives, and research to maximize their potential effectiveness.

The body of research on the impact of land use on energy use and climate is relatively small, with a substantial portion of the present work focusing on transportation. However, this research area is receiving significantly more attention with the growing interest in climate change. The California Energy Commission is dedicating significant resources to studying opportunities and barriers to integrated energy planning.

**KEYWORDS:** Land use planning, IEPR, *Integrated Energy Policy Report*, land use planning models, energy infrastructure, global climate change, blueprint planning, role of land use in climate change, role of utilities in land use planning, land use planning research.



## Executive Summary

California's land use patterns shape energy use in the state, which in turn contributes to the production of greenhouse gases. These patterns include the excessive use of land per household, separation between houses, the location of transit lines and jobs, development at low densities, and site designs that require more and longer automobile trips to meet everyday needs.

The state's population is expected to grow by 24 million additional residents by 2050, bringing the total population to 60 million. Supplies of gasoline, crude oil, and natural gas, on the other hand, could decline during this timeframe. How future land use patterns and vehicle use develop will affect not only California's ability to achieve its ambitious energy and climate change goals, but its ability to preserve residents' quality of life.

Recent California laws and policies set the stage for how the state will develop its land, use energy, and emit greenhouse gases in the future. Governor Schwarzenegger's Executive Order S-3-05 established greenhouse gas emission reduction targets for 2010, 2020, and 2050; Assembly Bill 32 (Núñez and Pavley, Chapter 488, Statutes of 2006) established a legally binding 2020 greenhouse gas emission reduction target.

Transportation accounts for about 40 percent of California's 2004 total greenhouse gas emissions; gasoline represents 70 percent of transportation's total greenhouse gas emissions and 27 percent of overall greenhouse gas emissions. For this reason, the state has initiated efforts to reduce petroleum use, reduce emissions from light-duty vehicles, reduce the carbon intensity of fuels, improve transportation energy efficiency, and embrace smart land use and intelligent transportation strategies.

Population growth, gasoline consumption, and vehicle miles traveled are interrelated and may grow in similar or diverging paths depending on the success of the above initiatives. Measures to reduce the growth rate of vehicle miles traveled will be particularly important.

Land use patterns play a direct role in the rate and growth of vehicle miles traveled, influencing the distance that people travel and the mode of travel they choose. Residential density may have the most profound effect on travel behavior, with higher density reducing vehicle miles traveled per capita. Balancing jobs and housing in a given area may also reduce vehicle miles traveled per capita by shortening commute distances. In addition, the type of housing that California's aging population chooses (for example, smaller units closer to services) may affect whether Californians drive more or less as they age. While a *correlation* exists between land use and driving patterns, more research is needed to establish *causality*.

State Propositions 13 and 218 have reduced the role of property-based taxation as a local government revenue source and have thus encouraged local governments to turn to large retail establishments to strengthen their tax bases. Such retail establishments, typified by "big box" stores, commonly require substantial vehicle travel on the part of consumers and require large amounts of energy to heat and cool.

Opportunities exist at all levels of government for integrated land use and transportation planning that would reduce energy demand and greenhouse gas emissions. At the local level, general plans and zoning codes are incorporating more growth management and

energy measures. At the regional level, hundreds of millions of dollars are spent annually on transportation, land use, and air quality planning, and coordinating these efforts will reduce energy demand. At the state level, laws, policies and plans (the California Environmental Quality Act, the California Transportation Plan, housing element updates, the California Water Plan, and stormwater plans) can be used as levers to effect sustainable land use patterns.

## **Examples of Better Land Use Planning**

A number of exemplary programs to encourage better land use planning exist at the state, regional, and local levels in California, and examples outside the state are also plentiful. California's Regional Blueprint Planning Program provides funding to help regional governments create more efficient land use patterns. The Blueprint Learning Network helps coordinate state and regional agencies to share experiences and best practices in making better infrastructure investment decisions.

Energy is not a stated component of blueprint planning but is beginning to be addressed. For example, both the Southern California and Sacramento Area Associations of Governments are evaluating the risk of long-term disruption in transportation fuels that could result from fuel scarcity or damage to major fuel delivery infrastructure, and in June 2007 the Blueprint Learning Network hosted a two-day workshop on "Land Use, Energy and Climate."

By enabling citizens to recommend better land use patterns and governments to make better land use decisions, blueprint planning could reduce future vehicle miles traveled. For instance, projections to 2050 showed that the scenario preferred by Sacramento stakeholders and adopted by the regional governing body could use 46 percent less new land, reduce vehicle miles traveled by 12.3 miles per household per day, and produce 15 percent less carbon dioxide and particulate matter per capita, as compared to the business-as-usual case. However, as promising as these projections are, this level of reduced vehicle miles traveled falls short of reductions needed to meet the state's greenhouse gas emissions reductions goals.

A similar planning effort in the San Francisco Bay Area showed that the smart-growth land use scenario, as compared to the business-as-usual case, could reduce the area's urban footprint by 16,000 acres (2 percent), reduce per capita water consumption by 50 gallons per day (17 percent), and, increase the proportion of new affordable housing from 16 percent to 41 percent of all new units.

Plans being developed in other states may be instructive to California. Oregon, New Jersey, and Maryland are conducting similar smarter land use planning efforts, some of which are specifically targeted toward greenhouse gas emission reductions. Regional programs in Portland, Oregon, and Salt Lake City are using stakeholder-developed land use scenarios to generate better land use plans that are already showing reductions in vehicle miles traveled: Portland residents decreased their daily per capita vehicle miles traveled by 11 percent between 1996 and 2002, while the nation and California both increased vehicle miles traveled.

California local governments are increasingly responding to the growing concern for climate change. Scores of California cities have signed on to the National Conference of Mayors Climate Change Program and are being assisted by the California League of Cities and the California State Association of Counties, as well as other groups, in developing local climate action plans.

Infrastructure funding policies directly and indirectly affect transportation and land use. California has a unique opportunity to direct infrastructure investments contained in the Governor's Strategic Growth Plan and approved by voters in November 2006. Funding criteria for Propositions 1B, 1C, 1D, and 84 will determine the extent to which bond monies contribute to better land use and reduce vehicle miles traveled.

The state should initiate a collaborative effort to include the Energy Commission, Caltrans, and local and regional planning entities to develop "allowable" vehicle miles traveled growth goals. This would establish the degree to which local and regional jurisdictions could allow growth to occur while contributing to greenhouse gas emission reduction goals.

Electric utilities in California are playing a larger and more explicit role in land use planning. Spearheaded by the California Energy Commission, utilities are actively planning for new large-scale infrastructure (for example, intrastate transmission lines) through the Senate Bill 1059 (Escutia, Chapter 638, Statutes of 2006). On a more local scale, how transmission lines are extended could influence the character of growth, its implicit energy demand, and even, to some extent, the sources of energy available to it. California Public Utilities Commission Rules 15 and 16 govern the provision of natural gas and electricity to new residences; although density is not considered under these rules, a de facto incentive to create high-density units may exist. New Jersey has taken an innovative approach to this matter by issuing regulations that specifically integrate smart growth principles into utility service policies. Anyone building in state-determined non-smart growth areas must pay the full cost of utility line extensions.

Utilities are becoming more engaged in local land use planning and have a unique opportunity to help plan new developments from inception, particularly on former military bases, where large expanses of land are becoming available for residential and commercial development. Utilities are involved in redevelopment planning at El Toro Marine Corps Air Station, Treasure Island, and Hunters Point, for example. Pacific Gas and Electric Company's involvement with the latter two was the springboard for its Sustainable Communities Program.

For all aspects of future land use and transportation, research and development remains critical to reducing energy use and vehicle miles traveled and meeting climate change targets. The *2006 Integrated Energy Policy Report Update* charged the Energy Commission's Public Interest Energy Research (PIER) Program with providing tools and conducting research to assist the energy and greenhouse gas reduction planning efforts of local governments. A number of currently funded projects support this charge. In the next year, more than \$2 million will be allocated for sustainable communities research. This funding will support initiatives designed to better understand the interaction between energy demand and environmental design principles, to identify infrastructure design impacts on energy and the environment, and to identify design improvements that would reduce energy use in California. Land use modeling tools are critical to these initiatives.

The Energy Commission is also funding transportation research through PIER, with projects designed to reduce petroleum consumption and greenhouse gas emissions through increased vehicle efficiency and lower carbon fuels. Creation of new, and validation of existing, transportation modeling tools used in these and similar research efforts are important elements. Understanding the role of smart communities—those that employ information technology to change how the community uses its physical space—in reducing vehicle miles traveled will also be beneficial.

Caltrans is developing improved, more integrated transportation models that will allow for improved evaluation of smart growth and should continue to do so. Focused research is needed to maximize the benefits of smart growth and mode transfer from automobiles to mass transit. Technologies that facilitate this transfer need more research to determine the appropriate mix of strategies to reduce vehicle miles traveled.

## **Findings and Recommendations**

Staff identified the following key findings and conclusions that the state and the Energy Commission should consider for reducing energy use and greenhouse gas emissions related to land use.

### ***Findings***

- With approximately 40 percent of California's greenhouse gas emissions attributed to the transportation sector, significant efforts to reduce vehicle miles traveled are needed to meet the state's greenhouse gas emission reduction goals. The state must find a way to not only reduce the current 3 percent annual growth rate in vehicle miles traveled, but begin to implement steps that will eventually reverse it.
- The research reviewed shows that increasing a community or development's density and accessibility to job centers are the two most strongly correlated factors for reducing vehicle miles traveled through design. More research is needed as to how these factors cause the reductions.
- Even when using commendable current collaborative efforts to reduce vehicle miles of travel by implementing smart growth principles, efforts fall far short of the reductions needed in vehicle miles of travel needed to meet greenhouse gas emissions goals.
- Existing tax policies, largely developed in response to Proposition 13 (1978), incentivize and promote commercial sprawl. That form of land use development provides local governments with much needed revenue for public services and infrastructure but at the expense of smart growth strategies. The state should consider tax policies to encourage regionally coordinated, energy-aware planning.
- Confronting issues such as housing, transportation mobility, economic development, and local climate change planning requires a regional approach, one that will protect the fiscal interests of urban, suburban, and rural communities while simultaneously lowering energy use.
- While the state has limited land use authority, it does have some key leverage points (California Environmental Quality Act, housing elements, and others) that can be used to assist local governments in reducing energy use and greenhouse gas emissions that result from land use planning choices. Thus, while land use authority is nearly completely vested with local government, the state can use the disbursement of transportation and housing funds to motivate collaborative planning at a regional level.
- The state-sponsored Blueprint Planning Program has engaged nearly all of the state's metropolitan planning organizations in long-range land use planning efforts. Several of these organizations are now adopting plans to better coordinate land use and transportation development. The plans strive to accommodate housing needs, reduce vehicle miles traveled, and identify priority planning areas. The plans are in early stages of implementation and may require technical, financial, and regulatory

assistance to achieve their goals. With some guidance, these same plans could link energy and greenhouse gas analyses into the long-term growth planning process.

- Other states and regional governments have adopted preferred growth scenarios that better coordinate land use and transportation development while accommodating housing needs, reducing vehicle miles traveled, and identifying priority planning areas. Some of the states and regions have channeled financial and technical assistance to the identified priority planning areas in efforts to support the plan goals.
- Infrastructure funding policies influence the design and use of infrastructure projects. The Governor's Strategic Growth Plan contained numerous programs to encourage energy-efficient, climate-friendly land use, but project criteria (where they exist) for many of the programs contain no energy or climate considerations. The next federal transportation bill could significantly bolster the blueprint planning effort if it mandates energy and climate considerations.
- Utilities have historically played only a limited role in land use planning efforts. Coordinated planning between a utility and local government can produce many mutual benefits in terms of demand management, infrastructure deployment, distributed electricity generation, and installation of renewable energy production. California investor-owned utilities have begun to engage with local and regional governments in mutual planning efforts, but these partnerships are prevented from reaching their full potential since the utilities cannot recoup the costs of their efforts.
- Understanding of land use impacts on energy demand, electricity generation and transmission, and on greenhouse gas emissions are in the early stages of exploration. Further research and development is necessary to explain and quantify the impacts land use has on energy systems, including: the causality (rather than the established correlation) of land development patterns and per capita vehicle miles traveled, the potential for low energy design principles, and the use of community-scale distributed and renewable generation technologies. There is a need for research to develop modeling and decision-support tools to allow the integration of energy considerations into future research and planning efforts. The Energy Commission is engaging in a new area of research that will look at the integrated relationships among land use, human behavior, urban design, environmental impacts, and energy under its new sustainable communities research program.

## **Recommendations**

- 1. The state should adopt a statewide growth management plan that is built from required local regional plans and align state planning, financing, infrastructure, and regulatory land use policies and programs to the plan.*
- 2. The state should require regional transportation planning and air quality agencies to adopt 25-year and 50-year regional growth plans that provide housing, transportation, and community services for expected population increases while reducing greenhouse gas emissions to state-determined climate change targets.*

The state's policies and programs that influence land use growth patterns should encourage climate-friendly and energy-efficient development. To do this, there must be a concentrated and collaborative process to identify where, and in what way, long-term growth should, and should not, occur in the state. Confronting issues such as housing, transportation mobility, economic development, and local climate change planning requires a regional approach, one that will protect the fiscal interests of urban, suburban, and rural communities while simultaneously lowering energy use and greenhouse gas emissions. Therefore, any state plan should be composed of regional plans, developed

by local governments, in a process facilitated by regional agencies. Once regional plans are adopted, the state should build a statewide growth management plan that is wholly developed from the regional plans. Upon adoption of such a plan, state policies and programs should be modified to align with and support the plan. To allow for programs and development projects to mature, while also keeping the state and regional plans up-to-date, the plans should be updated every 10 years.

- The Air Resources Board should adopt regional greenhouse gas emission reduction levels to guide regional growth management plans in their AB 32 scoping plan. The Board should include in the scoping plan clear guidance on greenhouse gas emissions accounting for urban land use activities and a local government protocol for assessing and tracking greenhouse gas emissions in jurisdictions.
- The Climate Action Team's Land Use Subgroup should convene a proceeding to develop recommendations for measuring and reducing vehicle miles traveled.
- The Legislature should pass legislation that requires local governments to develop regional growth management plans that will accommodate 25 years and 50 years of housing, transportation, and community service growth needs while meeting Air Resources Board-set regional greenhouse gas emission targets.

The legislation should:

- Require regional growth management plans to be adopted through a joint process between a region's municipal planning organizations (MPOs) and/or council of governments (COGs) and the local air quality management districts (AQMDs).
- Require local governments to adopt the portion of the regional plan and greenhouse gas emission reduction target that affects their jurisdiction into their general plans. The plans should clearly identify areas where growth and development should and should not occur.
- Require MPO/COGs and AQMDs to incorporate the plan and targets into their planning, financing, and regulatory programs.
- Require the Governor's Office of Planning and Research to collect the regional growth management plans and combine them to create a statewide growth management plan.
- Require state agencies to modify all programs and policies that affect land use, including but not limited to, planning, financing, capital outlay, and compliance, to incorporate and support the statewide growth management plan. Colleges, universities and state buildings should also be required to be consistent with the growth management plan.
- Require that the regional and statewide plans, and the local governments, MPO/COGs and AQMDs adoption of them, shall be updated on 10-year schedule.

***3. State infrastructure financing should encourage development that is concurrent with the state's greenhouse gas emission and energy consumption goals.***

Infrastructure funding policies influence the design and use of local government infrastructure and development projects. The state should build upon the Governor's Strategic Growth Plan's numerous programs to encourage energy efficient, climate friendly land use by requiring that all state financing for infrastructure incorporate energy and climate considerations.

- The Legislature should pass legislation for all remaining Strategic Growth Plan bond programs to incorporate climate change and energy consumption reduction measures.
- If the state adopts growth management legislation as described above, all state infrastructure planning, financing, and compliance programs should only allow resources, financial, technical, or otherwise, to be spent for development of projects in identified growth areas.
- The Legislature should pass legislation that requires that all state infrastructure planning, financing, and compliance programs should only allow resources, financial, technical, or otherwise, to be spent for development of projects in complete consistency with regional blueprints.
- The Legislature should pass legislation that requires that all state infrastructure planning, financing, and compliance programs not allow resources, financial, technical, or otherwise, to be spent for development of projects in areas not consistent with existing regional blueprints.

***4. The state should expand efforts to provide technical and financial assistance to regional agencies and local governments to facilitate climate-friendly and energy-efficient planning and development.***

Land use impacts on energy demand, energy generation, and transmission and on greenhouse gas emissions are in the early stages of exploration. Further research and development is necessary to explain and quantify the impacts land use has on energy systems. There is a need for research to develop and update existing modeling and decision-support tools to allow the integration of energy considerations into future research and planning efforts. Many local governments and regional agencies state that access to information and a lack of funding prevent them from implementing climate friendly and energy-efficient development plans and programs.

- The state should continue to fund the Blueprint Planning Grant program and Blueprint Learning Network to assist regional agencies and local governments in developing regional growth management plans. The grant program should include energy consumption and greenhouse gas emission reduction as primary outcomes of the blueprints developed within the program.
- Upon passage of the above described growth management legislation, the grant program and network should be modified to support development of the regional growth management plans as specified in the legislation.
- The Legislature should pass legislation that implements the Proposition 84 Sustainable Communities Program. The program should focus on assisting regional and local governments in developing, implementing, and incorporating into existing policies the above mentioned growth management plans, blueprints, and climate action plans.
- The Energy Commission should convene a group of stakeholders, both within and outside state government, to update its *Energy Aware Planning Guide* to provide guidance for local governments attempting to adopt local growth management and climate action plans.
- Using the Energy Commission's new Sustainable Communities research program and the California Department of Transportation's existing research efforts as the base, the state should convene a land use research group to identify research needs, carry out research, and develop and disseminate tools and resources to land use stakeholders.

***5. State government should be a model for climate friendly and energy-efficient development patterns.***

The state, with the passage of AB 32, possessing the knowledge of what will be necessary to meet the state's climate change and energy goals and attempting to influence land use practices outside of its authority, has an obligation to model appropriate behavior in its own land use practices. While AB 857 provided the framework for guiding state agency land use practices, there is no recourse for agencies that do not comply. Currently, the Governor's Office of Planning and Research has authority only to collect annual reports of agencies self-reported compliance with the law.

- The Legislature should pass legislation that builds upon AB 857's intentions by adding greenhouse gas emissions reduction and energy consumption as priority planning goals of the state. The legislation should require that state agencies engaging in or financing the development of infrastructure or capital outlay projects report on the project's compliance with state planning policies during each stage of its administrative and legislative budget approvals. The legislation should require that projects that do not meet the state planning priorities should not be funded except in situations where compliance would be proven infeasible by the sponsoring agency.
- The Climate Action Team Land Use Subgroup should develop greenhouse gas emissions reduction and energy efficiency guidelines for state agency programs that affect land use. State agencies should adopt the guidelines to the greatest extent feasible.

***6. The state should determine the extent to which state and local tax policies affect and guide land use practices and correct policies that encourage growth inconsistent with the state's growth management plan.***

Existing tax policies, largely developed in response to Proposition 13, promote residential sprawl and increase vehicle miles traveled and greenhouse gas emissions. The state should thoroughly review the effect of tax policy on land use patterns in the state.

- The Governor's Office of Planning and Research, working with local governments, the building community, the university system, and other stakeholders, should study the effects of state and local tax policy on land use practices in the state. The report should contain recommendations for changing identified tax policy that leads to detrimental land use practices.

***7. California's utilities should play an active role in regional and local government planning and development efforts at both the plan and project level to encourage climate-friendly and energy-efficient development in their service areas.***

The state's investor-owned utilities (IOUs) and municipal utilities need to play a significant role in planning and development programs and projects. IOUs have stated that their ability to do so is hamstrung by current energy efficiency program time constraints.

- The California Public Utilities Commission should allow utility-incentive and technical-assistance programs with longer lead times to enable greater collaboration with developers and local governments.

***8. The state should work with its Congressional delegation to ensure that future federal highway and other transportation and land use related legislation and programs include energy and climate change considerations.***

# CHAPTER 1: Introduction

California's land use patterns have significantly shaped our use of energy and the associated production of greenhouse gases. With the state's population expected to grow by 24 million additional residents by 2050, how the state manages that growth will determine whether it meet its energy and greenhouse gas (GHG) emission reduction goals.

The energy choices embedded in the location and design of the new homes, schools, industries, offices, and transportation infrastructure that will be planned and built over the next 50 years to accommodate California's new residents will last into the next century. These choices will determine California's future energy demand and will affect the degree to which the climate is changed by human forces.

Many of the policies currently being pursued to reduce the use of energy and the production of GHG associated with land use are directed at the transportation sector and are technology-based, such as the Low Carbon Fuel Standard (LCFS) and the state's GHG regulations for vehicles (AB 1493). If the state is to meet its energy and GHG emission reduction goals, it must also maximize the emission reduction potential from smart land use development.

## Growth in Vehicle Miles Traveled

Most urban growth over the last 30 years has been characterized by travel-inducing features: low-density; a lack of balance and accessibility among housing, jobs, and services; inefficient infrastructure design; and a focus on single-occupancy vehicle travel. This growth pattern has resulted in vehicle miles traveled (VMT) by California residents increasing at a rate of more than 3 percent a year between 1975 and 2004, markedly faster than the population growth rate over the same period, which was less than 2 percent.<sup>1</sup> This increase in VMT correlates to an increase in petroleum use and GHG production and has led to the transportation sector being responsible for 41 percent of the state's GHG emissions in 2004.<sup>2</sup>

The California Department of Transportation (Caltrans) estimates that VMT will continue to increase at nearly 3 percent per year for the foreseeable future. Even with ARB's greenhouse gas regulations and implementation of the LCFS, the increase in GHG emissions from the increased travel will outweigh the policies' combined benefits. The state, along with regional planning organizations and local government, must address VMT growth, and the most effective way to do so is through better land use planning and development. However, VMT growth reductions alone will still not be sufficient to meet the state's ambitious GHG reduction goals. Fortunately, smart growth has the potential to reduce energy through many avenues, not just transportation.

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<sup>1</sup> State of California, Department of Finance, *Race/Ethnic Population with Age and Sex Detail, 1970–2004*. Sacramento, CA, December 1998 and United States Government, Federal Highway Authority, *Highway Statistics 1975-2004*, Washington D.C., 2005.

<sup>2</sup> *State of California, California Energy Commission, Inventory of California Greenhouse Gas Emission and Sinks: 1990-2004*, Sacramento, CA, December 2006, CEC-600-2006-013, p. 8.

## Land Use Planning

Smart growth is defined in many ways. The organization Smart Growth America has a six-bullet point definition,<sup>3</sup> and the Congress for New Urbanism Charter gives a 27-point definition of its ideal of smart growth.<sup>4</sup> The Association of Bay Area Governments gives a broad definition of it as “development that revitalizes central cities and older suburbs, supports and enhances public transit, promotes walking and bicycling, and preserves open spaces and agricultural lands.”<sup>5</sup> Practically, most smart growth efforts and metrics have focused on smart growth’s ability to reduce VMT.

While this report focuses on the land use/transportation connection, the Energy Commission recognizes the multiple interactions between land use patterns and energy use. As the 2006 *Integrated Energy Policy Report Update* noted, “By including energy demand, supply, and infrastructure as central factors in the land use planning equation, the State and local governments can make intelligent use of all resources and meet energy related goals. Broadening the definition of smart growth to encompass *all* energy saving strategies is a first step in that direction. Increasing onsite production of renewable energy, using distributed electricity generation (DG), orienting residences in relation to the sun, increasing shading, incorporating roofs that reflect heat, and installing energy efficient appliances are a few non-transportation related strategies that would fall under a broader definition and produce significant energy savings.”<sup>6</sup>

Land use choices that result in lower energy use and VMT reductions are possible and examples are beginning to emerge across the state. Partnerships, involving the state, regional planning organizations and local governments, are developing plans for regional transportation and land use development that are projected to result in less VMT growth than if current or “business-as-usual” growth plans are adopted. The development and effective implementation of these new, collaborative “blueprint” plans could lead to growth that provides adequate housing and jobs for California’s increasing population and helps meet the state’s climate and energy goals while maintaining and enhancing quality of life. Blueprint planning is discussed in more detail in Chapter 5.

The ability of regional planning agencies and local governments to develop, adopt and implement new land use plans will depend greatly on government (both state and federal) and utility activities, policies, and assistance (both technical and financial). While the state has very limited land use authority, the policies it develops in regard to new infrastructure, utility funding, environmental review, and housing allocation are a few of the leverage points that the state can use to assist local governments in growing in an energy-efficient and climate-friendly manner.

In addition to policies and financing, there is a significant need to understand the effects of current development practices and the potential for better practices to inform land use decision making. One example is the need to augment tools that allow the state to quantitatively assess the impacts of growth decisions and create tools and analytical models to help regional and local agencies develop and implement more energy-efficient plans. The California Energy Commission (Energy Commission) and other agencies are

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<sup>3</sup> Smart Growth America, “What is Smart Growth?” available online at <http://www.smartgrowthamerica.org/whatissg.html>.

<sup>4</sup> “Charter of the New Urbanism,” available online at <http://cnu.org/charter>.

<sup>5</sup> Association of Bay Area Governments, “What is smart growth?” available online at <http://www.abag.ca.gov/planning/smartgrowth/whatisSG.html>

<sup>6</sup> State of California, California Energy Commission, *Integrated Energy Policy Report*, Sacramento, CA, 2006, p. 73.

beginning to address this need, but more resources must be invested in land use planning and to assess the effectiveness of the state's current and future land use policies.

## **Organization of This Report**

The following chapters examine:

- Land use, energy, and climate policy context;
- The role of land use in the state's generation, demand for and use of energy and emission of GHGs;
- Possible growth scenarios and their associated impacts;
- The role of regional planning organizations and utilities in shaping energy-aware land use plans;
- Opportunities for the state to change infrastructure and development policies to better facilitate energy-efficient and climate-friendly growth; and
- The current state of land use, energy, and climate research and future research needs.

Staff findings and recommendations are provided at the end of the report. The appendix provides the current status of the land use and energy policy recommendations made in the *2006 Integrated Energy Policy Report (IEPR) Update*.



## CHAPTER 2: Land Use, Energy, and Climate Policy Context

A number of recent laws and policies will significantly impact the way in which the state develops its land, uses energy, and emits GHGs. This section discusses the various state policies that will influence and direct California's efforts to reduce energy and climate impacts resulting from land use.

### Executive Order S-3-05

On June 1, 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05, establishing GHG emissions reduction targets for 2010, 2020 and 2050. The Order established targets to: reduce 2010 emissions to 2000 levels; reduce 2020 emissions to 1990 levels; and to reduce 2050 emissions to 80 percent below 1990 levels. The order directed the Secretary of the California Environmental Protection Agency (CalEPA) to coordinate efforts to meet these targets.

### Climate Action Team

As directed by Executive Order S-3-05, the Secretary of CalEPA created the Climate Action Team (CAT) to coordinate implementation of the Governor's GHG reduction targets. The CAT is composed of, but not limited to, representatives from the following agencies:

- Business, Transportation, and Housing (BTH)
- Department of Food and Agriculture
- Resources Agency
- Air Resources Board
- California Energy Commission
- Integrated Waste Management Board
- California Public Utilities Commission

The CAT has developed and is refining a list of more than 40 strategies to meet the goals of the Executive Order, including strategies to reduce the carbon intensity of vehicular travel and to reduce VMT. Specifically included in VMT reduction strategies are "Measures to Improve Transportation Energy Efficiency" and "Smart Land Use and Intelligent Transportation," both to be implemented by BTH through Caltrans.

These strategies build on current efforts to provide a framework for expanded and new initiatives, including incentives, tools, and information that advance cleaner transportation and reduce climate change emissions. On April 20, 2007 the CAT produced a document titled *Climate Action Team Proposed Early Actions to Mitigate Climate Change in California*. This draft document refines and updates earlier estimates of strategies to reduce GHG emissions. Combined, the two updated BTH strategies are expected to eliminate 19 million metric tons of carbon dioxide (CO<sub>2</sub>) equivalent per year by 2020.<sup>7</sup> This represents nearly 11 percent of the total reductions needed to meet the

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<sup>7</sup> State of California Environmental Protection Agency, *Climate Action Team Proposed Early Actions to Mitigate Climate Change in California, Draft for Public Review, Sacramento, CA, April 20, 2007, p.7.*

Governor's 2020 target.<sup>8</sup> The Energy Commission is playing an integral role in these efforts, with Chairman Pfannenstiel chairing the CAT's Land Use Subgroup.

### **Measures to Improve Transportation Efficiency**

CAT measures relating to transportation energy include the following:

- Incorporating energy efficiency and emissions reduction measures into the policy framework governing land use and transportation, including the framework for developing energy elements in state transportation and regional planning documents.
- Better coordination on cross-agency climate change and energy policy framework to ensure a concerted effort and synergy among state agencies' climate change emission reduction activities.
- Increasing incentives and accelerating technology applications to improve transportation system productivity and move toward cleaner and more efficient vehicles, especially for the public sector fleet.
- Enhancing outreach and educational programs to bring a coordinated message of sustainable transportation and root causes of climate change emissions.
- Diversifying transportation energy infrastructure and advancing measures to slow the growth rate of vehicle miles traveled and excessive reliance on petroleum.

### **Smart Land Use**

"Smart" land use<sup>9</sup> is an umbrella term for strategies that integrate transportation and land-use decisions. Such strategies generally encourage jobs/housing proximity, promote transit-oriented development, and encourage high-density residential/commercial development along transit corridors. These strategies develop more efficient land-use patterns within each jurisdiction or region to match population increases, and workforce and socioeconomic needs for the entire population.

### **Assembly Bill 32**

AB 32 (Núñez and Pavley, Chapter 488, Statutes of 2006) was signed into law by Governor Schwarzenegger on September 27, 2006. The act requires ARB to do the following:

- By July 1, 2007, to adopt a list of discrete, early action measures that can be implemented by regulation before January 1, 2010.
- By January 1, 2008, to establish a statewide GHG emissions cap for 2020, based upon 1990 emissions.
- By January 1, 2008, to adopt mandatory reporting requirements for significant sources of GHG emissions.

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<sup>8</sup> State of California Environmental Protection Agency *Report to Governor Schwarzenegger and the California Legislature*, Sacramento, CA, 2006, p. 64.

<sup>9</sup> The CAT has coupled Smart Land Use and Intelligent Transportation. As noted on the Department of Energy's Web page, intelligent transportation systems encompass a broad range of wireless and wire line communications-based information and electronics technologies. When integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies relieve congestion, improve safety and enhance American productivity. This report has limited discussion of ITS measures as they are not directly related to land use. ITS research areas are discussed in Chapter 8, however, since regional planning organizations are beginning to assess such measures to reduce congestion and emissions.

- By January 1, 2009, to adopt a plan indicating how emission reductions will be achieved from significant GHG sources via regulations, market mechanisms and other actions.
- By January 1, 2011, to adopt regulations to achieve the maximum technologically feasible and cost-effective reductions in GHGs.

AB 32 gives wide authority to ARB to take action to reduce GHGs from all “significant sources.” Right now, ARB does not plan to regulate land use and will depend on the CAT to make recommendations on land use matters.

## **Petroleum Reduction Goal**

In a joint report submitted to the Legislature and Governor in August 2003, the Energy Commission and the ARB presented an overarching strategy to reduce California’s dependence on petroleum fuels for transportation energy. Based on the use of reduction measures that were shown to be technically feasible and cost-beneficial, the agencies proposed a goal to reduce on-road petroleum fuel demand to 15 percent below 2003 levels by 2020. The key recommendations to achieve this goal were to increase new vehicle fuel economy and increase the use of non-petroleum fuels (alternative fuels). The Energy Commission incorporated this goal and key recommendations into its 2003 *Integrated Energy Policy Report*, which was adopted in December 2003.

## **Assembly Bill 1493**

AB 1493 (Pavley, Chapter 200, Statutes of 2002) directs the ARB to achieve the maximum feasible and cost-effective GHG reductions from light-duty motor vehicles. ARB adopted a rule limiting emissions from passenger cars and light-duty trucks according to a schedule that begins in the 2009 model year and is fully implemented by model year 2016. This rule is currently being challenged in court by automobile manufacturers that argue that ARB has exceeded its regulatory authority. Assuming the rule adopted under AB 1493 is fully implemented and gasoline use reduction is accomplished in the manner modeled by the Energy Commission staff for the 2005 *Integrated Energy Policy Report*, the reductions in emissions will be equivalent to reducing gasoline consumption in 2020 to a rate of 31 percent above 1990 gasoline consumption (and associated GHG emissions levels). If the automobile manufacturers win their lawsuit and the ARB rulemaking is reversed, gasoline demand from light-duty vehicles (and associated GHG emissions) is expected to exceed 1990 levels by 46 percent in 2020.

## **Low Carbon Fuel Standard**

The Governor’s Executive Order S-01-07, signed on January 18, 2007, calls for a reduction in the carbon intensity of fuel used on California roadways. The objective is to achieve at least a 10 percent reduction in the carbon intensity of California fuels used in passenger vehicles by 2020. The Executive Order directs the Secretary of the CalEPA to oversee development of a “life-cycle carbon intensity protocol” for measuring carbon intensity. Participants in the protocol development include the Energy Commission, ARB, University of California (UC) scientists, and other state agency staffs. This analysis will become part of the state Implementation Plan for alternative fuels as required by AB 1007 (Pavley, Chapter 371, Statutes of 2005) and will be submitted to the ARB for consideration as an “early action” item under AB 32. Potential low-carbon fuels include biodiesel, hydrogen, electricity, compressed natural gas, liquefied petroleum gas, liquefied natural gas, and biofuels.

The ARB completed its review of the LCFS protocols for adoption as an early action in June 2007. After being adopted as an "early action" by the ARB, the regulatory process at ARB is underway to put the new standard into effect. It is expected that the regulatory process will be completed no later than December 2008. GHG emissions reductions from the low-carbon fuel requirement have yet to be determined and may vary depending on the results of the court challenge to AB 1493. Early action rules are expected to become effective in 2010.

One provision of the rulemaking implementing AB 1493 allows for an alternative compliance option to meet its requirements. The low-carbon fuel standard may be used by fuel suppliers and/or automobile manufacturers to meet a portion of the AB 1493 requirements. If an alternative compliance strategy is used, then the low-carbon fuel standard may not achieve fuel use reductions beyond those attributable to AB 1493. This concern is discussed below, based on the report, *A Low-Carbon Fuel Standard for California; Part 1: Technical Analysis*, May 29, 2007, authored by Alexander Farrell of UC Berkeley and Daniel Sperling of UC Davis.<sup>10</sup>

## Historical and Projected VMT, Gasoline Demand, and Population

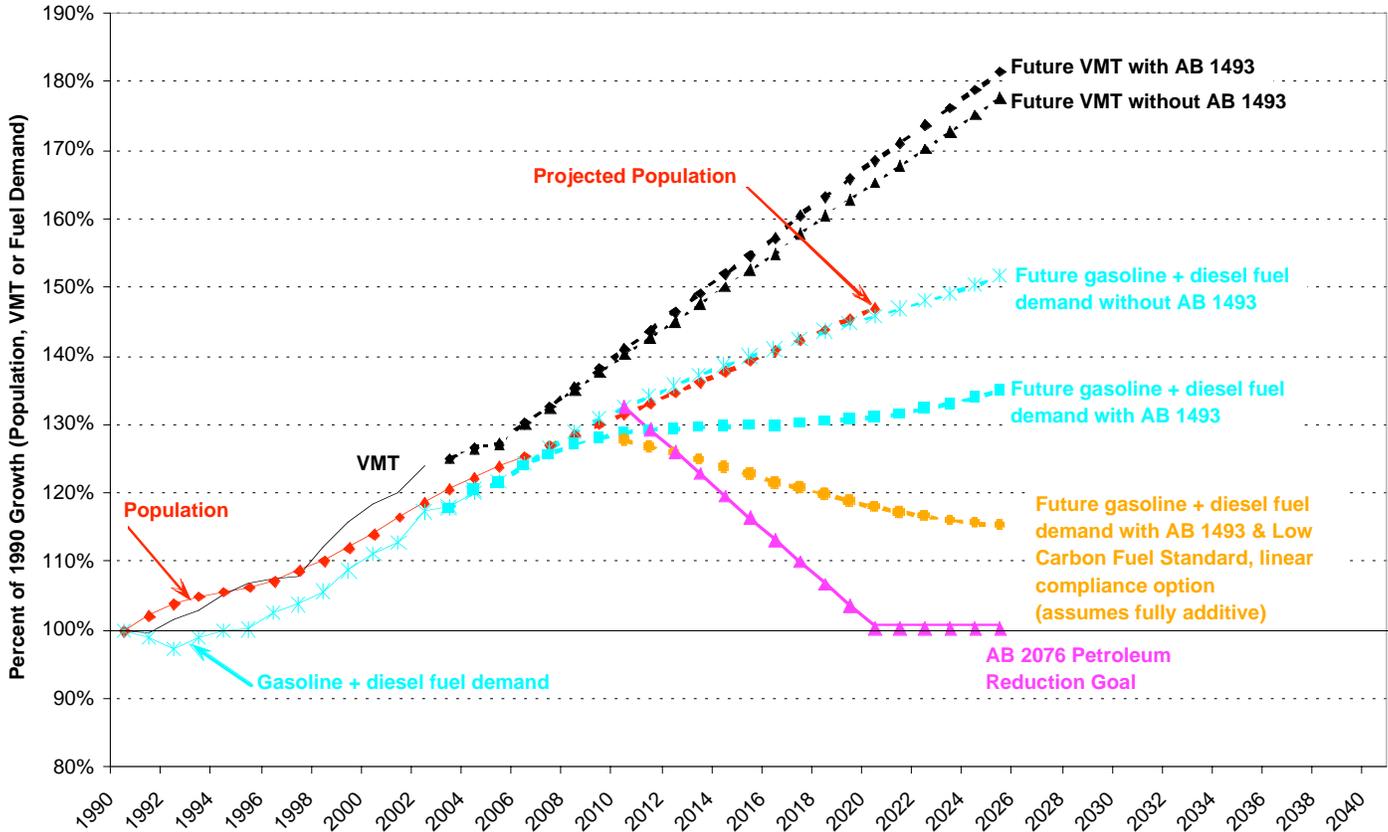
Figure 1 shows California's growth in VMT, population, and gasoline and on-road diesel consumption, all indexed to their 1990 value. Values plotted reflect growth from 1990. As stated above, this is the year that AB 32 GHG control measures are required to be met by 2020. Thus, Figure 1 can be used to view the historical growth in transportation fuel use (and associated GHG emissions) relative to the historical growth in population and VMT and the degree of reduction needed to return to 1990 levels. Also plotted in Figure 1 are projected gasoline and on-road diesel use, population growth, and VMT projected by Energy Commission staff for the 2005 *Integrated Energy Policy Report*. The model used to generate this data incorporates existing conditions and business-as-usual assumptions about where and how people travel. Transportation fuel use is plotted both with and without the effect of the AB 1493 rule, and one line shows the result with AB 1493 and with the low-carbon fuel standard, assuming it is entirely additive to reductions obtained by implementing AB 1493.

One observation from Figure 1 is that during 1990 to 2004, and as projected to about 2008, California's transportation fuel use grows more slowly than its population or VMT. This implies that Californians are driving vehicles with increasing fuel efficiency. A second observation from Figure 1 is that transportation fuel use under business-as-usual conditions is growing steadily and is expected to be more than 150 percent of 1990 levels by 2025. This growth trend closely matches projected population growth rates.

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<sup>10</sup> In the LCFS report, four options for a compliance schedule are provided in Table 2-2. Staff's analysis is based upon the linear compliance option of Table 2-2.

**Figure 1.**  
**Historical and Projected Population, VMT, and Fuel Demand**  
 Historical and Projected Population, VMT and Fuel Demand, with and without AB 1493 and including Low Carbon Fuel Standard (all values scaled to 100% in 1990, AB 32 Goal for 2020)



Source: Energy Commission staff, 2007

Since GHG emissions from gasoline are such a large fraction of total state GHG emissions (27 percent), it is likely that these emissions will have to be controlled to meet the goals of AB 32. The goals have yet to be established for specific energy end-use sectors such as transportation, but the overall goal represents about a 29 percent reduction in projected 2020 emissions. This percentage can be used to compare the historical and projected gasoline demand. From Figure 1 it can be seen that the gallons of transportation fuel used in 2004 grew 20 percent above 1990 usage. Projected usage in 2020 is about 45 percent over 1990 consumption, if the AB 1493 rule is not approved by the courts, and about 31 percent if the rule is upheld and implemented on the schedule adopted by ARB.

Figure 1 also shows the effect of the LCFS, assuming implementation of the “linear” compliance schedule and assuming that these reductions are fully additive to fuel use reductions accomplished by AB 1493 and the Zero Emissions Vehicle Program. The LCFS technical report shows annually decreasing carbon intensity<sup>11</sup>, but the effects of the LCFS are projected only to 2020. Staff assumed that the linear decrease in Figure 1 continues until 2025. The additive effect of these strategies reduces future transportation

<sup>11</sup> Table 2-2 of the LCFS technical report.

fuel consumption such that by 2025, transportation fuel consumption is only about 15 percent above 1990 consumption. This indicates that even with AB 1493 and the LCFS, further efforts would be needed to reduce the transportation sector’s fuel consumption and greenhouse gas emissions to their 1990 levels by 2020 as required by AB 32.

The degree to which transportation GHG emissions must be reduced is uncertain given the status of several approaches to reduce transportation GHG emissions. However, it is apparent that reduced VMT growth will be required to meet GHG reductions goals. It is imperative that land use planning and infrastructure investments place a high priority on reducing VMT growth. Meeting Executive Order S-3-05’s long-term goal, which requires a reduction by 2050 to 80 percent below 1990 emissions levels, would certainly require nearly carbon-free transportation and strong actions to reduce VMT.

If both AB 1493 and the LCFS are fully implemented (and also fully independent from one another) by 2020, California’s overall VMT could increase by more than 50 percent over 2005 levels while GHG emissions from the on-road sector would be back to their 1990 levels since more miles could be driven with since emissions per mile would be much less. If AB 1493 becomes fully effective but the LCFS is not implemented, the allowable 2020 VMT increase is about 18 percent over 2005 levels. If AB 1493 is blocked by ongoing court action and if the LCFS is likewise blocked, 2020 VMT would have to *decrease* about 15 percent from 2005 levels to return this sector to its 1990 GHG emissions levels. These are preliminary values that need to be more carefully developed using a statewide stakeholder process. Furthermore, as the ARB implements AB 32 requirements, they may require sectors subject to state-level actions to attain levels below their 1990 GHG emissions levels due to those sectors that do not fall within state-level jurisdictions. A visible transportation sub-sector that may not be subject to state-level action, and which is growing at the greatest rate, is jet fuel use.

**Table 1. Statewide Allowable VMT Growth Rates in 2020 Relative to 2005**

<b>Allowable On-Road Fuel Demand</b>	<b>Allowable VMT Growth from 2005</b>
<b>With AB 1493 and LCFS</b>	<b>+ 54 %</b>
<b>With AB 1493 but without LCFS</b>	<b>+18 %</b>
<b>Without AB 1493 or LCFS</b>	<b>-15 %</b>

Source: California Energy Commission staff, 2007



## CHAPTER 3: Land Use and Energy: Trends and Drivers

Many researchers have studied the relationship between land use and energy. This section examines the various trends that impel land use related energy use and some of the drivers shaping current development patterns. These trends and drivers are critical to understanding how different land use patterns can affect VMT and energy use.

### Vehicle Miles Traveled

As previously noted, VMT has been growing by 3 percent a year, and Caltrans expects similar growth into the future. Caltrans modeling estimates assume current population growth rates and the continuation of current development and transportation practices. Research on the effect of land use practices on transportation patterns suggests that different development patterns could reduce VMT growth rate.

A 2002 U.S. Environmental Protection Agency study<sup>12</sup> compared the impacts of compact and sprawling counties on transportation patterns. Sprawl was defined as:

- A population widely dispersed in low density residential development.
- A rigid separation of homes, shops, and workplaces.
- A lack of distinct, thriving activity centers, such as strong downtowns or suburban town centers.
- A network of roads marked by very large block size and poor access from one place to another.

Sprawl was measured for 83 of the nation's largest metropolitan areas.

The research suggests that counties with an inverse proportion of the above sprawl characteristics had significantly less average vehicle ownership, daily VMT per capita, annual traffic fatality rate, and maximum ozone level days. At the same time, shares of work trips by transit and walk modes increased to a significant degree.

### Density and Mixed Use

Researchers Ewing and Cervero have examined the variables that have a significant effect on the overall VMT and vehicle trips of individuals and households, mostly through their effect on the distance people travel and modes of travel they choose.<sup>13</sup>

Their research suggests that of the many factors that can be used to quantitatively analyze development and transportation interactions, density may have the most significant relationship to travel and transportation outcomes. Controlling for other factors, the difference between low and high density U.S. metropolitan areas is more than 40 percent daily per capita VMT. They found that doubling of neighborhood density can be expected to result in approximately a 5 percent reduction in both vehicle trips and VMT per capita.

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<sup>12</sup> Ewing R., R. Pendall, and D. Chen, "Measuring Sprawl and Its Impact," Smart Growth America/ U.S. Environmental Protection Agency, Washington D.C., 2002.

<sup>13</sup> Ewing R. and R. Cervero, "Travel and the Built Environment," *Transportation Research Record*, Vol. 1780, pp. 87-114, 2001.

According to the research, accessible, highly dense, mixed-use communities result in shorter length of vehicle trips. Of particular note was the difference between centrally located developments and development along the outskirts of established areas. Areas of high accessibility—such as center cities<sup>14</sup>—seemed to produce substantially lower VMT than dense mixed-use developments in the exurbs.<sup>15</sup> They found that trip frequencies seemed to depend mostly on socioeconomic and demographic factors, but overall VMT and vehicle trips declined as accessibility, density, and/or land-use mixing increased. As Dr. Reid Ewing noted in the June 26, 2007, Energy Commission workshop, “a smart growth development plan that increases average density by 30 percent, emphasizes infill, and mixes land uses to a high degree would be expected to reduce regional VMT by about 15 percent per capita over 30 years at an average metropolitan growth rate.”

A San Francisco Bay Area study found that, all else being equal, “(e)very 10 percent increase in the number of retail and service jobs within 4 miles of one’s residence is associated with a 1.68 percent reduction in shopping and personal-service VMT... (Also,) a doubling of accessibility to retail and service activities was associated with a 13.7 percent decline in daily hours spent getting to and from shops and consumer-service outlets” (p. 483).<sup>16</sup>

The results of a 2002 travel model that compared VMT between high-density and business-as-usual growth scenarios showed that miles traveled in privately owned vehicles (POV) would be 7.5 percent less in a high-density growth development than a business-as-usual development (see Table 2, below). Also, transit miles traveled were 39 percent more.<sup>17</sup>

**Table 2. Additional Daily Travel Miles  
in Privately Owned Vehicles (POV) and Transit—  
Business-as-Usual and High-Density Urbanization Scenarios,  
California, 2000 to 2025**

Business-as-usual	POV Miles	163,957
	Transit Miles	5,857
High-density	POV Miles	151,582
	Transit Miles	8,157
Difference—Absolute	POV Miles	12,375 less
	Transit Miles	2,300 more
Difference—Percent	POV Miles	7.5 percent less
	Transit Miles	39.0 percent more

Source: Burchell, Robert W., et al., 2002, *Costs of Sprawl—2000*, Transit Cooperative Research Program, Washington, DC, TCRP Report 74 (modified from Table 11.30).

<sup>14</sup> A city’s downtown and adjacent neighborhoods.

<sup>15</sup> Prosperous rural communities beyond the suburbs that become commuter towns for an urban area.

<sup>16</sup> Cervero, Robert and Michael Duncan, 2006, Which Reduces Vehicle Travel More: Jobs-Housing Balance or Retail-Housing Mixing? *Journal of the American Planning Association*, Autumn 2006, Vol. 72, No. 4.

<sup>17</sup> Burchell, Robert W., George Lowenstein, William R. Dolphin, Catherine C. Galley, Anthony Downs, Samuel Seskin, Katherine Gray Still, and Terry Moore, 2002, *Costs of Sprawl—2000*. Transit Cooperative Research Program, Washington, D.C., TCRP Report 74.

## Jobs-Housing Balance

The length and number of work trips seem to be growing because of an imbalance between the availability and affordability of housing with the number and earning power of jobs.<sup>18</sup> In the San Francisco Bay Area, average commuting vehicle miles grew by 23 percent between 1980 and 1990 as rising housing prices forced more and more people to move farther out and commute into San Francisco. If jobs were brought into balance with housing, “(all) things being equal, every 10 percent increase in the number of jobs in the same occupational category within 4 miles of one's residence (would be) associated with a 3.29 percent decrease in daily work-tour VMT.”<sup>19</sup>

A balance of jobs and housing may reduce daily work VMT, which is important in managing congestion, but work trips account for a small and shrinking percentage of total travel. According to the National Household Travel Survey 2001 Highlights Report, 45 percent of daily trips were made for family and personal reasons, such as shopping and running errands, 27 percent were made for social and recreational purposes, and 15 percent were made for commuting to work.<sup>20</sup> “Nonwork is the major reason for travel even in peak travel periods. It may also be linked to the rapidly increasing numbers of commercial vehicles in service” (p. 2).<sup>21</sup>

In contrast, Handy<sup>22</sup> believes that the data showing increases in non-work VMT are convincing but not conclusive. Nevertheless, non-work VMT is a large portion of travel, which may not respond to traditional methods of reducing VMT in the same way. Transit-oriented developments, for example, may be more successful if they are designed to facilitate non-auto errand trips as well as transit commutes. The relationships between possible explanations and travel behavior are complex, and researchers are just beginning to try to understand them.

## Social Equity

The jobs/housing balance could have a disproportionate effect on low-income households. As jobs move from center cities to outlying areas, low-income communities typically found in the more urbanized areas will have farther to commute and will likely have fewer transportation options. California workers are more likely to work outside the central city than those in other western metropolitan areas.<sup>23</sup> Fuel costs could represent a greater proportion of a low-income budget as compared to moderate or high-income budgets. If low-income workers migrate to the suburbs, again lack of transportation alternatives would make it difficult for this population to reduce VMT.

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<sup>18</sup> Cervero, Robert, 2003, “Growing Smart by Linking Transportation and Land Use: Perspectives from California,” *Built Environment* Vol. 29 No. 1, pp. 66-78.

<sup>19</sup> Cervero, Robert and Michael Duncan, 2006, “Which Reduces Vehicle Travel More: Jobs-Housing Balance or Retail-Housing Mixing?”, *Journal of the American Planning Association*, Autumn 2006, Vol. 72, No. 4, p. 482.

<sup>20</sup> U.S. Department of Transportation and Bureau of Transportation Statistics, 2003, NTHS 2001 Highlights Report, BTS03-05, Washington, D.C.

<sup>21</sup> Nelson, Dick and John Niles, January 9-13, 2000, “Observations on the Causes of Nonwork Travel Growth,” Transportation Research Board 79th Annual Meeting, Washington, D.C., Paper No. 00-1242.

<sup>22</sup> Handy, Susan, Andrew DeGarmo, and Kelly Clifton, 2002, *Understanding the Growth in Non-Work VMT*, Southwest Region University Transportation Center, Center for Transportation Research, Texas A&M University System, Texas, Research Report SWUTC/02/167802-1.

<sup>23</sup> Sanders, Steve, 2001, *A Strategic Scan of Smart Growth Issues in California*.

## Aging Population

As of July 1, 2005, an estimated 78.2 million Americans were between the ages of 45 and 54.<sup>24</sup> The greatest growth in California population for the years 2005-2015 will be in the 45-54 age group (just over 1.5 million), followed by the 55-64 age group (about 1.4 million), and the 65+ age group (about 1.3 million).<sup>25</sup> Researchers are not sure if these groups will drive more or less as they age. Retired people tend to travel less, but better health and mobility could mean that they will travel more.<sup>26</sup> Surveys of home buyers over the age of 45 showed that home buyers' highest priorities are good access to shopping, family, friends, and medical care. If home buyers move, it will be to smaller houses with smaller yards.<sup>27</sup> Market assessments conducted in 2003 and updated in 2005 to inform the Sacramento Blueprint Base Case conditions agree with these findings.<sup>28</sup>

## Residential Design and Energy Consumption

Studies have shown that the type of housing (such as multifamily) and the size of a house have strong relationships to residential energy use. "Residents of single-family detached housing, for example, are expected to consume 22 percent more primary energy than those of multifamily housing and 9 percent more than those of single-family attached housing"<sup>29</sup> (p. 62). In addition, the type of housing (such as multifamily) and the size of the house have a strong relationship to the density of development. Housing in compact areas is more likely to be multifamily and smaller than housing in sprawling areas. Depending on the household, energy consumption could be about 13 percent less in a compactly developed area.

At least two other studies have validated the relationship between higher density and lower energy use, as discussed by McGeogh et al. (2004) in their review of sustainable urban design features.<sup>30</sup> However, the relationship between higher density and lower energy use may not be linear. One study indicates that if cities are too noisy and the local air quality is poor, instead of using natural ventilation people will use their air conditioners.<sup>31</sup> Another study also suggests that if cities become too dense, in addition

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<sup>24</sup> [http://www.census.gov/Press-Release/www/releases/archives/facts\\_for\\_features\\_special\\_editions/006105.html](http://www.census.gov/Press-Release/www/releases/archives/facts_for_features_special_editions/006105.html).

<sup>25</sup> Center for Continuing Study of the California Economy, Opportunities and Challenges for the California Economy, California Economic Growth Chapter 2,

<sup>26</sup> Handy, Susan, Andrew DeGarmo, and Kelly Clifton, 2002, *Understanding the Growth in Non-Work VMT*, Southwest Region University Transportation Center, Center for Transportation Research, Texas A&M University System, Texas, Research Report SWUTC/02/167802-1.

<sup>27</sup> International City/County Management Association (ICMA) with Geoff Anderson, 1998, *Why Smart Growth: A Primer*, Smart Growth Network and ICMA.

<sup>28</sup> Levy, Stephan, 2004, "Growth Trends and Market Analysis for the Sacramento Region", Center for the Continuing Study of the California Economy, Palo Alto, CA Prepared for SACOG, Sacramento, CA.

<sup>29</sup> Rong, Fang, 2006, *Impact of Urban Sprawl on U.S. Residential Energy Use*, University of Maryland, <http://hdl.handle.net/1903/3848>.

<sup>30</sup> McGeogh, U, D, Newman, and J. Wrobel, (2004) "Model for Sustainable Urban Design: With Expanded Sections on Distributed Energy Resources," Prepared for the Oak Ridge National Laboratory by the Sustainable Energy Planning Office of the Gas Technology Institute; released February 28, 2004, GTI Project # 303803-23. Available online at [http://www.necsc.us/docs/ORNLDesign\\_Final.pdf](http://www.necsc.us/docs/ORNLDesign_Final.pdf)

<sup>31</sup> Cooper, J. T. R., and A. Smyth. 2002. "Energy trade-offs and market responses in transport and residential land-use patterns: Promoting sustainable development policy." *Urban Studies* 38(9): 1573-1588.

to reduced use of natural ventilation, the need for electric lighting goes up, and the use of natural lighting goes down.<sup>32</sup> Further research is needed to understand the implications of urban noise, air pollution, density, and other land use characteristics on building energy use, especially air conditioning and electric lighting.

## **Local Government Funding**

Land use patterns, and the VMT resulting from them, are influenced by the tax revenues available to local governments. One of the largest impediments to local governments' embracing of energy-efficient and climate-friendly growth patterns is the structure of local-government finance.

### ***Property Taxes***

Before Proposition 13 (1978), local property taxes were a primary source of revenue for local governments. They were individually levied according to the city, county, school district, and state's assessed value. Each entity could independently assess the value of a property and levy a tax based on that value. Overall tax rates were often in the range of 2 percent to 3 percent of a property's assessed value. Once enacted, Proposition 13 restricted the property tax rate to 1 percent of assessed value, and it prohibited reassessment of property except when it was sold. Thereafter, annual tax increases could amount to no more than 2 percent or the rate of inflation, whichever was less.

Proposition 13 significantly cut local tax revenue as compared to the prior period and altered the way local governments fund public services and infrastructure. In particular, it encouraged cities and counties to impose heavier exactions—sometimes known as developer fees or impact fees—to pay for roads, sewers, parks, and schools.

Other revenue demands, particularly education, have also crowded the property-tax base, making it less available for local government purposes and reducing incentives to improve the base through residential development. In 1992 and 1993, facing a \$14 billion shortfall in revenue, the Legislature shifted billions of dollars in local property tax revenues to schools to meet the state's minimum funding obligation to schools under Proposition 98. The shifted property taxes went into a fund established by the Legislature called the Educational Revenue Augmentation Fund.

### ***State Sales Tax***

Local governments receive 1/7 of the state sales tax for sales in their local districts. So in addition to exacting fees on developers, local governments also started encouraging development that increased sales tax revenue, such as shopping malls, car dealerships, and hotels. By contrast, land uses that produce only property taxes and have a high public service cost, such as moderately priced housing, became less desirable. This caused counties and cities to favor sales tax-generating retail development rather than

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<sup>32</sup> Koen Steemers (2003), "Energy and the city: density, buildings and transport," *Energy and Buildings* 35(1): 3-14. This paper discusses land use affects on both transport and energy use, particularly in the UK context. It points out that increasing density does not necessarily produce energy savings; in fact, moderately high densities (more on the order of European cities than Asian ones) may be the best from an energy standpoint. The authors point out that the two are linked — that in a city where the noise and pollution from cars is minimized, the buildings can be opened up, replacing powered ventilation, cooling and lighting with passive ventilation, cooling and lighting.

property-tax-bound residential uses, a circumstance commonly referred to as “the fiscalization of land use.”

As a result of these tax policies, local land use planning and decision making may demonstrate a bias toward tax revenue-driven development. Such development often may pit one community against another in an effort to attract businesses that generate sales tax. Local competition for retail and auto malls rarely balances community housing needs with the benefits of non-retail business and industry and may exacerbate transportation and associated environmental problems. The competition for the sales tax revenue can lead to local governments in the region offering escalating incentives to attract retail establishments, often through waiver of fees, favorable zoning, and other means. This competition for expected sales tax revenue is commonly referred to as “the race to the bottom.”



## **CHAPTER 4: Land Use and Transportation Planning Opportunities to Reduce Energy Demand and Greenhouse Gas Emissions**

Land use and transportation planning are linked and must be viewed together to understand how they can jointly reduce energy demand and GHG emissions. This chapter provides an overview of relevant programs, policies, and required plans that affect current land use and transportation planning, and some of the state policy documents that either do or could effect reductions in both energy demand and GHG emissions. The processes and plans discussed in this chapter are in place and can become part of a state effort to better integrate land use, transportation and energy resource management.

### **Current Approach to Land Use and Transportation Planning**

Authority for transportation and land use planning is divided unevenly among state, regional, and local governments. Cities, counties, and “metropolitan planning organizations” (MPOs) spend hundreds of millions of dollars annually on transportation, land use and air quality planning.<sup>33</sup> Much of this planning is done to allocate hundreds of billions of dollars of federal and state transportation funds via “metropolitan transportation plans” (MTPs). This planning effort involves every MPO in the state, along with air district and local government partners. It can contribute in a coordinated way to successful improvements in energy demand reduction and GHG emission reductions or it can produce transportation funding plans and general plans<sup>34</sup> that will work against resource efficiency for many years to come. Air quality, housing, employment, open space, farmland, fuel demand and mobility, and global warming are some of the quality-of-life factors that depend on coordination among MPOs and local governments and are directly affected by the allocation of transportation dollars.

### **Regional Transportation Planning Process**

Several mandatory transportation infrastructure, mobility, and funding reports and air quality management reports affect transportation decision-making in California. These include:

- Regional Transportation Plans (RTPs). RTPs meet the long-term (25-year planning horizon) transportation needs of the metropolitan population. The plans outline the development of mass transit, highway, airport, port, railroad, bicycle, and pedestrian facilities. RTPs can promote construction of roads or transit to areas previously less accessible thereby inducing growth into undeveloped land and/or they can help to reduce pressure to grow outward by enhancing mobility within and

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<sup>33</sup> Metropolitan planning organizations are often also the “Council of Governments.” MPO is a federal designation related to responsibility for preparing the RTP (see next page) and RTIP (see next page) and receiving and allocating transportation funding. Councils of Government are joint powers agencies established to analyze the relationship between policies in one subject area and its impact upon other regional issues. SACOG, SANDAG and SCAG, for example, are all both the COG and the MPO. ABAG and MTC are separately the COG and the MPO, respectively, serving the Bay Area.

<sup>34</sup> A document containing a statement of development policies including a diagram and text setting forth the objectives of the plan. The general plan must include certain state mandated elements related to land use, circulation, housing, conservation, open space, noise, and safety.

adjacent to the established urban footprint. RTPs are updated once every seven years. The level of sophistication of models, quality of data, and planning that contributes to RTPs varies widely throughout California.

- Regional Transportation Improvement Plans (RTIPs). Also produced by MPOs, RTIPs lay out short-term projects and funding in priority order. RTIPs are given to Caltrans to constitute a state plan. RTIPs link funding to projects and can affect the value of land thereby inducing investment either within or near the existing urban footprint or in outlying areas.
- State Transportation Improvement Plan (STIP).<sup>35</sup> STIPs are the aggregate of all of the individual RTIPs with the projects identified by Caltrans in its Inter-Regional Transportation Improvement Program (ITIP) into one document. Projects within the STIP receive 75 percent of the STIP funds, Caltrans controls only 25 percent of the STIP funds through ITIP projects, and MPOs control 75 percent of the funds.
- State Air Quality Management Plan (AQMP). AQMPs are produced by Air Quality Management Districts (AQMD) to project future air quality and address necessary measures to attain or maintain federal and state health-based ambient air quality standards.

RTPs and RTIPs integrate the transportation plans of all of the cities and counties within their jurisdictions. Once the RTIPs are funded and set into motion, transportation fuel demand is essentially set for many decades. Transportation energy consumption associated with the actions included in the RTIP can then only be affected by changes in end-use technology or regulatory intervention.

Federal air quality regulations also affect the transportation planning process. When a metropolitan area does not meet National Ambient Air Quality Standards (NAAQS), federal Clean Air Act Amendments (CAAA) require local AQMDs to work with MPOs to develop plans that bring RTIPs and the projected air pollution emissions from those projects into conformity with CAAA. The CAAA allow the U.S. Environmental Protection Agency to impose sanctions or penalties, such as blocking federal highway funds and imposing more stringent pollution offsets, when projects do not conform.

The urgent need to reduce vehicle emissions to attain conformity drives the effort to reduce the number and length of vehicle trips, which is the only, albeit indirect, land-use-linked transportation energy conservation program in place today.

MPOs are also developing other plans that could affect future land use planning. For example, the Southern California Association of Governments *2006 State of the Region Report* included an extensive discussion of energy and a guest editorial by Ronald Cooke on “The Energy Defensive Economy: Challenges Ahead for Local Government,” which discussed oil depletion, how it would affect local government, and recommendations for local government action.<sup>36</sup>

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<sup>35</sup> The STIP is funded with both federal (70 percent) and state (30 percent) dollars. Although the amount varies each year, about \$1.5 billion– \$2.0 billion total is allocated annually for the projects prioritized in the STIP.

<sup>36</sup> Southern California Association of Governments, *The State of the Region 2006*, accessed at [http://www.scag.ca.gov/publications/pdf/2006/SOTR06/SOTR06\\_EnergyExcerpt.pdf](http://www.scag.ca.gov/publications/pdf/2006/SOTR06/SOTR06_EnergyExcerpt.pdf)

## Local Land Use Planning Process

Local governments hold the majority of land use authority in California and express their legally enforceable policies through required general plans and zoning codes. State law requires these general plans to address land use, circulation, housing, open space, conservation, safety, and noise. State law does not require general plans to address energy although a few cities and counties have adopted an energy element making its provisions mandatory within their jurisdiction. In 2003, of the nearly 500 cities and counties in California that prepare general plans, 52 had energy elements of which only 5 had been written since 2000.<sup>37</sup> By 2006, 7 of the original 52 had been dropped and 11 more added for a total of 56 general plan energy elements. Some of the dropped elements may have become part of the required land use element or simply discarded.

Over the same time intervals, local governments in California have adopted many more growth management elements in their general plans. Growth management elements are not required by the state but once adopted become enforceable. By 2003, of the same 500 cities and counties in California, 80 had adopted growth management elements, with 25 of these dated 2000 or later. Between 2003 and 2006, 10 more growth management elements were adopted and 7 dropped for a total of 83.

These statistics are significant because they indicate that local governments are investing in managing energy and growth, which greatly affects energy demand. They also indicate that less than 20 percent of the cities and counties currently are likely to be addressing energy within their adopted General Plans.

Along with energy and growth management elements, many cities in California have adopted urban growth boundaries (UGBs). UGBs are mapped lines that separate an urban area from its surrounding greenbelt of open lands. UGBs help protect open land, and they encourage infill and higher densities, which in turn support more public transit. In California, UGBs can be established by voters or by city council action.<sup>38</sup>

Issues such as housing, transportation and congestion, economic development and air pollution and reducing GHGs lend themselves to, and in some cases require, a more regional approach. City and county boundaries and authority can limit an agency's ability to affect change as it may require collaboration from regional peers to effectively attain its policy goals. An example of this is the adoption of smart growth principles by a city attempting to reduce sprawl by limiting low-density development on its boundaries. If the city's regional partners do not support the city's efforts by adopting similar policies and allowing the same kind of low-density, sprawling development in its jurisdiction, then the region will still suffer from the negative impacts of the development.

## State Land Use Planning

The state has typically played a limited role in direct land use planning, rather conducting activities that more indirectly influence land use decisions. State officials prepare functional plans to guide department programs, decisions and projects. The Governor's Office of Planning and Research (OPR) is responsible for collection of the state's functional plans.

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<sup>37</sup> *The California Planners' Book of Lists 2005*, Governor's Office of Planning and Research, Sacramento, CA. Compiled from results of 2004 survey of local governments.

<sup>38</sup> Greenbelt Alliance, *Urban Growth Boundaries*, [www.greenbelt.org/downloads/about/ugb.pdf](http://www.greenbelt.org/downloads/about/ugb.pdf)

The state took a major step toward encouraging smarter growth with the passage of AB 857 (Wiggins, Chapter 1016, Statutes of 2002), which laid out three planning priorities for state agencies: promote infill development and social equity in existing communities; protect and conserve environmental and agricultural resources; and achieve more efficient use of land, transportation, energy, and public resources outside the infill areas. AB 857 also requires the Governor's *Environmental Goals and Policy Report* (EGPR) to be consistent with these planning priorities. The EGPR is intended to provide a 20- to 30-year overview of state growth and development as well as articulate the Governor's environmental goals and policies including, but not limited to, land use, population growth and distribution, development, the conservation of natural resources, and air and water quality. The EGPR forms the basis for judgments about major state investments and capital projects, including the allocation of state resources through the budget and appropriations process. The EGPR addressed the issues and initiatives relating to climate change as of the date of its preparation. The EGPR was transmitted by OPR to the state Legislature on November 10, 2003, but was never finalized or formally approved, as required by Government Code Section 65046.

Additional areas where the state plays a role (albeit indirect) in land use planning include the California Environmental Quality Act updates (OPR), the California Transportation Plan (Caltrans), housing element updates (Department of Housing and Community Development), the California Water Plan (Department of Water Resources), stormwater planning (State Water Resources Control Board), and infrastructure construction and financing.

### ***California Environmental Quality Act***

The California Environmental Quality Act (CEQA) requires state and local agencies to identify and reduce, if feasible, the significant, negative environmental impacts of land use decisions. The documents prepared under CEQA (Environmental Impact Reports, or EIRs) rarely address energy consequences or greenhouse gas emissions. In late 2006, the Center for Biological Diversity filed a lawsuit against the city of Banning, seeking to overturn the approval of a large housing development because the city did not evaluate the effect of GHG emissions from the increased vehicle trips on global warming. The California Attorney General and others sued San Bernardino County in April 2007 for, allegedly, violating CEQA by failing to address the impact of GHG on climate change in the county's new 25-year general plan EIR.

OPR's State Clearinghouse coordinates the state-level review of environmental documents under CEQA and provides technical assistance on land use planning and CEQA matters. OPR is responsible for updating CEQA, as appropriate. CEQA guidelines do not currently state if and how emissions of CO<sub>2</sub> are to be evaluated. The ARB, as the implementing agency for AB 32, has not issued any guidance to cities or counties on how GHG emissions and AB 32 should be evaluated in CEQA documents. The Association of Environmental Professionals (AEP) has prepared a draft white paper on how to analyze GHG emissions and global climate change in CEQA documents. A range of possible approaches are identified; however, critics have stated that it is premature for local governments to define significance thresholds, quantify emissions, and mandate mitigation measures for GHG emissions without guidance from the state.

### ***California Transportation Plan***

The California Transportation Plan (CTP) is a long-range transportation policy plan that provides for the movement of people, goods, services, and information at a statewide/interregional level. The CTP offers a blueprint to guide future transportation

decisions and investments that are intended to ensure California's ability to compete globally, provide safe and effective mobility for all persons, better link transportation and land use decisions, improve air quality, and reduce petroleum energy consumption.

The CTP provides a vision for California's transportation system and explores major trends that will likely influence travel behavior and transportation decisions over the next 20-plus years. In the context of these future trends and challenges, it provides goals, policies, and strategies to reach the vision. To fulfill the CTP's vision of improved mobility and to reduce congestion, the Schwarzenegger Administration launched a comprehensive transportation mobility initiative—"GoCalifornia." GoCalifornia is a mobility action plan designed to decrease congestion, improve travel times, and increase safety, while accommodating future growth in the population and the economy. It provides a roadmap to target transportation dollars to those improvements and investments that yield the greatest benefit for all Californians now and in the future. How these actions are carried out will likely affect future land use patterns and VMT.

### ***Housing Element Updates***

State law requires each city and county to adopt a general plan containing at least seven elements including housing. Unlike the other mandatory general plan elements, the housing element, required to be updated every five years, is subject to detailed statutory requirements and mandatory review by the state Department of Housing and Community Development (HCD). HCD is charged with reviewing local housing elements for compliance with state law and to report its written findings to the local government. Housing element law requires local governments to adequately plan to meet their existing and projected housing needs including their share of the regional housing need.

HCD must assess a Regional Housing Need Plan (RHNP) to ensure it promotes the following objectives:

- Increase the housing supply and the mix of housing types, tenure, and affordability in all cities and counties within the region in an equitable manner.
- Promote infill development and socioeconomic equity, protect environmental and agricultural resources, and encourage efficient development patterns.
- Promote an improved intraregional relationship between jobs and housing.

### ***California Water Plan***

The electricity used to pump and treat water for delivery to California customers and its subsequent use by those customers represents about 20 percent of the total electricity used in the state per year.<sup>39</sup> The California Water Plan is the state's strategic plan for managing water resources statewide. It is updated every five years by the California Department of Water Resources (DWR). The Water Plan is a key element in the Governor's Strategic Growth Plan. The last update, released in 2005, outlined two key initiatives:

- Promote integrated regional water management through regional partnerships and diversified management strategies.
- Maintain and improve statewide water management systems.

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<sup>39</sup> <http://www.energy.ca.gov/2005publications/CEC-100-2005-007/CEC-100-2005-007-CMF.PDF>

The 2005 Water Plan stated that “DWR will work with other state agencies to develop and help implement strategies to reduce greenhouse gas emissions in the state in accordance with the goals established by Executive Order S-03-05. DWR will provide expertise to help identify means of energy savings for the storage, conveyance, distribution, and use of water. DWR will describe the energy use characteristics of various resource management strategies in the next California Water Plan.”

California Water Plan Update 2009 will track and report progress on action plan items and initiatives, and will address the potential impacts of climate change. The update will be prepared with 16 other state agencies.

Delivery of water from California’s State Water Project (SWP) represents the largest single use of electrical energy in the state. It accounts for 2 to 3 percent of all the electricity consumed in California.<sup>40</sup> In a letter to Senator Don Perata in April 2007, DWR Director Lester Snow stated that the agency has filed an intent to register with the California Climate Action Registry and will perform a complete assessment of its GHG emissions and move to reduce those emissions.<sup>41</sup>

### ***Stormwater Plans***

In early 2005, the State Water Resources Control Board adopted sustainability as a core value for all California Water Boards’ activities and programs and directed California Water Boards’ staff to consider sustainability in all future policies, guidelines, and regulatory actions. One of the outcomes of this is low-impact development (LID). Unlike traditional stormwater management, which collects and conveys storm water runoff through storm drains, pipes, or other conveyances to a centralized storm water facility, LID takes a different approach by using site design and storm water management to maintain the site’s pre-development runoff rates and volumes. The goal of LID is to mimic a site’s predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to the source of rainfall. LID is seen as an alternative to conventional storm water management. This can reduce the amount of stormwater needed to be treated as well as recharging groundwater supplies, which can reduce the need to import energy intensive water supplies. As pointed out at the Energy Commission’s June 26, 2007, workshop, hard surfacing and flood control have changed the stormwater runoff pattern within the Chino Basin of California, resulting in the loss of more than 40,000 acre-feet per year that otherwise would have been recharged to groundwater.<sup>42</sup> The energy value of the lost storm water was, on average, 2250 kWh per acre-foot.

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<sup>40</sup> <http://energy.ca.gov/pier/iaw/industry/water.html>

<sup>41</sup> Department of Water Resources, Letter to the Honorable Don Perata, Senate President pro Tem, April 13, 2007

<sup>42</sup> Dr. Robert Wilkinson, University of California, presentation at the June 26, 2007, workshop on “Land Use, Energy, and Climate Change.”



# CHAPTER 5: Integrating Transportation and Land Use Analysis, Planning, and Process

## California Regional Blueprint Planning Program

The Regional Blueprint Planning Grant Program<sup>43</sup> was initiated in 2005 by the Secretary of Building, Transportation and Housing and is managed by Caltrans. This grant program, distributing nearly \$5 million annually in regional blueprint planning grants, is intended to better inform regional and local decision-making. The program involves the proactive engagement of all segments of the population, as well as critical stakeholders in the community, business, academia, developers, construction, and environmental organization, to foster consensus on a vision and preferred land use pattern in a given region. It is anticipated that the regional blueprint planning grants will build capacity for regional collaboration and integrated planning that will in turn enable regions to plan to accommodate all their future growth, thereby reducing sprawl. Regional blueprint planning is underway in 14 of 18 MPOs within California.<sup>44</sup> Two key goals of the program are to:

- Foster a more efficient land use pattern that (a) supports improved mobility and reduced dependency on single-occupant vehicle trips, (b) accommodates an adequate supply of housing for all incomes, (c) reduces impacts on valuable habitat, productive farmland, and air quality, (d) increases resource use efficiency, and (e) results in safe and vibrant neighborhoods.
- Provide consumers more housing and transportation choices.

## Blueprint Learning Network

- The Business, Transportation and Housing Agency established the Blueprint Learning Network (BLN) to work with the MPOs and Councils of Government (COGs) to further advance regional blueprint planning. BLN is a team that includes, but is not limited to: the Resources Agency, Caltrans, the California Department of Housing and Community Development, the California Center for Regional Leadership (CCRL), and the University of California at Davis. The program helps state agencies make better infrastructure investment decisions and lead to a better quality of life in California based on the environment, economy, and equity. The purpose of the BLN is to work with regional teams (MPOs and stakeholders) in a series of workshops on overcoming the challenges and obstacles to effective regional blueprint planning.

## Energy in Blueprint Planning – Current and Potential

Energy was not a stated component of the Blueprint Planning Grant Program. However, MPOs have been independently working on energy issues to understand the risk imposed to regional mobility from energy supply disruptions, peak oil, cost increases, and emission regulation changes, including GHG emission reduction. For example, the executive director of the Southern California Association of Governments (SCAG) hosted a “Peak Oil Seminar” to discuss risk associated with long-term disruptions in

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<sup>43</sup> State of California, Department of Transportation, California Regional Blueprint Program, 2005 Grant Application Package, Sacramento, CA, 2005.

<sup>44</sup> Presentation, Blueprint Learning Network annual meeting, November 29–30, 2006, Anaheim, CA.

transportation fuels to the Los Angeles basin.<sup>45</sup> Sacramento's MPO has published an energy issue paper and article in the Regional Report to inform citizens and decision makers about the possible scope of the issue.<sup>46</sup> SANDAG has partnered with the Energy Commission to update its Regional Energy Plan to incorporate the state's electricity sector "loading order,"<sup>47</sup> Renewables Portfolio Standard, GHG goals, and other state policies that have been enacted since 2002 into its long-range planning efforts. Energy Commission staff is developing relationships with the BLN to better integrate energy and GHG planning into the blueprint planning process.

The California investment in regional blueprint planning could have tremendous benefits to both transportation and building energy savings and GHG gas emissions reduction.

Of key importance is that blueprint plans are the joint product of MPO and local government collaboration. MPOs hold transportation planning and funding authority. Cities and counties possess land use authority. The MPO Board of Directors is composed of elected officials from the cities and counties of the MPO's jurisdiction. The MPO, then, is an ideal forum to build consensus and political will, deploy legal authority to take action and schedule funding to implement land use, transportation, and energy plans.

Below are descriptions of four of the leading blueprint projects for various sized regions.

### **Sacramento Blueprint Project**

In 2002, the Sacramento Area Council of Governments (SACOG) board of directors created the Blueprint Project in response to the region's projected congestion and poor air quality. Citizens and elected officials worked together, using the I-PLACE3S interactive computer software and extensive outreach, to improve land use and transportation decision making. All cities and counties of the Sacramento region voluntarily chose to participate in Blueprint. Many began to implement local portions of the results in advance of the final adoption, and several SACOG members are integrating the Blueprint policies into the update of their general plans.

Ultimately, the region's elected leaders, city and county planning departments, developers and citizens will use the detailed technical data developed during the study to make land use decisions that will influence how growth will happen now and in years to come. Blueprint data and maps will be used by the public and the SACOG to make choices about the transportation projects that will best serve the region as it changes.

### **Developing the Regional Blueprint Study**

To begin the project, a detailed long-term "base case" scenario was developed. The base case provided data and maps depicting the region in 2050, assuming the present regional growth patterns, transportation system, air quality, and other parameters were not significantly changed and growth proceeded according to market projections based upon the status quo. The base case was used as a benchmark from which to compare net

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<sup>45</sup> "Peak Oil Seminar," personal conversation with Mark Pisano, Executive Director, SCAG, November 2006.

<sup>46</sup> Sacramento Area Council of Governments, *Regional Report, February/March 2007*, Sacramento, CA, 2007, (pp. 4-8).

<sup>47</sup> The loading order is used to ensure that the most desirable electricity option is used first. The loading order consists of decreasing electricity demand by increasing energy efficiency and demand response, and meeting new generation needs first with renewable and distributed generation resources and, second, with clean fossil-fueled generation.

change created by the other scenarios. The sprawl, air pollution, traffic congestion, and VMT projected by the base case were considered unacceptable to the participants of the initiative’s public forums.<sup>48</sup>

A series of 37 neighborhood, county, and regional level workshops ultimately produced a set of regional scenarios. All levels of scenarios compared to and contrasted with the base case with at least three alternative development scenarios and allowed workshop participants to make changes and assess the net results. The relationships between mobility, employment, housing, open space, air quality, fuel demand, and land use options over time (to 2050) were quantified and discussed. Regional population and job growth projections were held constant among all the scenarios; each scenario accommodated the same number of new people (about 1.5 million by 2050) and the same number of new jobs (about 750,000 by 2050). A “preferred scenario” was ultimately developed, analyzed, and unanimously adopted by the 31 locally elected city and county officials that make up the SACOG Board of Directors.

### Land Use Related Transportation Fuel Demand Findings

The base case scenario required 661 square miles of new land to be developed to accommodate growth, most of which would occur in outlying areas where land is cheaper and homes and lots can be large. The preferred scenario, on the other hand, required 46 percent less new land to be developed than the base case. Much of the new housing and jobs was located in already developed areas, either on vacant parcels or on less desirable existing properties. The preferred scenario reduced CO<sub>2</sub> and particulate emissions by about 14 percent compared to the base case scenario. VMT dropped lower than the 2005 per household number (41.7 miles per day) down to 34.9 miles per day even with an additional 1.7 million people. Table 3 compares the two scenarios.

**Table 3. Key Statistics Comparing Base Case Scenario 2050 and Regional Preferred Scenario 2050**

PARAMETER	BASE CASE 2050	ADOPTED PLAN 2050	DIFFERENCE
<b>VMT per household per day</b> (excludes commercial vehicles)	47.2	34.9	12.3 fewer miles per household per day, a 25% reduction
<b>People Living in Areas with Good Mix of Jobs and Housing</b>	26%	53%	27% increase
<b>Growth Near Transit</b>	5% New Jobs 2% New Housing	41% New Jobs 38% New Housing	36% more new jobs near transit 36% more new homes near transit
<b>Additional Urbanized Land</b>	666 square miles	304 square miles	362 fewer square miles urbanized
<b>Daily Vehicle Minutes of Travel</b> (per household per day)	81 minutes	67 minutes	14 fewer minutes per day (more than two 40 hour work weeks per year)
<b>Per Capita Carbon Dioxide</b>	Set at 100%	85% of Base Case	15% less than the

<sup>48</sup> Mary Lynn Vellinga, “Forum favors a new direction for development”, *The Sacramento Bee*, Saturday, May 1, 2004.

<b>and Small Particulate Emissions from vehicles</b> (includes commercial vehicles)			Base Case per capita
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Source: SACOG, Blueprint Program, 2005.

SACOG is using the public input, data, and maps developed from the regional blueprint as the basis for its federally mandated 2007 Metropolitan Transportation Plan (MTP), now in process. This MTP will produce a prioritized list of transportation projects to expend \$42 billion for the six-county Sacramento Region over the next 20 years. A wide selection of mobility options and estimated costs were provided to citizens in a large series of well-attended public workshops, similar to the Blueprint workshop series. Outcomes are being used to direct the development of the MTP.

The Sacramento Blueprint Project is an excellent example of the degree to which collaborative planning could reduce the need to travel. It is important to understand that population growth is outpacing the rate at which land use options alone can reduce VMT. So, increased engine efficiencies and cleaner fuels are also a critical part of reaching the GHG targets for absolute reductions back to 1990 levels that are needed to meet 2020 GHG emissions reduction goals, as shown in Table 1.

***San Diego Association of Governments***

In 2004, the San Diego Association of Governments (SANDAG) Board of Directors unanimously adopted the “Regional Comprehensive Plan” (RCP) for the San Diego region. The RCP serves as the strategic framework for how the region can grow in a smarter, more sustainable manner to the year 2030. The RCP is based on three guiding principles:

- Better connect transportation and land use plans using smart growth principles.
- Use transportation and land use plans to guide environmental and infrastructure decisions.
- Use collaboration and incentives to implement regional goals.

One of the key components of the RCP is the Regional Energy Strategy (RES), prepared by the San Diego Regional Energy Office and adopted by SANDAG in 2003. Energy indicators based on goals of the RES have been included in the performance monitoring for the RCP each year.

**Smart Growth Map**

The Urban Form chapter of the RCP calls for the development of a smart growth map. In June 2006, the SANDAG Board accepted the first-ever “Smart Growth Concept Map” in the San Diego region. The concept map identifies locations within the region that can support smart growth and transportation investments and will be used to identify transportation and transit needs in the 2007 RTP. It also will be used to determine eligibility to participate in the region’s long-term \$280 million Smart Growth Incentive Program (SGIP) funded through TransNet, the half-cent sales tax approved by voters in 1987 to finance transportation improvements.

The Smart Growth Concept Map contains almost 200 existing, planned, or potential smart growth locations in seven categories of smart growth “place types” identified in the RCP. About 40 percent of the areas on the map qualify as “existing/planned” smart growth areas, and the remaining 60 percent represent potential smart growth areas. The

map is dynamic and will be updated periodically to reflect changes in local land use plans or regional transportation plans that may influence the designations of the smart growth locations.

### **2007 Regional Transportation Plan Update**

The RCP recommends that the next update of the regional transportation plan (RTP) incorporate smart growth principles from the RCP, placing an emphasis on public transit and other modes of transportation associated with smart growth. SANDAG is updating the RTP, with adoption of the 2007 RTP update scheduled later this year. Smart growth areas will receive higher priority for transportation investments, lending additional support to the smart growth principles contained in the RCP. The RTP Update calls for the development of a regional climate action plan. This plan will be developed as part of the update to the RES.

## **San Francisco Bay Area**

### **Smart Growth Strategy/Regional Livability Footprint Project**

In 1999, San Francisco Bay Area regional agencies responsible for transportation planning, environmental protection, and regional planning came together to promote and nurture smart growth efforts in the region. At the same time, the Bay Area Alliance for Sustainable Development, a coalition of 40 organizations representing business, the environment, social equity, and government, began an ambitious effort to develop public consensus and support for a “regional livability footprint,” that is, a preferred land-use pattern that could direct the Bay Area toward a more sustainable future. In 2000, the regional agencies and the Bay Area Alliance combined their outreach efforts and created the “Smart Growth Strategy/Regional Livability Footprint Project.”<sup>49</sup>

From 2000 to 2002 in numerous meetings, stakeholders conceptualized how future growth should occur in their individual neighborhoods and counties, and in the region as a whole. Business-as-usual growth to 2020 would convert 83,000 acres (more than twice the size of San Francisco) of undeveloped land to urban use and result in insufficient housing within the nine Bay Area counties for the number of workers expected by 2020. Housing would be needed outside the Bay Area, requiring 45,000 acres in neighboring counties, significantly increasing VMT.

By contrast, the smart growth land-use scenario, calling for compact, mixed-use communities that are close to transit lines and employment centers, would increase the urbanized footprint of the Bay Area by less than 16,000 acres, or 2 percent, and provide substantially more housing. The scenario increases the proportion of new housing affordable to very low- and low-income households, from 16 percent to 41 percent. The smart growth scenario emphasized development in cooler, bayside parts of the region, and in multifamily units, thus lowering heating and cooling demand. This combination of changes is expected to result in a 17 percent reduction in water consumption—down from a current 300 gallons a day to an average 250 gallons a day—in new housing units. Under the smart growth scenario, the Metropolitan Transportation Commission estimates the number of public transit riders to increase by one-third over current levels.

The ability to provide more housing in cooler parts of the Bay Area instead of outlying areas would not only reduce VMT but would also reduce energy demands for heating

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<sup>49</sup> Bay Area Joint Commission, *Smart Growth Strategy Regional Livability Footprint Project: Shaping the Future of the Nine-County Bay Area*. Final Report, Bay Area, CA, 2002.

and cooling. In the Bay Area, each mile from the coast is associated with a 1 degree increase in temperatures.<sup>50</sup>

## **FOCUS**

FOCUS, short for the Focusing Our Vision initiative, follows up on the 2002 livability project. It is a regional planning effort partially funded by a Blueprint grant and led by the Association of Bay Area Governments (ABAG) in coordination with the Bay Area AQMD and the Bay Conservation and Development Commission (BCDC).

Local governments in the nine county San Francisco Bay Area can apply for regional designation of an area within their community as a priority development area (PDA). Forty-nine Bay Area jurisdictions have submitted PDA applications and indicated a need for over \$20 billion in infrastructure funding. One of the recommendations of the recently developed Bay Area Climate Protection Program is that climate change issues be integrated into the FOCUS program and that climate change criteria be included in the ranking of priority areas for incentive funding.<sup>51</sup>

## **Metropolitan Transportation Commission Initiatives**

The Metropolitan Transportation Commission (MTC) draft proposal for the 2035 RTP is assessing the feasibility of a 10 percent reduction in VMT per capita (from current VMT) and a 40 percent reduction in transportation CO<sub>2</sub>. MTC and its partners anticipate smart land use will be important in reaching these goals.<sup>52</sup> MTC is developing “wedge” strategies to bridge short-term and long-term CO<sub>2</sub> goals. The strategies address land use, vehicle efficiency, smart driving, and transit use and will be evaluated during the RTP update process. MTC is also implementing a “transit-oriented development” (TOD) policy designed to promote cost-effective transit, ease regional housing shortages, create vibrant communities, and preserve open space.

## **San Luis Obispo Council of Governments (SLOCOG) Blueprint Planning**

The SLOCOG Regional Blueprint (Community 2050) is a joint effort of the regional government, air district, Local Area Formation Commission and the San Luis Obispo County Planning Department. The SLOCOG Blueprint will use scenario planning methods, UPLAN and I-PLACE3S land use planning tools, and public workshops to address relationships among housing, the economy, employment, the environment, agricultural protection and transportation. The results will be used as the basis for the “regional transportation plan” (RTP). SLOCOG’s member city and county governments will be encouraged to integrate the Blueprint and RTP principles and policies into their planning documents. As part of the Community 2050 process implementing Blueprint Planning, SLOCOG convened a “Regional Smart Growth Leadership Event” in April 2007 to engage stakeholders in a regional dialogue on smart growth and new urbanism.

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<sup>50</sup> Association of Bay Area Governments, Bay Area Air Quality Management District, Bay Conservation and Development Commission and Metropolitan Transportation Commission, Comments on Committee Workshop/Staff Report, June 29, 2007.

<sup>51</sup> Association of Bay Area Governments, Bay Area Air Quality Management District, Bay Conservation and Development Commission and Metropolitan Transportation Commission, Bay Area Regional Agency Climate Protection Program—CONSOLIDATED RECOMMENDATIONS, May 4, 2007, accessed at [http://www.mtc.ca.gov/planning/climate/JPC\\_ClimateProtectionProgram.pdf](http://www.mtc.ca.gov/planning/climate/JPC_ClimateProtectionProgram.pdf).

<sup>52</sup> Joint Policy Committee – Regional Planning Program, Comments submitted on the June 26, 2007 workshop on the Role of Land Use in Meeting California’s Energy and Climate Change Goals, July 18, 2007.

## **Local Government**

There are many efforts in local governments throughout California to incorporate smart growth, address climate change concerns, and reduce energy demand. By implementing innovative voluntary strategies, local communities can both reduce greenhouse gas emissions and prepare for the consequences of climate change that are already underway. Two statewide entities supporting local government efforts are described below.

### ***League of California Cities***

The League of California Cities is an association of California city officials who work together to enhance their knowledge and skills, exchange information, and combine resources so that they may influence policy decisions that affect cities.

The California League of Cities is considering the adoption of a policy and guiding principles on climate change that incorporate the following topics.<sup>53</sup>

- Energy efficiency in buildings and new residential or commercial developments
- Use of alternative fuels or low emission vehicles in city fleets
- CEQA
- Updating general plans to reflect climate change impacts
- Water supply impacts from climate change
- Land use planning
- Recycled content procurement policies

The League has endorsed the United States Conference of Mayors Climate Protection Agreement. This agreement (1) calls on the federal government to ratify and implement the necessary policies to meet the Kyoto Protocol's U.S. GHG emissions reduction targets of 7 percent below 1990 levels by 2012 and (2) commits signatories to the same targets for their cities and to achieving the targets through the following transportation and land use policies (but not limiting signatories exclusively to these policies):

- Inventory global warming emissions in city operations and in the community, set reduction targets, and create an action plan.
- Adopt and enforce land use policies that reduce sprawl, preserve open space, and create compact, pedestrian-friendly urban communities.
- Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling, and public transit.

### ***California State Association of Counties***

The California State Association of Counties (CSAC) represents all 58 counties in the state. CSAC has adopted a policy recognizing the need to encourage more strategic growth and target infrastructure investments to promote such action.<sup>54</sup> It is in the process of developing a policy on climate change and has convened a working group to discuss the role counties should play and to consider and identify where CSAC could develop climate change policy statements. CSAC believes that counties are more than

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<sup>53</sup> California League of Cities website, [www.cacities.org](http://www.cacities.org).

<sup>54</sup> California State Association of Counties, Comment Letter on Energy Commission Draft Report: The Role of Land Use in Meeting California's Energy and Climate Change Goals, July 5, 2007.

just another stakeholder group in the climate change debate; rather, they are a vital partner and should be active participants in the discussions and dialogue in the development of GHG emissions reductions strategies.

CSAC recommends that state policy recommendations with respect to growth consider the following principles:

- Incentives for regional blueprint and countywide plans must be provided.
- New development in designated urban areas must evaluate all costs associated with development on both the city and the county.
- Analytical methodologies, thresholds of significance and other standards must be established before CEQA can be used as a tool to address climate change.
- Baselines must be established and technical information and data provided for local jurisdictions to evaluate current policies and develop additional policies and actions.

### ***Institute for Local Government***

The Institute for Local Government serves as a source of independent research and information for California's communities and their leaders. It is the nonprofit research affiliate of the League of California Cities and the California State Association of Counties. The Institute specializes in addressing issues of topical and practical concern to local agencies in California. A key aspect of this involves developing practical "nuts and bolts" materials that help local officials formulate policies that meet the needs of their communities.

To assist local officials, the Institute for Local Government recently launched a new "Climate Action Program."<sup>55</sup> The Institute is working closely with the League of California Cities and the California State Association of Counties on climate action activities with a wide range of local officials and staff. The program will:

- Provide information and access to strategies that local officials can use in their communities to address climate change. This will include climate action resources, best practices, and case studies. A "climate action network" will actively link local officials to a variety of climate change programs and resources.
- Create incentives for local officials to set high goals for energy efficiency and climate change programs. This includes developing a certification and awards program for exemplary local efforts, along with criteria and a method to certify three tiers of local "best practices" to combat global warming.

### **Non-California Initiatives**

Many states and cities have efforts to reduce fuel use and GHG emission in place. A few of these are described below.

#### ***Massachusetts Greenhouse Gas Emissions Policy***

The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs Greenhouse Gases Emissions Policy requires that certain projects undergoing review by the Massachusetts Environmental Policy Act (MEPA) Office quantify GHG emissions generated by proposed projects and identify measures to avoid, minimize, or

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<sup>55</sup> California Institute for Local Government website, [www.ca-ilg.org/climatechange](http://www.ca-ilg.org/climatechange).

mitigate such emissions. A project will be subject to this policy if an environmental impact report (EIR) is required for the project and if it falls into one or more of the following four categories:

- The commonwealth or a state agency is the proponent.
- The commonwealth or a state agency is providing financial assistance.
- The project is privately funded but requires an air quality permit from the Department of Environmental Protection.
- The project is privately funded but will generate 3,000 or more new vehicle trips per day for office projects; 6,000 or more vehicle trips per day for mixed-use projects that are 25 percent office space; or 10,000 vehicle trips per day for other projects.

An advisory group has been convened to develop a standardized quantification and reporting protocol, and upon completion MEPA will require the quantification of greenhouse gas emissions. The analysis will include both "direct" GHG emissions (for example, stack and fugitive emissions from the proposed operation) and "indirect" emissions (for example, emissions from vehicles driven by employees and generating plants supplying electricity to the proposed operation).

In addition to the quantification of project-related GHG emissions, MEPA will also require that proponents consider a project alternative in the EIR that incorporates measures to avoid, minimize, or mitigate such emissions. Possible mitigation measures could include:

- Energy efficiency improvements in buildings.
- Layout of the site and building orientation to make best use of natural light, natural heating and cooling, and solar energy potential.
- Incorporation of low impact development techniques (including green roofs) to reduce the amount of asphalt and provide greater shading.
- Transportation demand management, including locating the project near mass transit, access to shuttle or bus services (preferably using alternative fuels), ridesharing programs, bicycle and pedestrian accommodations, and provision of Zipcar spaces.
- On-site renewable energy and combined heat and power generation.
- Use of clean and alternative fuels.
- Establishment of systems for on-site reuse and recycling of construction and demolition materials and recycling of occupant waste materials.

### ***Oregon Land Conservation Program***

Oregon's statewide land-use planning program, originated in 1973 under Senate Bill 100, was passed to provide protection for farm and forest lands, conservation of natural resources, orderly and efficient development, coordination among local governments, and citizen involvement. The Department of Land Conservation and Development (DLCD) administers the program. A seven-member volunteer citizen board known as the Land Conservation and Development Commission (LCDC) guides the DLCD. Oregon's LCDC, assisted by DLCD, adopts state land-use goals and implements rules, assures local plan compliance with the goals, coordinates state and local planning, and manages the coastal zone program.

Under the program, all cities and counties have adopted comprehensive plans that meet mandatory state standards. The standards are 19 statewide planning goals that deal with land use, development, housing, transportation, and conservation of natural resources. Goal 13, energy conservation, addresses energy efficient land use planning and buildings and Goal 14 addresses urbanization. Periodic review of plans and technical assistance in the form of grants to local jurisdictions are key elements of the program.

Oregon's statewide goals are achieved through local comprehensive planning. State law requires each city and county to adopt a comprehensive plan and the zoning and land-division ordinances needed to put the plan into effect. The local comprehensive plans must be consistent with the statewide planning goals. Plans are reviewed for such consistency by the LCDC. If approved, the plan then becomes the controlling document for land use in the area covered by that plan.

### ***New Jersey State Development and Redevelopment Plan and Smart Growth Program***

The New Jersey State Planning Commission developed and approved the State Development and Redevelopment Plan (State Plan) and the State Plan Policy Map. The State Plan provides a vision for state growth intended to preserve and enhance the quality of life for the state's residents. The State Plan is the result of hundreds of public forums, where the plan's goals, strategies, policies, and application were discussed. This bottom-up approach to planning was designed to encourage consistency between municipal, county, regional, and state plans to create a meaningful, up-to-date, and viable State Plan.

The New Jersey State Plan coordinates planning activities and establish statewide planning objectives in the following areas: land use, housing, economic development, transportation, natural resource conservation, agriculture and farmland retention, recreation, urban and suburban redevelopment, historic preservation, public facilities and services, and intergovernmental coordination.<sup>56</sup>

The State Plan provides a balance between growth and conservation by designating planning areas that share common conditions with regard to development and environmental features:

- Areas for Growth: Metropolitan planning areas.
- Areas for Limited Growth: Fringe planning areas, rural planning areas, and environmentally sensitive planning areas. In these planning areas, planning should promote a balance of conservation and limited growth. Environmental constraints affect development and preservation is encouraged in large contiguous tracts.
- Areas for Conservation: Fringe planning areas, rural planning areas and environmentally sensitive planning areas.

### ***Maryland Economic Growth, Resource Protection, and Planning***

The Maryland Economic Growth, Resource Protection, and Planning Act of 1992 (the Planning Act) was enacted to organize and direct comprehensive planning, regulating, and funding by state, county, and municipal governments to advance a specific economic growth and resource protection policy. The policy is organized around seven

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<sup>56</sup> New Jersey State Smart Growth Program website, <http://www.state.nj.us/dca/osg/>

statutory vision statements that must be pursued in county and municipal comprehensive plans, where priorities for land use, economic growth, and resource protection are established. The visions must also be followed by the state in undertaking its various programs. Both state and local funding decisions on public construction projects must adhere to the visions. The Act also established an Economic Growth, Resource Protection, and Planning Commission (the Commission) to oversee, study, and report on progress toward implementing the visions.

The state of Maryland reports that the work of state, county, and municipal governments, as well as that of the Commission from 1992 to 2002, has succeeded in the widespread integration of the visions in local and state government plans and actions.<sup>57</sup> The work accomplished under the Act helped to give shape and form to Maryland's smart growth program. The 1997 Maryland General Assembly passed five pieces of legislation and budget initiatives—Priority Funding Areas, Brownfields, Live Near Your Work, Job Creation Tax Credits and Rural Legacy—known collectively in Maryland as "Smart Growth."

The Maryland Smart Growth Program has four goals:

- Support existing communities by targeting resources to support development in areas where infrastructure exists.
- Save the most valuable natural resources before they are forever lost.
- Save taxpayers from the high cost of building infrastructure to serve development that has spread far from our traditional population centers.
- Provide Marylanders with a high quality of life, whether they choose to live in a rural community, suburb, small town, or city.

Smart Growth directs the state to target programs and funding to support established communities and locally designated growth areas, and to protect rural areas. The Priority Funding Areas Act provides a geographic focus for the state's investment in growth-related infrastructure.

### ***Portland Metro Regional Transportation and Land Use Planning***

In 2000, Portland Metro completed a planning process meant to look 50 years into the region's future (from 1990 to 2040), dubbed "the 2040 Growth Concept." The Portland area expected a large increase in population by 2040, which according to past trends would have meant a large increase in the "urban growth boundary" which defines the boundary between urban and rural areas in Portland. The impending growth clashed with what Portland residents value: access to natural beauty and comfortable communities. Regional projections showed that under existing land use policies, land used for urban development would increase more than 50 percent in the region.

Metro is the regional government of the Portland Metropolitan area. It coordinates land use policies in the 27-jurisdiction region and writing binding development policies. Metro undertook a major public involvement campaign for the 2040 planning process. It mailed livability questionnaires to every household in the region (over 500,000), conducted dozens of workshops and forums, and provided a variety of public education tools, including distributing videos and maps about the planning at local businesses. This process was important because the planning decisions are being based on the values of Portland area residents.

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<sup>57</sup> Maryland Smart Growth Program Website, <http://www.mdp.state.md.us/smartintro.htm>

The 2040 Growth Concept being planned for in Portland consists of only a modest increase in the urban growth boundary, while at the same time making more efficient use of existing urban land, protecting natural resources and green spaces, supporting regional centers, and ensuring a balanced transportation system. The most important focus has been protecting residents' access to nature through efficient use of urban infrastructure.

Metro released a report on performance measures in 2004. Development projects and policies have focused on urban and regional centers. Annual land converted to urban use was 40 percent lower in 2002 than it was in 1999. Metro acquired 8,000 acres of parks and open space through a 1995 bond measure, and 60 percent of the population is located within one-quarter-mile of a park. One of the most striking statistics concerned its transportation system: while the nation experienced a 6 percent increase in per capita vehicle miles traveled, Portland residents have decreased their VMT by 11 percent per capita between 1996 and 2002.<sup>58</sup>

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<sup>58</sup> [http://www.metro-region.org/library\\_docs/trans/preliminaryresearchfindings.pdf](http://www.metro-region.org/library_docs/trans/preliminaryresearchfindings.pdf).

## CHAPTER 6: Infrastructure Funding

Infrastructure funding policies and decisions can affect energy demand in many ways. The provision of roads, bridges, and tunnels can affect the efficiency of travel, the type of travel, and the demand for travel as well as cause many environmental impacts, such as bisecting habitat. The construction of power lines can determine the viability of renewable sources of energy generation, whether a new development can turn on the lights, and which power plants might come online first. Sewer lines are a key prerequisite for new development, and the State Water Project, as noted previously, is one of the largest infrastructures in the world, using up to 3 percent of the state's electricity to provide Californians with the water they need to drink, grow crops, conduct business, and water their lawns.

Infrastructure funding comes from the federal, state, and local levels. The funding policies and project choices made at any of these levels can determine the long-term energy and climate impacts of a community's infrastructure for decades. For instance, funding policies that support mixed-use, transit-oriented, and dense communities can reduce energy use, commute time, and GHG emissions while increasing transit ridership. The Bay Area MTC has determined that locating housing and hence population closer to existing points of transit access will have a greater positive impact on transit ridership than new investment in transit infrastructure.<sup>59</sup> Dense, mixed-use development may support small, locally serving renewable energy systems that require less transmission and related efficiency losses. To give another example, building a transmission system that can handle intermittent generation from wind resources is a necessary first step to large-scale deployment of wind generation. The following sections discuss infrastructure funding at the national, state, and local level.

### National

#### ***The Center for Clean Air Policy Federal Highway Bill Reauthorization Effort***

The Center for Clean Air Policy (CCAP) is leading a partnership to try to integrate land use, energy, and climate considerations into the next Federal Highway bill. CCAP is attempting to: (1) build a partnership focused on adding travel demand strategies to the national climate policy debate and (2) create a linkage between federal climate legislation and the reauthorization of the Surface Transportation Bill (SAFETEA-LU) in 2008.

In February 2007, CCAP kicked-off a policy discussion about integrating climate change mitigation strategies into the next U.S. federal transportation bill (hence Green – Transportation Equity Act, or Green-TEA) and addressing travel demand in national climate policy, by hosting a web-based seminar attended by more than 40 U.S. transportation and land use experts. CCAP is asking all interested parties to support the effort by providing a summary of how the effort is valuable to their own specific interests. The Energy Commission has been tracking CCAP's efforts and providing information when available. In particular, CCAP is interested in the SACOG blueprint program as an example of how climate change and energy can be successfully integrated into Federal Highway funding decisions. If CCAP and the interested parties are successful in integrating green planning requirements into the federal highway bill, California's MPOs

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<sup>59</sup> Bay Area Joint Vision website, (<http://www.bayareavision.org/focus/housingemphasis.html>)

will have increased responsibility and funding power to implement their blueprint plans, and the state should have substantial help reducing VMT growth, energy demand, and GHG emissions from transportation.

## California

### ***Strategic Growth Plan***

In November 2006, California voters authorized the passage of infrastructure bonds totaling about \$40 billion dollars. The largest portion (\$19 billion) is allocated for traffic congestion relief and public transportation. But significant dollars are allocated to other areas as well: school repairs and expansion (\$10.4 billion); water quality improvements and natural resource protection (\$5.4 billion); levee improvements and flood control (\$4.1 billion); and affordable housing (\$2.85 billion). The state has a major opportunity to direct these infrastructure investments toward land use choices that consider energy and climate change.

The Planning and Conservation League (PCL), with other organizations, is leading a "greening the bonds" effort. PCL has identified 10 principles to guide bond implementation, one of which encourages smart growth and makes cities more livable:

Current state law (AB 857, 2002) requires that "any infrastructure associated with development" must use land efficiently, avoid leapfrog development, be located only in areas planned for growth with existing essential services, and minimize ongoing costs to taxpayers. Any proposed infrastructure bond must follow these requirements in AB 857, and should help achieve, not undermine, our state's land use objectives. The infrastructure bonds should create financial and regulatory incentives for growth patterns that accommodate needed housing as well as reduce vehicle miles traveled and protect valuable habitat and important farmland. Growth policies that reduce vehicle miles traveled will promote housing closer to jobs and commercial centers, provide more housing choices and reduce commute burdens on families. These policies will also reduce air pollution, greenhouse gas emissions and the consumption of oil.

To ensure that regional agencies are equipped to make sound decisions consistent with smart growth principles and resource conservation, the state should update its transportation models to provide accurate information and should authorize bond funding for regional blueprints including funds to assist regions to collect and utilize adequate biological and geographical data on the region's natural resource infrastructure. Incentives for local and regional blueprints should be made available to all regions of California.<sup>60</sup>

The Urban Land Institute (ULI) is undertaking a public infrastructure initiative, encompassing a series of forums, to make the case for linking infrastructure and land use. ULI is also meeting with state officials to ensure bond implementation supports smart growth principles. The William and Flora Hewlett Foundation, with the Energy Foundation and the Packard Foundation, recently hosted a Global Warming, Land Use and Investment Policy meeting to allow members of the Governor's administration, state

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<sup>60</sup> The Planning and Conservation League website, [http://action.nwf.org/campaign/infrastructure\\_bond\\_principles/explanation](http://action.nwf.org/campaign/infrastructure_bond_principles/explanation).

Senate and Assembly members, and climate and urban growth experts to discuss how bond funding could be implemented.

The following is a summary of the infrastructure bonds, a brief discussion of fund status, and the implications for effective land use planning and reduction in VMT growth.

### **Transportation Bonds**

**Proposition 1B (Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006)** provides \$19.925 billion in general obligation bonds for projects intended to relieve congestion, facilitate goods movement, improve air quality, and enhance safety and security of transportation. It includes \$4.5 billion for projects that would improve corridor mobility (called the Corridor Mobility Improvement Account, or CMIA). CMIA guidelines, prepared by Caltrans, provide general guidelines on funding priorities for CMIA funds. One guideline factor calls for evaluation of “project benefits,” but energy benefits and GHG emission reductions are not explicitly considered. These may be considered under “optional benefits.” Project eligibility criteria include projects that “improve access to jobs, housing, markets, and commerce.”

Proposition 1B funding also includes \$4 billion for transit, \$3.2 billion to improve goods movement and air quality, and \$1.475 billion to improve transportation safety and security. Considered collectively, Proposition 1B funding components could be mutually supportive and could contribute to energy savings and GHG emission reductions.

Proposition 1B explicitly allows the Legislature to provide oversight over the expenditure of \$5.1 billion, including goods movement trade corridors, transit security, air quality, state-local partnership grants, and port security. None of the implementing agencies are responsible for energy matters or air quality, except the \$1 billion identified for ongoing bus replacements.

The Legislative Analyst’s Office (LAO) recommended that the Legislature provide eligibility guidelines where such guidelines are not clearly established by Proposition 1B. The LAO recommended that Proposition 1B funds be limited to projects with long-term benefits and that air quality impacts be considered for new capacity projects and appropriating all funds through the annual budget bill.

The California Transportation Commission (Commission) has been charged, by a January 2007 letter from Senate President Pro Tempore Don Perata, with developing a plan for incorporating strategies to reduce mobile source GHG emissions in the RTP Guidelines. These guidelines shape the RTP projects that will be funded through Proposition 1B programs, and this initiative represents a significant opportunity to integrate climate and energy considerations into the implementation of Proposition 1B, as well as serve as a model for development of criteria for the other infrastructure bonds.

**Proposition 1C (Housing and Emergency Shelter Trust Fund Act of 2006)** provides \$2.85 billion in general obligation bonds to support a variety of housing and development programs. The proposition has a smart growth focus for some of its funding as it provides \$850 million for infill development grants and brownfield cleanup and \$300 million to develop higher densities along transit stations. Both funds require Legislative appropriation. While the LAO recommends that the Legislature needs to provide guidance or definition of project selection criteria, no specific selection criteria are identified for the remaining funds noted above. Some regional blueprint plans identify infill and brownfield redevelopment opportunities linked with transit and

reducing automobile trips and length. Both energy-efficient and location-efficient cost-saving information for these sites could be generated to allow for preferred mortgage status for new homeowners based on lower transportation and energy costs.<sup>61</sup>

**Proposition 1D (Kindergarten-University Public Education Facilities Bond Act of 2006)** provides \$10.4 billion to fund repair and upgrade of public schools, including kindergarten through grade 12, community colleges, and state universities. This proposition provides \$100 million for environmentally friendly school facility projects, including those that promote the efficient use of energy and water, incorporate recycled materials, and/or maximize the use of natural lighting. The LAO recommends that a community impact analysis be conducted to reduce off-campus impacts of campus facility growth. The scope of that impact assessment is not identified by LAO.

Planning for schools and universities offers many opportunities for better land use. For example, the city of Roseville and Placer County require, as part of their general plans, interagency coordination to co-locate schools with park and recreation facilities and the joint use of school and public facilities.<sup>62</sup> These requirements can reduce the number and length of trips and GHG emissions while strengthening community cohesion.

Repairs and renovations of neighborhood schools may be more cost-effective than large-scale construction of new schools located on the periphery of urban development. The siting of new schools should consider their accessibility via bike and pedestrian paths, consistent with the federal government's "Safe Routes to School" initiative, which encourages children to walk and ride to school.

**Proposition 84 (Water Quality, Safety and Supply, Flood Control, Natural Resource Protection, Park Improvements)** provides \$5.4 billion in general obligation funding for a variety of water, flood control, natural resources, parks and conservation projects. Of this total, \$620 million is continuously appropriated and does not need Legislative approval for projects. The remaining funds require Legislative approval through either the annual budget act or other legislation. The money could be used to provide infrastructure enhancements to offset the expected impacts of global warming. This includes \$800 million for flood control; \$580 million for sustainable communities and climate change reduction; \$540 million for protection of beaches, bays, and coastal waters; and \$65 million for statewide water planning. Proposition 84 funding could also contribute to lower energy demand and GHG emissions if, for example, green spaces are designed to enhance the inflow of cooler rural air to into urban areas and lower air conditioning use and parks are located to reduce automobile travel.

The LAO identified a need for legislative direction for expenditure of at least the regional planning, housing, and infill funding.

### **Implications for Land Use, Climate Change, and VMT**

Project funding criteria must be developed to effectively distribute the funds identified in Table 4.

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<sup>61</sup> The Institute for Location Efficiency (ILE) is a national nonprofit organization founded by the Center for Neighborhood Technology, the Natural Resources Defenses Council, and the Surface Transportation Policy Project, [www.locationefficiency.com](http://www.locationefficiency.com), The U.S. Housing and Urban Development Department manages the Energy Efficient Mortgages Program, <http://www.hud.gov/offices/hsg/sfh/eem/energy-r.cfm>.

<sup>62</sup> The Cities, Counties Schools (CCS) Partnership, a joint effort of the League of California Cities, California State Association of Counties (CSAC) and California School Boards Association (CSBA), Stretching Community Dollars Workbook.

**Table 4. Strategic Growth Funds**

Prop 1B	\$1 billion for state-local partnership program account
Prop 1C	\$850 million for infill local infrastructure and parks \$200 million for urban rural and suburban regional parks \$300 million for transit oriented development
Prop 1D	\$100 million for green schools
Prop 1E	\$290 million for protection, creation and enhancement of flood protection corridors and bypasses \$300 million for stormwater flood management projects
Prop 84	\$1 billion for water projects that integrate water management with land use planning \$90 million for sustainable communities \$400 million for parks

Source: California Energy Commission staff, 2007

Careful thought and analysis is needed for maximum bond expenditure effectiveness. There is a possibility that well-intentioned funding could have unexpected repercussions. For example, funding intended to relieve congestion can induce people to return to their cars rather than to continue to use public transit by reducing the social cost (congestion-induced delays are a form of social cost) of travel. This “rebound effect” could increase personal vehicle use from 3 percent to as much as 14 percent or more, when the “cost of travel” is cut in half,<sup>63</sup> thus negating some of the benefits that could arise from the expenditures identified in Table 3. Conversely, if bond expenditures are part of integrated regional efforts to reduce travel demand and air pollution, improve jobs-housing balance with wise infill and brownfield development, and locate parks and schools within walking and transit distance of a large portion of the population, perhaps greater than expected outcomes could be achieved. Evidence produced in the Sacramento blueprint shows it is possible. Actual measurements of VMT reductions in Portland show that it has been done.

## Congestion Pricing and Demand Management

Congestion pricing refers to charging drivers a premium for using roads during peak times. Some of the most prominent examples in California include the high- occupancy toll (HOT) lanes along the I-15 corridor in San Diego and those along SR-91 in Orange County. Drivers pay a fee for using the lanes, which changes in real time in response to the level of traffic: the toll is raised to ensure a minimum speed. Drivers see the toll on an electronic billboard before they enter. The tolls along I-15 range from \$0.50 to \$4.00 during normal traffic flows but can be as high as \$8.00 during very busy times. Along SR-91, the tolls range from \$0.75 to \$3.50. Drivers of high occupancy vehicles are able to use the lanes for free. The state may consider the effects of all new road capacity carrying some kind of congestion charge. At the June 2007 workshop, Ewing noted that almost half of the \$20 million bond funds passed in November 2006 could be used for highway capacity expansion; he recommended no highway funds for high-performance highways without tolls.

<sup>63</sup> Small, Kenneth A. and Kurt Van Dender, *Fuel Efficiency and Motor Vehicle Travel: The Declining Rebound Effect*, UC Irvine Economics Working Paper #05-06-03, Corrected July 17, 2006 (to be published in *Economic Journal*, vol. 28, no. 1 (2007) pp. 25-51.

As noted at the June 2007 workshop, the Pier Pass program at the Port of Long Beach reduced gate fees for truckers in the 6 to 10 PM period and has reduced truck trips on the 710 freeway by 30 percent during peak use.<sup>64</sup>

Another form of congestion pricing is charging motorists a flat rate to enter a particular area, such as a downtown. This form of congestion pricing is being practiced in London, where the charge to drive into the central city began at £5 but was raised after only two years of implementation and is currently £8. In the wake of the success in London, several European cities (including Stockholm and Edinburgh) have implemented or are in the process of implementing congestion pricing. It has yet to be introduced in the United States, but Mayor Michael Bloomberg has proposed it for the lower portion of the island of Manhattan.

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<sup>64</sup> Barna, John, California Transportation Commission, presentation at the June 26, 2007, workshop on Land Use, Energy and Climate Change



## **CHAPTER 7: Electric Utilities' Role in Land Use**

Electric utilities in California are beginning to play a larger and more explicit role in the planning and use of land. This role includes planning for utility infrastructure (long-range and near-term) and future sources of energy. This section examines a number of cutting-edge endeavors by utilities, both in California and the United States, that serve as models for a greater interplay of energy and land use. Energy efficiency, solar roofs, and green building endeavors are not specifically highlighted here, both because they are receiving extensive coverage in other areas (and will be discussed in other IEPR workshops and reports) and because they are not as directly tied to the specific use of land.

### **Utility Infrastructure Planning and Development**

#### ***Long-Term Planning for Utility Infrastructure***

Perhaps the most significant involvement of utilities in the planning for new large-scale infrastructure is the SB 1059 Transmission Corridors effort spearheaded by the Energy Commission. The focus of this program is to integrate transmission corridor zone planning at the state level with local planning.

SB 1059 requires the Energy Commission as the lead agency to work with cities, counties, state and federal agencies, and California tribes in designating transmission line corridors. It requires cities and counties to consider designated corridors when making land use decisions that could affect corridor viability.

California utilities were active participants in the “early-listening” process designed to better understand stakeholder concerns and to determine how the corridor designation process could be implemented to meet the needs of utilities and other stakeholders. Utility comments presented at the March 5, 2007, Joint Committee Workshop on SB 1059 Implementation included: the need to coordinate among local, state, and federal agencies; importance of including existing land use planning (for example, habitat conservation plans and local general plans); and the need to include other initiatives such as regional Blueprint plans and military joint land use plans. As an example, SANDAG has been seeking funding to undertake a regional feasibility study with San Diego Gas & Electric (SDGE) and Caltrans regarding the siting of multiple infrastructure needs in agreed-upon corridors.

#### ***Line Extension Policies***

The process and costs for extending power lines and other utility infrastructure to new developments can help or hinder the smarter use of land. California Public Utility Commission (CPUC) Tariff Rules 15 (Distribution Extensions) and 16 (Service Extensions) govern the provision of natural gas and electricity to new residences. These rules are self-regulating, and a set dollar amount is provided for the cost of service for each new account. In the case of electric service, \$1,300 is allotted to a developer to pay for the wiring from the transmission line to the transformer and then to the residential unit. Although density is not considered under the rules, a de facto incentive to create higher-density units may exist. A developer would receive \$1,300 for each single-family home to provide electric service. If there is a great distance between single-family homes, the \$1,300 may not be sufficient to cover the costs. On the other hand, if there are 50 housing units in a high-rise building, the developer would receive \$65,000 ( $\$1,300 \times 50$

units), and the actual costs would likely be considerably less than the total received. The basic structure of Rules 15 and 16 was created more than 20 years ago, and there is no discussion at the CPUC regarding changing these rules.<sup>65</sup>

The New Jersey Board of Public Utilities (NJBPUB), in March 2006, issued regulations requiring integration of “smart growth” principles into utility service policies. These regulations change how utilities (gas, electric, telephone, water, and wastewater) can invest in line extensions and customer services. Developers in designated smart growth areas will now be refunded money (according to a specific methodology) for line extensions and services needed to supply electric services. For developments in other areas, builders and developers will be required to pay the full costs of pipes, conduits, wire, poles, transformers, regulators, service lines, and meters.

### ***Inclusion of Utility Infrastructure in CEQA Documents***

New electric and gas transmission and distribution lines and substations will be needed to accommodate load growth associated with new industrial, commercial, and residential development. CEQA documents for these types of developments typically have not addressed the associated electrical and gas components of proposed developments. Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and SDG&E are promoting a revision to the CEQA Guidelines Environmental Checklist through the auspices of the California Council of Environmental & Economic Balance (CCEEB). All of the investor-owned utilities (IOUs) have identified a major issue with the currently adopted CEQA Environmental Checklist in the State Guidelines. The Initial Study Checklist does not currently require discussion of a project’s electric and gas infrastructure requirements. However, most proposed development projects require construction of new electric and gas utility infrastructure. CEQA requires evaluation of impacts associated with the “whole action.” Any subsequent CEQA process to cover the gas and utility infrastructure can result in significant cost and schedule impacts. The IOUs, through CCEEB, have proposed the following addition to the CEQA Guidelines Checklist, Appendix G:

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<sup>65</sup> Werner Blumer, California Public Utilities Commission, personal communication, June 15, 2007.

## XVI. UTILITIES AND SERVICE SYSTEMS

Would the project:

h) Require or result in the construction of new electrical or gas facilities, such as power lines, substations, pipelines, compressor stations, or related access roads, or require relocation or expansion of existing electrical or gas facilities, the construction of which could cause significant environmental effects?

The utilities believe the benefits to be as follows:

- Fully discloses electric and gas infrastructure impacts.
- Provides equal treatment of gas and electrical systems relative to the infrastructure.
- Minimizes "piecemealing."<sup>66</sup>
- Eliminates unnecessary secondary CEQA processes.

## Local Land Use Planning and Development

Utilities are becoming more directly involved in local land use planning, from the general plan stage to actual new developments. For the most part, local governments are not responsible for the delivery of energy to their constituents, and so the planning for energy delivery to new homeowners and businesses tends not to be considered to any great degree in the development and implementation of general plans. Yet, the utilities are greatly affected by these plans, particularly in terms of understanding where and how much new growth is expected.

### ***Southern California Edison***

A large utility like SCE must cover multiple regional and local government planning activities since its service area encompasses multiple jurisdictions. SCE has an ongoing effort to more closely coordinate with local and regional government planning.<sup>67</sup> Local governments typically do not need utility input to their general plans, but utilities do need the general plans since utility forecast plans must be consistent with adopted land use plans. SCE's four-pronged approach to local and regional coordination includes the following elements:

- Participate in general plan development and review third-party environmental impact studies in a more comprehensive and consistent manner.
- Improve load forecasting by incorporating community information.
- Develop educational materials, especially directed at local government planning staff, that provide detailed information on issues directly related to energy delivery (for example, undergrounding of transmission lines).
- Create stronger relationships with local governments.

Utility communications with local governments could be enhanced through use of an updated Energy Commission *Energy Aware Planning Guide*. SCE informed Energy Commission staff that this material was very useful in the past as a source of neutral, unbiased information. An update of the guide should include new examples of energy

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<sup>66</sup> Piecemealing is the division of a single project into smaller projects to avoid the responsibility for considering the impact of the project as a whole.

<sup>67</sup> Mary Deming, Southern California Edison, personal communication, June 8, 2007.

planning such as the transmission line element developed, with Energy Commission funding, for the Colusa County general plan.

### ***San Diego Gas and Electric***

SDG&E shares common geographic boundaries with SANDAG. The utility is a member of the SANDAG Energy Working Group and has provided funding to assist the SANDAG energy program and working group.<sup>68</sup> The Energy Working Group provided a forum for the utility to meet with affected stakeholders. Through participation in the Energy Working Group, SDG&E will be involved in updating the San Diego Regional Energy Strategy.

The Energy Working Group's top priority in 2006 was to provide direction and input to SDG&E on its long-term resource plan. The Working Group advised the SANDAG Board on recommendations for the utility's plan to be consistent with the Regional Energy Strategy. The Board provided policy recommendations for SDG&E to consider and implement in its long-term planning, including its upcoming Long-Term Procurement Plan filing to the CPUC.

In addition to its involvement with SANDAG, SDG&E has reached out over the last few years to several local agencies to ensure the integration of utility system needs in its general plan updates. Examples include:

- SDG&E worked with the city of Chula Vista to identify new distribution substations that would be needed based on the preferred growth scenario as well as identify existing utility corridors in accordance with state general plan guidelines. Transmission corridors that may require expansion based on local and system-wide growth were also identified.
- SDG&E worked with the city of San Diego to provide general substation location mapping and existing utility corridors in accordance with state general plan guidelines. SDG&E also provided the city with draft general plan policies for consideration which were modified for city use and included in the general plan update.
- SDG&E is working with the county of San Diego on the General Plan 2020 Update by providing input to its Power and Energy Background Report, which will form the basis of its Energy Element. SDG&E also provided the county with the 2007 Transmission Planning Map requested by the Energy Commission in the 2007 IEPR as a bridge between state and local planning efforts.

### ***Pacific Gas and Electric***

PG&E claims to envision sustainable communities that ultimately strive for zero net carbon emissions, sustainable land-use and transportation planning, sustainable water use, and elimination of the concept of waste. PG&E and the other IOUs have existing programs that promote energy efficiency, solar electricity, and demand response at the individual building scale. However, PG&E believes that to effectively address California's climate change challenge and promote sustainability, it is necessary to take a more holistic approach to energy planning and delivery.<sup>69</sup>

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<sup>68</sup> Susan Freedman, San Diego Association of Governments, personal communication, June 11, 2007; SANDAG comments on Draft Staff Paper, July 6, 2007.

<sup>69</sup> Darren Bouten, Pacific Gas and Electric, personal communication, June 11 and 18, 2007.

Such an approach would include collaborating with local governments, irrigation districts and water supply companies on land-use and water infrastructure planning policies that promote energy efficient infrastructure. It would include working with waste management companies to provide potential community-scale energy solutions from landfill methane, agricultural, and other biomass “waste.” It would also include collaborating with developers throughout the planning and development process to implement:

- Master planning strategies that optimize site design and community energy performance,
- Building design measures that significantly reduce energy demand, and
- Sustainable energy supply strategies at the neighborhood and community scale.

PG&E is in the process of developing a Sustainable Communities Program that will encompass two components:

- A building-level approach where existing programs (for example, energy efficiency, and solar homes) are bundled and packaged more effectively to building owners and developers to incorporate sustainability concepts and reduce carbon; and
- A community / regional approach where the utility will work with local governments on updates to general plans and building codes and standards, on the development of climate change action plans, and on new development projects.
- The first component is essentially a building-by-building approach, which more closely tracks current CPUC requirements for program management and delivery. The second component, currently under development, envisions a much broader approach, incorporating direct water-energy and land use-energy links to enable communities to significantly reduce their carbon footprint. Both building-scale programs with shorter lead times and neighborhood and / or community-scale programs that promote significant greenhouse reductions, but have longer lead times, are necessary to achieve California’s aggressive greenhouse gas reduction targets. However, the CPUC energy efficiency requirements that allow investor-owned utilities to recoup costs under the first component (building level) would not allow funding of the planning and implementation activities that are envisioned in the second component (community / regional).

## ***Municipal Utilities***

Municipal utilities and those directly owned by local government have smaller service areas and, presumably, are more able to participate fully in general plan processes. In its *General Manager’s Report and Recommendation on Rates and Services* (April 5, 2007), the Sacramento Municipal Utility District (SMUD) states, “The District is committed to work regionally to ensure that our planning supports smart growth principles, and that (our) process will engage the regional planning authorities to facilitate wise energy use in future planning processes” (p. 11).

SMUD has been an active participant in the ongoing Sacramento County general plan update. SMUD’s participation directly led to the addition of an objective in the county’s land use element, as described (in part) below

Objective:      New development in existing communities in new growth areas and improvements to existing buildings and housing stock that are designed and constructed to be energy efficient and incorporate renewable energy technologies where cost-effective and feasible.

Intent: Key goals of sustainable development and smart growth are to reduce the impacts of development on the environment, conserve natural resources, reduce air pollution, reduce greenhouse gas emissions, and protect human health. The community is also concerned that residents and businesses can afford to live and work in the community, with future energy costs a major cost consideration. The region as a whole is trying to attract businesses that focus on clean energy technology and products. The state and the nation are working to achieve independence from foreign and environmentally harmful energy sources.

The City of Palo Alto Utilities (CPAU) has developed a close working relationship with city planning and building departments over the last several years. This allows the utility to recognize and correct zoning and municipal codes that impede more efficient energy delivery. CPAU is currently providing input on proposed zoning ordinance changes that will exempt thermal energy storage systems from restrictions on total square footage limitations for lots.<sup>70</sup>

## New Development Opportunities

Utilities have a unique opportunity to participate in new developments from the ground-up, especially those associated with very large tracts of land such as former military bases. As an example, energy issues are taking front and center in a partnership effort involving the redevelopment of the El Toro Marine Corps Air Station in Irvine, California. The city of Irvine envisioned the Great Park development as a multi-use development with sustainability and environmental stewardship as core values.

SCE and Southern California Gas Company have joined forces with the city of Irvine, Lennar Corporation, and energy and land use experts (the “Green Team”) to design and develop a new energy infrastructure for the proposed Irvine Great Park. The Irvine Great Park Energy Subteam Update (November 2006) states that:

As with any substantial development, the Orange County Great Park and surrounding communities will have significant impacts on regional energy resources. California’s already strained electrical grid will be further taxed; limited natural gas resources will be stretched thinner, and demand for dwindling transportation fuels will grow. These challenges present unique opportunities to the Great Park, opportunities to improve the diversity, resiliency, and efficiency of energy resource production and use within the community. (p. 1).

The new infrastructure associated with the Park will “...be designed and built from the ground up, fostering opportunities to enhance efficiency, increase flexibility and diversity, and prepare for future energy sources. A new transportation system will be developed, opening the door for advanced system designs, monitoring, and linkages between Park, community, and mass transit.”<sup>71</sup>

The Green Team is working with stakeholders to develop consensus goals, consisting of the following outcomes:

- Strive toward net zero energy usage through energy efficiency and fuel diversification.

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<sup>70</sup> Karl Knapp, City of Palo Alto, personal communication, May 16, 2007.

<sup>71</sup> The Irvine Great Park Energy Subteam Update, November 2006.

- Maximize self reliance and security for critical energy services.
- Construct responsive buildings that help the electric utility reduce costs of imports and plant capacity through energy management.
- Provide diverse and secure energy sources and technologies that offer ample choice for residents and businesses.
- Offer a forward-looking, adaptive approach to design that helps everyone learn how to improve their performance and sustain a high quality of life in the face of unexpected change through education.

PG&E has partnered with the city of San Francisco to create the “cleanest and greenest city in the U.S. (PG&E, 2006).” The plan will include alternative energy sources, a reduction in greenhouse gas emissions and a commitment to sustainability. One of the six key elements involves the creation of model urban communities in Treasure Island and Hunters Point from their existing brownfields condition:

...we can bring these communities to the absolute cutting edge of green energy and technology, not only in the provision of energy, but in their entire planning, design and development. These communities can be conceived and built as zero net energy urban environments (p. 14).<sup>72</sup>

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<sup>72</sup> PG&E, A Partnership for a Greener San Francisco, August 2006.

## CHAPTER 8: Land Use Planning Research and Development

California's population will increase by 24 million people by 2050. The state is already grappling to provide the infrastructure necessary to accommodate this growth while at the same time protecting the state's environment and natural resources. California's plan to reduce energy use, reduce the number of VMT, and meet its climate change targets while at the same time accommodating this growth will be greatly challenged. This chapter addresses available academic research in the area of land use and its integration with energy and transportation.

For example, California's Million Solar Roofs Initiative is moving forward with outfitting the state with home solar panels. To what extent have neighborhoods been designed with south-facing roofs ideally suited for solar generation? Are there obstructions that will reduce the effectiveness of the photovoltaic (PV) systems? How might urban forestry programs impact PV systems? To give another example, the water-energy relationship has reinforced the fact that water use is energy use. To what extent can neighborhood design be optimized to save water and simultaneously recharge aquifers vital to California's water supply? Such design strategies could have significant energy, CO<sub>2</sub> reduction, and multiple other environmental benefits that typically would not be considered. These propositions are but two of the many that connect land use decisions and long-term energy usage and that are under consideration by the Energy Commission's Public Interest Energy Research (PIER) Program.<sup>73</sup>

By including energy demand, supply, and infrastructure as central factors in the land use planning equation, state and local governments will have the tools to make intelligent use of energy resources and work to meet energy-related goals. The *2006 IEPR Update* provided policy direction for research that helps "identify, quantify, evaluate, and verify sustainable energy planning practices and designs and help(s) explain the associated complex energy interdependencies, efficiency, and environmental enhancement opportunities of these practices and designs." It also states that this research should be used to develop "analytic tools" that model these same relationships. More specifically, the *IEPR* directed the Public Interest Energy Research (PIER) arm of the Energy Commission to "provide tools and conduct research to assist local government's energy and greenhouse gas reduction planning efforts" (p. 96).

Such tools are a critical part of the planning process. Planners have a host of constraints placed on them in making land use decisions, including zoning, federal air quality mandates, tax revenue projections, and demographic projections.

The Energy Commission funds research advancing science and technology not adequately supported by the private or regulatory markets. Current and planned land use-related research, particularly into sustainable communities, is, and will be, largely focused on developing initiatives intended to improve regulatory decision-making and inform energy policy. In particular, this research is, and will be, addressing the following:

- Evaluating the causality between land development patterns and vehicle miles traveled.

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<sup>73</sup> The PIER Program recently expanded to include transportation research, which it previously excluded. To date, transportation research has focused on reducing the carbon content of fuel and increasing efficiency of vehicles.

- Determining whether petroleum use in the transportation sector can be reduced through changes in the design of development patterns, and whether there is a synergy between reductions attributable to land use and those attributable fuel type and carbon content.
- Identifying the energy and resource efficiency impacts associated with various community design options, as well as identifying what reference guidelines and case studies are needed by design and building professionals in planning more sustainable communities.
- Finding useful feedback that can be given on the energy impacts (HVAC, solar water heating, PV) of various street layouts and house orientations to the developer or planner.
- Outlining ways to better quantify, evaluate, and verify complex energy relationships, as well as environmental enhancement (including CO<sub>2</sub> reduction) and efficiency opportunities of sustainable energy planning designs and practices.
- Identifying the tools and models or improvements to these tools and models that are needed to set and achieve sustainability goals, as well as incorporate energy and the environment into planning and design decisions.

Because of the long-lasting nature of community design, it is increasingly important to optimize natural environmental design features, energy efficiency, and opportunities for emerging energy technologies, and to use these tools in synchrony with each other. Beyond these considerations, achieving sustainability will ultimately require coordination across the entire energy sector. There is a need for implementation that will integrate current environmental and building efficiency research with industry efficiency, demand response, renewable energy, distributed generation, and transportation into a single, comprehensive research plan.

In fiscal year 2007-08, the Energy Commission's Research, Development and Demonstration Committee has allocated more than \$2 million for sustainable communities research. This funding will support a broad-based research program including initiatives identifying, quantifying, and verifying the complex energy relationships, interdependencies, and environmental enhancement opportunities of alternative practices and designs; and conducting basic research to assess impacts associated with environmental features of sustainable communities (for example, optimize urban canopy and PV). The benefits from this research will include a better understanding of the holistic interaction between energy demand and environmental design principles as well as identification of underlying infrastructure design impacts on energy and the environment and identification of design improvements that would reduce energy use in California.

## **Land Use and Transportation Research**

In its new transportation program, PIER is conducting research with the goal of reducing petroleum consumption and associated GHG emissions through increased vehicle efficiency, increased use of alternative fuels, and through better land use decisions.<sup>74</sup> Research is needed to establish the scientific basis for, and make appropriate judgments about, the causal relationships between development patterns and VMT. The GHG reducing potential of land use (with respect to transportation) hinges on its ability to

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<sup>74</sup> These three avenues of fuels use reduction are the three foundational pillars of the PIER transportation program and are discussed more fully in the AB 2076 report (P600-03-005F).

reduce distance and number of trips traveled or shift travel from carbon-intensive to less carbon-intensive travel modes.

The effect of land use on travel behavior is currently one of spirited discussion among academics; Ewing and Cervero provide an excellent research summary.<sup>75</sup> In general, residents in dense neighborhoods or neighborhoods with grid patterns appear to drive less than those living in traditional low-density suburbs, but some studies have shown these reductions in VMT to be relatively minor.

The correlation between smart growth and lower per capita VMT is fairly well-established; however, a causal link between land use and VMT has yet to be established. There are many possible explanations for the correlation between land use and VMT. One of the trickiest to study, but possibly the most influential, is residential self-selection. Observed lower per capita VMT in smart growth areas may be due to the fact that such areas appeal to people who do not like driving and move to them in order not to drive as much as they would have to in other areas. The net result—of lower VMT—is the same, but if residential self-selection is a very strong force, it may mean that smart growth has little power to *cause* reductions in VMT, but rather enables people to reduce their VMT. This distinction may be academic at the moment and may not affect recommended improvements to transportation models, but as smart growth scales up, it will be important to sort this out to understand the likely effects of widespread deployment of smart growth development strategies. Identifying the influence of the many factors responsible for the observed correlation between land use and VMT—including self-selection, broader choice set, congestion, and increased convenience of non-auto modes—would allow planners to build even more robust models and craft more finely targeted policies.

## ***Possible Areas of Future Transportation Research***

### **Smart Land Use and Intelligent Transportation Systems**

The Governor's Climate Action Team identified smart land use and intelligent transportation systems as having major potential to meet the goals of the Governor's climate policy (see Chapter 2). These projected reductions are significant and represent a major portion of the total GHG reduction goal. As stated earlier, a draft report was released for public review on April 20, 2007. The update provides revised estimates of GHG emissions reductions from these strategies without discussing how these estimates were derived. Validation of the modeling tools being used to estimate GHG emissions reductions from smart land use and intelligent transportation systems should be pursued.

The California Partnership for Advanced Transit and Highways (PATH) and the UC Davis Energy Efficiency Center are researching Intelligent Transportation Systems and looking for ways to increase ridership on public transportation systems as a way to reduce vehicle miles traveled. Through case studies and pilot projects, this research explores ways to get people out of their cars and into regional transit systems through innovative means such as carsharing, supported by real-time information delivery. Many of the pilot projects have met with success, but it remains to be seen whether the programs can be scaled up effectively.

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<sup>75</sup> Ewing, R, and R Cervero, 2001, "Travel and the built environment: A synthesis," *Transportation Research Record* 1780: 87–114.

## Transportation Modeling Tools

The Natural Resources Defense Council (NRDC) concluded in a recent study that transportation modeling tools do not accurately characterize the effects of higher density developments in transit-rich areas. Traditional four-step transportation models also do not allow communities to accurately assess the cost effectiveness of mixed-use or transit-oriented development. There are several simple post-processor fixes that are commonly applied to correct the models and more accurately represent the observed correlations between smart land use and VMT. Another approach to correct traditional models is to integrate the transportation and land use models like has been done in the 2004 update of the I-PLACE3S model. Integrated land use and transportation models generally do better in accounting for the effects of smart growth, but because they are computationally more demanding, they may be beyond the scope of smaller MPOs at present. Conversely, the somewhat simplified I-PLACE3S model could assist smaller MPOs in accessing smart growth analytical capacity, especially if technical assistance is provided at start up.

This finding highlights the potential need for more research into the validity and improvement of transportation modeling tools. In particular, sorting out the causation amid the well-established correlation between smart development and lowered per capita VMT would make integrated transportation models more robust and policies more finely targeted. The NRDC study may mean that regional models employed by MPOs, while designed for their particular region, would be a more accurate planning tool if they were modified to better account for “location efficient” policy choices, that is, development policies that allow for the accessibility of new housing and facilities, giving preference to developments or housing choices<sup>76</sup> that take advantage of existing transportation infrastructure. Researching the information and data needed so that transportation modeling tools can include capabilities to assess CO<sub>2</sub> reduction potential offers additional room for improvement in these tools. Given that the transportation sector is the largest single sector of GHG emissions in California, it becomes increasingly important that these tools use the best data and approaches available.

Some key research questions that must be addressed to give transportation models more predictive power are:

- What is the association between trip types (home-work, work-home, home-shop, shop-home, other) and fuel use / GHG emissions?<sup>77</sup>
- How are these types of trips expected to change as the population ages?
- Should more emphasis be placed on reducing one specific type of trip, or are reductions balanced among trip types best? Conversely, is an emphasis on improving mobility by alternate modes / fuels or improving accessibility a more productive approach?
- How can modeling take into consideration the different urban densities and availability of public transit that varies throughout California cities?
- Smart growth is designed to provide people with more transportation choices, but how effective is it in prompting people to take advantage of those choices and to drive less?

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<sup>76</sup> Such housing choices can be supported by location-efficient mortgages, which will increase the amount of money a homeowner can borrow if the home is located near a transit line.

<sup>77</sup> Cervero, Robert and Michael Duncan. 2006. “Which Reduces Vehicle Travel More: Jobs-Housing Balance or Retail-Housing Mixing?” *Journal of the American Planning Association*, Autumn,

- How do people’s attitudes and behaviors impact the effectiveness of policy decisions to encourage smart growth?

Caltrans is in the process of upgrading transportation models to integrate land use within them to better reflect the benefits of smart growth.

### **Smart Communities**

There is also a need to explore the relationship between smart growth and “smart communities.” Smart communities are those that use information technology to change how their physical space is used. Similar to smart growth, smart communities can reduce VMT growth rates, although that would be accomplished through broadband systems of communications connecting homes, offices, schools, and health care facilities, rather than primarily through transportation infrastructure design. Research may be warranted on the potential of smart communities to reduce VMT growth rates, its impact on overall energy use, and the environmental benefits or concerns. Generally, research should examine the potential benefits of smart communities such as:

- Widespread wireless or other high-speed, readily available Internet access and physical locations for people to access the Internet, and how this availability may affect travel.
- The reconfiguration of work as things that people *do*, rather than a place they *go*, and the associated changes in travel patterns, development needs (such as less need for office space), and information technology use.
- The management of energy infrastructure in an online, transparent way.
- Information and education programs for state and local officials (including planning officials) on the potential for energy savings through planning, design, development, and infrastructure decisions.
- Incorporation of location efficiency models in transportation infrastructure planning and investments.
- Transportation policies and strategies to help transportation planners manage the demand for travel, including real time travel information, reducing the number and length of vehicle trips and promoting trips that increase the viability of other means of travel.

### ***Scientific Research and Modeling Tools to Better Understand Land Use, Energy, and Environmental Relationships***

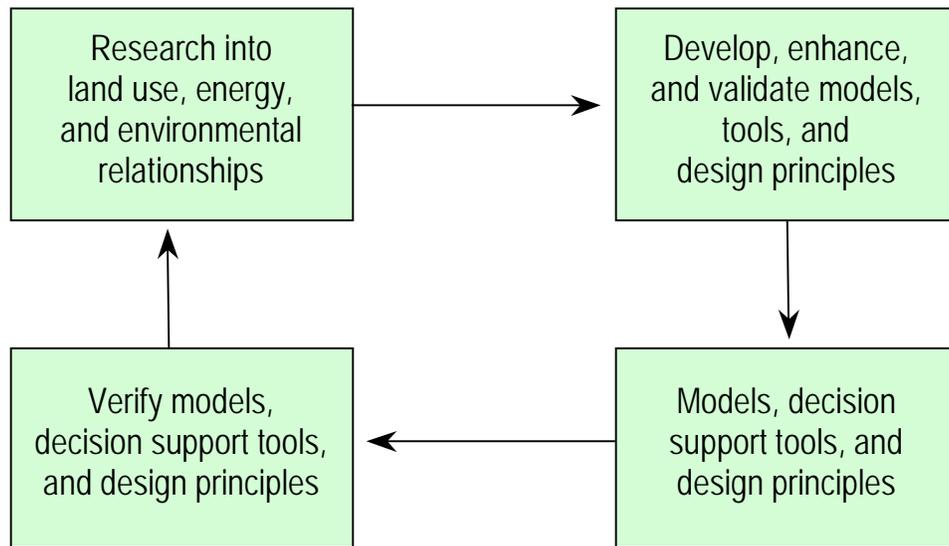
It is anticipated that at the highest level, PIER Sustainable Communities projects<sup>78</sup> will fit into the following broad research areas: scientific studies and developing models, decision support tools, and design principles. These areas are designed to provide a better understanding of land use, energy and environmental relationships and to improve the decision-making ability of local government officials, developers, builders, and others, with scientific studies generally informing model development.

This process is not necessarily linear, however, but at times a feedback cycle between these activities, as illustrated in Figure 2.

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<sup>78</sup> For PIER funding, a public interest research need must be demonstrated. The development of tools must be geared toward a public interest benefit and the advancement of science and/or technology.

**Figure 2. Priority Research Areas**



### ***Examples of Current PIER-Funded Land Use, Energy, and Environmental Research***

The Energy Commission, through the PIER Program, is funding work to integrate a building and generation energy planning capacity into the existing regional and local transportation and land use planning software tool, I-PLACE3S.<sup>79</sup> This effort will empower local government planners, COGs and MPOs, and decision makers across a region to view the outcomes of building energy use analyses alongside established key planning data such as housing costs, VMT, infrastructure cost assessments, and air emissions.

Within the next 25 years, the United States is projected to design and construct more than 213 billion square feet of new building space, presenting an opportunity to design and incorporate higher levels of energy and resource efficiency.<sup>80</sup> The Energy Commission is funding research in Chula Vista, California, to look at more efficient site design for new planned communities. The project will demonstrate the use of four different modeling tools (Building Energy Analyzer, Energy-10, City Green and CommunityViz) combined together to optimize energy, economic, and environmental parameters; analyze impacts of efficient community designs on utility infrastructure; and identify solutions to institutional and market barriers. The project will include stakeholder reviews and feasibility analyses that incorporate input from city officials, builders, developers, and others.

A new analytic tool under development is the “Subdivision Energy Analyzer Tool.” At the subdivision scale, this analytical tool will allow developers to examine and optimize

<sup>79</sup> I-PLACE3S is an acronym for Internet accessed PLAnning for Community Energy, Environmental and Economic Sustainability.

<sup>80</sup> Nelson, Arthur, “Toward a New Metropolis: The Opportunity to Rebuild America,” Virginia Polytechnic Institute and State University – A Discussion Paper Prepared for The Brookings Institution Metropolitan Policy Program, December, 2004.

different street layouts and housing orientations that enhance the ability to generate solar electricity and reduce energy use.

Because California's economy and the global economy rely on fossil fuels for electricity generation, greenhouse gases that affect climate have accumulated in the atmosphere. As a result, changes in California's climate are predicted to impact water resources, the health of citizens, and the diverse natural ecosystems that Californians prize. In addition to feeling the impacts of climate change, ecosystems affect climate, so that ecosystem responses to climate change may trigger subsequent changes in regional climate. This set of two-way interactions is known as "climate-ecosystem feedbacks", and is an area that has not been well studied. A better understanding of climate-ecosystem feedbacks is important for improving predictions of regional climate change. It will also help California's lawmakers and citizens decide how to offset greenhouse gas emissions. For example, proposals to plant forests in areas that are currently rangelands (known as afforestation) will help soak up greenhouse gases from the atmosphere but will have other effects on climate that have not yet been quantified.

Regional climate models have been increasingly used for predicting climate change because they can represent local details relevant to regional climate, such as mountain ranges and variation in vegetation type, at higher spatial resolution than can global climate models. The California Energy Commission has funded new regional climate modeling research with the long-term goal of improving predictions of future climate in California, taking into account not only the effects of greenhouse gases, but also the effects of urbanization and agricultural land use. Another related area that PIER will address in the future is two-way interactions between climate and vegetation that would result if climate change produces changes in ecosystems. For instance, a preliminary PIER scoping study suggests that aerosols are affecting precipitation levels and climate in California. Californian ecosystems are expected to change their geographic distribution with climate change, and possibly as a result of afforestation. PIER-funded research projects are investigating these issues for future consideration in developing climate projections for California.

### ***Areas for Possible Future PIER-Funded Land Use, Energy, and Environmental Research***

In fiscal year 2007-2008, PIER will initiate research to improve understanding of the relationships among land use, energy, and environment.<sup>81</sup> In particular, this research will address the need to identify and validate community-level design principles for land-use decision making by local and regional governments. An example includes research that provides a better understanding of the relative tradeoffs between residential-scale solar and the urban tree canopy. Urban shade trees can reduce a home's energy use by reducing the energy required to cool (and heat) the home, but trees can also reduce the efficiency and output of a home's solar panels by blocking sunlight. The tradeoffs including overall energy, environmental, and economic benefits between shade trees and PV production has yet to be quantified. These are complicated tradeoffs, affected by regional climate, a house's orientation, size, type and placement of trees, and many other factors. Because the state is investing in both residential solar energy systems<sup>82</sup> and

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<sup>81</sup> It is worth noting that for PIER generally *short-term* refers to a 1- to 5-year time frame; *mid-term*, 3 to 10 years; and *long-term*, 10 to 20 years.

<sup>82</sup> The New Solar Homes Partnership (NSHP) is a component of the California Solar Initiative, which was signed into law in 2006 under Senate Bill 1 (SB 1) by Governor Arnold Schwarzenegger. NSHP works with new home production builders to build homes that are between 15 percent to 35 percent more efficient than the current codes and have photovoltaics

urban canopy programs, it would be beneficial to understand how these policies can be optimized to provide maximum benefits while understanding potential tradeoffs.

Another broad subject area in community-level design principles addresses water and energy. In Southern California, for example, the difference between energy needed to pump groundwater can be as much as 2500 kilowatt-hours/ acre-foot less than the energy needed to import water.<sup>83</sup> Landscaping can be modified or designed to maximize groundwater infiltration, both improving the amount contained and quality of groundwater in the aquifers and reducing the need to pump and treat run-off, both energy intensive processes. Larger groundwater reserves can allow water agencies to pump groundwater rather than rely on electricity-intensive imported water. Research efforts planned for this year will evaluate the ability of landscape design to effectively recharge aquifers and the potential energy savings and environmental benefit from increased local pumping versus remote pumping and long-range transport.

### **Density and Urban Building Energy Use**

Research is needed to study the implications of densification on urban building energy use to help determine if there is an optimal configuration to minimize energy use in urban buildings. While research indicates that higher density, particularly if achieved with units that share walls, results in lower primary energy use than lower densities,<sup>84</sup> the relationship between higher density and lower energy use may not be linear. Some studies indicate that if cities are too noisy and there are local air quality concerns, instead of using natural ventilation, people will use their air conditioners.<sup>85</sup> One study also suggests that if cities become too dense, in addition to less use of natural ventilation, the need for electric lighting goes up, and the use of natural lighting goes down. Further research is needed to understand the implications of smart growth planning on building energy use.

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that will generate up to 50 percent of the home's electricity needs. SB 1 establishes three goals for the California Solar Initiative: create 3,000 megawatts of new solar-produced electricity by 2017 (of which 400 MW are from NSHP), establish a self-sufficient solar industry in which solar energy systems are a viable mainstream option in 10 years, and to place solar energy systems on 50 percent of new homes in 13 years.

<sup>83</sup> Cohen, Ronnie, Gary Wolff, and Barry Nelson, 2004, *Energy Drown the Drain: The Hidden Costs of California's Water Supply*, Natural Resources Defense Council, Available at <http://nrdc.org/water/conservation/edrain/edrain.pdf>.

<sup>84</sup> Rong, Fang, 2006, *Impact of Urban Sprawl on U.S. Residential Energy Use*, University of Maryland, <http://hdl.handle.net/1903/3848>.

<sup>85</sup> Cooper, J. T. R., and A. Smyth. 2002. "Energy trade-offs and market responses in transport and residential land-use patterns: Promoting sustainable development policy." *Urban Studies* 38(9): 1573–1588.

<sup>86</sup> Koen Steemers (2003), "Energy and the city: density, buildings and transport," *Energy and Buildings* 35(1): 3-14. This paper discusses land use affects on both transport and energy use, particularly in the UK context. It points out that increasing density does not necessarily produce energy savings; in fact, moderately high densities (more on the order of European cities than Asian ones) may be the best from an energy standpoint. The authors point out that the two are linked—that in a city where the noise and pollution from cars is minimized, the buildings can be opened up, replacing powered ventilation, cooling and lighting with passive ventilation, cooling, and lighting.

The *2006 IEPR Update* states that the Energy Commission should “develop tools and methods to identify and set energy sustainability goals and to verify that these goals are met” (p. 96). Some tools exist and are being used already and, as a starting point for research, it may be useful to study some of these existing tools and methods. For example, local governments are building LEED (Leadership in Energy and Environmental Design) certified buildings to assist in meeting their sustainability goals. Additionally, LEED–Neighborhood Design (LEED-ND) is being developed with the NRDC and the Congress for New Urbanism. Development projects will be rated based upon their location efficiency; environmental preservation; compact, complete, and connected neighborhoods; and resource efficiency. The Energy Commission may be able to leverage the LEED–ND program in a way that assists in establishing standards or priorities for growth in California. Some potential research opportunities include:

- For cities with LEED-certified projects, conduct monitoring and validation studies to demonstrate how well the projects are meeting their projected goals, including CO<sub>2</sub> reductions, and to evaluate the scoring criteria to see if certain credit areas warrant a higher weighting because of embedded energy savings.<sup>87</sup>
- Once the LEED–ND standards are final, research projects could include monitoring and validating the impact of LEED-ND certified projects and analyzing and quantifying the benefits for California cities and California as a whole and assess whether there is a need for a more California-specific LEED-ND.

Land use planners and other city officials sometimes use models to calculate/estimate the impacts of their decisions. For example, decision-makers have models forecasting transportation trends for the next 50 years, but they have few reliable models that forecast energy use at the community level for the next decade, given various land use practices. Thus, developing energy use models at the community level will assist in informed land use decision making.

Tools are in use that could help the state understand optimal energy-related environmental community planning and design approaches. Such tools, focused on particular sub-systems within a community, include: CITYgreen, Harmonize Emissions Analysis Tool (HEAT), and Construction Technology Group’s Sustainable Communities Model. A survey of functionality for all existing tools and quality and consistency of their input data sources would help determine if better data is needed to ensure that such models produce as reliable and consistent outputs as possible.

Communities are looking for tools that can address climate change at the local and regional level.<sup>88</sup> The *2006 IEPR Update* states that the Energy Commission (through PIER) should “Provide tools and conduct research to assist local governments’ energy and greenhouse gas reduction planning efforts” (p. 96). Tools exist to support local governments in reducing their GHG emissions. For example, HEAT is an Internet-based resource for storing, tracking, modeling, and reporting emissions and reductions of GHGs and criteria air pollutants.

Research is warranted to investigate the quality of data used in the models, validate the modeling capabilities, and assess the strengths and weaknesses of tools. In the coming

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<sup>87</sup> For example, water efficiency credits for LEED-NC may result in energy savings as well and perhaps should be considered for a higher weighting to encourage such activities in achieving LEED certification.

<sup>88</sup> Sixty-six California cities have signed on to the U.S. Mayors’ Climate Protection Agreement, which commits signatories to reducing their carbon emissions to 7 percent below 1990 levels by 2012.

years, PIER will conduct research in support of local governmental efforts on climate protection. If these tools are being used to estimate achievements of state energy policy goals, research that strengthens the science and technology behind and within these tools may be of consideration.

Critical research questions that will allow for better planning and effectiveness at reducing GHG emissions at the local level may include:<sup>89</sup>

- Exploratory study: Urban Forestry and carbon sinks - how to account for GHG reductions from sequestration by trees as well as other energy/environmental benefits.
- Methods ensuring consistency and scientific soundness. What scientific research is needed to develop methods for estimating GHG reductions and emissions robust as well as transparent? Using this information what are the recommendations for developing a California Standard? (in coordination with Air Resources Board)
- What are the benefits and potential impact of making offsets local and what ways can they be made verifiable? How far can a city go to achieve Kyoto-like goals within its own jurisdiction and authority?
- Why are cities not investing more in short- and medium-term energy savings projects? And what potential impact in reducing GHG emissions would such projects have?
- What are the recommended energy savings projects and their potential impacts?
- What is the best way to develop a robust database and information exchange among (California) cities that have agreed to advance the goals of the Kyoto Protocol by signing the U.S. Mayors' Climate Change Protection Agreement?
- What data is needed to accurately report emissions on a communitywide and municipal scale?
- How should monitoring, tracking, and validation of progress occur?
- For the cities that are implementing GHG emission reduction programs, what are the quantifiable differences they are making compared to those that do not have programs?
- What role can cities play in achieving the state emissions reduction target?

The knowledge produced from the research described above will provide the information needed and enable the development and improvement of models, decision-support tools, and design principles to promote more comprehensive energy-aware planning. Such efforts represent a broadening of the scale of the research, moving from an individual object (building) level to the aggregate level (for example, moving from the energy efficiency of a house to the energy efficiency of a neighborhood), as well as considering energy as part of smart growth, including transportation energy, as well as other forms of energy demand and supply. Achieving this broadening of scope will begin to place energy planning at the appropriate level for local and regional governments to design their land use practices and policies around more energy- and resource-efficient communities.

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<sup>89</sup> The Institute for Local Reliance just published a report *Lessons from the Pioneers: Tackling Global Warming at the Local Level* (Jan 2007). It surveyed the climate change activities in 10 cities (2 in California) to find out how well these "Kyoto cities" were doing in meeting their goals and what strategies and methodologies they were using. The overriding conclusion is that, despite commitments and elaboration of significant programs, reducing GHG emissions below 1990 levels "will be a major challenge." Several research recommendations were made, and some are included in this list.

Land use changes may be able to reduce driving for necessity by “bringing destinations closer to origins and improving the viability of alternative modes” but studies show that people choose to drive more than necessary.<sup>90</sup> If people will choose to drive more even when land use changes offer less of a need to drive, land use change may have limited power to produce savings from the transportation sector, savings that are critical in California meeting its climate reduction goals. Investigating ways to ensure that the land use changes have a better chance of achieving the desired effect is an important area for research.

This report has identified a number of ways in which land use features can affect energy use. While the effects of certain specific features have been explored with some detail, there is much research to be done on what a complete, appealing, energy-efficient community would look like, what the energy implications of such communities would be, and how those communities can take root and flourish across the state. As the Energy Commission funds research to address these questions, it will be considering not only efforts that will help local governments and regional planners in the next 5-10 years, but will also be creating a vision of how Californians will live, work, and travel in 50 years, at a time when energy resources are more tightly constrained than they are now, when vehicle technology has undergone another generation or two of development, and information technology is even more powerful and pervasive.

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<sup>90</sup> Handy, Susan, 2003, “Driving Less,” *Access* 23: 20-25.



## CHAPTER 9: Staff Findings, Conclusions, and Recommendations

The following are key findings, conclusions and recommendations that the State of California and Energy Commission should consider in their attempts to reduce energy use and GHG emissions related to land use.

### Findings

- With about 40 percent of California’s greenhouse gas emissions attributed to the transportation sector, significant efforts to reduce vehicle miles traveled are needed to meet the state’s GHG emission reduction goals. The state must find a way to not only reduce the current 3 percent annual growth rate in vehicle miles traveled, but begin to implement steps that will eventually reverse it.
- The research reviewed shows that increasing a community or development’s density and accessibility to job centers are the two most strongly correlated factors for reducing vehicle miles traveled through design. More research is needed as to how these factors cause the reductions.
- Even when using commendable collaborative efforts to reduce vehicle miles of travel by implementing smart growth principles, efforts fall far short of the reductions needed in vehicle miles of travel needed to meet greenhouse gas emissions goals.
- Existing tax policies, largely developed in response to Proposition 13 (1978), encourage and promote commercial sprawl. That form of land use development provides local governments with much needed revenue for public services and infrastructure but at the expense of smart growth strategies. The state should consider revising tax policies to encourage regionally coordinated, energy-aware planning.
- Confronting issues such as housing, transportation mobility, economic development, and local climate change planning requires a regional approach, one that will protect the fiscal interests of urban, suburban, and rural communities while simultaneously lowering energy use.
- While the state has limited land use authority, it does have some key leverage points (California Environmental Quality Act, housing elements, and others) that can be used to assist local governments in reducing energy use and greenhouse gas emissions that result from land use planning choices. Thus, while land use authority is nearly completely vested with local government, the state can use the disbursement of transportation and housing funds to motivate collaborative planning at a regional level.
- The state-sponsored Blueprint Planning Program has engaged nearly all of the state’s metropolitan planning organizations in long-range land use planning efforts. Several of these organizations are now adopting plans to better coordinate land use and transportation development. The plans strive to accommodate housing needs, reduce vehicle miles traveled, and identify priority planning areas. The plans are in early stages of implementation and may require technical, financial, and regulatory assistance to achieve their goals. With some guidance, these same plans could link energy and greenhouse gas analyses into the long-term growth planning process.
- Other states and regional governments have adopted preferred growth scenarios that better coordinate land use and transportation development while accommodating housing needs, reducing vehicle miles traveled, and identifying priority planning

areas. Some of the states and regions have channeled financial and technical assistance to the identified priority planning areas in efforts to support the plan goals.

- Infrastructure funding policies influence the design and use of infrastructure projects. The Governor's Strategic Growth Plan contained numerous programs to encourage energy-efficient, climate-friendly land use, but project criteria (where they exist) for many of the programs contain no energy or climate considerations. The next federal transportation bill could significantly bolster the blueprint planning effort if it mandates energy and climate considerations.
- Utilities have historically played only a limited role in local government planning efforts. Coordinated planning between a utility and local government can produce many mutual benefits in terms of demand management, infrastructure deployment, distributed electricity generation, and installation of renewable energy generation. California investor-owned utilities have begun to engage with local and regional governments in mutual planning efforts, but these partnerships are prevented from reaching their full potential since the utilities cannot recoup the costs of their efforts.
- Land use impacts on energy demand, distributed electricity generation, transmission, and greenhouse gas emissions are in the early stages of exploration. Further research and development is necessary to explain and quantify the impacts land use has on energy systems, including: the causality (rather than the established correlation) of land development patterns and per capita vehicle miles traveled, the potential for low energy design principles, and the use of community-scale distributed and renewable generation technologies. There is a need for research to develop modeling and decision-support tools to allow the integration of energy considerations into future research and planning efforts. The Energy Commission is engaging in a new area of research that will look at the integrated relationships among land use, human behavior, urban design, environmental impacts, and energy under its new "sustainable communities" research program.

## Conclusions

This report describes how different land use patterns could reduce the use of energy in California and therefore, reduce the generation of GHG emissions. The state has identified significant GHG reduction goals and has identified measures towards achieving those goals. The rules implemented by ARB to comply with AB 1493 and the recent effort to develop a low-carbon transportation fuel are directed toward reducing the carbon intensity of fuels used in the transportation sector. Although significant efforts, they are not likely to be sufficient on their own to meet state GHG emissions reduction goals. Reducing the miles traveled per vehicle will also be necessary.

The number and length of vehicle trips are closely linked to where an individual lives and the proximity to transit, jobs, and shopping. VMT will differ depending on the type of land use. Smart growth development plans that increase average density by 30 percent, emphasize infill, and mix land uses to a high degree could optimally reduce regional VMT by about 15 percent at the end of 30 years. Regional Blueprint efforts in California, such as the plan developed by SACOG, show that preferred growth scenarios could reduce VMT per household by 15 percent over 30 years. However, when population growth is factored in, VMT would actually grow, although at a lower rate than business-as-usual growth scenarios. This suggests that current Blueprint planning, together with other measures targeted at reducing the amount of use and carbon intensity of fuels still cannot meet state climate change goals.

Challenges exist with not only achieving current Blueprint planning VMT goals but also with expanding them. The solutions lie in multiple actions that could provide incremental benefits. These solutions include: improved transportation models to more accurately forecast the true benefits of smart growth and Blueprint planning; density targets for new growth; changes in zoning to allow for greater residential density; transportation policies that identify goals for VMT reduction and urban design; state funding and transportation investments targeted toward smart growth areas; pricing and congestion management measures, including demand reduction measures to reduce need for new roadway infrastructure; modification of CPUC rules to facilitate electric utility involvement in local planning; and modifications to CEQA.

## Recommendations

- 1. The state should adopt a statewide growth management plan that is built from required local regional plans and align state planning, financing, infrastructure, and regulatory land use policies and programs to the plan.*
- 2. The state should require regional transportation planning and air quality agencies to adopt 25-year and 50-year regional growth plans that provide housing, transportation, and community services for expected population increases while reducing greenhouse gas emissions to state-determined climate change targets.*

The state's policies and programs that influence land use growth patterns should encourage climate friendly and energy efficient development. To do this, there must be a concentrated and collaborative process to identify where, and in what way, long-term growth should, and should not, occur in the state. Confronting issues such as housing, transportation mobility, economic development, and local climate change planning requires a regional approach, one that will protect the fiscal interests of urban, suburban, and rural communities while simultaneously lowering energy use and greenhouse gas emissions. Therefore, any state plan should be composed of regional plans, developed by local governments, in a process facilitated by regional agencies. Once regional plans are adopted, the state should build a statewide growth management plan that is wholly developed from the regional plans. Upon adoption of such a plan, state policies and programs should be modified to align with and support the plan. To allow for programs and development projects to mature, while also keeping the state and regional plans up-to-date, the plans should be updated every 10 years.

- The Air Resources Board should adopt regional greenhouse gas emission reduction levels to guide regional growth management plans in its AB 32 scoping plan. The Board should include in the scoping plan clear guidance on greenhouse gas emissions accounting for urban land use activities and a local government protocol for assessing and tracking greenhouse gas emissions in jurisdictions.
- The Climate Action Team's Land Use Subgroup should convene a proceeding to develop recommendations for measuring and reducing vehicle miles traveled.
- The Legislature should pass legislation that requires local governments to develop regional growth management plans that will accommodate 25 years and 50 years of housing, transportation, and community service growth needs while meeting Air Resources Board-set regional greenhouse gas emission targets.

The legislation should:

- Require regional growth management plans to be adopted through a joint process between a region's municipal planning organizations and/or council of governments (MPO/COGs) and the local air quality management district (AQMDs).

- Require local governments to adopt the portion of the regional plan and greenhouse gas emission reduction target that affect their jurisdiction into their general plans. The plans should clearly identify areas where growth and development should and should not occur.
- Require MPO/COGs and AQMDs to incorporate the plan and targets into their planning, financing, and regulatory programs.
- Require the Governor's Office of Planning and Research to collect the regional growth management plans and combine them to create a statewide growth management plan.
- Require state agencies to modify all programs and policies that affect land use, including but not limited to, planning, financing, capital outlay, and compliance, to incorporate and support the statewide growth management plan. Colleges, universities, and state buildings should also be required to be consistent with the growth management plan.
- Require that the regional and statewide plans, and the local governments, MPO/COGs and AQMDs adoption of them, shall be updated on a 10-year schedule.

***3. State infrastructure financing should encourage development that is concurrent with the state's greenhouse gas emission and energy consumption goals.***

Infrastructure funding policies influence the design and use of local government infrastructure and development projects. The state should build upon the Governor's Strategic Growth Plan's numerous programs to encourage energy efficient, climate-friendly land use by requiring that all state financing for infrastructure incorporate energy and climate considerations.

- The Legislature should pass legislation for all remaining Strategic Growth Plan bond programs to incorporate climate change and energy consumption reduction measures.
- If the state adopts growth management legislation as described above, all state infrastructure planning, financing, and compliance programs should only allow resources, financial, technical, or otherwise, to be spent for development of projects in identified growth areas.
- The Legislature should pass legislation that requires that all state infrastructure planning, financing, and compliance programs should only allow resources, financial, technical, or otherwise, to be spent for development of projects in complete consistency with regional blueprints.
- The Legislature should pass legislation that requires that all state infrastructure planning, financing, and compliance programs not allow resources, financial, technical, or otherwise, to be spent for development of projects in areas not consistent with existing regional blueprints.

***4. The state should expand efforts to provide technical and financial assistance to regional agencies and local governments to facilitate climate-friendly and energy-efficient planning and development.***

Land use impacts on energy demand, energy generation, transmission, and greenhouse gas emissions are in the early stages of exploration. Further research and development are necessary to explain and quantify the impacts land use has on energy systems. There is a need for research to develop and update existing modeling and decision-support tools to allow the integration of energy considerations into future research and planning

efforts. Many local governments and regional agencies state that access to information and a lack of funding prevent them from implementing climate friendly and energy efficient development plans and programs.

- The state should continue to fund the Blueprint Planning Grant program and Blueprint Learning Network to assist regional agencies and local governments in developing regional growth management plans. The grant program should include energy consumption and greenhouse gas emission reduction as primary outcomes of the blueprints developed within the program.
- Upon passage of the above described growth management legislation, the grant program and network should be modified to support development of the regional growth management plans as specified in the legislation.
- The Legislature should pass legislation that implements the Proposition 84 Sustainable Communities Program. The program should focus on assisting regional and local governments in developing, implementing and incorporating into existing policies the above mentioned growth management plans, blueprints and, climate action plans.
- The Energy Commission should convene a group of stakeholders, both within and outside state government, to update its *Energy Aware Planning Guide* to guide local governments attempting to adopt local growth management and climate action plans.
- Using the Energy Commission's new Sustainable Communities research program and the California Department of Transportation's existing research efforts as the base, the state should convene a land use research group to identify research needs, carry out research, and develop and disseminate tools and resources to land use stakeholders.

***5. State government should be a model for climate-friendly and energy-efficient development patterns.***

The state, with the passage of AB 32, possessing the knowledge of what it is going to be necessary to meet the state's climate change and energy goals and attempting to influence land use practices outside of its authority, has an obligation to model appropriate behavior in its own land use practices. While AB 857 provided the framework for guiding state agency land use practices, there is no recourse for agencies that do not comply. Currently, the Governor's Office of Planning and Research has authority only to collect annual reports of agencies self-reported compliance with the law.

- The Legislature should pass legislation that builds upon AB 857's intentions by adding greenhouse gas emissions reduction and energy consumption as priority planning goals of the state. The legislation should require that state agencies engaging in or financing the development of infrastructure or capital outlay projects report on the project's compliance with state planning policies during each stage of its administrative and legislative budget approvals. The legislation should require that projects that do not meet the state planning priorities should not be funded except in situations where compliance would be proven infeasible by the sponsoring agency.
- The Climate Action Team Land Use Subgroup should develop greenhouse gas emissions reduction and energy efficiency guidelines for state agency programs that affect land use. State agencies should adopt the guidelines to the greatest extent feasible.

***6. The state should determine the extent to which state and local tax policies affect and guide land use practices and correct policies that encourage growth inconsistent with the state's growth management plan.***

Existing tax policies, largely developed in response to Proposition 13, promote residential sprawl and increase vehicle miles traveled, and greenhouse gas emissions. The state should thoroughly review the impact of tax policy on land use patterns in the state.

- The Governor's Office of Planning and Research, working with local governments, the building community, the university system, and other stakeholders should study the impacts of state and local tax policy on land use practices in the state. The report should contain recommendations for changing identified tax policy that leads to detrimental land use practices.

***7. California's utilities should play an active role in regional and local government planning and development efforts at both the plan and project level to encourage climate-friendly and energy-efficient development in their service areas.***

The state's investor-owned utilities (IOUs) and municipal utilities need to play a significant role in planning and development programs and projects. IOUs have stated that their ability to do so is hamstrung by current energy efficiency program time constraints.

- The California Public Utilities Commission should allow utility-incentive and technical-assistance programs with longer lead times to enable greater collaboration with developers and local governments.

***8. The state should work with its Congressional delegation to ensure that future federal highway and other transportation and land use related legislation and programs include energy and climate change considerations.***



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## **Appendix: 2006 Energy Report Update: Policy Recommendations Update**

### **Require Local Governments to Adopt Greenhouse Gas Emission Reduction Plans**

The state's Assembly Bill 32 plan should require local governments to develop greenhouse gas reduction plans and finance such efforts through the Assembly Bill 32 administrative fee at a level commensurate with the greenhouse gas savings expected from improved land use planning.

**Update:** The CARB is currently developing the AB 32 implementation plan. It will be released by January 1, 2009.

### **Promote and Facilitate Efficient Land Use Practices That Save Energy and Reduce Greenhouse Gas Emissions**

The Energy Commission should invite stakeholders to participate in an ongoing land use/energy working group that would convene on a regular basis to guide the state's land use and energy research and program development.

**Update:** The Energy Commission is chairing the Climate Action Team Sub-Group on Land Use and Local Government. The sub-group is tasked with coordinating climate change mitigation and adaptation efforts in cross-cutting areas that are crucial to meeting the state's greenhouse gas (GHG) emissions reduction goals related to local government and land use activities. The sub-group is made up of state agencies and will work with local governments and other stakeholders to develop the tools, and programs necessary to achieve the state's climate and energy goals.

Working with its partners, the Energy Commission should establish a central repository for efficient land use information resources. The Energy Commission should produce case studies and best practices guides that describe the successes of local government land use efforts that reduce energy needs and greenhouse gas emissions.

**Update:** The Energy Commission has entered into partnerships with national, regional, and local government entities to produce case studies and tools that will help local governments and their partners to develop plans to reduce energy usage and GHG emissions. These partnerships will produce the following, but not limited to, products:

- Model Regional Energy Strategy
- Model General Plan Energy Element
- Model Local Climate Action Plan

- **Alternative Fuel Infrastructure Toolkit**
- **An annual conference on smart growth and climate change**
- **Local Government GHG analysis tool**

The legislature should pass legislation that would require local governments to include an energy element in their General Plans.

**Update: At the time of this document's release, there is no legislation in the 2007-2008 legislative session that would require a local government in California to adopt a mandatory energy element in its general plan.**

The CPUC should require investor owned utilities to partner with local governments to incentivize smart growth in their service territories. The CPUC should allow IOUs to recover the cost of the partnerships.

**Update: At the time of this document's release, there is no activity to report on this recommendation.**

Under the authority granted to them by AB 2021 (Levine, 2006), the Energy Commission should assist municipal utilities in partnering with local governments to encourage smart growth in their service territories

**Update: At the time of this document's release, there is no activity to report on this recommendation.**

## **Provide New Tools and Conduct Research to Assist Local Government's Energy and Greenhouse Gas Reduction Planning Efforts**

The Energy Commission should complete the update of the I-PLACE3S energy module and then continue to provide research and analytical tool development that will allow the state and its partners the ability to:

- Better understand the relationships, processes, and outcomes that underlie smart growth and energy.
- Identify, quantify, evaluate, and verify sustainable energy planning practices and designs.
- Understand the associated complex energy relationships, interdependencies, efficiency, and environmental enhancement opportunities of these practices and designs.
- Develop tools and methods to identify and set energy sustainability goals, as well as to verify that these goals are met.
- Take a comprehensive approach, using life cycle studies or system analyses, to identify the costs, benefits, and trade offs of achieving these goals and to allow for more informed decision and policy making.

**Update:** The I-PLACE3S energy module is currently still in the development phase. The PIER program has started a new research approach that draws from current program areas for an integrated analysis of Sustainable Communities. The research from this effort will provide a better understanding of land use, energy, and environmental relationships and attempt to improve the decision-making ability of local government officials, developers, builders, and others.

The PIER program is engaged in the development of a number of tools and research that will enable local governments to better account for energy and climate impacts of growth scenarios, as identified earlier in this paper.

## **For the 2007 IEPR, the State Should Analyze the Role of the State's Infrastructure Planning and Financing Activities in Promoting Smart Growth**

The state should assess compliance with Assembly Bill 857 and provide an assessment of successes and barriers to action.

**Update:** At the time of this document's release, there was no activity to develop and release a report an assessment of successes and barriers to action on AB 857 compliance.

The state should develop criteria for smart growth development and prioritize infrastructure funding towards development that meets the criteria.

**Update:** The Energy Commission is chairing the Climate Action Team Sub-Group on Land Use and Local Government. The sub-group will be examining the state's role in infrastructure financing and planning and developing smart growth, energy, and climate criteria for state agencies to consider for incorporation into their infrastructure programs.