City of Santa Barbara
California

PLANNING COMMISSION
STAFF REPORT

REPORT DATE:	January 3, 2008
AGENDA DATE:	January 10, 2008
SUBJECT:	Responses to Climate Change and Sustainability Issues, Including Energy Conservation
TO:	Planning Commission
FROM:	Planning Division, (805) 564-5470 Jan Hubbell, AICP, Senior Planner

INTRODUCTION:

The Planning Commission has, over the past year, expressed increasing interest in energy conservation, both on a project-specific level and on the broader community level. The Commission has occasionally added "ad-hoc" conditions to projects requiring installation of solar photo-voltaic systems. Many projects have also agreed to include "green" components in their projects. Staff has expressed some concerns about ad-hoc conditions when there are so many different options. As work has begun on *Plan Santa Barbara*, the Commission's interest has broadened to include community concerns. This report and the discussion at the Planning Commission meeting are intended to provide background on energy conservation and other sustainability issues, discuss what the City is doing now, and how these issues will be incorporated into future planning efforts. Additionally, there is discussion of how to handle these issues during project environmental review.

BACKGROUND:

For over 40 years, concern has been expressed by various scientists, the environmental community, politicians, and others regarding resource use, impacts of industry on the environment, and need for long-range planning related to development and growth. Early concerns regarding chemical usage and impacts, highlighted by Rachel Carson in *Silent Spring*, resulted in the environmental movement of the late 1960s, given additional impetus by the 1969 Santa Barbara Channel oil spill, and led to the institution of Earth Day in 1970. Several laws went into effect in the late 1960s and early 1970s, with the intent of reducing impacts on the planet, including the Clean Water Act, Clean Air Act, Endangered Species Act, National Environmental Policy Act (NEPA), the California

Environmental Quality Act (CEQA), and many other laws. These laws have tended to look at pieces of the environment, but have not always worked together to deal with the environment as a whole, with a clear understanding of the inter-relationships between various pollutants, land use planning and other issues.

More recently, there has developed an interest in fostering a more sustainable presence on and use of the earth. Sustainability is not just another word for the environment; rather, it characterizes a holistic approach to resource protection, conservation and use. The classic Bundtland Commission (1987) definition of sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." As a concept, sustainability involves what are frequently referred to as the three "Es": environment, economy and social equity, or just equity. Consequently, sustainability implies more of a balancing of potentially competing factors than only focusing on protecting the environment, or promoting economic expansion, or the provision of essential public services and facilities. It also implies that, though the balance may shift from time to time, none of the three "Es" can be left entirely out of the equation. Presumably, over time, balance will be achieved. Time in a very long term sense – spanning generations – is another key component of sustainability. The issues of climate change and energy use under discussion here are two long-term and related issues requiring a more sustainable response.

Ahwahnee Principles. In California, the Local Government Commission worked with a number of architects to develop the Ahwahnee Principles, with the intent of looking at land use planning in a way that would not waste resources, and would result in more sustainable communities. The Ahwahnee Principles were adopted in 1991 (Exhibit A). Many cities and counties, including the City of Santa Barbara, have since adopted these principles. The Ahwahnee Principles include planning principles for community and regional planning, and implementation.

Kyoto Protocol. Although there had been discussion in scientific circles, any discussion of man's greater impact on the earth's climate was seen as alarmist until the 1990s. The first discussion of climate change and man's role in increasing global temperatures that was taken seriously by the public and politicians occurred during this decade. This resulted in the adoption of the Kyoto Protocol by most industrialized nations in 1997 (Summary - Exhibit B). Significant exceptions included Australia and the United States. Following the election of a new prime minister, Australia recently adopted the Kyoto Protocol. Additionally, in 2006, California accepted the challenge of meeting the requirements of the Kyoto Protocol to reduce greenhouse gas emissions to less than 1990 levels (Assembly Bill 32). The Air Resources Board set the 1990 greenhouse gas emissions total on December 7, 2007, setting the goal for California to reduce its emissions. Greenhouse gas emissions have risen by 13% since 1990. In order to return to 1990 levels, the state will need to find ways to reduce projected emissions by 30% by 2020.

It seems likely that part of the way that emissions will be reduced is through evaluation of emissions as part of environmental review under the California Environmental Quality Act (CEQA). The Association of Environmental Professionals (AEP), an organization of

professionals in California involved in environmental review, has issued a white paper that discusses a variety of alternatives for doing environmental review of greenhouse gas emissions and global climate change (Exhibit C). While the alternatives best relate to cumulative impacts included in program EIRs, such as the EIR that will be prepared for *Plan Santa Barbara*, there are also valuable ideas included in the paper for project review.

CITY OF SANTA BARBARA ROLE

The City of Santa Barbara has taken on a number of issues related to sustainability during the past few years, including being an early, and strong, supporter of recycling. Some of the more important current efforts are discussed below.

Sustainable Santa Barbara: In the summer of 2005, the City Administrator's Office formed a Green Team, composed of City managers and supervisors, to develop goals for a sustainable Santa Barbara. The mission statement for *Sustainable Santa Barbara* is: "Practice and promote the protection and enhancement of our environment, personally and as an organization, in all city services and operations." A goal of the program for the future could be to foster sustainable practices in the wider community as well.

The City of Santa Barbara has developed many successful programs to become environmental leaders in the areas of climate protection, waste prevention, and water conservation. Smart energy technology is used to conserve energy and rely on clean renewable sources. The City was the first Southern California city to certify its greenhouse gas emissions with the California Climate Registry. The City uses B20 biodiesel fuel in City vehicles and, whenever available, purchases alternative fuel or hybrid vehicles. Alternative transportation options such as biking, walking, carpooling, or riding a bus, are encouraged in lieu of driving alone. In the area of waste prevention, the City conducts events and meetings as "Zero Waste" events where all utensils and plates are compostable or recyclable. 98% of parkland is considered "green" where no harmful pesticides are used to control weeds and pests. The City is also a leader in water conservation. Innovative technology for irrigation and plumbing is used and free water check-ups to residents and businesses are provided.

The City's Green Team is currently preparing draft options to reduce greenhouse gas emissions from facilities and fleet owned by the City of Santa Barbara. Draft implementation strategies and emission targets will be reviewed by the City's Sustainability Council Committee and City Council in early spring 2008. The Fiscal Year 2008 Sustainable Santa Barbara Program workplan and key projects to be implemented are attached (Exhibit D).

Architecture 2030 Energy Ordinance. A nationwide discussion has been building over the past few years to slow the growth of greenhouse gas emissions and then reverse the trend over the next ten years. One effort has been called Architecture 2030, led by architect Edward Mazria, which promotes the 2030 Challenge. The 2030 Challenge has focused on the built environment because, according to their analysis, buildings are the major source of demand for energy and materials that produce by-product greenhouse gases.

Ed Mazria presented this information at a public lecture at the Marjorie Luke Theater on September 26, 2006, and in the David Gebhard Public Meeting Room on November 28, 2006, to invited staff, board and commission members, and elected officials.

A local Architecture 2030 group has been formed, made up of representatives of the local chapter of the American Institute of Architects (AIA), Community Environmental Council (CEC), building industry representatives, and environmental organizations. They requested a presentation to the entire Council at the January 30, 2007 meeting to encourage the City to take steps in meeting the 2030 Challenge. At that meeting, the Council unanimously directed staff to take the matter to the Subcommittee on Sustainability for discussion and direction.

In March, 2007, staff met with the Council Subcommittee, which had favorable comments and encouraged staff to draft an Energy Ordinance for Council consideration. As such, staff hired Mr. Michael Gabel of Gabel & Associates, Inc. to assist with the drafting of the Ordinance. Two public meetings were held to discuss the points for an energy ordinance and to receive public input.

In general terms, the Energy Ordinance (Exhibit E) requires residential buildings of three stories or less to be 20 percent more energy efficient than current state standards and all other residential or non-residential construction to be 10 percent more energy efficient than the current state standards. Compliance may be achieved by using either a Prescriptive Approach or a Performance Approach with variable features of compliance contained within each category. Additionally, all appliances (excluding HVAC equipment and water heaters) installed shall be Energy Star rated. Among other requirements, the ordinance would regulate swimming pools, and mechanical heating and cooling systems.

On October 16, 2007, the Ordinance Committee reviewed the draft ordinance and unanimously passed the draft ordinance on to City Council for introduction. On October 23, 2007, the Energy Ordinance was introduced at City Council and was approved to be sent to the California Energy Commission (CEC) for their review and approval.

The Energy Ordinance is currently being reviewed by the California Energy Commission. It is anticipated that, once the Energy Ordinance is approved by the California Energy Commission, it will be brought back to City Council for formal adoption. The estimated effective date of the new Energy Ordinance is February/March 2008.

Conversion Technology: The City and County of Santa Barbara are jointly studying the feasibility of siting a facility at Tajiguas Landfill that would utilize "conversion technology" to convert portions of our waste stream into energy. Although energy production is an important component, the primary goal is to reduce the amount of material that would otherwise be landfilled, which not only would reduce the environmental impacts caused by landfilling, but also help extend the life of Tajiguas.

While recycling efforts and increasing diversion rates will continue to be a priority, the amount of waste being landfilled is still significant and isn't expected to decrease substantially given the projected growth in population; thus, we believe it's appropriate to consider alternative solutions to landfilling.

The purpose of the presentation at the Planning Commission is to provide the Commission with a summary of the issues, what City staff is doing to evaluate alternatives through conversion technology, and the goals City staff have developed to guide us through this process. Most importantly, staff is interested in getting any feedback and input the Commission wishes to provide.

Alternative Transportation: The City and region are continuing to take steps to improve the feasibility and convenience of transportation alternatives to the single person automobile trip. Some example activities include pedestrian and bicycle facility improvements; increased funding and improved service levels for Metropolitan Transit District buses; City flexwork programs; and the On-Trac Plan of Transit/Rail Action for Commuters.

PLAN SANTA BARBARA

Sustainability Considerations:

Plan Santa Barbara is a comprehensive review to update the City's General Plan. Over the years, some elements of the plan have been updated, most recently the Housing Element in 2004 and the Circulation Element in 1998, and the last major amendment to the Land Use Element was in 1990. However, two imminent events have triggered the current effort: the sunset as of 2010 of Charter Section 1508 (Measure E) – limiting the amount of non-residential development – and reaching of the 39,000 residential-unit threshold in the Housing Element that calls for re-evaluation of the residential build-out limit of 40,005 units.

In 2005, the City Council adopted goals to guide the *Plan Santa Barbara* process. These goals were similar to the goals that were used in the 1990 General Plan update. The primary amendment was addition of a ninth goal: "Develop explicit environmentally sustainable policies." The Phase I public input process for *Plan Santa Barbara* reveals that many members of the public want the City to incorporate sustainability into the current planning effort too.

As discussed earlier in this report, early in 2006, the City launched the *Sustainable Santa Barbara* program which is initially concentrating on greening the City's own operations and facilities, thereby setting an example of sustainability for the rest of the community.

The emphasis of the City's sustainability program is on the environment. Council Goal #9 also emphasizes the environment, although several of the other goals address social equity and economic considerations. For *Plan Santa Barbara,* an initial step will be to develop working definitions of sustainability and related terms appropriate to Santa Barbara to further guide incorporation of the concept of sustainability into the updated General Plan.

Sustainability will be addressed in two distinct parts of the planning process. First, definitions, goals, policies, programs, criteria or findings will be added to the plan. Second, the environmental review process under CEQA which is discussed below, will also address sustainability issues.

As presently conceived, the sustainability goals and policies will be part of the overarching policy framework for the plan. Sustainability will also be a companion consideration for many of the topics covered in the plan, such as: community design, environmental protection, transportation, the economy, public services and diversity, and will eventually be reflected in the policies in all elements of the plan. While policies and implementation strategies found in the General Plan elements will primarily guide development in the City over the period to 2030, sustainability goals and policies may look beyond that date. This will require incorporating techniques of adaptive management, the development of community indicators, and providing resources for future monitoring to maintain the relevancy and usefulness of sustainability components of the plan.

The two issues of climate change and energy (or more specifically fossil fuel consumption and greenhouse gas emissions) are often linked to sustainability because of their long-term consequences. Climate change is a very relevant concern for Santa Barbara for its location on the coast and in a region already susceptible to drought. It is anticipated that goals and policies addressing the long-term implications of climate change will be part of the overarching policy framework. Energy conservation, fuel alternatives and reduction of green-house gases would more likely be addressed by policies in several of the General Plan elements, notably the Circulation Element, but also the Land Use and Conservation elements.

Sustainability policy options will be the subject of a community forum in March 2008, and part of the *Plan Santa Barbara* package of policy options to be brought to the Planning Commission in May or June.

Plan Santa Barbara Program EIR

Plan Santa Barbara will undergo CEQA review with a Program EIR, which is more general in nature than an individual project EIR, and is focused on the cumulative environmental effects of incremental development citywide over the next twenty years. The Program EIR will identify existing environmental conditions, comparative environmental effects associated with alternative future growth scenarios and policy options, and mitigation measures that could feasibly lessen significant environmental impacts (such as land use policy changes, City programs, or standard conditions to apply to future development).

Energy Conservation: Using guidance from Appendix F of the State CEQA Guidelines (Energy Conservation), the EIR will discuss existing citywide energy use from mobile and stationary sources and potential energy use in twenty years. The EIR will identify potential mitigation measures that could reduce energy consumption through the type and design of development and circulation infrastructure, and during both the construction and operation phases of development.

Climate Change: The EIR discussion of global warming/ climate change effects will draw from the various EIR impact analyses, including air quality, flooding, wildfire hazard, solid waste management, and the energy conservation discussion, to characterize the existing City contribution to climate change, potential future contribution with

additional incremental development over the next twenty years, and mitigation measures from these sections that could reduce the City's contribution to global warming impacts.

Sustainability: As discussed above, the *Plan Santa Barbara* policy framework document will address sustainability and environmental protection, and will identify policy changes to be incorporated into the City General Plan. There will be a lot of overlap between environmentally protective and sustainable policies in the Plan and mitigation measures in the EIR, such as in the areas of housing design, transportation, open space; green building; energy conservation/ air quality; water conservation/ water quality; waste reduction/ recycling; landscaping requirements, etc.

PROJECT REVIEW:

On a number of occasions over the past year, the Planning Commission has requested that, as part of the preparation of environmental impact reports (EIRs), the project's potential energy impacts be studied, with particular emphasis on avoiding or reducing inefficient, wasteful and unnecessary consumption of energy. This is a requirement of the California Environmental Quality Act (CEQA), as specified in Appendix F of the CEQA Guidelines (Exhibit F). Staff believes that there is good guidance to rely on in doing that analysis, using California's existing Title 24, which includes energy standards for new construction, and the City's new energy ordinance, discussed above. In Initial Studies, there will be a brief discussion of energy conservation included in the Plans and Policies Section. There will also be a brief discussion of Climate Change in the Air Quality section. There will be no impact significance determination for either discussion at this point in time. Staff is not comfortable making a significance determination for individual projects, given the cumulative nature of climate change analysis. We expect that either the Air Resources Board or the Governor's Office of Planning and Research will issue regulations in the near future that will provide more information on how to analyze impacts.

In addition to analyzing energy consumption, the Planning Commission has suggested that an analysis and quantification of a project's sustainability benefits, or "Smart Growth" impacts be included in EIRs. As part of recently issued requests for proposals for EIR preparation, staff have included a request for consultant assistance in coming up with useful and meaningful tools for conducting such an analysis. Again, impact significance will not be determined. However, measures and conditions could be developed as a result of the analyses. A copy of a recent presentation by the Office of Planning and Research on Climate Change and CEQA is also included in the Exhibits (Exhibit G). They will need to be clear and quantifiable and may be useful in establishing policy or to address incremental or project-specific effects. Care will also need to be taken that they do not exceed local purview.

CONCLUSION:

This report discusses the broadest level of Climate Change and Sustainability issues as they will affect the City of Santa Barbara over the long-term. Staff will also provide additional information as part of the presentation on this item at the Commission meeting. Exhibits are also attached that include a City policy on energy Use and Reduction, an

article on water efficiency planning and a series of articles from *Planning* Magazine, a publication of the American Planning Association (APA), and a recently issued policy statement regarding climate change from the California Chapter of APA. Between the discussions occurring as part of *Plan Santa Barbara*, and Commission review as part of individual projects; staff expects this subject to result in lively discussion.

Exhibits:

A. Ahwahnee Principles
B. Kyoto Protocol
C. Alternative Approaches to Analyzing Greenhouse Gas Emissions and Global Climate Change in CEQA Documents, Association of Environmental Professionals, June 29, 2007,
D. Sustainable Santa Barbara Program Workplan – Fiscal Year 2008
E. Energy Ordinance
F. CEQA Guidelines Appendix F – Energy Conservation
G. "Climate Change and CEQA" – A presentation by the Governor's Office of Planning and Research to the California State Association of Counties, November 14, 2007
H. City of Santa Barbara Energy Use & Reduction Policy
I. "How Water Works for LEED," *Building Operating Management,* October 2007
J. "Climate Change: What Is It and What Can Planners Do About It?" by Michele Rodriguez
K. "Planning Policy Principles for Climate Change Response" by the Climate Change Task Force of the California Chapter, American Planning Association, September 2007
L. Articles on Climate Change and Global Warming from *Planning*, Magazine, August/September 2007

Ahwahnee Principles for Resource-Efficient Communities

Preamble:

Existing patterns of urban and suburban development seriously impair our quality of life. The symptoms are: more congestion and air pollution resulting from our increased dependence on automobiles, the loss of precious open space, the need for costly improvements to roads and public services, the inequitable distribution of economic resources, and the loss of a sense of community. By drawing upon the best from the past and the present, we can plan communities that will more successfully serve the needs of those who live and work within them. Such planning should adhere to certain fundamental principles.

Community Principles

1. All planning should be in the form of complete and integrated communities containing housing, shops, work places, schools, parks and civic facilities essential to the daily life of the residents.
2. Community size should be designed so that housing, jobs, daily needs and other activities are within easy walking distance of each other.
3. As many activities as possible should be located within easy walking distance of transit stops.
4. A community should contain a diversity of housing types to enable citizens from a wide range of economic levels and age groups to live within its boundaries.
5. Businesses within the community should provide a range of job types for the community's residents.
6. The location and character of the community should be consistent with a larger transit network.
7. The community should have a center focus that combines commercial, civic, cultural and recreational uses.
8. The community should contain an ample supply of specialized open space in the form of squares, greens and parks whose frequent use is encouraged through placement and design.
9. Public spaces should be designed to encourage the attention and presence of people at all hours of the day and night.
10. Each community or cluster of communities should have a well-defined edge, such as agricultural greenbelts or wildlife corridors, permanently protected from development.
11. Streets, pedestrian paths and bike paths should contribute to a system of fully-connected and interesting routes to all destinations. Their design should encourage pedestrian and bicycle use by being small and spatially defined by buildings, trees and lighting; and by discouraging high speed traffic.
12. Wherever possible, the natural terrain, drainage and vegetation of the community should be preserved with superior examples contained within parks or greenbelts.
13. The community design should help conserve resources and minimize waste.
14. Communities should provide for the efficient use of water through the use of natural drainage, drought tolerant landscaping and recycling.
15. The street orientation, the placement of buildings and the use of shading should contribute to the energy efficiency of the community.

Regional Principles

1. The regional land-use planning structure should be integrated within a larger transportation network built around transit rather than freeways.
2. Regions should be bounded by and provide a continuous system of greenbelt/wildlife corridors to be determined by natural conditions.
3. Regional institutions and services (government, stadiums, museums, etc.) should be located in the urban core.
4. Materials and methods of construction should be specific to the region, exhibiting a continuity of history and culture and compatibility with the climate to encourage the development of local character and community identity.

Implementation Principles

EXHIBIT A

1. The general plan should be updated to incorporate the above principles.
2. Rather than allowing developer-initiated, piecemeal development, local governments should take charge of the planning process. General plans should designate where new growth, infill or redevelopment will be allowed to occur.
3. Prior to any development, a specific plan should be prepared based on these planning principles.
4. Plans should be developed through an open process and participants in the process should be provided visual models of all planning proposals.

Authors: Peter Calthorpe, Michael Corbett, Andres Duany, Elizabeth Moule, Elizabeth Plater-Zyberk, and Stefanos Polyzoides

Editor: Peter Katz, Judy Corbett, and Steve Weissman

Kyoto Protocol – Summary

Negotiating the Protocol

The adoption of the Framework Convention on Climate Change (UNFCCC) in 1994 was a major step forward in tackling the problem of global warming. Yet as greenhouse gas (GHG) emission levels continued to rise around the world, it became increasingly evident that only a firm and binding commitment by developed countries to reduce emissions could send a signal strong enough to convince businesses, communities and individuals to act on climate change. Member countries of the UNFCCC therefore began negotiations on a Protocol – an international agreement linked to the existing Treaty, but standing on its own.

After two and a half years of intense negotiations, **the Kyoto Protocol was adopted at the third Conference of the Parties to the UNFCCC (COP 3) in Kyoto, Japan, on 11 December 1997.** The Protocol shares the objective and institutions of the Convention. The major distinction between the two, however, is that while the Convention **encouraged** developed countries to stabilize GHG emissions, the Protocol **commits** them to do so. The detailed rules for its implementation were adopted at COP 7 in Marrakesh in 2001, and are called the "Marrakesh Accords."

Because it will affect virtually all major sectors of the economy, the Kyoto Protocol is considered to be the most far-reaching agreement on environment and sustainable development ever adopted. However, any treaty not only has to be effective in tackling a complicated worldwide problem, it must also be politically acceptable. Most of the world's countries eventually agreed to the Protocol, but some nations, including the United States and Australia, chose not to ratify it. Following ratification by Russia, **the Kyoto Protocol entered into force on 16 February 2005.**

Fair targets and flexible ways of meeting them

The Protocol requires developed countries to reduce their GHG emissions below levels specified for each of them in the Treaty. These targets must be met within a five-year time frame between 2008 and 2012, and add up to a total cut in GHG emissions of at least 5% against the baseline of 1990. Review and enforcement of these commitments are carried out by United Nations-based bodies. The Protocol places a heavier burden on developed nations under the principle of "common but differentiated responsibilities." This has two main reasons. Firstly, those countries can more easily pay the cost of cutting emissions. Secondly, developed countries have historically contributed more to the problem by emitting larger amounts of GHGs per person than in developing countries.

In order to give Parties a certain degree of flexibility in meeting their emission reduction targets, the Protocol developed three innovative mechanisms - known as Emissions Trading, Joint Implementation and the Clean Development Mechanism (CDM). These so-called "market-based mechanisms" allow developed Parties to earn and trade emissions credits through projects implemented either in other developed countries or in developing countries, which they can use towards meeting their commitments. These mechanisms

EXHIBIT B

help identify lowest-cost opportunities for reducing emissions and attract private sector participation in emission reduction efforts. Developing nations benefit in terms of technology transfer and investment brought about through collaboration with industrialized nations under the CDM.

Compelling scientific evidence

Some scientists have doubted the scientific basis of the Kyoto Protocol, claiming that there is not a clear connection between increases in GHG emissions and climate change. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), launched in the course of 2007, put an end to that discussion. Prepared by scientists from all over the world, it placed the reality of human-induced climate change beyond any doubt. It is politically significant that governments endorsed the IPCC's Fourth Assessment Report by consensus, making it a solid foundation for sound political decision-making.

The road ahead

The Kyoto Protocol is generally seen as an important first step towards a truly global emission reduction regime that will stabilize GHG concentrations at a level which will avoid dangerous climate change. As a result of the Protocol, governments have already put, and are continuing to put legislation and policies in place to meet their commitments; a carbon market has been created; and more and more businesses are making the investment decisions needed for a climate-friendly future. The Protocol provides the essential architecture for any new international agreement or set of agreements on climate change. The first commitment period of the Kyoto Protocol expires in 2012. By then, a new international framework needs to have been negotiated and ratified which can deliver the stringent emission reductions the IPCC tells us are needed.

Alternative Approaches to Analyzing Greenhouse Gas Emissions and Global Climate Change in CEQA Documents

Final - June 29, 2007

Association of Environmental Professionals

Principal Authors: Michael Hendrix and Cori Wilson, Michael Brandman Associates[1]

Contributing Authors: Curtis E. Alling, AICP, EDAW, Inc.
Tony Held, Ph.D., P.E., Terry Rivasplata, AICP, Tim Rimpo, Richard Walter, and Kenneth M. Bogdan, Esq., Jones & Stokes

Executive Summary

Global climate change (GCC) is a change in the average weather of the earth that can be measured by wind patterns, storms, precipitation, and temperature. This paper is not a scientific analysis of the existence or potential causes of GCC. Further, this paper does not address National Environmental Policy Act (NEPA) requirements. Instead, the intent of this paper is to provide practical, interim information to California Environmental Quality Act (CEQA) practitioners to help Lead Agencies determine how to address GCC in CEQA documents prior to the development and adoption of guidance by appropriate government agencies.

A typical individual project does not generate enough greenhouse gas emissions to influence GCC significantly on its own; the issue of GCC is by definition a cumulative environmental impact. Therefore, if the Lead Agency chooses to address GCC effects in a CEQA document, it should be discussed in the context of a cumulative impact. A complicating factor, however, is that there are currently no published CEQA thresholds or approved methods for determining whether a project's potential contribution to a cumulative GCC impact is considerable.

This paper provides a summary of background information on GCC, the current regulatory environment surrounding greenhouse gas (GHG) emissions, and the various approaches that a Lead Agency may select in a CEQA document to address the potential impacts of GCC and a project's cumulative contribution to GHG. There are many potentially valid approaches, some of which may not be addressed in this paper; for this reason, this document does not recommend a single approach, but rather describes several alternative methodologies and factors that a Lead Agency can consider in selecting the most appropriate methodology for a particular project.

[1] Preparation of this paper was partially funded by Michael Brandman Associates

EXHIBIT C

Introduction

The California Air Resources Board (CARB), the California Environmental Protection Agency (CalEPA), and other government agencies with jurisdiction over air quality have not developed guidelines about how to prepare a CEQA impact assessment for a project's GHG contribution to GCC. The State Legislature enacted and the Governor signed Assembly Bill (AB) 32, the Global Warming Solutions Act of 2006, which charged CARB to develop regulations on how the state would address reduction of GHG in response to GCC concerns.

This paper discusses the evaluation of climate change impacts in CEQA documents for typical development-related projects, such as private development (e.g., residential, commercial, and industrial) and planning programs (e.g., Specific Plans, General Plans, General Plan Updates). The authors represent the Association of Environmental Professionals (AEP). AEP is a statewide group of environmental professionals with over 1,600 members. AEP members are heavily involved in the preparation of CEQA documents, such as Negative Declarations and Environmental Impact Reports (EIR) and other matters related to CEQA compliance. One of the goals of AEP is to help educate its members and other professionals responsible for CEQA compliance in California. To that end, AEP has prepared this paper for consideration by the Governor's Office of Planning and Research, The Resources Agency, CARB, and its own membership. There is an urgent need for this information because many Lead Agencies have begun to assess a project's significance regarding GCC effects in CEQA documents and project opponents have challenged CEQA documents for omitting such an assessment. The State Attorney General's Office and some environmental groups have requested that large-scale projects (e.g., General Plan Updates, large land development proposals, regional transportation plans) analyze impacts on GCC and/or GHG emissions as part of the CEQA process (AG 2006 and AG 2007). While several CEQA court cases are pending, precedent-setting judicial guidance is not expected soon.

Global Climate Change

General Overview

Global climate change, which most scientists believe to be caused by GHG, is a widely discussed scientific, economic, and political issue in the United States. Briefly stated, GCC is a change in the average weather of the earth that may be measured by changes in wind patterns, storms, precipitation, and temperature. The baseline by which these changes are measured originates in historical records identifying temperature changes that have occurred in the past, such as during previous ice ages. Many of the recent concerns over GCC use this data to extrapolate a level of statistical significance specifically focusing on temperature records from the last 150 years (the Industrial Age) that differ from previous climate changes in rate and magnitude.

The United Nations Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of GHG needed to stabilize global temperatures and climate change impacts. The IPCC predicted that the range of global mean temperature change from 1990 to 2100, given six scenarios, could range from 1.1°C to 6.4°C (IPCC 2007). Regardless of analytical methodology, global average temperature and sea level are expected to rise under all scenarios (IPCC 2007).

Greenhouse Gases

Gases that trap heat in the atmosphere are called greenhouse gases (GHG), analogous to the way a greenhouse retains heat. Common GHG include water vapor, carbon dioxide, methane, nitrous oxides, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, ozone, and aerosols. Natural processes and human activities emit GHG. The accumulation of GHG in the

atmosphere regulates the earth's temperature. Without the natural heat trapping effect of GHG, the earth's surface would be about 34 degrees Centigrade (°C) cooler (CAT 2006). However, it is believed that emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations.

Climate change is driven by forcings and feedbacks. A feedback is "an internal climate process that amplifies or dampens the climate response to a specific forcing" (NRC 2005). Radiative forcing is the difference between the incoming energy and outgoing energy in the climate system. The global warming potential (GWP) is the potential of a gas or aerosol to trap heat in the atmosphere; it is the "cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas" (EPA 2006a).

Individual GHG species have varying GWP and atmospheric lifetimes. The carbon dioxide equivalent is a consistent methodology for comparing GHG emissions since it normalizes various GHG emissions to a consistent metric. The reference gas for GWP is carbon dioxide; carbon dioxide has a GWP of one. Compared to methane's GWP of 21, methane has a greater global warming effect than carbon dioxide on a molecule per molecule basis (EPA 2006b). One teragram (Tg) (equal to one million metric tons) of carbon dioxide equivalent (Tg CO_2 Eq.) is the mass emissions of an individual GHG multiplied by its GWP.

Of all greenhouse gases in the atmosphere, water vapor is the most abundant, important, and variable. It is not considered a pollutant; in the atmosphere, it maintains a climate necessary for life. The main source of water vapor is evaporation from the oceans (approximately 85 percent). Other sources include evaporation from other water bodies, sublimation (change from solid to gas) from ice and snow, and transpiration from plant leaves.

Ozone is a greenhouse gas; however, unlike other GHG, ozone in the troposphere is relatively short-lived and, therefore, is not global in nature. It is difficult to make an accurate determination of the contribution of ozone precursors (nitrogen oxides and volatile organic compounds) to GCC (CARB 2004b).

Aerosols are suspensions of particulate matter in a gas emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light. Cloud formation can also be affected by aerosols. Sulfate aerosols are emitted when fuel containing sulfur is burned. Black carbon (or soot) is emitted during bio mass burning or incomplete combustion of fossil fuels. Particulate matter regulation has been lowering aerosol concentrations in the United States; however, global concentrations are likely increasing.

Carbon dioxide (CO_2) is an odorless, colorless gas, which has both natural and anthropogenic sources. Natural sources include the following: decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources of carbon dioxide are from burning coal, oil, natural gas, and wood. Concentrations of carbon dioxide were 379 parts per million (ppm) in 2005, which is an increase of 1.4 ppm per year since 1960 (IPCC 2007).

Methane is a flammable gas and is the main component of natural gas. When one molecule of methane is burned in the presence of oxygen, one molecule of carbon dioxide and two molecules of water are released. There are no ill health effects from methane. A natural source of methane is from the anaerobic decay of organic matter. Geological deposits, known as natural gas fields, also contain methane, which is extracted for fuel. Other sources are from landfills, fermentation of manure, and cattle.

Nitrous oxide (N_2O), also known as laughing gas, is a colorless greenhouse gas. Higher concentrations can cause dizziness, euphoria, and sometimes slight hallucinations. Nitrous oxide is produced by microbial processes in soil and water, including those reactions that occur in fertilizer containing nitrogen. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load. It is used in rocket engines, racecars, and as an aerosol spray propellant.

Chlorofluorocarbons (CFCs) are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. CFCs are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the earth's surface). CFCs were first synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. They destroy stratospheric ozone; therefore, their production was stopped as required by the Montreal Protocol in 1987.

Hydrofluorocarbons (HFCs) are synthetic man-made chemicals that are used as a substitute for CFCs for automobile air conditioners and refrigerants.

Perfluorocarbons (PFCs) have stable molecular structures and do not break down though the chemical processes in the lower atmosphere. High-energy ultraviolet rays about 60 kilometers above the earth's surface are able to destroy the compounds. PFCs have very long lifetimes, between 10,000 and 50,000 years. Two common PFCs are tetrafluoromethane and hexafluoroethane. Concentrations of tetrafluoromethane in the atmosphere are over 70 parts per trillion (ppt) (EPA 2006d). The two main sources of PFCs are primary aluminum production and semiconductor manufacture.

Sulfur hexafluoride (SF_6) is an inorganic, odorless, colorless, nontoxic, nonflammable gas. It has the highest GWP of any gas evaluated, 23,900. Concentrations in the 1990s were about 4 ppt (EPA 2006d). Sulfur hexafluoride is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas for leak detection.

International and Federal Legislation

International and Federal legislation has been enacted to deal with GCC issues. The Montreal Protocol was originally signed in 1987 and substantially amended in 1990 and 1992. The Montreal Protocol governs compounds that deplete ozone in the stratosphere—chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform. The Protocol provided that these compounds were to be phased out by 2000 (2005 for methyl chloroform).

In 1988, the United Nations and the World Meteorological Organization established the Intergovernmental Panel on Climate Change (IPCC) to assess "the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts, and options for adaptation and mitigation" (IPCC 2004).

On March 21, 1994, the United States joined a number of countries around the world in signing the United Nations Framework Convention on Climate Change (UNFCCC). Under the Convention, governments: gather and share information on greenhouse gas emissions, national policies, and best practices; launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and cooperate in preparing for adaptation to the impacts of climate change (UNFCCC 2007).

A particularly notable result of UNFCC efforts was a treaty known as the Kyoto Protocol. Countries sign the treaty to demonstrate their commitment to reduce their emissions of GHG or engage in emissions trading. More than 160 countries—representing 55 percent of global emissions—are currently participating in the protocol. In 1998, U. S. Vice President, Al Gore, symbolically signed the Protocol; however, in order for the Protocol to be formally ratified, it must be adopted by the U. S. Congress. This was not done during the Clinton Administration, and the current U. S. President, George W. Bush, has indicated that he does not intend to submit the treaty for ratification.

In October 1993, President Clinton announced his Climate Change Action Plan, which had a goal to return greenhouse gas emissions to 1990 levels by the year 2000. This was to be accomplished through 50 initiatives that relied on innovative voluntary partnerships between the private sector and government aimed at producing cost-effective reductions in greenhouse gas emissions.

The United States Environmental Protection Agency (EPA) currently does not regulate GHG emissions from motor vehicles. *Massachusetts v. EPA* (Supreme Court Case 05-1120) was argued before the U. S. Supreme Court on November 29, 2006, in which it was petitioned that EPA regulate four GHG, including carbon dioxide, under §202(a)(1) of the Clean Air Act. A decision was made April 2, 2007, in which the Court held that petitioners have a standing to challenge the EPA and that the EPA has statutory authority to regulate emission of GHG from motor vehicles.

California Legislation

California Code of Regulations Title 24 Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The latest amendments were made in October 2005 and currently require new homes to use half the energy they used only a decade ago. Energy efficient buildings require less electricity, and electricity production by fossil fuels results in greenhouse gas emissions. Therefore, increased energy efficiency results in decreased greenhouse gas emissions.

California Assembly Bill 1493 (Pavley) enacted on July 22, 2002, required CARB to develop and adopt regulations that reduce GHG emitted by passenger vehicles and light duty trucks. Regulations adopted by CARB will apply to 2009 and later model year vehicles. CARB estimates that the regulation will reduce climate change emissions from light duty passenger vehicle fleet by an estimated 18 percent in 2020 and by 27 percent in 2030 (CARB, 2004).

California Governor Arnold Schwarzenegger announced on June 1, 2005, through Executive Order S-3-05, the following GHG emission reduction targets: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; by 2050, reduce GHG emissions to 80 percent below 1990 levels (CA 2005). The California Climate Action Team's (CAT) Report to the

Governor contains recommendations and strategies to help ensure the targets in Executive Order S-3-05 are met (CAT 2006).

In 2006, the California State Legislature adopted AB 32, the California Global Warming Solutions Act of 2006 and the Governor signed it into law. AB 32 focuses on reducing GHG in California. GHG as defined under AB 32 include: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. AB 32 requires the California Air Resources Board (CARB), the State agency charged with regulating statewide air quality, to adopt rules and regulations that would achieve greenhouse gas emissions equivalent to statewide levels in 1990 by 2020. On or before June 30, 2007, CARB is required to publish a list of discrete early action GHG emission reduction measures that can be implemented by 2010.

AB 32 also requires that by January 1, 2008, the State Board determines what the statewide greenhouse gas emissions level was in 1990, and approve a statewide greenhouse gas emissions limit that is equivalent to that level, to be achieved by 2020. While the level of 1990 GHG emissions has not yet been approved, reported emissions vary from 425 to 468 Tg CO_2 Eq. (CEC 2006). In 2004, the emissions were estimated at 492 Tg CO_2 Eq. (CEC 2006).

CARB published its Proposed Early Actions to Mitigate Climate Change in California (CARB 2007b), which describes recommendations for discrete early action measures to reduce GHG emissions. The measures will become part of California's strategy for achieving GHG reductions under AB 32. One of the sources for the potential measures includes the CAT Report. Three new regulations are proposed to meet the definition of "discrete early action greenhouse gas reduction measures," which include the following: a low carbon fuel standard; reduction of HFC-134a emissions from non-professional servicing of motor vehicle air conditioning systems; and improved landfill methane capture (CARB 2007b). CARB estimates that by 2020, the reductions from those three measures would be approximately 13 to 26 million metric tons of carbon dioxide equivalent. Note that CARB defers General Plans and CEQA; early action is not recommended by CARB at this time.

Under AB 32, CARB has the primary responsibility for reducing GHG emissions. However, the CAT Report contains strategies that many other California agencies can take. The CAT published a public review draft of Proposed Early Actions to Mitigate Climate Change in California (CAT 2007). Most of the strategies were in the 2006 CAT Report or are similar to the 2006 CAT strategies.

Executive Order S-01-07 was approved by the Governor on January 18, 2007. The order mandates that a statewide goal shall be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. It also requires that a Low Carbon Fuel Standard for transportation fuels be established for California.

The Western Regional Climate Action Initiative was signed on February 26, 2007 by five states: Washington, Oregon, Arizona, New Mexico, and California. British Columbia, Canada joined on April 20, 2007. The Initiative plans on collaborating to identify, evaluate, and implement ways to reduce GHG emissions in the states collectively and to achieve related co-benefits. The Initiative plans to design a regional market-based multi-sector mechanism, such as a load-based cap and trade program by August 2008. In addition, a multi-state registry will track, manage, and credit entities that reduce GHG emissions.

California is also exploring the possibility of cap and trade systems for greenhouse gases. The Market Advisory Committee to CARB published draft recommendations for designing a greenhouse gas cap and trade system for California (MAC 2007).

Inventory

In 2004, total worldwide GHG emissions was estimated to be 20,135 Tg CO_2 Eq., excluding emissions/removals from land use, land use change, and forestry (UNFCCC 2006). (Note that sinks, or GHG removal processes, play an important role in the GHG inventory as forest and other land uses absorb carbon.) In 2004, GHG emissions in the U.S. were 7074.4 Tg CO_2 Eq. (EPA 2006a). In 2005, total U.S. GHG emissions were 7,260.4 Tg CO_2 Eq., a 16.3 increase from 1990 emissions, while U.S. gross domestic product has increased by 55 percent over the same period (EPA 2007a). Emissions rose from 2004 to 2005, increasing by 0.8 percent. The main causes of the increase: (1) strong economic growth in 2005, leading to increased demand for electricity and (2) an increase in the demand for electricity due to warmer summer conditions (EPA 2007a). However, a decrease in demand for fuels due to warmer winter conditions and higher fuel prices moderated the increase in emissions (EPA 2007a). California is a substantial contributor of GHG as it is the second largest contributor in the U.S. and the sixteenth largest in the world (CEC 2006). In 2004, California produced 492 Tg CO_2 Eq. (CEC 2006), which is approximately seven percent of U.S. emissions. The major source of GHG in California is transportation, contributing 41 percent of the State's total GHG emissions (CEC 2006). Electricity generation is the second largest source, contributing 22 percent of the State's GHG emissions.

California Environmental Quality Act

In 1970, the state legislature passed the California Environmental Quality Act (CEQA). The basic purposes of CEQA are to inform governmental decision-makers and the public about the significant environmental effects of proposed activities, identify ways to avoid or significantly reduce environmental damage, use feasible alternatives or mitigation measures to avoid significant damage, and disclose to the public why a governmental agency approved a project if significant effects are involved (CEQA Guidelines §15002[a]). Under CEQA, the environment denotes the physical conditions affected by a project, including land, air, water, minerals, flora, fauna, noise, and objects of historical or aesthetic significance (CEQA §21060.5). Therefore, unlike other single-topic environmental laws, CEQA encourages the protection of many aspects of the physical environment by requiring state and local agencies to prepare multidisciplinary environmental impact analysis and to make decisions based on the analysis regarding the environmental effects of the proposed project (CEQA Guidelines §15002[a]).

CEQA Challenges

Some project opponents, groups, or individuals have used CEQA's lawsuit provisions to attempt to block development projects they see as detrimental to the environment. Others insist upon additional mitigation to address environmental impacts of a project. CEQA challenges have been used to seek analysis of potential issues not contemplated by the Lead Agency. There are several pending lawsuits and recently published decisions by trial courts. However, these lawsuits cannot be characterized as imposing requirements. The cases will not result in published precedent, or a court decision on which Lead Agencies can rely, until Court of Appeal publishes a decision. As these cases are currently in trial courts, there is not likely to be a published legal precedent for well over a year, and more likely two or more years.

In a pending lawsuit, the Center for Biological Diversity filed a CEQA challenge to the Black Bench Specific Plan EIR for the failure to include an analysis of GHG emissions (*Center for Biological Diversity v. City of Banning*). As another example, the Attorney General filed a suit on April 13, 2007, against San Bernardino County for allegedly failing to adequately address climate change in its CEQA document evaluating the County's General Plan. The State Attorney General has also submitted letters to local Lead Agencies on some major projects requesting inclusion of an assessment of climate change impacts. One letter was submitted for a large refinery expansion project in the County of Contra Costa. The project addressed climate change in the Final EIR, but indicated that because there are no published thresholds, the Final EIR did not make a significance finding. The Attorney General indicates that the Lead Agency is obligated to determine significance. Further, the Lead Agency should ensure compliance with AB 32 to reduce GHG emissions to 1990 levels by estimating the GHG emissions and adopting feasible measures to avoid or reduce those emissions (AG 2007). Another letter was submitted on the Orange County Transportation Authority 2006 Long-Range Transportation Plan Draft EIR (AG 2006). The letter indicates that the Draft EIR should have quantified GHG emissions and mitigated for the impacts.

On April 27, 2007, the Sacramento trial court rejected the Natural Resource Defense Council's challenge against the Reclamation Board for its approval of a permit to allow the development of land in the San Joaquin River delta for failure to analyze climate change impacts associated with the development (*Natural Resource Defense Council v. Reclamation Board of the Resources Agency of the State of California*, Case No. 06 CS 01228). The Reclamation Board permit relied on an EIR prepared earlier by the City of Lathrop for the land development to be protected by the levee that was subject to the Board permit. The Court indicated that the requirements to trigger preparation of a new EIR were not met because the concept of climate change is not "new information" that had become available between the certification of the original Addendum to the SEIR and the approval of the permits, and therefore, the original EIR was adequate (Public Resources Code §21166). In other words, climate change issues were known when the original City of Lathrop EIR was prepared, but the absence of climate change impact analysis was not raised in any comments as a shortcoming of the EIR at the time. The tentative ruling also states that as the projected effects of climate change become clearer and can be related to specific sites, those effects will have to be factored into the analysis of many projects. On May 22, 2007, consistent with the above ruling, in *American Canyon Community United for Responsible Growth et al. v. City of American Canyon et al.* (Napa County Superior Court Case No. 26-27462), the Court rejected the petitioner's claim that the City was required to perform supplemental environmental review of the project's potential impacts on climate change in response to AB 32 (SM 2007).

On May 25, 2007, the U.S. District Court for the Eastern District of California upheld the challenge of the biological opinion issued by the U.S. Fish and Wildlife Service because the Service failed to address climate change (*Natural Resources Defense Council v. Kempthorne,* No. 05-1207). The biological opinion followed consultation under Section 7 of the Endangered Species Act for the Central Valley Project and State Water Project, which divert water from the Sacramento-San Joaquin Delta to central and southern California (NOSS 2007). Plaintiffs argued that the projects' impacts could be compounded by hydrological and temperature changes resulting from climate change, thus leaving unanalyzed potentially adverse impacts to the endangered delta smelt (NOSS 2007). The Court indicated that the biological opinion should also address "when and how climate change impacts will be addressed, whether existing take limits will remain, and the probable impacts on [project] operations" (NOSS 2007).

Prior to the passage of AB 32, the majority of CEQA documents did not evaluate GHG emissions or impacts on GCC. The primary focus of air pollutant analysis in CEQA documents was the emission of criteria pollutants, or those identified in the state and federal Clean Air Acts as pollutants of concern. The passage of AB 32 (Statutes of 2006) could be construed as evidence that an analysis of GHG emissions and effects of climate change should be presented in CEQA documents. Also known as the California Global Warming Solutions Act of 2006, AB 32 added Division 25.5 to the Health and Safety Code, commencing with §38500. In §38501(a), the findings of the act included the declaration by the Legislature that "global warming poses a serious threat to the economic well-being, public health, natural resources, and environment of California." This legislative finding provides added state policy basis for addressing GCC in CEQA, in addition to the basic purpose of CEQA. §38501(a) of the act also states that "the potential effects of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems." Section 38598(b) of the California Global Warming Solutions Act directs that "nothing in this division shall relieve any state entity of its legal obligations to comply with existing law or regulation." When the legislative findings about the threats to the environment and the absence of relief from other laws are considered together, the act creates compelling statutory basis for addressing significant adverse effects of GCC in CEQA compliance.

CEQA Mandates for Analysis of Impacts

CEQA requires that Lead Agencies inform decision-makers and the public regarding the following: potential significant environmental effects of proposed projects; feasible ways that environmental damage can be avoided or reduced through the use of feasible mitigation measures and/or project alternatives; and disclose the reasons why the Lead Agency approved a project if significant environmental effects are involved (CEQA Guidelines §15002). CEQA also requires Lead Agencies to evaluate potential environmental effects based to the fullest extent possible on scientific and factual data (CEQA Guidelines §15064[b]). Significance conclusions must be based on substantial evidence, which includes facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts (CEQA Guidelines §15064f[5]). Scientific data in support of GCC, AB 32, and the requirements of CEQA could be used as support for a GCC analysis in CEQA documents.

Conversely, linking the GHG emissions to a project or plan to a direct influence on climate change could be considered overly speculative at this time. CEQA Guidelines §15151 states that, "...disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of the disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure."

In addition, under the "rule of reason," an EIR is required to evaluate impacts to the extent that is reasonably feasible ([CEQA Guideline §15151; *San Francisco Ecology Center v. City and County of San Francisco* (1975) 48 Cal.App.3rd 584]). While CEQA does require Lead Agencies to make a good faith effort to disclose what they reasonably can, CEQA does not demand what is not realistically possible ([*Residents at Hawks Stadium Committee v. Board of Trustees* (1979) 89 Cal.App.3rd 274, 286]). A Lead Agency, therefore, has discretion to design the CEQA document; it does not need to conduct every recommended test or perform all requested research or analysis ([CEQA Guideline §15204(a); *Laurel Heights Improvements Association v. Regents* (1988) 47 Cal.App.3rd 376, 410]).

Cumulative Versus Project-Specific Impacts

If a Lead Agency chooses to address GCC in a document, it should be addressed in the context of a cumulative (versus project-specific) impact. The determination of whether a project creates significant direct impacts on the environment, as well as whether the project's contribution to areawide impacts is "cumulatively considerable," is the sole responsibility of the Lead Agency based on substantial evidence.

Thresholds of Significance

There are currently no published thresholds of significance for measuring the impact of GCC on, or from, a project. To our knowledge to date, neither CARB nor any air districts have submitted a comment letter during a Notice of Preparation period recommending that an EIR address GHG emissions. CEQA Guidelines §15064.7 indicates only that, "each public agency is encouraged to develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects."

It may further be asserted that because there are no published thresholds of significance, a Lead Agency is relieved of the threshold determination. This supports a Lead Agency in finding that a determination of significance for GCC impacts is speculative. In *Laurel Heights Improvements Association v. Regents* ([1993] 6 Cal.App.4th 1112, 1137), the Court upheld the conclusion in the EIR that potential cumulative impacts of toxic air emissions are too speculative based on the lack of accepted methodologies or standards and based on CEQA Guideline §15145.

The City of Rancho Cordova developed a threshold of 2 tons of CO_2 per person, which was estimated based on vehicle emission reductions needed to meet 1990 levels (RC 2006). An Air Quality and Emissions Reduction Plan was also prepared for the project, which contains vehicle trip reduction measures, which is estimated to be a 15 percent reduction in emissions (EH 2006). The project declared the emissions significant because they were over the 2 tons per person threshold. If a Lead Agency develops a threshold, the methodology should be clearly explained in the analysis.

Approaches

In the absence of regulatory guidance, and prior to the resolution of CEQA challenges regarding GCC impact analysis, CEQA documents may choose to address GHG emissions on a case-by-case basis using methods tailored to the project's circumstances individual interpretation of existing CEQA guidance. The selection of an approach can be based on the location and characteristics of the project, or the level of information available about the site, the jurisdiction, or regional GHG emissions.

The following discussion explores the various approaches that could be used in CEQA documents to analyze GCC. Also included is the support for each approach and the items to consider when selecting the best approach. Each approach may have advantages and disadvantages, but it is the responsibility of the Lead Agency to select the most appropriate methodology based on the project's unique circumstances. There are many other kinds of actions and projects undertaken or approved by Lead Agencies that are not addressed in these proposed approaches, such as timber harvest plans, water quality management plans, highway improvement projects, and others that do not directly contribute to GHG emissions or have complicated interrelationships to the GHG balance in the atmosphere.

Approach 1 No Analysis

The No Analysis approach does not address or mention GHG emissions or GCC. The omission of any climate change discussion on a project could result in critical remarks during the comment period. During the comment period, this approach could be supported by explaining that regulatory guidance on how to address potential impacts of GCC currently does not exist.

GCC is a widely accepted concept and the debate is subsiding about whether anthropogenic sources have had a substantial influence on GCC. Nonetheless, uncertainty persists about the rate and ultimate extent of GCC. The National Research Council, a branch of the National Academies of Science, states, "...the mechanisms involved in land-atmosphere interactions are not well understood, let alone represented in climate models" (NRC 2005, page 125). Similar conclusions are presented in other reports (PI 2003 [page 5, 13] and IPCC 2003). Most recently, CARB deferred the topic of "GHGs in General Plans and CEQA" for further analysis, so there is no early action recommendation for evaluation of GHGs in CEQA documents at this time (CARB 2007b).

This approach may be useful for CEQA documents that were circulated prior to the adoption of AB 32; however, if evidence exists that GCC impacts may occur, this approach should be avoided, even if the CEQA document was circulated before adoption of AB 32. A Lead Agency may conclude that there is insufficient scientific evidence at present to allow a meaningful assessment of GHG and GCC impacts for a specific project, and therefore is considered overly speculative within the CEQA context. As with all alternative approaches, the Lead Agency should fully document the reasoning for selecting this approach in the CEQA document and/or the administrative record.

Approach 2 Screening Analysis

The Screening Analysis approach would exempt small or certain types of projects from doing a detailed analysis. CEQA Guidelines §15206 could help support using this approach, or the Lead Agency could select some other appropriate definition or threshold. Another method that could be used is reliance on a nexus between the project's significance for operational criteria pollutant emissions. Though the thresholds for significance for criteria pollutants are based on the attainment status of the pollutants, emissions for criteria pollutants tend to follow similar pattern as the emissions for GHG emissions (i.e., more vehicle miles traveled equals more GHG and criteria pollutants). For example, if a project has a less than significant impact for other air pollutant impacts, it could follow that the project would have a less than significant impact regarding to GHG emissions. Some projects do not involve any appreciable increase in GHG emissions; it should be appropriate for the Lead Agency to determine that this level of analysis would suffice. This approach would allow a Lead Agency to establish a process to screen projects and determine they would not make significant contributions to GHG emissions or GCC and therefore would not need to mitigate accordingly. As with all approaches, the Lead Agency should fully document the rationale for using the screening analysis, the thresholds for excluding certain kinds or sizes of projects, and support it with substantial evidence in the record.

Approach 3 Qualitative Analysis without Significance Determination

The Qualitative Analysis without Significance Determination approach involves a discussion of GCC and potential ways the project will contribute to the generation of GHG emissions, but does not provide any significance conclusions. This approach can be based on the fact that regulatory guidance relating to CEQA on how to address potential impacts of GCC does not currently exist. This approach discloses potential impacts but stops short of making a significance determination. Under this approach, the Lead Agency would have to determine that the analysis of GHG and GCC

within the CEQA process is overly speculative and there is no substantial evidence available at present to legitimately evaluate this issue in a CEQA document. This approach may be most appropriate for small projects or programmatic projects where very little information on GHG emissions is known. The courts have indicated that if an impact is too speculative, it need not be evaluated in detail, provided there is a reasoned explanation for the determination (such as in cases related to the issue of urban decay). After making a good faith effort to fully explore the potential for GCC effects of a project, if the conclusion is still too speculative to be meaningful, the discussion can be concluded without a significance determination, consistent with CEQA Guidelines §15145). The Lead Agency must provide a factual and reasoned basis for the determination that there is no accurate or appropriate methodology for determining significance of this potential impact ([*Alliance of Small Emitters/Metals Industry v. South Coast Air Quality Management District* (1997) 60 Cal.App.4th 55, 66; *Anderson First Coalition v. City of Anderson* (2005) 130 Cal.App.4th 1173]).

Approach 4 Qualitative Analysis with Significance Determination

The Qualitative Analysis with Significance Determination approach qualitatively discusses climate change impacts and concludes that the project impacts are significant. Similar to Approach 3, this approach concludes that regulatory guidance on how to address potential impacts of GCC currently does not exist, but then surpasses that alternative to make a significance finding. This approach should offer reasonable and feasible mitigation measures and/or design features that reduce GHG emissions.

Approach 5 Quantitative Analysis without Significance Determination

In the Quantitative Analysis without Significance Determination approach, GHG emissions from the project are quantified but are not compared to a quantitative threshold. This approach lacks a significance conclusion because regulatory guidance on how to address potential impacts of GCC currently does not exist. The Lead Agency may determine that it is too speculative to reach a significance conclusion regarding this issue (see Approach 3). This approach has been used by the City of San José (SJ 2007).

For projects with established development, such as cities, counties, or existing specific plans, it may be possible to prepare an emissions inventory of GHG. In such cases, the analysis can rely more heavily upon the quantitative analysis by estimating the existing GHG emissions inventory, the past GHG emissions inventory for Year 2000, Year 1990, and future year emissions inventory with the project. The challenge of this approach may be in the ability to find sufficient data to develop reliable estimates of past and proposed GHG emissions. If these past inventories can be credibly developed, this approach can then quantitatively show how the project will (or will not) meet the State GHG emissions targets. The types of projects that can rely upon the quantities of GHG emissions in determining significance is fairly limited, but lend themselves to regional projects such as General Plan Updates.

While this approach does provide a quantifiable methodology, an inventory of project-related GHG emissions may not be meaningful in certain contexts. There are no adopted thresholds for GHG emissions and the Year 1990 emissions target for Year 2020 has not yet been established. AB 32 gave CARB until 2008 to develop the 1990 emissions inventory because of the complexity of quantifying such emissions. In addition, a quantitative analysis contains many assumptions that could be challenged, especially at this interim stage lacking government guidance on how to calculate GHG emissions. While the analysis shows effort toward quantifying emissions, this approach lacks a significance finding.

Another limitation regarding to the quantitative analysis is that emissions models, such as EMFAC and URBEMIS, evaluate aggregate emissions and do not demonstrate, with respect to a global impact, how much of these emissions are "new" emissions specifically attributable to the proposed project in question. For most projects, the main contribution of GHG emissions is from motor vehicles, but the quantity of those emissions appropriately characterized as "new" is uncertain. New projects do not necessarily create new trips because drivers typically relocate from a different geographical area. Issues related to trip length, access to transit, and land use patterns can be examined to address whether new or longer trips are the result of a proposed project. Some mixed use and transportation-oriented projects can actually reduce the number of vehicle miles traveled that a person drives, which could also be disclosed in CEQA documents.

Approach 6 Quantitative Analysis with Net Zero Threshold

The Quantitative Analysis with Net Zero Threshold approach involves quantifying GHG emissions and using zero net carbon dioxide equivalent increase as the threshold. This approach would be useful where it can be demonstrated that a program or project results in zero GHG emissions, or otherwise does not contribute to climate change. This approach would make most projects significant with regard to their cumulative contribution to GHG emissions. Large programs or projects, for instance, might have difficulty reducing or documenting that they could reduce impacts to zero additional GHG emissions. This approach also has similar concerns associated with a quantitative analysis, as identified in Approach 5.

This approach may require the use of carbon offsets or offsite mitigation, which may be problematic due to limited details about the effectiveness of such programs or projects. To use carbon offsets or offsite mitigation, an adequate description of physical changes that would occur as a result of the offset program or offsite mitigation and the schedule for implementation would be needed in the CEQA document to demonstrate that the program reduces GHG emissions sufficiently to reduce a significant impact to a less-than-significant level.

This approach may also de-emphasize onsite design features that would lower GHG emissions through innovative energy conservation design and trip reduction measures because it is difficult to quantify the GHG reductions available through design features. Working with the traffic engineer to develop trip generation rates that account for trip reduction design features may help to encourage onsite design features that reduce GHG emissions. It is consistent with good environmental planning practice to reduce project emissions with design or operational changes before relying on carbon offset trading to provide for mitigation. Much like mitigation approaches for other impact issues, seeking to avoid and minimize the effect (in this case, the GHG emissions) is appropriate before trying to compensate for the impact (as the purchase of carbon offsets would do).

Approach 7 Quantitative Analysis Relative to California GHG Emission Reduction Strategies

The Quantitative Analysis Relative to California GHG Emission Reduction Strategies approach employs both quantitative and qualitative components. The quantitative analysis contains an inventory of project GHG emissions. The qualitative component involves project compliance with the emission reduction strategies contained in the California Climate Action Team's (CAT) Report to the Governor, which contains recommendations and strategies to help ensure the targets in Executive Order S-3-05 are met. Use of the strategies in the CAT report to determine project consistency are appropriate because the report "proposes a path to achieve the Governor's targets that will build on voluntary actions of California businesses, local government and community actions, and State

incentive and regulatory programs" (CAT 2006). While the CAT report does not specifically mention CEQA, it does include a list of the various measures that can be employed to achieve the GHG reduction targets (see Appendix A for a summary of the measures and methods whereby a project could demonstrate compliance). Also, some air quality management districts are developing GHG emission reduction strategies that may become useful for future CEQA reviews.

It may be possible to conclude that proposed projects that implement all feasible and applicable emissions reduction strategies would have a less than significant impact on GCC, particularly if research is developed by the State to support the GHG reduction effectiveness of those measures. This same type of approach could be used for projects within counties that have an adopted GHG reduction plan. In cases where quantifying emissions are not reasonable or possible, such as Specific Plans where the development is programmatic, an approach whereby reduction measures are adopted to conclude a project has less-than-significant effects could still be used, as long as substantial evidence is developed to support the GHG reduction effectiveness. It is up to the Lead Agency to identify feasible CAT strategies that the project could implement.

By combining both qualitative and quantitative approaches, the analysis can be tailored to the particular type and size of the project and still provide—to the fullest extent feasible—a comprehensive analysis of GCC impacts and appropriate feasible mitigation to reduce impacts. However, this approach has the same limitations associated with the quantification of GHG emissions as discussed in Approach 5.

The CAT strategies are preliminary and they do not represent an approved air quality management plan for GHG emissions. Once that plan is published, the Lead Agency may choose to rely on it; AB 32 requires that a list of emission reduction strategies be published to achieve its established goals. However, until those reduction strategies and/or an air quality management plan for GHG are published, emission reduction strategies to meet Executive Order S-3-05 is the only document published as of this date that can be used in this manner.

The emission reductions afforded by the CAT strategies are quantified statewide. However, evidence has not yet been developed to quantify the CAT's strategies on a regional or project-by-project basis. As research and data evolve regarding the effectiveness of reduction measures, a CEQA document may calculate carbon reduction estimates compared to the project without the reduction strategies to the extent that credible methods to do so have been established. This quantified approach may be converted to a carbon-reduction efficiency estimate, where impact analysis can be oriented to achieving a certain reduced rate of GHG emissions per capita. If a per capita threshold can be developed to help achieve State reduction targets, this per capita approach may be useful in CEQA documents.

This approach requires more substantial analysis, which is not possible for all projects, especially smaller ones. In addition, some strategies are not feasible for all projects. In that situation, a feasibility analysis or further discussion may be needed. Some of the strategies listed in the CAT report are not applicable to land use projects. In addition, there are other design features that could be used to reduce a project's potentially significant impact other than the CAT strategies.

Approach 8 Use of Partial Exemption, "Within the Scope" of a Program EIR, or Tiering

Streamlining approaches are available when a Lead Agency assesses a later project's consistency with the cumulative climate change analysis in a broader EIR, such as a General Plan EIR. If a broader

EIR on a plan, program, or zoning action is certified and contains the cumulative GHG and GCC impact analysis and mitigation, a later project that is consistent with the actions, goals, and/or policies in that plan, program, or zoning action need not again evaluate the cumulative impact regarding GHG contribution and GCC. In this situation, the later project may use the "partial exemption" provision of CEQA §21083.3 and CEQA Guidelines §15183. This approach would be adequate provided that the cumulative effect had been adequately addressed in the broader EIR. In a similar approach, if the cumulative GHG and GCC impact analysis and mitigation are adequately addressed in a program EIR, and a later project is found to be "within the scope" of the earlier program and program EIR, the CEQA review for the later project can consider the issues already addressed in the earlier program EIR, consistent with CEQA Guidelines §15168. Tiering may also be used, consistent with CEQA §21093 and §21094, along with CEQA Guideline §15152, when the cumulative GHG and GCC issues are adequately addressed in a broader EIR and a later project-specific EIR is being prepared. The cumulative issue need not be re-addressed if done so adequately before and circumstances have not substantially changed. Counties and cities are in opportune positions to implement specific measures that would benefit their jurisdictions the most, if they include GHG and GCC policies and analysis in their General Plans and General Plan EIRs. Marin County prepared a Greenhouse Gas Reduction Plan (MC 2006), which sets a target of GHG reductions 15 to 20 percent below 1990 levels by 2020 for internal government and 15 percent countywide. The Plan contains measures such as reductions in building energy use, transportation, waste management, and land use.

Mitigation and Project Design Features

Design features can include strategies similar to those presented in the CAT's Report to the Governor in 2006, such as the following: increased recycling; community gardens and/or composting facilities; onsite tree planting; clustering development to preserve forest/woodland resources; increased water use efficiency by use of potable and non-potable water and low-flow appliances; increased building efficiency; Leadership in Energy and Environmental Design (LEED) Green Building Ratings; use of energy efficient appliances; smart land use concepts such as high-density and/or retail and residential mixed use; non-emission generating onsite electricity generation (photovoltaic cells, wind turbines, etc.); waste heat capture (for industrial projects to provide process and/or building heat); transit-oriented design; park and ride features; carpooling; and pedestrian friendly design features. The range of potential CAT strategies that Lead Agencies may use to develop specific project design features are contained in the Appendix of this report. Air quality management districts are also working on GHG emission reduction strategies. Still, it must be remembered that the application of any of these strategies is entirely up to the discretion of the Lead Agency based on such factors as the characteristics and size of the project and the need, if any, to include mitigation into the project for GHG emissions or GCC impacts.

The Lead Agency may also choose to contribute to offsite mitigation or a carbon-offset program, once established. For instance, a project could contribute to a program that invests in biomass, wind power, solar power, alternative vehicle fuels, or increased energy efficiency programs. Or a project could offset GHG emissions by making a monetary contribution to a tree-planting program that would provide for carbon sequestration over a reasonable period of time, compared to the planned life of the project and the nature of the mitigation or offset measure. Substantial evidence should be presented to explain the rationale supporting selection of the measure, its duration, details on the selection, and a quantification of the GHG reduction, if available.

If a Lead Agency decides to include design features and/or mitigation that reduce GHG emissions, it would be prudent to also identify any secondary impacts resulting from implementation. Secondary impacts could include an increase or decrease in criteria pollutant levels, impacts to biological

resources, changes to aesthetics, etc. Design features that results in damage to other environmental components should be avoided. For typical projects, one of the main sources of GHG emissions is from vehicles. Designing projects that reduce vehicle trips will decrease GHG emissions.

Quantitative Analysis

If the Lead Agency decides to conduct a quantitative analysis, an inventory of GHG emissions (carbon dioxide, methane, nitrous oxide, etc.) generated by the project could be estimated. The project inventory could be compared to the California inventory and/or the County inventory, when they become available. There are a number of sources for methods by which GHG emissions from a project can be estimated, as follows: the California Climate Action Registry protocol (CCAR 2007); URBEMIS2007; EPA factors (EPA 2004, EPA 2004b, EPA 1998, EPA 2004d); and the U.S. Energy Information Administration (EIA 2007).

CEQA Projects Affected by Climate Change Impacts

The effects that GCC may have on a specific project also need to be considered in CEQA reviews. Care is needed to determine if there is a connection between a project's location or character and the potential for impacts on the project to occur that are caused by GCC. Mandating mitigation to lessen the environmental impacts of climate change on a project-level analysis without clear disclosure of the relationship between the project and the environmental impact would not comply with CEQA. Section 21002.1 of the California Public Resources Code states, "the purpose of an environmental impact report is to identify the significant effects on the environment of a project..." Without establishing what those effects are for residents in the State of California, and the relative degree of certainty of those effects, an adequate disclosure of GCC impacts on a project would not be realized.

The precise timing, nature, and magnitude of climate change impacts at specific locations is not certain, although projections with wide confidence limits have been developed for some parameters such as sea level rise and meteorology. However, effects of climate change specifically mentioned in AB 32, such as rising sea levels, modified meteorology and flood hydrographs, and changes in snowpack could be addressed in CEQA documents. How GCC may affect species ranges may also be considered. CEQA documents should address whether projected changes in sea level, meteorology, flooding, snow pack, and other identifiable consequences of GCC may create hazards for or otherwise adversely affect a project. The degree of uncertainty should also be addressed.

Potential health effects from GCC may arise from temperature increases, climate-sensitive diseases, extreme events, and air quality. There may be direct temperature effects through increases in average temperature leading to more extreme heat waves and less extreme cold spells. Those living in warmer climates are likely to experience more stress and heat-related problems (e.g., heat rash and heat stroke). In addition, climate sensitive diseases (such as malaria, dengue fever, yellow fever, and encephalitis) may increase, such as those spread by mosquitoes and other disease-carrying insects.

GCC-related meteorological changes and sea level rises are expected to lead to other adverse impacts. Extreme events, such as flooding and hurricanes, can displace people and damage property and agriculture. Drought in some areas may increase and snowpack may decrease, which would decrease water and food availability. Rising sea levels would increase stress on levees and exacerbate storm wave run-up and coastal erosion. GCC may also contribute to air quality problems from increased frequency of smog and particulate air pollution (EPA 2006c).

Some agencies have begun to assess potential risks from climate change in various regions of the State. The California Climate Change Center uses three IPCC climate change scenarios to assess risks from climate change to California (CCCC 2006). The report indicates GCC could result in the following changes in California: poor air quality; more severe heat; increased wildfires; shifting vegetation; declining forest productivity; decreased spring snowpack; water shortages; a potential reduction in hydropower; a loss in winter recreation; agricultural damages from heat, pests, pathogens, and weeds; and rising sea levels resulting in shrinking beaches and increased coastal floods (CCCC 2006).

The California Department of Water Resources published a report that describes the progress on incorporating climate change into existing water resources planning and management tools and methodologies (DWR 2006). While it does not focus on CEQA, the report does describe potential impacts of climate change on California's water resources. The California Coastal Commission published a Discussion Draft titled Global Warming and the California Coastal Commission (CCC 2006), which recommends that the Commission address GCC because the Coastal Act protects resources that are threatened by global warming.

It is hoped that a greater number of California agencies will assess climate change risks. Once information is made available by State government agencies, it could be used to determine more precisely to what extent a project is affected. Until then, environmental documents could make a good faith effort to assess the potential effects of GCC on projects. In some cases, such as coastal developments, an evaluation could be feasible, with recognized limitations related to uncertainties. In other locations, specific impact analysis may not be feasible.

Conclusion

Lead Agencies in California are attempting to respond to increasing calls for evaluation of the potential impacts of greenhouse gas emissions and global climate change during CEQA reviews. There are a wide range of potential approaches for evaluating climate change and greenhouse gas emission impacts in CEQA documents. This paper has been prepared to help Lead Agencies select the most appropriate approach to analyze greenhouse gas emissions and global climate change until formal guidance or regulations are published by appropriate government agencies.

Document Process

A comment draft dated March 5, 2007, was emailed to all California AEP members. Ten comment letters were received on the first draft. Permission was obtained by commenters to publish their comments on the AEP website. The updated second draft, dated April 10, 2007, was emailed to those that commented on the first draft. The April 10, 2007 version was published in the Environmental Monitor in the Spring 2007 edition. A Revised Draft dated April 27, 2007 was distributed at the 2007 AEP State Conference and posted on the AEP website in late April. Several additional comments were received and incorporated into this final version. The AEP thanks all commenters for their input provided during this process.

References

AG 2006 Attorney General, State of California, Bill Lockyer. Letter to Orange County Transportation Authority. Regarding Orange County Transportation Authority 2006 Long-Range Transportation Plan Draft Program Environmental Impact Report. March 30, 2006.

AG 2007 Attorney General, State of California, Edmund G. Brown, Jr.. Letter to Contra Costa County Planning Commission. Comments on the ConocoPhillips Rodeo Refinery Expansion Project and Final Environmental Impact Report (File #LP052048), May 8, 2007.

CA 2004 State of California, Executive Order S-20-04. July 27, 2004. http://www.dot.ca.gov/hq/energy/ExecOrderS-20-04.htm

CA 2005 State of California, Executive Order S-3-05. June 1, 2005. http://www.dot.ca.gov/hq/energy/ExecOrderS-3-05.htm

CARB 2004 California Air Resources Board. December 10, 2004. Fact Sheet, Climate Change Emission Control Regulations. www.arb.ca.gov/cc/factsheets/cc_newfs.pdf

CARB 2004b California Environmental Protection Agency, Air Resources Board. July 21, 2004. Technical Support Document for Staff Proposal Regarding Reduction of Greenhouse Gas Emissions from Motor Vehicles Climate Change Overview. http://www.arb.ca.gov/cc/factsheets/support_ccoverview.pdf

CARB 2007b California Air Resources Board. Proposed Early Actions to Mitigate Climate Change in California. April 20, 2007. www.climatechange.ca.gov/climate_action_team /reports/index.html, Accessed April 23, 2007.

CAT 2006 State of California, Environmental Protection Agency, Climate Action Team. March 2006. Climate Action Team Report to Governor Schwarzenegger and the California Legislature. www.climatechange.ca.gov/climate_action_team/reports/index.html

CAT 2007 State of California, Environmental Protection Agency, Climate Action Team. Climate Action Team Proposed Early Actions to Mitigate Climate Change in California. Draft for Public Review. April 20, 2007.

CCAR 2007 California Climate Action Registry. General Reporting Protocol. Reporting Entity-Wide Greenhouse Gas Emissions. Version 2.2, March 2007. http://www.climateregistry.org/docs/PROTOCOLS/GRP%20V2-March2007.pdf

CCC 2006 California Coastal Commission. December 12, 2006. Discussion Draft - Global Warming and the California Coastal Commission. http://documents.coastal.ca.gov/reports/2006/12/Th3-12-2006.pdf

CCCC 2006 California Climate Change Center. Our Changing Climate, Assessing the Risks to California: A Summary Report from the California Climate Change Center. July 2006. CEC-500-2006-077. www.climatechange.ca.gov/biennial_reports/2006report/index.html

CEC 2005 California Energy Commission. 2005 Building Efficiency Standards. Non Residential Compliance Manual. Commission Certified Manual. CEC-400-2005-006-CMF, Revision 3. 4Q-05. Page 1-4. http://www.energy.ca.gov/title24/2005standards/index.html

CEC 2006 California Energy Commission. December 2006. Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004. Staff Final Report. CEC-600-2006-013-SF. http://www.energy.ca.gov/2006publications/CEC-600-2006-013/CEC-600-2006-013-SF.PDF

CTG 2007 CTG Energetics, Inc., Chris Pyke. Best Practices for Climate Change and the Sustainable Design and Operation of Neighborhoods and Communities. April 20, 2007.

DWR 2006 California Department of Water Resources. July 2006. Progress on Incorporating Climate Change into Management of California's Water Resources. http://baydeltaoffice.water.ca.gov/climatechange.cfm, Accessed April 6, 2007.

EH 2006 Elliott Homes, Inc. Air Quality and Emissions Reduction Plan, Rio del Oro, City of Rancho Cordova. November 2006. http://www.cityofranchocordova.org/city_departments/planning_rio_del_oro.html, Accessed June 14, 2007.

EIA 2007 Energy Information Administration, Official Energy Statistics from the United States Government. http://www.eia.doe.gov/environment.html

EPA 1998 U.S. Environmental Protection Agency. July 1998. AP-42 Emission Factor, Natural Gas Combustion. www.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf

EPA 2004 U.S. Environmental Protection Agency, prepared by ICF Consulting. November 2004. EPA420-P-04-016. Update of Methane and Nitrous Oxide Emission Factors for On-Highway Vehicles. http://www.epa.gov/otaq/models/ngm/420p04016.pdf

EPA 2004b U.S. Environmental Protection Agency. Climate Leaders Greenhouse Gas Inventory Protocol. October 2004. Direct Emissions from Mobile Combustion Sources. http://www.epa.gov/climateleaders/docs/mobilesourceguidance.pdf

EPA 2004c U.S. Environmental Protection Agency, Climate Leaders. October 2004. Direct HFC and PFC Emissions from Use of Refrigeration and Air Conditioning Equipment. EPA430-K-03-004. www.epa.gov/climateleaders/docs/refrige_acequipuseguidance.pdf

EPA 2004d U.S. Environmental Protection Agency, Climate Leaders. October 2004. Direct Emissions from Stationary Combustion Sources. www.epa.gov/climateleaders/docs/mobilesourceguidance.pdf

EPA 2006a U.S. Environmental Protection Agency, Office of Atmospheric Programs. April 2006. The U.S. Inventory of Greenhouse Gas Emissions and Sinks: Fast Facts. http://epa.gov/climatechange/emissions/downloads06/06FastFacts.pdf

EPA 2006b U.S. Environmental Protection Agency. 2006. Non CO2 Gases Economic Analysis and Inventory. Global Warming Potentials and Atmospheric Lifetimes. http://www.epa.gov/nonco2/econ-inv/table.html. Accessed December 20, 2006.

EPA 2006c U.S. Environmental Protection Agency. 2006. Climate Change - Health and Environmental Effects. http://www.epa.gov/climatechange/effects/health.html Accessed December 20, 2006.

EPA 2006d U.S. Environmental Protection Agency. 2006. High Global Warming Potential (GWP) Gases. Science. http://www.epa.gov/highgwp/scientific.html, Accessed December 2006.

EPA 2007a U.S. Environmental Protection Agency. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005. Executive Summary. April 2007. USEPA #430-R-07-002 http://www.epa.gov/climatechange/emissions/usinventoryreport.html

IPCC 2001 Intergovernmental Panel on Climate Change. 2001. Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change [Houghton, J.T., Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, and C.A. Johnson (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 881pp. http://www.ipcc.ch/pub/reports.htm

IPCC 2003 Intergovernmental Panel on Climate Change. July 2003. IPCC Meeting on Current Scientific Understanding of the Processes Affecting Terrestrial Carbon Stocks and Human Influences upon Them. Expert Meeting Report. http://www.ipcc.ch/pub/carbon.pdf

IPCC 2004 Intergovernmental Panel on Climate Change. 2004. 16 Years of Scientific Assessment in Support of the Climate Convention. December 2004. http://www.ipcc.ch/about/anniversarybrochure.pdf

IPCC 2007 Intergovernmental Panel on Climate Change. 2007. R.B. Alley, et al. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policymakers. www.ipcc.ch/WG1_SPM_17Apr07.pdf

JS 2007 Jones & Stokes. Tony Held, Ph.D., P.E.; Whitney Leeman, Ph.D., Tim Rimpo; Marina Pelosi; Richard Walter; Terry Rivasplata; Ken Bogdan, Esq.. 2007. Addressing Global Climate Change in Environmental Impact Statements (EIS) and Environmental Impact Reports (EIR) in the Post AB 32 Regulatory Environment.

MAC 2007a Market Advisory Committee for the California Air Resources Board. Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California. www.climatechange.ca.gov/events/2007-06-12_mac_meeting/2007-06-01_MAC_DRAFT_REPORT.PDF, Accessed June 11, 2007.

MC 2006 Marin County. October 2006. Marin County Greenhouse Gas Reduction Plan. http://www.co.marin.ca.us/depts/CD/main/comdev/advance/Climate.cfm.

NOAA 2005 National Oceanic and Atmospheric Administration. 2005. Greenhouse Gases. Frequently Asked Questions. http://lwf.ncdc.noaa.gov/oa/climate/gases.html Accessed December 20, 2006.

NOSS 2007 Nossaman Land Use Law, P.S. Weiland, S. Meyer, R.D. Thornton. Federal District Court Decides that Fish and Wildlife Service Violated Endangered Species Act by Failing to Address Climate Change during Section 7 Consultation. May 30, 2007. http://www.envoynews.com/nossaman/e_article000827848.cfm?x=b11,0,w

NRC 2005 National Research Council of the National Academies, Climate Research Committee, Board on Atmospheric Sciences and Climate, Committee on Radiative Forcing Effects on Climate. Radiative Forcing of Climate Change: Expanding the Concept and Addressing Uncertainties. The National Academies Press, Washington, D.C.

PI 2003 Pacific Institute. Climate Change and California Water Resources: A Survey and Summary of the Literature. Michael Kiparsky and Peter H. Gleick. July 2003. http://www.pacinst.org/reports/climate_change_and_california_water_resources.pdf

RC 2006 City of Rancho Cordova. Rio del Oro Specific Plan Draft Environmental Impact Report. Prepared by EDAW. December 8, 2006. http://www.cityofranchocordova.org/city_departments/planning_rio_del_oro.html

SM 2007 Sheppard Mullin, Attorneys at Law, Arthur J. Friedman. Global Climate Change Legislation does not Require Supplemental Environmental Review under CEQA. May 23, 2007. www.RealEstateandConstructionLawBlog.com

SJ 2007 City of San José. Coyote Valley Specific Plan Draft EIR. March 2007. http://www.sanjoseca.gov/coyotevalley/publications_DEIR.htm

UNFCCC 2006 United Nations Framework Convention on Climate Change. 2006. Greenhouse Gas Emissions Data, Predefined Queries, Annex I Parties - GHG total without LULUCF (land use, land-use change, and forestry). http://unfccc.int/ghg_emissions_data/predefined_queries/items/3841.php

UNFCCC 2007 United Nations Framework Convention on Climate Change. Essential Background. http://unfccc.int/essential_background/convention/items/2627.php, Accessed February 2007.

WH 2007 The White House, President George W. Bush, Council on Environmental Quality. http://www.whitehouse.gov/ceq/global-change.html. Accessed January 23, 2007.

APPENDIX A

California Climate Action Team's Strategies

California Climate Action Team's Strategies

Several of the approaches outlined in this report refer to GHG emission reduction strategies contained in the CAT's Report to the Governor (CAT 2006), which outlines strategies for meeting the Governor's emission reduction targets contained in Executive Order S-3-05. To assess project compliance with the CAT strategies, the strategies would be described and project consistency would be determined. Note that many of the California Climate Action Team's (CAT) strategies are applicable only to state agencies such as CARB. In addition, not all strategies will be feasible to every project. The Lead Agency must make the determination of the feasibility of the project to implement the emission reduction strategies. Some of the CAT strategies are listed in Table A-1 along with project design features or mitigation to comply with each strategy.

Table A-1: California Climate Action Team Strategies

Strategy	Possible Project Design/Mitigation to Comply with Strategy
Vehicle Climate Change Standards: AB 1493 (Pavley) required the state to develop and adopt regulations that achieve the maximum feasible and cost-effective reduction of climate change emissions emitted by passenger vehicles and light duty trucks. Regulations were adopted by the ARB in September 2004.	These are CARB enforced standards; vehicles that access the project that are required to comply with the standards will comply with these strategies.
Other Light Duty Vehicle Technology: New standards would be adopted to phase in beginning in the 2017 model.	
Heavy-Duty Vehicle Emission Reduction Measures: Increased efficiency in the design of heavy-duty vehicles and an education program for the heavy-duty vehicle sector.	
Diesel Anti-Idling: In July 2004, the CARB adopted a measure to limit diesel-fueled commercial motor vehicle idling.	Signs posted that restrict idling; education for truck drivers regarding diesel health impacts.
Hydrofluorocarbon Reduction: 1) Ban retail sale of HFC in small cans; 2) Require that only low GWP refrigerants be used in new vehicular systems; 3) Adopt specifications for new commercial refrigeration; 4) Add refrigerant leak-tightness to the pass criteria for vehicular Inspection and Maintenance programs; 5) Enforce federal ban on releasing HFCs.	This measure applies to consumer products. When CARB adopts regulations for these reduction measures, any products that the regulations apply to will comply with the measures.
Transportation Refrigeration Units (TRU), Off-Road Electrification, Port Electrification: Strategies to reduce emissions from TRUs, increase off-road electrification, and increase use of shore-side/port electrification.	In projects where TRUs access the site, implement measures to reduce emissions; install electrification in applicable projects (i.e., truck stops, warehouses, etc.)

Strategy	Possible Project Design/Mitigation to Comply with Strategy
Manure Management: The proposed San Joaquin Valley Rule 4570 will reduce volatile organic compounds from confined animal facilities through implementation of control options.	San Joaquin Valley: In projects that address confined animal facilities, project design as recommended in proposed Rule 4570 would reduce GHG emissions.
Alternative Fuels - Biodiesel Blends: CARB would develop regulations to require the use of 1 to 4 percent biodiesel displacement of California diesel fuel.	Applicable to some industrial and agricultural projects.
Alternative Fuels - Ethanol: Increased use of ethanol fuel.	Applicable to some industrial and agricultural projects.
Achieve 50 percent Statewide Recycling Goal: Achieving the State's 50 percent waste diversion mandate as established by the Integrated Waste Management Act of 1989, (AB 939, Sher, Chapter 1095, Statutes of 1989), will reduce climate change emissions associated with energy intensive material extraction and production as well as methane emission from landfills. A diversion rate of 48 percent has been achieved on a statewide basis. Therefore, a 2 percent additional reduction is needed.	1) Design locations for separate waste and recycling receptacles. 2) Utilize recycled components in the building design.
Zero Waste - High Recycling: Additional recycling beyond the State's 50 percent recycling goal.	
Landfill Methane Capture: Install direct gas use or electricity projects at landfills to capture and use emitted methane.	Methane capture would be applicable to projects involving landfills.
Urban Forestry: A new statewide goal of planting 5 million trees in urban areas by 2020 would be achieved through the expansion of local urban forestry programs.	Trees near structures act as insulators from weather thereby decreasing energy requirements. Trees also store carbon.
Afforestation/Reforestation Projects: Reforestation projects focus on restoring native tree cover on lands that were previously forested and are now covered with other vegetative types.	Clustering residential development to preserve forest/woodland resources; increasing density; and preserving and restoring open space.
Water Use Efficiency: Approximately 19 percent of all electricity, 30 percent of all natural gas, and 88 million gallons of diesel are used to convey, treat, distribute and use water and wastewater. Increasing the efficiency of water transport and reducing water use would reduce greenhouse gas emissions.	Use of both potable and non-potable water to the maximum extent practicable; low flow appliances (i.e., toilets, dishwashers, shower heads, washing machines, etc.); automatic shut off valves for sinks in restrooms; drought resistant landscaping; "Save Water" signs near water faucets.
Building Energy Efficiency Standards in Place and in Progress: Public Resources Code 25402 authorizes the CEC to adopt and periodically update its building energy efficiency standards (that apply to newly constructed buildings and additions to and alterations to existing	If feasible, a project could achieve a greater reduction in combined space heating, cooling and water heating energy compared to the current Title 24 Standards.

Strategy	Possible Project Design/Mitigation to Comply with Strategy
buildings).	
Appliance Energy Efficiency Standards in Place and in Progress: Public Resources Code 25402 authorizes the Energy Commission to adopt and periodically update its appliance energy efficiency standards (that apply to devices and equipment using energy that are sold or offered for sale in California).	Use of energy efficient appliances (i.e., washer/dryers, refrigerators, stoves, etc.)
Cement Manufacturing: Cost-effective reductions to reduce energy consumption and to lower carbon dioxide emissions in the cement industry.	Features to reduce emissions would be applicable to projects involving cement manufacturing.
Smart Land Use and Intelligent Transportation Systems (ITS): Smart land use strategies encourage jobs/housing proximity, promote transit-oriented development, and encourage high-density residential/commercial development along transit corridors. ITS is the application of advanced technology systems and management strategies to improve operational efficiency of transportation systems and movement of people, goods and services. Governor Schwarzenegger is finalizing a comprehensive 10-year strategic growth plan with the intent of developing ways to promote, through state investments, incentives and technical assistance, land use, and technology strategies that provide for a prosperous economy, social equity, and a quality environment.	Smart land use, demand management, ITS, and value pricing are critical elements for improving mobility and transportation efficiency. Specific strategies include: promoting jobs/housing proximity and transit-oriented development; encouraging high density residential/commercial development along transit/rail corridor; valuing and congestion pricing; implementing intelligent transportation systems, traveler information/traffic control, incident management; accelerating the development of broadband infrastructure; and comprehensive, integrated, multimodal/intermodal transportation planning.
Enteric Fermentation: Cattle emit methane from digestion processes. Changes in diet could result in a reduction in emissions.	In agricultural/cattle related projects, design features that reduce emissions could be implemented.
Green Buildings Initiative: Green Building Executive Order, S-20-04 (CA 2004), sets a goal of reducing energy use in public and private buildings by 20 percent by the year 2015, as compared with 2003 levels.	A project could increase its energy efficiency percent beyond Title 24 requirements. In addition, the project could implement other green building design (i.e., natural daylighting and on-site renewable, electricity generation).
California Solar Initiative: Installation of 1 million solar roofs or an equivalent 3,000 MW by 2017 on homes and businesses; increased use of solar thermal systems to offset the increasing demand for natural gas; use of advanced metering in solar applications; and creation of a funding source that can provide rebates over 10 years through a declining incentive schedule.	If feasible, the project could install photovoltaic cells or other solar options.
Source: State of California, Environmental Protection Agency, Climate Action Team, 2006.	

Sustainable Santa Barbara

Sustainable Santa Barbara Program Workplan – Fiscal Year 2008

PREAMBLE: "*Sustainability* is about the quality of life in a community -- whether the economic, social and environmental systems that make up the community are providing a healthy, productive, meaningful life for all community residents, present and future."

MISSION: Practice and promote the protection and enhancement of our environment, personally and as an organization, in all City services and operations.

IMPLEMENTATION PLAN:

2007

October-December: Lead environmental staff conducts department assessments based on LEED-EB checklists and department guidelines to incorporate more environmentally-friendly initiatives in FY 2009 department workplans, develop building maintenance plans, and identify capital improvement projects

October-January: Staff develops draft greenhouse gas emission goal options and strategies and presents options to the Sustainable Council Committee

2008

January/February: Staff develops proposed objectives for Fiscal Year 2009 and Citywide Indicators (environmental programs and citywide)

February: Staff presents recommended greenhouse gas emission strategies and options to City Council

March: Review of FY 09 Green P3 objectives and workplan with Sustainable Council Committee

April: Review greenhouse gas emission reduction goal and strategies with City Board and Commission Members

May: Conduct training sessions for all City employees focused on energy conservation and greenhouse gas emission reductions

June: Council adopts the Fiscal Year 2009 Budget and Workplan

July: Review Draft Annual Report with Sustainable Council Committee

August: Council receives third annual report on accomplishments achieved in Fiscal Year 2008

EXHIBIT D

Sustainable Santa Barbara

FY 08 Projects

- Award a contract for installing a solar electric generation system at the buildings in the City yards at both Public Works and Parks and Recreation operations (Garden/Laguna) by January 30, 2008.
- Complete a report on the feasibility of reactivating the Gibraltar Hydro-Electric Plant as a renewable electrical power source.
- Incorporate energy-saving retrofits in at least 75% of all housing rehabilitation loan program projects.
- Ensure that 100% of new construction and major renovation projects for City owned and operated buildings are designed to achieve Leadership in Energy and Environmental Design (LEED) Silver Certification or higher.
- Complete an energy audit to evaluate 80% of water distribution systems pumps for energy efficiency.
- Develop a formal program to retrofit remaining fluorescent lamps and magnetic ballasts to energy-efficient fluorescent lamps and electronic ballasts.
- Implement the Alternative Transportation Incentive Program and the Car Pool Program to increase use of alternative modes of transportation
- Transition most City offices and operations to a 9/80 work schedule in July 2007.
- Develop a training seminar for the Boards and Commission and the public to increase awareness of green building design practices.
- Develop and implement a Mandatory Commercial Recycling Ordinance for Council consideration as proposed in the Solid Waste Strategic Plan.
- Expand the Pilot Food Scrap Recovery and Composting Program by adding Santa Barbara School District.
- Develop a Green Purchasing Policy to assist departments in procuring environmentally superior products.
- Support Clean Marina Program by conducting annual seafloor debris clean up (Clean Sweep Event).
- Create a sustainability library collection of print and non-print material and promote the collection to City staff and the public via website and bookmarks.

ORDINANCE NO. _____

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF SANTA BARBARA REPEALING CHAPTER 22.82 OF TITLE 22 OF THE SANTA BARBARA MUNICIPAL CODE AND ENACTING A NEW CHAPTER 22.82 ESTABLISHING LOCAL ENERGY EFFICIENCY STANDARDS FOR CERTAIN BUILDINGS AND IMPROVEMENTS COVERED BY THE 2005 CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS

The City Council of the City of Santa Barbara does ordain as follows:

SECTION 1. Findings.

1. The modifications to the 2005 California Building Energy Efficiency Standards required by this ordinance are reasonably necessary due to local climatic conditions. Despite moderate summer ambient temperatures in the local area, the City of Santa Barbara is served by an energy system that experiences power outages or power reductions (i.e., "brown-outs") during peak demand periods. Reduction of total and peak energy use as a result of incremental energy conservation measures required by this ordinance will have local and regional benefits in the cost-effective reduction of energy costs for the building owner, additional available system energy capacity, and a reduction in greenhouse gas emissions.

2. The proposed ordinance preserves and enhances the environment; in that it would set forth increased minimum energy efficiency standards within the City of Santa Barbara for buildings and improvements covered by the ordinance. In accordance with CEQA Section 15061(b)(3), "[C]EQA applies only to projects, which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." Staff has determined that the proposed ordinance is exempt from CEQA review.

3. The modifications to the City's energy efficiency standards correspond with the first level of the Architecture 2030 Challenge, corresponding to a fifty percent (50%) reduction in fossil fuel use in buildings when compared to regional averages, previously accepted by the City Council and intended to reduce energy consumption over time, achieving "carbon neutrality" by 2030 in new buildings and retrofits.

EXHIBIT E

4. In order to maintain and advance the energy efficiency standards, it is in the best interest of the City to revisit this ordinance prior to expiration, ensuring that local energy standards meet the goals of reducing energy consumption, thereby saving on energy bills and decreasing greenhouse gas emissions.

5. Gabel Associates, LLC has been hired by the City to study the cost-effectiveness of the energy conservation measures contained in this ordinance. This study has concluded that the energy conservation measures contained in this ordinance are cost-effective. The City Council hereby adopts the conclusions of this study and authorizes the inclusion of the Gabel Associates study in an application for consideration by the California Energy Commission in compliance with Public Resources Code 25402.1(h)(2).

SECTION 2. Chapter 22.82 of Title 22 of the Santa Barbara Municipal Code, titled "Energy Conservation Standards for New Residential Construction", is hereby repealed and a new Chapter 22.82 is enacted to read as follows:

Chapter 22.82 Energy Efficiency Standards

22.82.010 Purpose.

This Chapter ("Energy Efficiency Standards") sets forth increased minimum energy efficiency standards within the City of Santa Barbara for all new construction of any size, additions to existing buildings or structures over a certain size threshold, and the installation of new heaters or circulation pumps for swimming pools, spas and water features. This Chapter is intended to supplement the 2005 California Building Energy Efficiency Standards, as specified in California Code of Regulations, Title 24, Parts 1 and 6 (Standards). Compliance with the 2005 California Building Energy Efficiency Standards is required even if the increased minimum energy efficiency standards specified in this Chapter do not apply.

22.82.020 Definitions.

For purposes of this Chapter 22.82, words or phrases used in this Chapter that are specifically defined in Parts 1, 2, or 6 of Title 24 of the California Code of Regulations shall have the same meaning as given in the Code of Regulations. In addition, the following words and phrases shall have the meanings indicated, unless context or usage clearly requires a different meaning:

A. **2005 BUILDING ENERGY EFFICIENCY STANDARDS**. The standards and regulations adopted by the California Energy Commission contained in Parts 1 and 6 of Title 24 of the California Code of Regulations as such standards and regulations may be amended from time to time.

B. **EXISTING + ADDITION + ALTERATION**. An approach to modeling the time dependent valuation energy use of an addition including the existing building and alterations as specified in the Residential Compliance Manual and Nonresidential Compliance Manual.

C. **NONRESIDENTIAL COMPLIANCE MANUAL.** The manual developed by the California Energy Commission, under Section 25402.1(e) of the Public Resources Code, to aid designers, builders, and contractors in meeting the requirements of the state's 2005 Building Energy Efficiency Standards for nonresidential, high-rise residential, and hotel/motel buildings.

D. **PHOTOVOLTAIC CREDIT**. A TDV Energy credit that may be used under certain conditions to demonstrate compliance with the City's general compliance requirements as specified in Section 22.82.070. This credit is available if the solar photovoltaic energy system is capable of generating electricity from sunlight, supplying the electricity directly to the building, and the system is connected, through a reversible meter, to the utility grid. The methodology used to calculate the time dependent valuation energy equivalent to the photovoltaic credit shall be the CECPV Calculator Version 2.1 or higher which may be found at the following web site: **http://www.gosolarcalifornia.ca.gov/nshpcalculator/download_calculator.html**

E. **RESIDENTIAL COMPLIANCE MANUAL.** The manual developed by the California Energy Commission, under Section 25402.1(e) of the Public Resources Code, to aid designers, builders, and contractors in meeting the requirements of the state's 2005 Building Energy Efficiency Standards for low-rise residential buildings.

F. **SOLAR PHOTOVOLTAIC ENERGY SYSTEM**. A photovoltaic solar collector or other photovoltaic solar energy device that has a primary purpose of providing for the collection and distribution of solar energy for the generation of alternating current rated peak electricity. The installation of any solar photovoltaic energy system must meet all installation criteria of the current edition of the California Electrical Code and the California Energy Commission's Guidebook "*Eligibility Criteria and Conditions for Incentives for Solar Energy Systems Senate Bill 1*".

G. **SWIMMING POOL.** Any structure intended to contain water over 18 inches deep.

H. **TIME DEPENDENT VALUATION ENERGY or ("TDV ENERGY").** The time varying energy caused to be used by the building or addition to provide space conditioning and water heating and, for specified buildings, lighting. TDV energy accounts for the energy used at the building site and consumed in producing and in delivering energy to a site, including, but not limited to, power generation, transmission and distribution losses. TDV Energy is expressed in terms of thousands of British thermal units per square foot per year (kBtu/sq.ft.-yr).

I. **WATER FEATURE.** Any structure intended to contain water over 18 inches deep. Examples of water features include, but are not limited to, ponds and fountains.

22.82.030 Applicability.

A. The provisions of this Chapter apply to any of the following buildings or improvements for which a building permit is required by this Code:

1. Any new building or structure of any size,

2. Any addition to an existing building or structure where the addition is greater than 100 square feet of conditioned floor area,

3. Indoor lighting alterations in conditioned spaces greater than 100 square feet of floor area within nonresidential buildings,

4. All new mechanical heating or cooling systems, and

5. All new heaters or circulation pumps for swimming pools, spas, and water features.

B. Subject to the limitations specified in this section 22.82.030, the coverage of this Chapter shall be determined in accordance with the scope and application section of either the Residential Compliance Manual or Nonresidential Compliance Manual, as appropriate for the proposed occupancy.

22.82.040 Compliance.

A building permit application subject to the requirements of this Chapter will not be issued a building permit by the Building Official unless the energy compliance documentation submitted with the permit application complies with the requirements of this Chapter. A final inspection for a building permit subject to the requirements of this Chapter will not be approved unless the work authorized by the building permit has been constructed in accordance with the approved plans, conditions of approvals, and requirements of this Chapter.

22.82.050 Mandatory Energy Efficiency Requirements.

In addition to meeting all requirements of 2005 Building Energy Efficiency Standards, all applications for building permits that include buildings or improvements covered by this Chapter shall include the following mandatory energy efficiency measures as may be applicable to the proposed building or improvement:

A. **RESIDENTIAL BUILDINGS.** Any appliance (excluding HVAC equipment and water heaters) to be installed in a residential building shall be Energy Star rated, if the appliance installed is of a type that is Energy Star rated.

B. **SWIMMING POOL AND SPA HEATERS AND PUMPS.** Any heater or circulation pump to be installed for any swimming pool, spa, or water feature shall incorporate the following energy conservation features:

1. All natural gas heaters shall have an annual fuel utilization efficiency of 90% or higher; and

2. All circulating pump motors and filtration pump motors with a nominal rating of 0.75 horsepower or greater (except pump motors only serving spa jets) shall be two-speed or variable speed motors. The installation of all two-speed and variable speed motors shall include the installation of a controller which shall be time-based and shall be programmed to alternate the speed of the motor between low and high to make effective use of the energy savings potential of the unit's multi-speed capability.

C. **MECHANICAL HEATING OR COOLING SYSTEMS.** All fan motors and pump motors associated with mechanical heating or cooling systems that are single-speed, poly-phase, 1.0 nominal horsepower to 500 nominal horsepower, 2-, 4-, and 6-pole squirrel cage induction, NEMA Design A or B, continuous duty-rated motors must be NEMA Premium motors by the National Electrical Manufacturers Association.

22.82.060 General Compliance Requirements.

In addition to any applicable mandatory requirements specified in Section 22.82.050 and the requirements of the 2005 Building Energy Efficiency Standards, the following general compliance requirements shall apply to permit applications subject to this Chapter as follows:

A. **LOW-RISE RESIDENTIAL BUILDINGS.** Applications for building permits that involve new low-rise residential buildings or additions to existing low-rise residential buildings where the additions are greater than 100 square feet of conditioned floor area shall demonstrate compliance with the general compliance requirements as follows:

1. **New Low-Rise Residential Buildings.** When an application for a building permit involves a new low-rise residential building, the performance approach specified in Section 151 of the 2005 Building Energy Efficiency Standards must be used to demonstrate that the TDV Energy of the proposed building is at least 20.0% less than the TDV Energy of the standard building.

2. **Additions to Low-Rise Residential Buildings.** When an application for a building permit involves an addition to an existing low-rise residential building, this general compliance requirement may be met by either of the following methods:

a. Using the performance approach specified in Section 151 of the 2005 Building Energy Efficiency Standards to demonstrate that the TDV Energy of the proposed addition is at least 20.0% less than the TDV Energy of the standard design, or

b. Using the "Existing+Addition +Alteration" calculation methodology to demonstrate that the TDV Energy of the proposed building is at least 20.0% less than the TDV Energy of the standard design, as calculated in accordance with the performance approach specified in Section 151 of the 2005 Building Energy Efficiency Standards. In modeling buildings under the Existing+Addition+Alteration method, domestic hot water energy use must be

included in the calculation model unless the application does not involve a change to the building's existing water heater(s).

B. **HIGH-RISE RESIDENTIAL BUILDINGS.** Applications for building permits that involve new high-rise residential buildings or additions to existing high-rise residential buildings where the additions are greater than 100 square feet of conditioned floor area shall demonstrate compliance with the general compliance requirements as follows:

1. **New High-Rise Residential Buildings.** When an application for a building permit involves a new high-rise residential building, the applicant shall use either the Prescriptive Approach or the Performance Approach to demonstrate compliance as specified below:

a. **Prescriptive Approach.** If the building permit applicant chooses the prescriptive approach, the applicant shall use the Overall Envelope Approach in specified in Section 143(b) of the 2005 Building Energy Efficiency Standards to demonstrate that the Overall Heat Gain of the proposed building is at least 10.0% less than the Overall Heat Gain of the standard building; and the Overall Heat Loss of the proposed building is at least 10.0% less than the Overall Heat Loss of the standard building.

b. **Performance Approach.** If the applicant chooses the performance approach, the applicant shall select one of the following energy budget calculation methodologies to demonstrate compliance with the general compliance requirements:

(1) **Building Envelope Only.** Model the building envelope only using a state-approved energy compliance software program and demonstrate that the TDV Energy of the sum of the Space Heating, Space Cooling and Indoor Fans energy components of the proposed building is at least 15.0% less than the TDV Energy of the sum of the Space Heating, Space Cooling and Indoor Fans energy components of the standard building; or,

(2) **Building Envelope and Mechanical System.** Model the building envelope and mechanical system using a state-approved energy compliance software program and demonstrate that the TDV Energy of the sum of the Space Heating, Space Cooling, Indoor Fans, Pump and Heat Rejection energy components of the proposed building is at least 15.0% less than the TDV Energy of the sum of the Space Heating, Space Cooling, Indoor Fans, Pump and Heat Rejection energy components of the standard building.

2. **Additions to High-Rise Residential Buildings.** When an application for a building permit involves an addition to an existing high-rise residential building, this general compliance requirement may be met by either of the following methods:

a. Using the performance approach specified in Section 151 of the 2005 Building Energy Efficiency Standards to demonstrate that the TDV Energy of the proposed addition is at least 15.0% less than the TDV Energy of the standard design, or

b. Using the "Existing+Addition +Alteration" calculation method to demonstrate that the TDV Energy for the sum of the energy components for the proposed building specified in either b(1) or b(2) above is at least 15.0% less than the TDV Energy for the sum of the same energy components of the standard design.

C. **NONRESIDENTIAL AND HOTEL/MOTEL OCCUPANCIES.** Applications for building permits that involve new nonresidential buildings or hotel/motel occupancies or additions to existing nonresidential buildings or hotel/motel occupancies where the additions are greater than 100 square feet of conditioned floor area shall demonstrate compliance with the general compliance requirements as follows:

1. **New Nonresidential Buildings or Hotel/Motel Occupancies.** When an application for a building permit involves a new nonresidential building or a new building housing a hotel/motel occupancy, compliance with the general compliance requirements established by this Chapter may be demonstrated by using either the prescriptive approach or performance approach as specified below:

a. **Prescriptive Approach.** Subject to the exceptions listed below and the provisions of the 2005 Building Energy Efficiency Standards, the prescriptive approach requires compliance with the prescriptive envelope requirement and/or the prescriptive indoor lighting requirement, depending upon the work proposed in the permit application, as specified below:

(1) **Prescriptive Envelopment Requirement.** The Overall Envelope Approach in Section 143(b) of the 2005 Building Energy Efficiency Standards shall be used to demonstrate that the Overall Heat Gain of the proposed building is at least 10.0% less than the Overall Heat Gain of the standard building; and the Overall Heat Loss of the proposed building is at least 10.0% less than the Overall Heat Loss of the standard building, and

(2) **Prescriptive Indoor Lighting Requirement.** The "Prescriptive Requirements for Indoor Lighting" contained in Section 146 of the 2005 Building Energy Efficiency Standards that apply to conditioned spaces shall be used to demonstrate that the Adjusted Actual (Installed) Watts are at least 10.0% less than the Total Allowed Watts.

(i) **Tailored Method Exception.** When using the Tailored Method in retail stores to determine compliance with the prescriptive requirements for indoor lighting, Display Lighting watts may be omitted from the above calculation.

(ii) **Small Alterations Exception.** Lighting alterations which encompass a gross conditioned floor area equal to or less than 100 square feet are exempt from the prescriptive indoor lighting requirement.

b. **Performance Approach.** When using the performance approach to demonstrate compliance with the general compliance requirements, the permit applicant shall select one of the following calculation methodologies:

(1) **Building Envelope Only.** Model the building envelope only for compliance using a state-approved energy compliance software program and demonstrate that the TDV Energy of the sum of the Space Heating, Space Cooling and Indoor Fans energy components of the proposed building is at least 10.0% less than the TDV Energy of the sum of the Space Heating, Space Cooling and Indoor Fans energy components of the standard building; or,

(2) **Building Envelope and Mechanical System.** Model the building envelope and mechanical system for compliance using a state-approved energy compliance software program and demonstrate that the TDV Energy of the sum of the Space Heating, Space Cooling, Indoor Fans, Pump and Heat Rejection energy components of the proposed building is at least 10.0% less than the TDV Energy of the sum of the Space Heating, Space Cooling, Indoor Fans, Pump and Heat Rejection energy components for the standard building, or,

(3) **Building Envelope and Lighting.** Model the building envelope and lighting for compliance using a state-approved energy compliance software program and demonstrate that the TDV Energy of the sum of the Space Heating, Space Cooling, Indoor Fans and Lighting energy components of the proposed building is at least 10.0% less than the TDV Energy of the sum of the Space Heating, the Space Cooling, Indoor Fans and Lighting energy components of the standard building; or,

(4) **Building Envelope, Lighting, and Mechanical System.** Model the building envelope, lighting and mechanical system for compliance using a state-approved energy compliance software program and demonstrate that the TDV Energy of the sum of the Space Heating, Space Cooling, Lighting, Indoor Fans, Pump and Heat Rejection energy components of the proposed building is at least 10.0% less than the TDV Energy of the sum of the Space Heating, Space Cooling, Lighting, Indoor Fans, Pump and Heat Rejection energy components of the standard building.

2. **Additions to Existing Nonresidential Buildings or Hotel/Motel Occupancies.** When an application for a building permit involves an addition to an existing nonresidential building or an existing building housing a hotel/motel occupancy, this general compliance requirement may be met by either of the following methods:

a. Using one of the performance approach methodologies specified above in subparagraph 1.b above to demonstrate that the TDV Energy of the sum of the energy components for the proposed addition specified in any one of the paragraphs 1.b(1)-(4) above is at least 10.0% less than the sum of the same energy components of the standard design, or

b. Using the "Existing+Addition +Alteration" calculation method to demonstrate that the TDV Energy of the sum of the energy components for the proposed building specified in any one of the paragraphs 1.b.(1)-(4) above is at least 10.0% less than the sum of the same energy components of the standard design.

D. **DOCUMENTATION.** In order to demonstrate compliance with the requirements of this Section, a permit applicant may be required to submit supplementary forms and documentation in addition to the building drawings, specifications, and standard Title 24 report forms, as deemed appropriate by the Building Official.

22.82.070 Credit for Solar Photovoltaic Energy Systems.

A. **NOT ALLOWED TO DEMONSTRATE COMPLIANCE WITH STATE STANDARDS.** A photovoltaic TDV Energy credit shall not be used to demonstrate compliance with the 2005 Building Energy Efficiency Standards.

B. **CREDIT ALLOWED TO SATISFY A PORTION OF THE GENERAL COMPLIANCE REQUIREMENTS.** A photovoltaic credit may be used to reduce the TDV Energy use of a proposed building or addition in order to satisfy the general compliance requirements of this Chapter as follows:

1. **Low-Rise Residential Buildings.** An application for a new low-rise residential building or an addition to an existing low-rise residential building may use a photovoltaic credit in order to demonstrate compliance with the general compliance requirements of this Chapter only after the TDV Energy of the proposed building or addition, calculated without the photovoltaic credit, is at least 15.0% less than the TDV Energy of the standard building or design.

2. **High-Rise Residential Buildings.** An application for a new high-rise residential building or an addition to an existing high-rise residential building may use a photovoltaic credit in order to demonstrate compliance with the general compliance requirements of this Chapter only after the TDV Energy of the proposed building or addition, calculated without the photovoltaic credit, is at least 10.0% less than the TDV Energy of the standard building or design.

3. **Nonresidential Buildings and Hotel/Motel Occupancies.** An application for a new nonresidential building or a new hotel/motel occupancy or an addition to an existing nonresidential building or an existing hotel/motel occupancy may use a photovoltaic credit in order to demonstrate compliance with the general compliance requirements of this Chapter only after the TDV Energy of the proposed building or addition, calculated without the photovoltaic credit, is at least 5.0% less than the TDV Energy of the standard building or design.

C. **CALCULATION OF PHOTOVOLTAIC CREDIT.**

1. **Performance Approach Required.** In order to request a photovoltaic credit pursuant to this Section, an applicant for a building permit must use an applicable performance approach methodology specified in Section 22.82.050 to demonstrate compliance with the general compliance requirements of this Chapter.

2. **Calculation Inputs.** When using the CECPV Calculator to calculate a photovoltaic credit, the permit applicant shall input "Site-Specific Detailed Input" including roof pitch (or tilt), the azimuth and the site shading conditions.

3. **Documentation.** In order to receive a photovoltaic credit, an applicant for a building permit must include a copy of the CF-1R-PV form generated by the CECPV Calculator on the plans submitted for a building permit.

22.82.080 Expiration.

This Chapter 22.82 shall expire upon the date that the state's 2008 Building Energy Efficiency Standards take effect.

Appendix F
ENERGY CONSERVATION

I. Introduction

The goal of conserving energy implies the wise and efficient use of energy. The means of achieving this goal include:

(1) decreasing overall per capita energy consumption,
(2) decreasing reliance on natural gas and oil, and
(3) increasing reliance on renewable energy sources.

In order to assure that energy implications are considered in project decisions, the California Environmental Quality Act requires that EIRs include a discussion of the potential energy impacts of proposed projects, with particular emphasis on avoiding or reducing inefficient, wasteful and unnecessary consumption of energy.

Energy conservation implies that a project's cost effectiveness be reviewed not only in dollars, but also in terms of energy requirements. For many projects, lifetime costs may be determined more by energy efficiency than by initial dollar costs.

II. EIR Contents

Potentially significant energy implications of a project should be considered in an EIR. The following list of energy impact possibilities and potential conservation measures is designed to assist in the preparation of an EIR. In many instances, specific items may not apply or additional items may be needed.

A. Project Description may include the following items:
   1. Energy consuming equipment and processes which will be used during construction, operation, and/or removal of the project. If appropriate, this discussion should consider the energy intensiveness of materials and equipment required for the project.
   2. Total energy requirements of the project by fuel type and end use.
   3. Energy conservation equipment and design features.
   4. Initial and life-cycle energy costs or supplies.
   5. Total estimated daily trips to be generated by the project and the additional energy consumed per trip by mode.

B. Environmental Setting may include existing energy supplies and energy use patterns in the region and locality.

C. Environmental Impacts may include:
   1. The project's energy requirements and its energy use efficiencies by amount and fuel type for each stage of the project's life cycle including construction, operation, maintenance and/or removal. If appropriate, the energy intensiveness of materials may be discussed.
   2. The effects of the project on local and regional energy supplies and on requirements for additional capacity.
   3. The effects of the project on peak and base period demands for electricity and other forms of energy.
   4. The degree to which the project complies with existing energy standards.
   5. The effects of the project on energy resources.
   6. The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives.

D. Mitigation Measures may include:
   1. Potential measures to reduce wasteful, inefficient and unnecessary consumption of energy during construction, operation, maintenance and/or removal. The discussion should explain why certain measures were incorporated in the project and why other measures were dismissed.
   2. The potential of siting, orientation, and design to minimize energy consumption, including transportation energy.
   3. The potential for reducing peak energy demand.
   4. Alternate fuels (particularly renewable ones) or energy systems.
   5. Energy conservation which could result from recycling efforts.

E. Alternatives should be compared in terms of overall energy consumption and in terms of reducing wasteful, inefficient and unnecessary consumption of energy.

F. Unavoidable Adverse Effects may include wasteful, inefficient and unnecessary consumption of energy during the project construction, operation, maintenance and/or removal that cannot be feasibly mitigated.

G. Irreversible Commitment of Resources may include a discussion of how the project preempts future energy development or future energy conservation.

H. Short-Term Gains versus Long-Term Impacts can be compared by calculating the energy costs over the lifetime of the project.

I. Growth Inducing Effects may include the estimated energy consumption of growth induced by the project.

EXHIBIT F

Climate Change and CEQA

Presentation to the
California State Association of Counties
Creating a Better Tomorrow
November 14, 2007

Presented by
Cynthia Bryant, Director
Governor's Office of Planning and Research

EXHIBIT G

Introduction

This presentation will cover:

- A few basics about OPR and CEQA
- A look at climate change analyses in CEQA documents to date
- Senate Bill 97 and new CEQA provisions
- OPR's approach to developing CEQA Guidelines
- How you can participate in rulemaking

OPR Who We Are

- OPR is the statewide land use agency, with responsibility for policy development
- We are routinely involved in development of CEQA regulations and technical assistance to the public
- We have been engaged on the issue of CEQA and climate change since passage of AB 32

CEQA Basics

- Basic purpose of CEQA:
  - Public disclosure of the significant impacts of a "project".
  - Requires identification of impacts, analysis, and mitigation where feasible.
- What it does:
  - It gives wide latitude to lead agencies to determine what impacts are "significant" and how to mitigate significant impacts.
- What it does not do:
  - It does not prescribe standards of significance, analytical methodologies, or specific mitigation measures.
  - It does not dictate the agency's final decision on a project.

Current Practice in GHG Analysis

- The approaches to CEQA analysis of climate change and GHG emissions are in their infancy and still evolving.
- Among the CEQA analyses prepared to date, there is a wide variation in the type and degree of analysis.
- Not all public agencies are analyzing climate change in their CEQA documents.
- Several CEQA lawsuits have been filed to require projects to analyze climate change and GHG emissions as an environmental effect.

Current Practice in GHG Analysis

Between April – October, 2007

- CEQA documents submitted to OPR's State Clearinghouse were monitored to identify those with GHG or climate change discussion.
- 82 documents contained a discussion of some type.
  - 61 Environmental Impact Reports (EIR)
  - 21 Negative Declarations (ND)
- 82 documents represents 4.8% of all EIRs and NDs submitted to OPR during this period.

Current Practice in GHG Analysis

- A variety of project types are represented by the 82 CEQA documents:
  - Large housing developments
  - Energy/infrastructure projects
  - Transportation projects, including RTPs
  - Oil Refinery Expansions
  - Habitat Restoration
  - City/County General Plan updates

Current Practice in GHG Analysis

- Many lead agencies have included a climate change or GHG analysis in CEQA documents.
- The analysis and its results have varied by lead agency.
- Many significant questions must be answered before a consistent, effective, and workable process of analysis can be created.
- As the State of California continues to implement AB 32, the analysis of climate change in CEQA will likely continue to evolve.

Current Practice in GHG Analysis

- The climate change analysis is typically included in these sections of a CEQA document:
  - Air Quality Analysis
  - Cumulative Impacts (EIRs only)
  - Special Climate Change Section

Current Practice in GHG Analysis

- The analyses have normally included the following:
  - Regulatory Setting:
    - Executive Order S-3-05, Assembly Bill 32, *State of Massachusetts v. U.S. EPA*, etc.
  - Emission Quantification:
    - Some lead agencies quantified the project's GHG emissions using existing air emission calculators for criteria pollutants.

Current Practice in GHG Analysis

- Mitigation Measures:
  - Lead agencies have identified GHG mitigation measures to reduce the amount of emissions caused by a project.
  - Mitigation measures have included direct actions to offset the emissions and the implementation of a climate action plan created by the lead agency.
  - General plan EIRs have listed land use policies that will reduce GHG emissions as mitigation measures.
  - Lead agencies that did not make a finding of significance usually did not include mitigation measures.

Current Practice in GHG Analysis

- Examples of Mitigation Measures:
  - "The City shall establish a global climate change action plan that includes a baseline inventory of all GHG emissions within the City limits; establish a GHG emissions reduction target; develop enforceable, feasible GHG emissions reduction measures; and performance monitoring of the GHG reduction measures shall occur every 3 years to ensure the emissions reductions are being achieved."
  - "Contractors shall be required to use alternative fuels, new technology, lower emission engines and other methods as may be feasible, and shall specify the anticipated GHG reductions."

Current Practice in GHG Analysis

- Examples of Mitigation Measures:
  - "The project will use planting in the riparian areas to mitigate emissions of GHGs by carbon sequestration."
  - "Truck drivers shall turn off engines when not in use; all diesel delivery trucks servicing the project shall not idle for more that five minutes per truck trip per day."

Current Practice in GHG Analysis

- Finding of Significance:
  - Some lead agencies have made a determination of significance:
    - Impact on climate change is significant and unavoidable
    - Impact on climate change is less than significant with mitigation

Current Practice in GHG Analysis

- Finding of Significance
  - Some lead agencies have not made a determination of significance.
    - CEQA Guidelines Section 15145 - lead agencies may end the discussion of an impact if the agency finds that the impact is too speculative for evaluation.
    - In the absence of established thresholds of significance or regulations, some agencies believe a determination of significance would be speculative.

Questions To Consider

- The differences in approach raise several questions about climate change and CEQA.
  - What constitutes a ***new*** GHG emission?
  - What is the appropriate ***baseline*** for calculating new emissions?
  - What makes a project's GHG emissions ***significant***?
  - Nearly every project has the potential to emit GHGs; so, does every project require an ***EIR***?
  - Is the effect of climate change too ***speculative*** to be considered a significant environmental impact?
  - How much mitigation is ***enough*** to reduce the impact so it is not significant?

What Others Are Doing

- Several other organizations are in the process of developing guidance to local agencies:
  - California Air Pollution Control Officers Association (CAPCOA) – Thresholds of Significance for GHGs
  - League of California Cities – California Climate Action Network (CCAN) is coordinating information and recognizing climate change "best practices."
  - California State Association of Counties (CSAC) – Climate Change Working Group is developing policy statements addressing climate change.

What Others Are Doing

(Other organizations, continued)

- Association of Environmental Professionals (AEP) – White Paper: *Alternative Approaches to Analyzing Greenhouse Gas Emissions and Global Climate Change in CEQA Documents*

- California Chapter American Planning Association (CCAPA) – Climate Committee

What Others Are Doing

- Two other states have incorporated climate change analysis into the environmental review process.
  - The State of Massachusetts
  - King County, Washington

Observations

- Some lead agencies in California are already addressing climate change in CEQA documents.
- A wide variety of approaches are being used.
- Complex questions must be answered before a consistent, effective, and workable process can be developed.
- The efforts of several agencies and organizations may provide some insight/answers.
- California is breaking new ground.

Senate Bill (SB) 97

- Requires OPR to develop CEQA Guidelines "for the mitigation of GHG emissions or the effects of GHG emissions" by 7-1-09.
- Requires the Resources Agency to adopt those CEQA Guidelines by 1-1-10.
- Requires OPR and Resources Agency to periodically update the Guidelines.
- Removes climate change analysis as a cause of action under CEQA for certain state-financed infrastructure projects. This provision is retroactive. This provision sunsets on 1-1-10.

Senate Bill (SB) 97

- This bill:
  - Acknowledges that climate change analysis has its place in the CEQA process.
  - Gives OPR authority to draft the CEQA Guidelines for addressing GHG.
  - Enables projects financed by Prop 1B and 1E to move forward with limitations on CEQA challenges.
  - Does not protect all public agencies from CEQA challenges.

OPR Approach to Regulations

- OPR philosophy about CEQA and climate change
  - A comprehensive approach
  - CEQA is only one of many tools
    - new technology
    - low carbon fuels
    - CAT strategies
    - Now: CEQA review
  - Attention to land use and development policies
  - Involved in many parallel efforts by agencies and organizations that seek GHG reductions through best practices and wise land use policy

OPR Approach to Regulations

- We need to know more before we draft CEQA Guidelines
  - We are continually learning from CEQA practitioners and public agencies.
  - We will need the cooperation and participation of state agencies and departments.
  - We are actively seeking public input from all interested parties.
  - We have added a "climate change" page to the OPR website.
  - Possible interim "technical advisory."

How You Can Participate

- We believe the "process" of developing guidelines is as important as the final product.
- OPR will work with state agencies and other stakeholders
- We want to hear from you – ideas, suggestions, advice.

OPR Contact Information

Governor's Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
(916) 322-2318

Please visit OPR's new webpage,
CEQA Guidelines and Greenhouse Gases
at **www.opr.ca.gov**

Director: Cynthia Bryant

	CITY OF SANTA BARBARA ADMINISTRATIVE POLICIES:	Policy No.
	ENERGY USE & REDUCTION POLICY	
	Issued by: Public Works Facilities Manager	Date: 12/27/2007

Purpose

Provide guidelines to City employees to use electricity in an efficient manner consistent with the City's efforts to reduce energy consumption and minimize our greenhouse gas emissions.

Background

1. **Environmental Impact of Energy Use**: Electricity consumption relies primarily on non-renewable fossil fuels, and electrical power plants are one of the largest generators of greenhouse gas emissions, a significant contributing factor in global climate change.

2. **Electrical Energy Emergencies:** Electricity can be in critically short supply in California during peak usage periods where there is a risk of supply interruptions.

3. **Economic Considerations:** Energy conservation is the most cost effective means toward a sustainable energy supply. Electricity costs are significant to the City budget and constitute the majority of our utility expenditures. Each City employee needs to play a role in reducing our costs by conserving energy.

4. **Conservation in Facilities**: Energy conservation, through improved technology, continuing innovation and systematic implementation of best practices, is a large component of the *Sustainable Santa Barbara* program. Our City goal for decreased energy usage and increased utilization of renewable resources can only be achieved through efforts of all staff in line with this Energy Use and Reduction Policy.

Workspace Energy Conservation Recommendations:

5. **Recommendations for Employees:** All staff are directed to take basic energy conservation steps in their work areas as listed below:
   - "Hibernate" computer work stations when not in use. Hibernation significantly reduces power consumption but allows after-hours access for software deployment. Work stations should be rebooted once a week to ensure proper memory reset.
   - Turn off general lighting and equipment no longer in use when you are the last person to leave a work area.
   - Turn off lights in spaces with sufficient natural lighting and in unoccupied areas. Use task lighting instead of general lighting where possible.
   - Small refrigerators, water heating devices and other appliances should be pooled for office instead of personal use, and removed if unnecessary.
   - Space heaters should only be used where conventional heating systems are unavailable or intentionally kept off. Individual space heaters in sufficiently heated buildings are prohibited unless authorized by the Facilities Coordinator.

- New appliances over 150 watts are to be approved by the Facility Coordinator. The following link will provide you with power consumption guidelines for appliances: http://www.psnh.com/Residential/ReduceBill/ApplianceUsage.asp
- Small continuous-draw items such as battery and phone chargers and AC adaptors should be connected to a switched power strip to be turned off when not in use.
- Employees are encouraged to contact facility coordinators with any recommendations to avoid energy waste.

6. **Recommendations for Facility Coordinating Staff:** Energy use can best be reduced in shared work areas. Responsible staff is directed to:
   - Procure only Energy Star certified appliances when available.
   - Assist Facilities Maintenance staff to ensure that air conditioning and heating settings maximize energy efficiency.
   - Ensure that shared electrical equipment, such as photocopier printers and kitchen area appliances, are off when not in use and set to enter energy-saving mode automatically, as appropriate, during infrequent use.
   - Ensure that lighting is off when workspace is not in use. Safety and security lighting should be set at the lowest level possible
   - Identify and reduce unnecessary lighting.
   - Remove underused and obsolete electrical appliances from City facilities.
   - New appliances over 150 watts, both personal and for the shared workspace should be reviewed and alternatives should be considered in order to prevent net increase of a facility's electricity consumption.

7. **Recommendations for Facility Maintenance Staff**:
   - Convert any remaining incandescent lighting to compact fluorescent or LED.
   - Convert older florescent T12 ballasts to T8 or superior ballasts as practicable.
   - Ensure HVAC systems are properly maintained, regularly serviced and that thermostats are set to within the range of 73-76°.
   - Evaluate and convert all appropriate areas to energy-efficient lighting systems such as motion sensor, multi-level switching, and light sensor, as practicable.
   - Replace Single and Dual Zone HVAC systems with more efficient multi-zone systems as practicable.

Leased-Space Energy Usage

8. Lease tenants in City-owned properties should be advised of the City's effort to conserve energy through:
   - Contract language for new or renewed leases must include electrical energy conservation measures and, as practicable, pass-through responsibility for utility billing.

- Communication tools such as newsletters and emails to tenants should be used to convey City energy conservation goals.

Electrical Energy Emergencies:

9. Efforts to conserve energy must be especially vigorous any time a State Electrical Emergency is in effect. All email users will be notified by the Public Works Department Facilities Manager whenever such an emergency occurs. In such case peak period energy usage must be curtailed as follows:

Stage 1 *Any time it is clear that an operating reserve shortfall to the State power supply is unavoidable*

Electricity usage curtailments-

Turn off all lighting adjacent to natural light sources.
Turn off all non-essential appliances.
Unplug water fountains with electric coolers.
Natural ventilation is to be used in place of air conditioning units during warm months, unless employee health-related needs (such as interior ventilation or heat exhaustion concerns) require otherwise.

Stage 2- *Any time it is clear that a SERIOUS (less than 5%) operating reserve shortfall to the State power supply is unavoidable*

Electricity usage curtailments- (in addition to stage 1)

Turn off all coffee machines.
Turn off all photocopiers and printers not in use.
Turn off all lighting not essential to the task at hand.
Elevators are not to be used except for disabled persons and deliveries.
Generator operating staff (where applicable) are advised to standby.

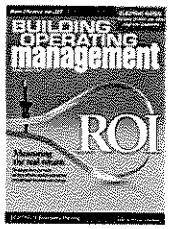
Stage 3- *Any time it is clear that a CRITICAL (less than 1.5%) operating reserve shortfall to the State power supply is unavoidable*

Electricity usage curtailments- (in addition to stage 1 and 2)

Non-essential workstation computers are to be turned off.
Any remaining non-essential lighting or equipment is to be turned off.
Generator operating staff (where applicable) are prepared for supply interruption.

Every roof is designed to protect the building

BUILDING OPERATING management



WATER CONSERVATION

How Water Works for LEED

Timely water efficiency planning is important for achieving LEED credits

By John Starr and Jim Nicolow

Most environmental news today from mainstream media focuses on climate change and the role of greenhouse gases produced by an increasingly industrialized world. When water issues are discussed, it is often in the context of bottled water's negative impacts or cross-border water rights battles, rather than the importance of water efficiency in buildings.

Most estimates place the amount of freshwater — the water needed for drinking, industry and sanitation — at about 2.5 percent of the world's total. Of that, only one-third is easily accessible to humans via lakes, streams and rivers, and more than half of it is being captured. Demand for freshwater is rising quickly, and if current trends continue, experts project that demand will double in the next 30 years.

Sponsored Links:

Green HVAC Solutions
High Efficiency and IAQ, Lower Cost McQuay GreenWay(tm) System Solutions

Siemens
Making buildings comfortable, safe, secure and less costly to operate

Because water is one of the world's most vital natural resources, all building projects — especially green projects — should include water efficiency as a goal. The good news is that significant water efficiency improvements over conventional practice are readily achievable. To obtain many of these improvements, though, facility executives should plan early, especially if LEED certification is a goal.

Water in LEED

LEED for New Construction addresses new construction and major renovation of commercial and institutional projects. Performance is evaluated in five environmental categories, one of which is Water Efficiency. LEED is a point-based system administered by the U.S. Green Building Council, with points awarded for meeting the specific requirements of credits in each of the categories.

Of the 69 possible points in LEED, only five are directly associated with water efficiency. These five points are apportioned among three LEED Water Efficiency credits:

- Credit 1 – Water-efficient Landscaping, two points
- Credit 2 – Innovative Wastewater Technologies, one point
- Credit 3 – Water Use Reduction, two points

Some water efficiency technologies and strategies can easily be incorporated at any point in the design process, or even late in the construction process, while others require early planning and integration of multiple disciplines. Understanding the requirements for each Water Efficiency Credit, as well as the design strategies for meeting those requirements and the planning process necessary to successfully develop and incorporate those strategies, is critical to optimizing water efficiency on LEED projects.

MORE ON THIS TOPIC

Browse articles on water efficiency, epa watersense on FacilitiesNet

View more Green content

Search for water efficiency, epa watersense articles on FacilityZone

Water-efficient Landscaping

The intent of the Water-efficient Landscaping credit is to "limit or eliminate the use of potable water, or other natural surface or subsurface water resources available on or near the project site, for landscape irrigation." One point is awarded for a 50 percent reduction in water consumption for irrigation from a calculated mid-summer baseline case, and a total of two points are awarded for a 100 percent reduction.

The optimization hierarchy for cost-effectively reducing resource consumption involves reducing demands, then meeting demands efficiently, and finally greening the supply of any residual, reduced demand. In the case of irrigation water, reducing demand can be achieved through implementation of a water-efficient landscaping design. Grouping plantings based upon irrigation requirements, minimizing water-intensive turf grass areas, and selecting plant species adapted to the climate conditions of the site are all strategies that will reduce the amount of irrigation water required compared with a conventional, water-intensive landscape design. These strategies alone may be sufficient to eliminate the need for supplemental irrigation entirely, achieving two points.

As an example, the Twin Creeks Science and Education Center in Great Smoky Mountains National Park, which is targeting LEED Silver certification, was designed to maintain the existing natural forest plant palette, eliminating the need for supplemental irrigation, and qualifying for both Water-efficient Landscaping points.

When landscape design strategies alone are not sufficient to reach a project's irrigation efficiency goals, the next step is meeting demands efficiently through optimization of the irrigation system design. Use of high-efficiency drip, micro and sub-surface systems can reduce the amount of water required to irrigate a given landscape. The U.S. Green Building Council reports that drip systems alone can reduce water use by 30 to 50 percent. Climate-based controls, such as moisture sensors with rain shut-offs and weather-based evapotranspiration controllers, can further reduce demands by allowing naturally occurring rainfall to meet a portion of irrigation needs.

Finally, greening the supply can be achieved by tapping alternate water sources. LEED recognizes two alternate water sources: rainwater collection and wastewater recovery. Rainwater collection involves collecting and holding on-site rainfall in cisterns, underground tanks or ponds during rainfall. This water can then be used by the irrigation system later during dry periods. Wastewater recovery can be achieved either on site or at the municipal scale.

On-site systems capture gray water (which does not contain human or food processing waste) from the building for irrigation use. The Biodesign Institute at Arizona State University, LEED-certified at the Platinum level, captures condensate from the mechanical system, storing it in an underground tank for irrigation use. (See project profile.)

The Gwinnett Environmental & Heritage Center in Buford, Ga., LEED-certified at the Gold Level, makes use of municipally supplied treated wastewater for irrigation. Non-potable water is supplied as needed via a municipal supply line from Gwinnett County's wastewater treatment plant.

LEED points for the water-efficient landscaping credits can be earned most effectively with early planning. When incorporating rainwater collection or wastewater recovery in particular, it is crucial to assemble a team of experts and establish project roles early in the process. Rainwater collection and wastewater treatment systems span multiple conventional project disciplines, making it especially important to clearly articulate responsibilities. Water-efficient landscape and irrigation system design require an experienced landscape architect.

Local requirements for rainwater harvest and wastewater treatment vary greatly, so early involvement and input from local code officials is also important. If the facility executive assembles an experienced team, including the architect, landscape architect, civil and plumbing engineers and rainwater system designer, early in the design process, realistic efficiency goals can be set collaboratively and achieved cost effectively.

Innovative Wastewater Technologies

The intent of the Innovative Wastewater Technologies credit is to "reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge." One point is awarded for either reducing potable water use for sewage conveyance by 50 percent, or for treating 50 percent of wastewater on site to tertiary standards (with the treated water infiltrated or used on site). Tertiary treatment is the final stage of treatment before water can be discharged back into the environment.

In the case of wastewater, the first step in the usual water-use optimization process, reducing demand, is not applicable. Occupant requirements for trips to the restroom are a constant. Strategies for meeting the first compliance option, reducing potable water use for sewage conveyance, therefore fall into two categories that can be used either independently or in concert. By simply meeting demands efficiently, ultra high-efficiency plumbing fixtures can reduce the water required for sewage conveyance by more than the 50 percent requirement.

For instance, composting toilets and waterless urinals use no water. These two technologies alone can eliminate a facility's use of potable water for sewage conveyance, qualifying both for this credit's point, plus potentially a LEED Innovation in Design point for exemplary performance. It should be noted, however, that composting toilets are used rarely in commercial facilities.

Alternately, if the selected plumbing fixtures alone are not adequate to reach the 50 percent reduction threshold of the first option, or if ultra high-efficiency plumbing fixtures are not selected, the water necessary for toilet and urinal flushing can be reduced by a minimum of 50 percent, or eliminated entirely, through use of rainwater collection or wastewater treatment strategies.

The Southface Eco Office in Atlanta provides an example of how this credit can be achieved. The facility, targeting LEED Platinum certification, completely eliminates the use of potable water for sewage conveyance using a variety of complementary strategies. In the staff restrooms, foam flush composting toilets, which require only six ounces of water per use, plus waterless urinals, dramatically reduce the volume of water required for sewage conveyance. In the public restrooms, water requirements are reduced via a combination of dual-flush toilets, ultra-high-efficiency toilets and waterless urinals. The remaining water required for sewage conveyance — a greatly reduced volume — is supplied via rainwater collected from a

roof-mounted solar array and stored in a rooftop cistern, plus a supplemental in-ground storage tank.

The second option for meeting this credit's requirements is treatment of at least 50 percent of wastewater on site to tertiary standards. This can be achieved with biological remediation systems, such as "living machines," which use natural biological activity to break down wastes, or via more conventional wastewater treatment systems, which would typically only be economically feasible on very large projects.

A capable team and early involvement of local code officials are critical components for the successful design and implementation of non-potable water supply systems. Some ultra-high-efficiency fixtures, such as composting toilets, also have unique spatial requirements. In addition, dual-plumbing lines for non-potable water supply within the building are fairly easy to plan for initially, but much more difficult to retrofit later.

Water Use Reduction

The intent of the Water Use Reduction credit is to "maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems." One point is awarded for reducing water use by 20 percent, two points are awarded for reducing water use by 30 percent. The fixtures governed by this credit include water closets, urinals, lavatory faucets, showers, and kitchen or break room sinks. Other water-using fixtures and equipment, such as dishwashers, clothes washers and mechanical equipment, are not addressed by this credit; however, water efficiency measures for these "non-regulated" uses can qualify for a LEED Innovation in Design point.

Again, the first step in the optimization process, reducing demands, is not applicable. It's not possible to design away occupants' needs to use the restroom, wash their hands or shower. Strategies for water-use reduction therefore fall into the same two categories identified for Innovative Wastewater Technologies: either meeting demands efficiently or supplying the demand in alternate, more environmentally responsible ways. The two credits are complementary: Water savings related to the Innovative Waste Water Technology credit will also contribute to the Water Use Reduction credit.

In addition to the rainwater collection and wastewater treatment strategies, and the water-efficient plumbing fixtures (such as dual-flush toilets, waterless urinals and composting toilets), low-flow lavatory faucets and low-flow showerheads also contribute to meeting demands efficiently. For both credits, the baseline water use against which efficiency measures are evaluated is 1.6 gallon-per-flush toilets, 1 gallon-per-flush urinals, and 2.5 gallon-per-minute faucets and showers.

The 30 percent reduction necessary to earn both points for this credit is achievable with proven, cost-effective technologies. Simply using low-flow lavatory faucets with automatic controls (0.5 gallons-per-minute, 12 seconds per use) is typically sufficient to achieve a 20 percent reduction in water use, qualifying for one point. Waterless urinals typically achieve an additional 14 percent reduction which, when combined with low-flow faucets, typically exceed the 30 percent reduction threshold, thereby earning both points.

Dual-flush toilets and flushometers, which allow users to choose a standard 1.6 gallon flush for solid waste, or a lower 0.8 to 1.1 gallon flush for liquid, will typically yield more than a 10 percent reduction in water use. Another option is ultra low-flow toilets, which use less than 1.6 gallons per flush. These fixtures are now produced by many major fixture manufacturers. When combined with low-flow faucets and waterless urinals, dual-flush or ultra-low-flow toilets can achieve more than a 40 percent reduction in water use, qualifying for both Water Use Reduction points, plus an Innovation in Design point for exemplary performance. All of these strategies were employed at the Southface Eco Office, resulting in a project expected to use only one-quarter of the water of a conventional facility.

Among the three LEED Water Efficiency credits, Water Use Reduction can often be achieved without the early planning and design integration required by the other two

credits. Most alternative plumbing fixtures use conventional plumbing supply and waste lines, allowing these fixtures to be substituted for less-efficient standard fixtures at any point in the design process, and even well into the construction process.

With freshwater projected to become increasingly scarce, water efficiency measures can extend this limited resource while reducing waste and decreasing operational costs. In spite of LEED's limited emphasis on water efficiency, water-efficient design should be a goal of any project. BOM

John Starr, AIA, is a principal with Lord, Aeck & Sargent. As a leader in the firm's Science Studio and as director of the firm's Arts & Culture Studio, he focuses on designing buildings that incorporate sustainability as a core part of their mission. Jim Nicolow, AIA, is a senior associate with Lord, Aeck & Sargent. He leads the firm's Sustainability Initiative.

RELATED LINKS:

U.S. Green Building Council

U.S. Green Building Council's LEED Program

© 1995- 2007
Trade Press Publishing Corp.

Climate Change: What Is It and What Can Planners Do About It?

By Michele Rodriguez, Urban & Regional Planning Consultant
Copyright by the author

Introduction

Planners have a huge amount of power regarding the future of this planet, right in the palm of their hands — the pencil, the pen, policy and programmatic implementation.

History of Global Climate Change

The Living Planet Report, by the World Wildlife Fund, describes how in the past 30 years human demand on natural resources has increased 160 percent while the ability of natural systems to renew themselves has declined 40 percent. People are removing resources from the earth and releasing pollutants into the atmosphere faster than the earth can replenish itself. This increase in greenhouse gases is due largely to human activity. The world's oceans are being over-fished, the forests are being clear-cut, and toxics are being released into the environment. The result of these human activities, combined with the increases in greenhouse gases are resulting in a thinning of the ozone layer – allowing more harmful solar radiation to enter the earth's atmosphere and because of the increase in greenhouse gases much of that energy is trapped causing an overall rise in temperatures. With the earth surface warming world climate change is occurring as evidenced by the polar ice caps melting, extreme weather patterns, increased flooding occurrences, and increased pest and mosquitoes breeding, changes to agricultural production cycles and bird flight patterns.

In 1988, the United Nations created the Intergovernmental Panel on Climate Change (IPCC) to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts and options for adoption and mitigation. This group has released three conclusive reports since then confirming the scientific basis of global warming. The Fourth Assessment Report "Climate Change 2007" is due to be published in early February. The early versions predicted that by 2100 the sea level would rise between 5 and 23 inches. The February peer-review journal Science predicts between 20 to 55 inches forecast by 2100. Some critics worry that the IPCC scientists did not take into account the physical expansion of water as it warms, and melting ice sheets which could increase the amount of sea level rise. Recent NASA data shows that Greenland is losing 53 cubic miles of ice each year – twice the rate it was losing in 1996. According to the National Oceanic Society, water infiltration of sea water into our Delta fresh water is a strong possibility threatening the water supply for two-thirds of all Californians and millions of acres of irrigated farmland.

The panel goes on to predict temperature rises of 2-11.5 degrees Fahrenheit by the year 2100. The report states that global warming is very likely not due to known natural causes alone, which translate to more than a 90 percent certainty that global warming is caused by man's burning of fossil fuels.

Over the last 10 years U.S. and California greenhouse gas emissions are increasing exacerbating

EXHIBIT J

the problem. The United States each year contributes about a quarter of the world's greenhouse gases. According to the State of California, the California and United State greenhouse gas emissions continue to rise.

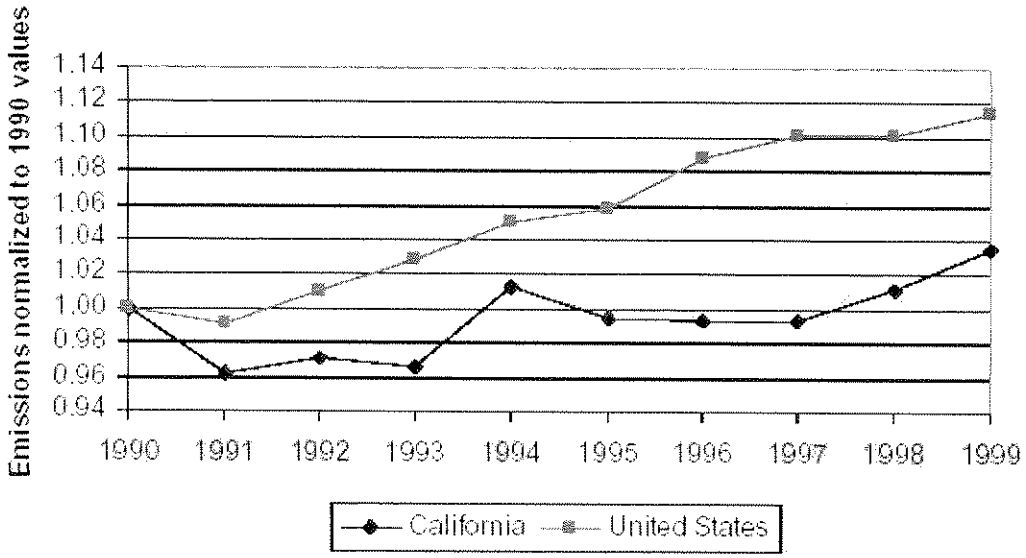


Figure ES-4: 1990-1999 Relative Gross Greenhouse Gas Emissions (excluding marine bunker fuels)

The distribution of California greenhouse gas emissions in 1999, 84 percent was caused by carbon dioxide.

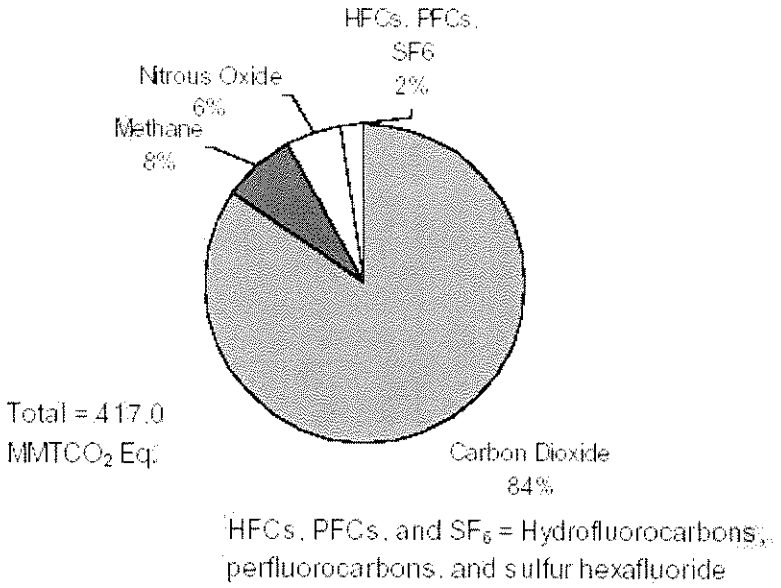
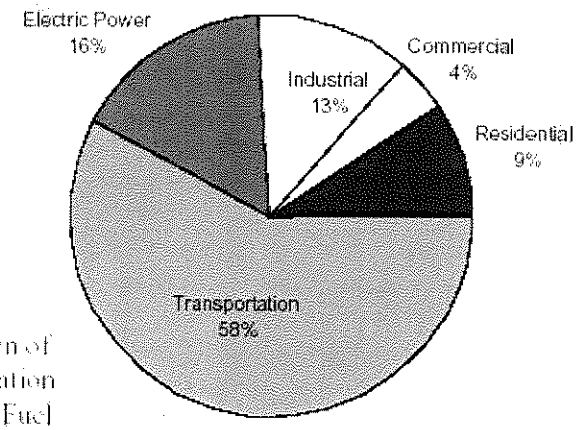
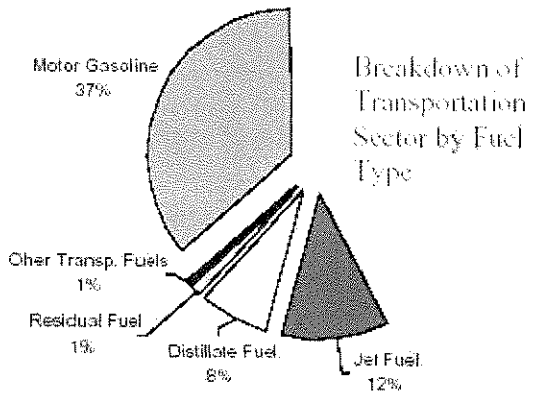


Figure ES-6: Distribution of California Greenhouse Gas Emissions by Gas in 1999 (excluding marine bunker fuels)

Of the 84 percent, 58 percent is caused from the transportation sector, with 37 percent of that from motor gasoline. The second highest cause of California greenhouse gas emissions is electric power (16 percent) and industrial, residential and commercial uses (13 percent, 9 percent and 4 percent respectively).





Total = 345.7 million metric tons

What Is the Federal Government Doing about Global Warming?

President Bush rejected the Kyoto Protocol in 2001, an international treaty requiring 35 industrial nations to cut their global-warming gases by 5 percent on average below 1990 levels by 2012. The White House has said the treaty would have cost 5 million U.S. jobs. Energy Secretary Samuel Bodman said in February that "the imposition of a carbon cap in this country may lead to the transfer of jobs and industry abroad (to nations) that do not have such a carbon cap". Bush has called for slowing the growth rate of U.S. greenhouse gas emissions, but has rejected government-ordered reductions. In February, he called for a 20 percent reduction in U.S. gasoline consumption over the next 10 years.

According to the U.S. Green Building Council, President Bush released an Executive Order on January 24, 2007, which calls for the head of each Federal agency to reduce "energy intensity" (energy consumption per square foot of building space) by 3 percent annually through the end of fiscal year 2015, or 30 percent by the end of the fiscal year 2015. The Executive Order establishes goals for all new construction and major renovations of agency buildings in accordance with green building strategies such as resource conservation; use of recycled materials; building site selection; and indoor environmental quality. The Green Building Rating System, a nationally accepted standard for green building design, construction, and operations, has been adopted by 11 Federal government agencies. In addition to establishing goals for building performance, the Executive Order sets environmental targets in the areas of purchasing and acquisition, renewable energy, toxics reductions, recycling, renewable energy, electronics equipment, fleets, and water conservations.

Announced in June 1997, the U.S. Department of Energy, the Million Solar Roofs (MSR) Initiative aims to encourage the installation of solar energy systems on one million U.S. buildings by 2010. The initiative concentrates on two types of solar technology: solar electric systems (or photovoltaic's) that produce electricity from sunlight and solar thermal that produce heat for domestic hot water, space heating, or heating swimming pools. The Million Solar Roofs Initiative has awarded some local jurisdictions grant funds to provide free technical assistance to residents and businesses.

President Bush's FY 2006 Budget proposes $5.5 billion for climate-change programs and energy tax incentives. This figure includes nearly $4 billion for the Climate Change Technology Program, nearly $2 billion for the Climate Change Science Program and $3.6 billion over 5 years for renewable energy tax incentives for technology. A portion of the Science program focuses on enhancing and improving the Department of Energy's greenhouse bas emission reduction registry. These tax incentives include credits for residential solar heating systems, electricity produced from alternative energy sources, energy produced from landfill gas and the purchase of hybrid and fuel-cell vehicles. Local governments can and are taking advantage of these tax incentives by offering technical assistance and referring companies and homeowners to the rebates and other incentives. The credits for hybrid and fuel-cell vehicles are smartly being used for local government fleet vehicle purchases.

The Secretary of Agriculture announced in 2003 their interest in encouraging the increased use of biomass energy, practices that reduce emissions from agriculture, and sustainable forest management.

What Is the State of California Doing about Global Warming?

In his Environmental Action Plan, Governor Schwarzenegger signed an Executive Order on June 1, 2005, which established statewide greenhouse gas emission targets and directed the Secretary of the California Environmental Protection Agency to achieve the following targets:

By 2010, reduce to 2000 emission levels
By 2020, reduce to 1990 emission levels
By 2050, reduce to 80 percent below 1990 levels

The California Global Warming Solutions Act of 2006 (AB 32) establishes among other things a comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reduction of greenhouse gases (GHG). It makes the Air Resources board (ARB) responsible for monitoring and reducing greenhouse gas emissions. It requires ARB to establish a statewide GHG emissions cap for 2020, based on 1990 emissions and adopt mandatory reporting rules for significant sources of GHG by January 1, 2008.

According to the California Energy Commission, in 2004, 10.2 percent of all electricity came from renewable resources such as wind, solar, geothermal, biomass and small hydroelectric facilities. Large hydro plants generated another 14.9 percent of our electricity. In 2002, California established its Renewable Portfolio Standard Program, with the goal of increasing the percentage of renewable energy in the state's electricity mix to 20 percent by 2017. Many

counties and cities are taking advantage of the various grants being offered by the California Energy Commission to complete local renewable energy programs.

In January 2006, the California Public Utilities Commission created the California Solar Initiative (CPUC ruling - R.04-03-017) which moves the consumer renewable energy rebate program for existing homes from the Energy Commission to the utility companies under the direction of the CPUC. This new incentive program, for renewable systems of less than one megawatt, begins in January 2007 and provides a total of $2.9 billion over ten years. Local communities should take advantage of this funding source to conduct their own renewable energy incentive programs. The P.G. & E. Pacific Energy Center in San Francisco is an excellent resource including advice and information, an energy library and educational programs for staff and the public.

Beginning in 2007, the California Energy Commission began offering $350 million targeted for new residential building construction. It will use funds already allocated to the Energy Commission to foster renewable energy projects between 2007 and 2011. Called the New Solar Homes Partnership, it will focus on new residential construction. This funding could be used by a local agency to incentivize local green building programs (more on green building below).

The State of California Climate Change Portal has a variety of resources including the West Coast Global Warming Initiative, an agreement between Oregon, Washington and California on greenhouse gas reduction. It also includes research, carbon emissions inventory information and other funding sources.

ABAG and Global Warming Reduction

The *Bay Area Vision* project is a multi-agency project including ABAG, MTC and BAAQMD, which builds on the Smart Growth Strategy Livability Footprint from 2002. Its main goal is to shift development toward more compact and connected development pattern. The project proponents have correctly introduced global climate change and its connection between land use and transportation planning. It further goes on to identify carbon emissions, particularly from vehicles as a major contributor. I recommend that the baseline carbon emissions be determined for the entire nine-bay area counties as well as for each county. The carbon emission data could be segregated by main contribution so that policies and programs can be geared toward reduction in that area.

ABAG will develop incentives to encourage cities to participate in the program. Depending upon the incentives they develop they could identify the estimated carbon reduction of the incentives thereby quantifying which incentives had the greatest reduction of carbon emissions so that incentives could be prioritized accordingly.

New rounds of Regional Housing Needs Allocation and Housing Element Updates are underway. ABAG's focus on transit oriented development emphasizing the values of transportation choices, existing infrastructure, social equity and homes for all income levels is critical to carbon emissions reduction in the Bay Area.

The Bay Area Green Business Program was developed by the Association of Bay Area Governments in collaboration with US EPA, Cal EPA Department of Toxic Substances Control and the business community. The Program is a voluntary partnership among business leaders, government agencies and nonprofit organizations and recognizes and promotes businesses that demonstrate continuous compliance with applicable environmental regulations and conserve energy, water, and other materials. The Program is currently offered in Alameda, Contra Costa, Marin, San Francisco, Santa Clara and Sonoma counties.

In January, ABAG report, entitled *Natural Hazards and Climate Change —Risk Management and Public Policy Opportunities*, examines the impacts of climate change and options for local government. The report details implementation of strategies identified in the multi-jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area

ABAG could continue to integrate more considerations regarding global climate change into its other programs including the Emergency Planning for the Bay/Delta Levee Failure program, the Critical Coastal Areas Pilot Projects, the Bay Trail and its Corridors Projects. Its regional GIS could be an asset to show local sea level rise, to conduct solar potential mapping, and carbon emissions calculations and monitoring.

What Can Cities and Counties Do about Global Warming?

Planning sustainable communities is of global importance, as distant decisions can affect the health of natural systems and consequently human well-being. Furthermore, the carrying capacity of an ecosystem, city, or bioregion is also affected by land use planning and human resource consumption. To accomplish this it will be necessary to make significant changes in the way communities process and consume resources, a shift sometimes referred to as an "ecological U-turn."

The American Planning Association Board of Directors ratified their policy on planning for sustainability on April 17, 2000. They identified the following four objectives in the Policy Guide on Planning for Sustainability and relate very directly to global climate change and carbon reduction:

1. Reduce dependence upon fossil fuels, extracted underground metals and minerals.
2. Reduce dependence on chemicals and other manufactured substances that can accumulate in Nature.
3. Reduce dependence on activities that harm life sustaining ecosystems.
4. Meet the hierarchy of present and future human needs fairly and efficiently.

Cities and Counties are a major contributor to greenhouse gas emissions and through their policy framework on energy, transportation, recycling/waste, open space, agriculture/food security, and land use can significantly reduce greenhouse gases.

One way local jurisdictions can reduce climate change is to participate in the Mayors for Climate Protection program. The program was created by Mayors in the United States who have committed their cities to reducing greenhouse gas emissions either through:

- The Cities for Climate Protection Campaign (CCP) or
- The US Mayors Climate Protection Agreement

So far, over 300 Mayors, representing more than 50 million Americans have signed the U.S. Mayors Climate Protection Agreement.

Under the Agreement, participating cities commit to take the following actions:

- Strive to meet or beat the Kyoto Protocol targets in their own communities, through actions ranging from anti-sprawl land-use policies to urban forest restoration projects to public information campaigns;
- Urge their state governments, and the federal government, to enact policies and programs to meet or beat the greenhouse gas emission reduction target suggested for the United States in the Kyoto Protocol — 7 percent reduction from 1990 levels by 2012; and
- Urge the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish a national emission trading system

Once cities make the commitment to participate in the CCP Campaign, ICLEI provides software and technical assistance. Experienced ICLEI staff members help local government officials act on climate protection through a process marked by 5 milestones:

1. Conduct a baseline emissions inventory and forecast.
2. Adopt an emissions reduction target for the forecast year.
3. Develop a Local Action Plan.
4. Implement policies and measures.
5. Monitor and verify results.

According to the Mayor for Climate Protection website there are many ways cities prosper from climate action through their investment in mass transit; commitment to clean, renewable energy; improved public health from cleaner air; and new partnerships with the private sector all result in greater economic prosperity for its citizens. They also make a city a cleaner, safer, more desirable place to live. The following four economic benefits are listed from cities making investments in these changes:

1. <u>Saving Taxpayer Dollars Through Energy Efficiency</u>

By investing in energy efficient technologies—from high-mileage or alternative fuel fleet vehicles to energy efficient public buildings, water and sewage treatment plants and streetlights—cities have dramatically reduced their energy expenses while cutting their contribution to global warming.

2. <u>Investments in Mass Transit: A 6 to 1 return</u>

Cities that invest in public transportation realize substantial economic benefits. They include increased real estate values, investments in neighborhood development and direct savings for city residents coping with today's high prices at the gas pump. Mass transit also helps improve

mobility and opportunities for the elderly -- one of the highest priorities for older Americans.

3. New Jobs and Businesses in the Clean Energy Industry

As demand for clean, renewable energy continues to grow, cities that tap into this demand will have a competitive economic advantage. Renewable energy technologies, such as wind and solar power, generate more jobs in construction, manufacturing and installation than fossil fuel-based energy technologies. They also create opportunities for public-private partnerships. As America's fossil fuel supply continues to decline, the importance of investing in clean energy technologies will continue to grow.

Cities promote the development of the clean energy industry in two ways: through agreements to purchase clean energy and by creating incentives for utilities, businesses and ratepayers to opt for clean energy sources. Many businesses are realizing the economic benefit of switching to renewable energy sources. Hundreds of major U.S. corporations already rely on clean, renewable energy for a growing portion of their energy needs. Cities and towns with policies that promote renewable energy sources will continue to attract the many businesses joining this trend.

4. Protecting Health and Safety and Reducing Health Costs

Over 140 million Americans, 25 percent of them children, live, work and play in areas where air quality does not meet national standards. Harmful motor vehicle emissions account for between 25 and 51 percent of the air pollutants in these unhealthy neighborhoods. From 2000 to 2002, the number of recorded high-ozone days in the U.S. increased 18.5 percent.

Pollution-related health ailments bring with them both a human toll and a staggering cost: $3.2 billion is spent each year treating children under the age of 18 for asthma alone. Unhealthy air is known to trigger asthma attacks. By investing in technologies that reduce pollution, cities and their partners in the business community can improve air quality and decrease and prevent negative health impacts like lung and heart disease, asthma and other respiratory ailments.

Besides the Mayor for Climate Protection program, many cities and counties have decided that their actions can greatly reduce greenhouse gas emissions through various recycling, green building, green business, and energy efficiency programs. Many jurisdictions "Think Globally, Act Locally" and have very effective programs including the counties of Marin, San Mateo, San Francisco, Alameda and the cities of San Jose, Pleasanton, Berkeley, Oakland, and Santa Monica in California; Seattle; Portland, Oregon; Austin, Texas; New York City, and I'm sure many more.

The programs typically include incentives, changes to codes and standards, pilot projects, education and outreach, and permitting changes.

Green Building

One way a local jurisdiction can reduce its greenhouse gas emissions is the operation of a Green Building program. According to the U.S. Green Building Council (USGBC) buildings consume 40 percent of raw materials, 48 percent of U.S. carbon emissions, 70 percent of U.S. electricity,

while green buildings save 70 percent of solid waste, 40 percent of water, and 35 percent of carbon emissions and between 30-50 percent of energy.

Green buildings are healthier, have a smaller environmental footprint, use less energy, and cost less to operate. Green building is the convergence of three fundamental objectives:

1. Conserve natural resources.
2. Increase energy efficiency.
3. Improve indoor air quality.

Green Building practices applies to a building site as well as the building materials. Conventional building practices consume large quantities of wood, plastic, cardboard, paper, water and other natural resources. The generation and use of energy are major contributors to air pollution and global climate change. Improving energy efficiency and using renewal energy sources are effective ways to reduce the impacts of global warming.

Many jurisdictions run a Green Building Program including Marin County, City of San Jose, San Mateo County, City of Pleasanton, Los Angeles, Santa Monica, West Hollywood, Santa Clarita, Irvine, and San Francisco. The programs vary by jurisdiction and an example of what is offered:

- Green Building Guidebook,
- Technical assistance,
- Website information,
- Training and education of architects, builders and staff on green building techniques,
- Requirement that government buildings receive Green Building certification,
- Construction and Demolition Waste Recovery ordinances,
- Energy Efficiency ordinances, and
- Adding the Green Building Rating System to their Design Review Findings.

Global Green offers a Local Government Green Building Initiative to assist with needs analysis and strategic planning, design of a Green Building Program and workshops and training.

The U.S. Green Building Council (USGBC) is a coalition of leaders from every sector of the building industry. With over 7,800 members and 75 regional chapters they created the LEED certification which is a voluntary, consensus-based national rating system for developing high-performance, sustainable buildings. LEED addresses all building types.

USGBC provides educational offerings on green design, construction, and operations for professionals from all sectors of the building industry. A LEED Accredited Professional™ has detailed knowledge of LEED project certification requirements and processes by successfully passing a comprehensive exam.

In November, the USGBC unveiled specific climate actions to have an immediate and measurable impact on carbon reduction including developing a carbon dioxide offset program to track and quantify the emissions and reductions from LEED (Leadership in Energy and Environmental Design) projects. In addition, all new commercial LEED projects are required to

reduce carbon dioxide emissions by 50 percent when compared to current levels. USGBC has committed by the end of 2007 to become a 100 percent carbon neutral organization.

Green Business

Local jurisdictions could operate their own local Green Business Program and decide whether they want to have create a more difficult certification standard, like Marin Counties Sustainable Partners program which require business to meet the basic requirements and additional environmental impact reduction efforts, employee welfare and benefit policies, and corporate philanthropy practices

Renewable Energy Programs

Renewable energy doesn't depend on foreign oil sources and are mainly derived from wind, water (tidal and hydroelectric), waste (methane), and solar. Jurisdictions should proactively consider these various forms of renewable energy sources and how they could be enhanced in their Zoning Ordinances, permitting processes and proactively set-out to train their employees on the technologies. Vote Solar in San Francisco has a goal to bring solar energy into the mainstream. They have a variety of free resources to assist cities in building demand for solar on public and private buildings and on new home buildings. They also feature case studies of successful solar on public buildings.

The P.G. & E. Pacific Energy Center in San Francisco offers a variety of energy resources including advice and information, a library and educational program.

General Plans and Zoning Ordinances

General Plans have the potential to significantly reduce global warming through land use placement and density, building design, energy and circulation policies. Cities can begin by establishing global warming reduction goals that set forth the intent of using renewable energy, fuel-efficient transportation, and green building and business practices.

Cities can benchmark their contribution to greenhouse gas emissions and based upon the type of land use which creates the greatest contribution to their local emissions focus their policies on the area of needed reduction.

Although California planning law doesn't require incorporating "indicators," benchmarks, and "targets" in General Plans they can be used to set policy direction and to monitor progress. They can also be used to provide an opportunity to consider the need for new or revised General Plan strategies or implementation measures.

The range of ordinances which could be developed is endless, if planners are creative. Many jurisdictions have developed Construction and Demolition Waste Recovery ordinances to require mandatory re-use or recycling of construction waste. Energy Efficiency ordinances are relatively new and cutting-edge, essentially requiring buildings that exceed a particular size not generate more energy than a much smaller sized building thus requiring the building be designed to exceed Title 24 requirements and potentially install renewable energy sources to fill the gap. Other cities are looking at ways to reduce the permitting requirements for renewable energy technologies.

What is Carbon Trading?

According to the Feb/March 2007 issue of *Plenty* magazine, in January 2003, the giant chemical manufacturer DuPoint became a founding member of the Chicago Climate Exchange (CCX), the nations only voluntary greenhouse gas emissions trading marketplace. The founders believed that the most effective way to fight global warming is a carbon dioxide cap-and-trade system. The "cap" refers to an overall limit on the amount of carbon a particular company, city, state, or country can produce. A member of CCX sets reduction targets and if the member has extra allowances they can be sold and make a profit. If they don't meet the reduction requirements they must either buy allowances from other or purchase "offsets" – credits from approved sources, such as an organization that plant trees.

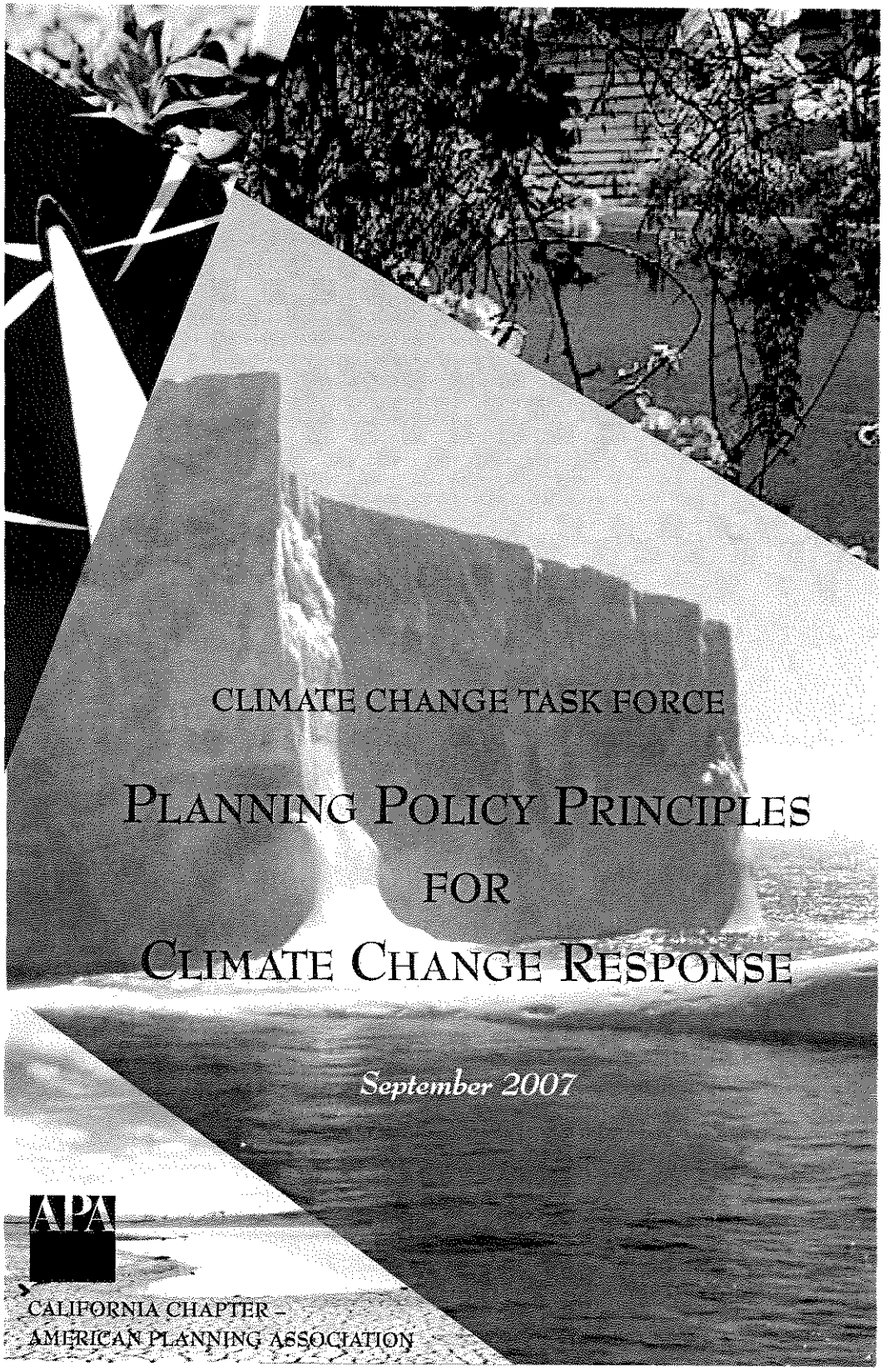
In August, several environmental organizations, including Environmental Defense and the Natural Resources Defense Council, drafted a letter urging cities and states to enact their own more stringent programs, because the exchange's standards weren't tough enough. For example, a company that constructs new facilities after joining CCCX can exempt one of those new buildings from the carbon reduction rules it has agreed to.

The California Climate Action Registry, a state-backed, voluntary registry allows organizations to record their greenhouse gas emissions. The registry doesn't require any emissions reductions, its organizers hope that tracking data will lead to cutbacks.

Conclusion

Planners have the ability to integrate into their land use planning sensible policies and programs to significantly reduce global warming. Let's step up to the challenge and do our part to protect this world for our children's children and leave it in a better way then when we got here.

Michele Rodriguez was the principal in charge of the Marin Countywide Plan update which is the first general plan in the nation with the overarching theme of sustainability.
Michele@boggis.com



CLIMATE CHANGE TASK FORCE

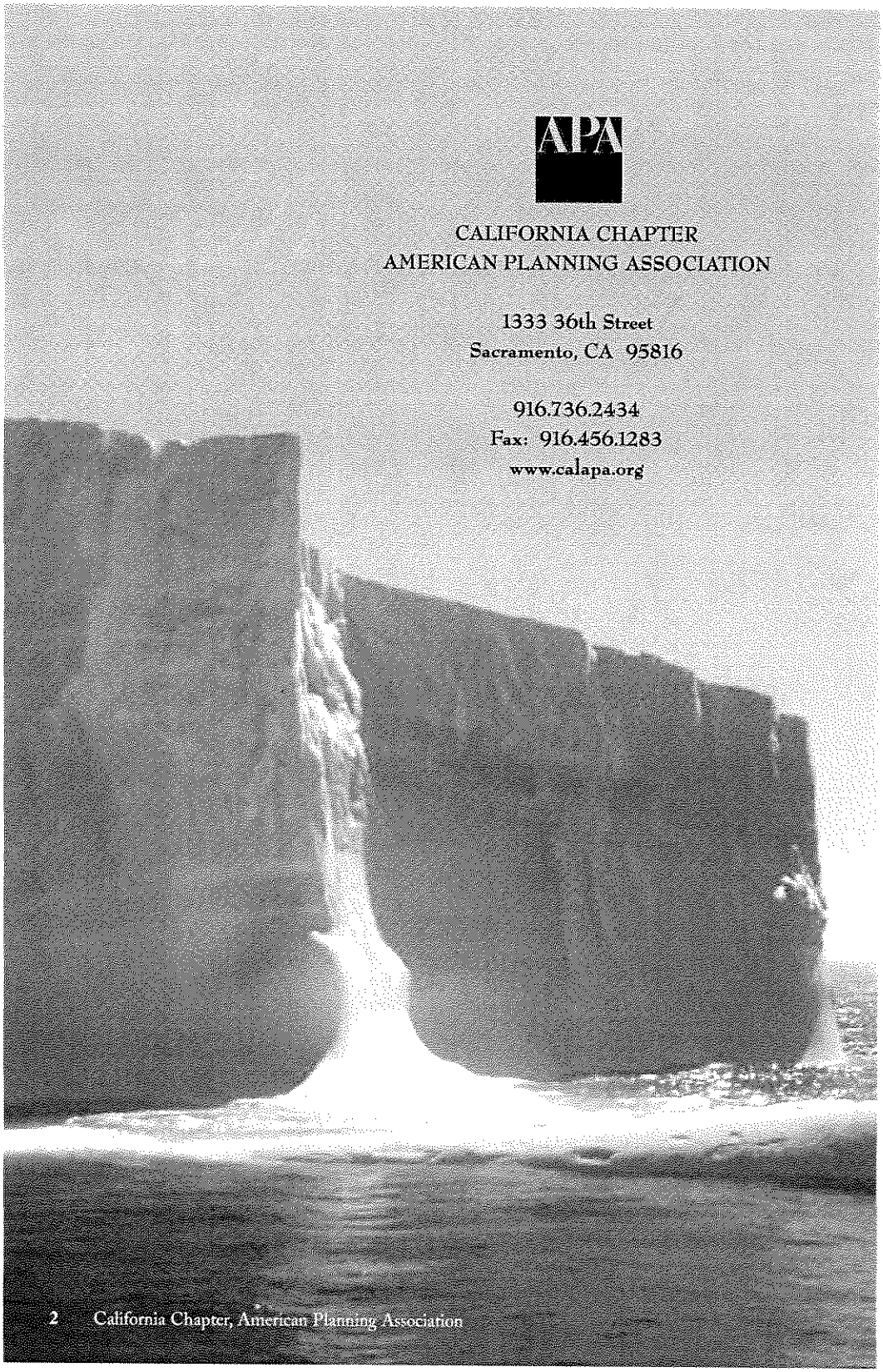
PLANNING POLICY PRINCIPLES FOR CLIMATE CHANGE RESPONSE

September 2007

APA

CALIFORNIA CHAPTER –
AMERICAN PLANNING ASSOCIATION

EXHIBIT K



CALIFORNIA CHAPTER
AMERICAN PLANNING ASSOCIATION

1333 36th Street
Sacramento, CA 95816

916.736.2434
Fax: 916.456.1283
www.calapa.org

CALIFORNIA CHAPTER – AMERICAN PLANNING ASSOCIATION
CLIMATE CHANGE TASK FORCE

Planning Policy Principles for Climate Change Response

September 2007

The California Chapter of the American Planning Association (CCAPA) represents over 6,000 public and private-sector planners in California. California planners are the professionals responsible for formulating community planning policy and conducting local government review of proposed development projects. The purpose of this paper is to present CCAPA's perspective on the most important policy principles to guide the planning-related actions needed to effectively respond to greenhouse gas emission and climate change challenges.

Land use patterns, transportation/land use relationships, and urban design all substantially influence energy consumption and greenhouse gas (GHG) generation. To achieve the carbon reduction goals of AB 32, a multi-faceted response will be necessary that incorporates both traditional strategies and new approaches to reduce emissions. Community planning and land development policies emphasizing sustainable planning and design will be essential as part of the carbon-reduction response in California, particularly in light of the State's continued population growth. The current CCAPA Legislative Platform already promotes sustainable communities, green building design, and reduced use of fossil fuels. This paper provides further details specifically addressing greenhouse gas emissions.

Adaptation to the consequences of climate change is another critical community planning challenge. Cities and counties must consider how to protect their communities from the potentially increased environmental hazards and impacts related to sea-level rise, coastal storms and erosion, modified flood hydrographs, increased stress on levees, wildfire risks, and growing demands for water supply while the Sierra snowpack shrinks. The CCAPA Legislative Platform promotes safe and healthy communities and wise use of natural resources. This paper provides further details specifically addressing adaptation to climate change.

The California Environmental Quality Act (CEQA) also plays an important, complementary role in the State's response to climate change. Its purpose is to disclose information about potential environmental impacts so public agencies can make better, more informed decisions on proposed projects. Coverage of greenhouse gas emissions and climate change adaptation issues in CEQA documents for appropriate projects is consistent with CEQA's policies and can be beneficial in helping agencies take specific actions to reduce greenhouse gas emissions and protect communities from climate change impacts. The CCAPA Legislative Platform promotes effective and streamlined implementation of CEQA. This paper provides recommended approaches for CEQA's role in implementation of climate change strategies.

The following policy principles are offered for consideration by the Governor, Legislature, State agencies, regional government, and local agencies when developing planning-related policies and actions that address climate change issues.

State Roles

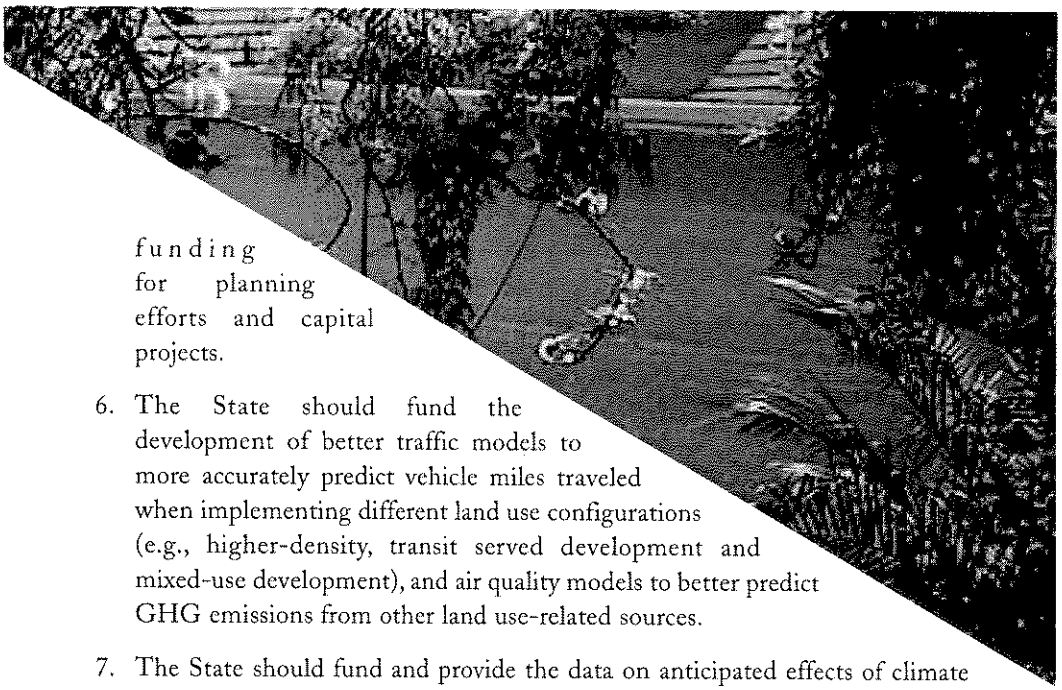
1. The Governor's Office of Planning and Research (OPR) should assume its long-established statutory role of developing guidance and coordinating comprehensive land use planning efforts by state, regional, and local agencies to address climate change issues and land use planning. The State should provide OPR with the direction, funding, staffing and authority commensurate with this task.

2. The State should clearly define and simplify the role that regional planning agencies play in responding to climate change challenges, consistent with the principles outlined for regional agencies in the next section.

3. The State should fund and empower regional planning bodies to address climate change issues in comprehensive, regional land use and transportation plans. State-funded projects consistent with regional plans that address climate change should be given high priority.

4. OPR should lead the State process for adoption of guidelines for climate change provisions in both regional plans and local general plans. Guidelines should be completed within one year.

5. The State should offer incentives for local governments to cooperate in preparation of regional climate change strategies. Incentives should include



funding for planning efforts and capital projects.

6. The State should fund the development of better traffic models to more accurately predict vehicle miles traveled when implementing different land use configurations (e.g., higher-density, transit served development and mixed-use development), and air quality models to better predict GHG emissions from other land use-related sources.

7. The State should fund and provide the data on anticipated effects of climate change (e.g., flooding, sea level rise, temperature change impacts on crops and habitat, water supply) for regional agencies and local governments to use in developing land use polices for adaptation to those effects.

8. California Air Resource Board's (CARB's) establishment and allocation of GHG reduction measures to be achieved from land use should not unfairly burden regions and jurisdictions that experienced rapid development between 1990 and 2007, and should recognize that regions with the greatest future development have a greater ability to contribute to reducing GHG emissions.

9. The State should adjust tax policies related to land use planning and development to promote sustainable communities.

Regional Agency Roles

1. Regional planning agencies should act as the clearinghouse for information regarding GHG emissions mitigation and climate change analysis by providing a conduit between local governments, air districts, and the State. As such, regional agencies should:

   - Work with stakeholders (including the State and local governments) in an open and transparent process to develop regional goals for GHG emission reductions.

   - Develop a regional plan to reduce GHG emissions and adapt to climate change effects. The regional plan should be approved using a Program Environmental

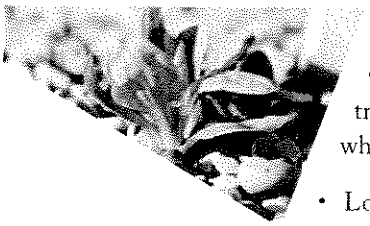
Impact Report (EIR) that can be used by local agencies for tiering when approving plans and projects that are consistent with the regional plan.

- Coordinate various efforts to reduce GHG emissions between local governments, air districts, the State and other stakeholders.
- Provide technical assistance to local governments to understand the requirements and options developed by the State and provide technical assistance to local governments that choose to implement changes in their land use plans consistent with the region's goals and policies for meeting GHG emissions reductions and adapting to climate change effects.

2. Local government implementation of land use and infrastructure plans consistent with regional plans should remain voluntary, but regional agencies should provide incentives to local governments to cooperate, such as priority for receiving State funding administered by regional agencies. Regional agencies should develop a variety of options that local governments can choose to use or modify to meet local requirements for GHG emissions reductions.

Local Government Roles

1. Local jurisdictions should reduce GHG emissions by adopting land use and capital improvement plans that accommodate and encourage people to travel by walking, bicycling, ridesharing and transit, as opposed to driving alone and that encourage green and sustainable development. Specifically:
   - Land use plans and codes should encourage mixed land use, higher densities (especially around transit), affordable housing, compact form, non-motor vehicle circulation, water and energy conservation, microgeneration of electricity in a manner compatible with surrounding uses, and low-carbon resources for building materials, among other carbon-reduction strategies.
   - Local governments should provide incentives for development projects that meet climate change response policies, such as CEQA and permit streamlining.
   - Local governments should adopt building codes that require silver LEED certification or better (or equivalent standards, if developed by the State).
2. Local governments should accommodate all modes of transportation and make them attractive and convenient. Specifically:
   - Road standards in newly developing areas should result in highly connected streets with small blocks.



- Local streets should accommodate users of all transportation modes throughout their communities wherever practical.
- Local jurisdictions should coordinate with regional efforts to plan and accommodate transit and bicycling.
- Where appropriate and practical, local jurisdictions should accommodate transit with needed infrastructure, plan for complete networks of bikeways, ensure that streets have safe and inviting sidewalks and street crossings, provide park-and-ride facilities and plan shared parking where appropriate.

3. Local plans and policies should be developed to reduce GHG emissions and adapt to climate change effects in a manner consistent with corresponding regional plans. When approving development projects, local governments should require land uses and other development characteristics that are consistent with local and regional climate change response strategies.

Role of CEQA

1. The Resources Agency and OPR, in consultation with CARB and California Energy Commission (CEC), should revise the CEQA Guidelines to provide acceptable methodologies for climate change analysis, significance thresholds, and mitigation measures. The Guidelines should recognize that CEQA climate change analysis consists of two parts: impacts of the project on GHG emissions, and impacts of climate change on the project (e.g., increased flooding, reduced water supply). The Guidelines revision, or an accompanying technical paper, should identify "best practices" for the following topics:

   - Methods for quantifying GHG emissions, and projects for which qualitative analysis is sufficient.
   - Defining baseline conditions and significance thresholds.
   - Acceptable mitigation measures for energy conservation and microgeneration, alternative energy sources, trip reduction, and other topics.
   - Criteria for streamlining project-level climate change analysis, e.g., through tiering, finding a project "within the scope" of a carbon reduction program, or use of CEQA's "partial exemption" provisions (Section 21083.3).

   The CEQA Guidelines revisions should be completed within one year.

2. The Legislature should require CEQA climate change analysis only for large projects, and exempt small and infill projects from this requirement. For instance, limiting the requirement for climate change analysis to projects of statewide,

regional, or area wide significance should be used as a starting point for the definition. General plans, general plan updates, regional transportation plans, and specific plans should also be included in the definition of projects requiring climate change analysis.

3. CEQA documents for projects that qualify for LEED or LEED-ND certification, or equivalent certification, if developed by the State, should not be required to include a climate change analysis. A means for qualifying a project early in the CEQA process will need to be developed for this recommendation to be feasible.

4. CEQA documents prepared for local general plans that are consistent with regional climate change strategies should focus on local implementation measures and incorporate by reference the regional climate change CEQA analysis.

5. Project-level CEQA documents need not provide additional project-level climate change analysis or mitigation if the project meets all of the following:

- Is within the scope of applicable regional and local plans that include climate change strategies, and that have certified program EIRs.
- Is consistent with applicable regional and local climate change strategies included in the regional or local plans for which an EIR was certified.
- Incorporates applicable project-level mitigation measures from the certified regional and local plan EIRs.

CCAPA will continue to review recommendations of agencies and organizations that are also developing strategies that use planning tools to respond to climate change at the state, regional and local levels, and will update this document to reflect the latest thinking on this issue. Of critical importance is that any recommendations be flexible, with a menu of possible options, to ensure the wide variety of local conditions can be accommodated in meeting the AB 32 carbon reduction goals. CCAPA looks forward to helping shape the state's climate change response and welcomes comments and feedback on this document.

American Planning Association
Making great communities happen

Print Now

August/September 2007

Pollution Solutions

Reducing emissions in your own city is an important first step in helping the globe.

By Adam Millard-Ball

"Hyperbolic clouds of rhetorical gas" was how a *Seattle Times* editorial described the 1988 attempt by King County council members Ron Sims and Bruce Laing, FAICP, to set up an Office of Global Warming. "If Sims and Laing want to study the greenhouse effect, they should buy themselves some tomato plants and a bag of steer manure," said the newspaper.

Nearly 20 years later, Sims is now forging ahead with a climate plan as chief executive of the county. "They're not laughing at Ron Sims now," proclaimed a *Seattle Times* headline last year.

King County, Washington, is riding the crest of a wave of greenhouse gas reduction plans that is rolling across the country. As of June, more than 500 mayors had signed onto the U.S. Mayors Climate Protection agreement, spearheaded by Sims's neighbor, Seattle Mayor Greg Nickels. On top of that, nearly 250 local governments in the U.S. — plus another 400 around the world — have joined the Cities for Climate Protection Campaign run by nonprofit ICLEI, the International Council for Local Environmental Initiatives. And the Clinton Climate Initiative is working with nearly 40 large cities worldwide, including Los Angeles, Philadelphia, and Houston.

The mayoral agreement commits members to strive for a seven percent reduction below 1990 levels of greenhouse gas emissions by 2012 by reducing sprawl, promoting alternatives to the private automobile, increasing energy efficiency and recycling rates, and planting trees. Symbolically, the seven percent target is the same as the U.S. would have faced had it ratified the Kyoto Protocol.

Cities for Climate Protection members — including towns, counties, and other local agencies as well as cities — agree to a more formalized five-step process. A baseline emissions inventory and forecast is followed by adoption of an emissions reduction target, development of a local action plan, implementation of specific policies and measures, and monitoring of results.

Some of these adopted targets call for deep cuts in communitywide emissions, taking a "backcasting" approach based on the scale of action that is needed. King County and Berkeley, California, have both committed to an 80 percent reduction by 2050.

"The 80 percent target represents what scientists are saying that we have to achieve as a globe to avoid significant damage," says Timothy Burroughs, Berkeley's climate coordinator, who joined the city this year after a stint as climate program officer at ICLEI.

Berkeley voters adopted the target by an overwhelming majority of 82 percent as part of Measure G last November. And Burroughs points to strong political support as a driving force behind the plan.

"Mayor Tom Bates has stated that he wants Berkeley to be the greenest city in the country. He's made greenhouse gas reduction his major issue," says Burroughs. "That gives staff the freedom to develop creative options, and keep it in the minds of the public. If he's on board, that allows city staff to be on board as well."

"We're lucky to be in a region that is fairly progressive on this issue," he adds. But he suggests that there are also opportunities for climate planning in more conservative communities.

"Depending on where you are, greenhouse gas emissions may not be the thing you want to emphasize,"

EXHIBIT L

advises Burroughs. "But you can frame projects in different ways." Communities that lack political support for something called a "climate initiative" might stress air quality or walkability benefits instead, he suggests.

More than one reason

"We're finding that some of the most progressive work is being done in unlikely places, such as Keene, New Hampshire," agrees Glen Brand. He's cofounder and director of the Sierra Club's Cool Cities campaign, which aims to help cities realize their targets under the U.S. Mayors agreement.

Brand says that cost savings are behind many of the success stories in unexpected places. Houston, Texas, is aiming for 80 percent of new fleet vehicle purchases to be hybrids by 2010, saving nearly $1,900 in lifecycle costs per car. "Mayor Bill White can talk about the fiscal benefits as well as the environmental benefits," says Brand.

In Twin Falls, Idaho, the school district signed an energy savings performance contract with Honeywell Corporation, which provided much of the upfront capital investment in lighting and heating, ventilation, and air conditioning systems. The firm is paid through the energy savings, which are expected to total $3.5 million over the building's lifetime. "That's a lot of money for a tiny school district in a conservative part of the country," says Brand.

"Not all of these cities [with climate initiatives] have said that climate change is part of this bigger issue of environmental sustainability," adds Michele Betsill, assistant professor of political science at Colorado State University–Fort Collins, who tracks the development of local climate policy. "Some of them have said that this is something we can do where there's a lot of economic benefit."

"Changing [incandescent] traffic lights to LEDs is a great demonstration project," Betsill suggests. "It shows people that for relatively little up-front cost you can save on labor — as you don't have to change the bulbs as often — save on electricity, and reduce greenhouse gas emissions."

Many local climate initiatives, however, go far beyond municipal energy use by laying out policies to achieve emissions reductions in the wider community. According to the U.S. Mayors best practices guide, St. Paul, Minnesota, is aiming to save 3,600 tons of carbon dioxide per year through urban reforestation, which reduces cooling loads on buildings, while Salt Lake City's plan includes savings of 16,500 tons of carbon dioxide equivalent through methane capture at landfill sites. Chicago, meanwhile, promotes green building design, including reflective roofs to reduce air conditioning loads, and has committed to achieving LEED silver ratings for new city buildings.

It's taxing

Another ambitious effort can be found in Boulder, Colorado, where voters adopted a first-of-its-kind Climate Action Plan Tax last November.

A per-kilowatt hour surcharge on electricity bills is estimated to raise about $1 million per year for greenhouse gas reduction efforts. The tax, which sunsets in 2012, will be collected by the local utility, Xcel Energy. Boulder estimates that the average household will pay $1.33 per month, with the average business contributing $3.80 per month.

Sarah van Pelt, the city's environmental sustainability coordinator, describes going to the voters as a gamble, but one that was essential to implementing the climate plan.

More than half of the revenue — $3.3 million over six years — is slated for energy efficiency programs, such as raising awareness of the utility's rebates for energy efficient equipment and appliances. "We want to make sure contractors know about the rebates and have training in best practices," she says. "Boulder is trying to fill gaps in services that are provided by Xcel, and leverage Xcel's [energy efficiency] service."

The tax also allows the city to continue staffing its climate programs, which previously had been funded on a short-term basis from the trash tax and contingency funds. "This type of work needs so much one-on-one engagement with business leaders, decision makers, and community groups that you have to have staff if you're going to be effective," says van Pelt. "That's how you get the work done."

Ground-level attack

Elsewhere, transportation and land-use strategies to reduce the need to drive are a cornerstone of local climate plans. While climate planning efforts are often led by local departments of the environment or a city manager's office, land-use and transportation planners have been pursuing many of the same policies for years.

Karen Wolf, AICP, senior policy advisor in the King County Executive Office, draws the analogy with public health to argue that climate can provide an extra impetus for smart-growth planning.

"A lot of what we do in government can come together under this carbon umbrella," says Wolf, who managed the county's most recent comprehensive plan update. "I was thrilled a couple of years ago when I realized that as a land-use planner, I could call on public health to support my policies."

"When I've got the public health officials for the whole county talking about how important is it to integrate transportation and land use with public health, that adds a whole new credibility to what we're doing," Wolf continues. "It's the same with climate change. It's another way to reinforce what we're doing and to do more and to do better."

Wolf and her colleague Elizabeth Willmott, the county's global warming coordinator, stress interdisciplinary thinking as fundamental to the county's climate efforts. The climate plan was developed last year by a global warming team led by deputy chief of staff Jim Lopez.

The team brings scientific and technical expertise together with managers from transportation, buildings, public health, and other departments. "We have a mix of managers who can make sure that the actions of the plan will be funded and implemented, but we also have the technical expertise to make sure that we are in the right zone of policy," says Willmott.

The county will embark on a public participation process this fall in tandem with the HealthScape project, which looks at how the built environment and transportation affect public health, air quality, and climate change. Lopez, meanwhile, has been trained by former Vice President Al Gore to deliver the PowerPoint slideshow seen in Gore's Oscar-winning documentary, *An Inconvenient Truth*.

Climate planning is as much about the process as the plan itself, suggests Colorado State University's Michele Betsill. "This is the same with any plan that you are doing: Early stakeholder involvement has been shown to increase the likelihood that your plan will be implemented," she says.

Berkeley's outreach program, designed to explain the range of options that can achieve the voter-adopted emissions reduction target, kicked off in May with a workshop led by Mayor Bates.

"A lot of cities have greenhouse gas reduction plans, but most of them don't have plans that were developed through a community process," says Timothy Burroughs. "It makes Berkeley somewhat unique."

The outreach may help develop consensus as to whether more controversial measures should be part of the plan. "Measure G gave us an amazing mandate to do this community process," says Burroughs. "But it's easier to commit to a target than to say 'yes, you can charge me more to park downtown.'"

Burroughs sees standardizing methodologies as a key next step for local climate planning efforts. This approach can help state agencies account for local greenhouse gas reductions, he says, and improve the effectiveness of the online emissions measurement system being funded through the Clinton Climate Foundation.

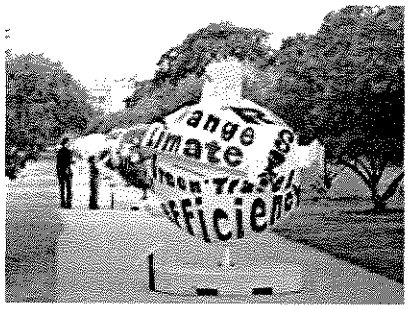
Due to be launched by the end of the year, the tool is being developed by Microsoft, in partnership with ICLEI and the nonprofit Center for Neighborhood Technology. Available free to cities, it aims to implement a common measurement system, estimate emissions reduction impacts, and allow sharing of best practices.

Cities must tackle numerous technical issues when they develop greenhouse gas inventories and estimate the potential for reductions, adds Jen McGraw, climate change program manager at the Center for

Neighborhood Technology. Planners need to determine the boundaries of the plan and whether to focus on carbon dioxide or include other greenhouse gases such as methane emissions from landfill sites.

Airports are a big question, she says, because some cities exclude them altogether while others like Seattle factor airport emissions on the percentage of use by local residents. "Air travel is a small percentage of global emissions, but it's growing and really polluting," she says.

Carbon trades



Another driver for standardized measurement protocols — at least for emissions from municipal operations — is the Chicago Climate Exchange, a marketplace where carbon savings or "offsets" can be bought and sold. While the exchange primarily caters to private companies, a growing number of state and local governments are signing up, including Aspen, Berkeley, Boulder, Chicago, Oakland, and King County, which operates King County Metro Transit, and thus houses the first major transit agency to join.

"We joined so that we could start to write the rules on markets," says Willmott, calling for a broader view that takes account of emissions savings from transit as well as the direct emissions from buses. "We want rules that don't penalize us for the greenhouse gas emissions from our transit system, but rather reward us for having a transit system that gets people out of their cars."

King County is also exploring ways to include the cost of carbon into all planning and project decisions, Willmott says. "We believe that carbon markets are coming."

Some environmental groups are more cautious about the rush to trade in carbon offsets. "States and cities should not join the Chicago Climate Exchange," was the title of an open letter distributed last year by a coalition of environmental groups, including Environmental Defense and the Natural Resources Defense Council.

The letter pointed to the lack of guarantees that offsets are "additional" — i.e., would not have happened anyway — and expressed a concern that participation may hamper the development of mandatory programs.

"There may be a role for trading, but it's only after the municipalities have implemented the solutions that reduce carbon locally," argues the Sierra Club's Glen Brand. "We think that trading should be a last resort when they've exhausted all the opportunities, and when we've gotten the most out of renewable energy and energy efficiency in particular."

Lip service?

Despite the planning efforts across the country, the jury is still out on climate plans' effectiveness in cutting greenhouse gas emissions. Michele Betsill's research suggests that plans to date have had little impact.

"Even these cities that have really integrated climate protection into various components of their local governance are not achieving significant reductions in greenhouse gases," she says. "They are not meeting the targets that they've set for themselves."

According to Betsill, the growth in popularity of climate planning has not been accompanied by deeper efforts. "There are a few cities who are truly engaged in meaningful action, but there's a lot going on at a superficial level of just rhetorical commitment," she says. "We found that several cities were taking things they were already doing and repackaging them as climate-friendly policies."

A report this year from the Institute for Local Self-Reliance concurs. With the exception of Portland, Oregon, it found that emissions had increased substantially in the 10 cities studied, and that at most one or two would meet their seven percent target under the U.S. Mayors Agreement. "Many cities will likely fail in their attempts unless complementary state and federal policies [such as renewable energy

requirements and fuel-economy standards] are put in place," says the report.

"Cities are not investing significant amounts of their own money to reduce GHG emissions," the report continues. "This may be understandable, given tight budgets, but cities should remember that energy-related investments, unlike many public investments, repay themselves, often in relatively short time frames."

But Betsill suggests that the impact of climate plans may stretch beyond the city's own operations and policies, and help with a broader process of community engagement on climate issues. "People who wouldn't usually have thought about climate change are coming to meetings or doing their own internal audits," she says. "I see local governments having an important role as agents of learning within their communities."

One of the main purposes of the U.S. Mayors agreement is to "put pressure on states and the federal government," rather than making a concrete local commitment, adds Betsill.

Brand agrees that local planning efforts have broad spillover benefits. "Some clean energy solutions are unfamiliar to the general public or public officials," he says. "Seeing a solar panel on city hall is a way of not only educating people, but making it tangible for folks, and demonstrating that the energy solutions to global warming are feasible, cost-effective, and politically popular."

Bigger playing field

Regional agencies can also play a key part, says Brand. He believes that metropolitan planning organizations can act as one lever of change, given their role as a conduit for federal transportation dollars and responsibilities for air quality conformity. "Many people see that carbon dioxide will be added to the list of responsibilities for MPOs," he says.

In the San Francisco Bay Area, the air quality management district is developing a regional climate strategy through the multiagency Joint Policy Committee. In addition to a regional emissions inventory and a preliminary study of greenhouse gas reduction technologies, the district is considering carbon dioxide emissions when developing rules for criteria pollutants under the Clean Air Act. Ana Sandoval, principal environmental planner, points to a new rule restricting emissions from charbroilers in restaurants, which is the most stringent in the state for criteria pollutants and looks at energy efficiency as well.

The district is also launching a $3 million grant program to reduce greenhouse gas emissions, with an initial call for projects expected this year. According to Sandoval, while guidelines for the program are still under development, possibilities for funding include capital improvements, technology, and educational and faith-based programs.

Other efforts are coming from the green building community. The American Institute of Architects adopted its "2030 Challenge" last year, a position statement that calls for all buildings designed by 2030 to be carbon-neutral.

Brand suggests that this type of initiative could provide a model for the American Planning Association, which is developing a global warming policy guide for consideration at the 2008 national conference in Las Vegas.

"We all need to do our part to address this problem," says Brand. "Citizens need to do it, businesses need to do it, mayors, public officials, states, and the federal government need to do it, but also professionals need to do it. They are one ones who set the course and the agenda for the next generation."

"Land use is where a lot of this happens," agrees King County's Karen Wolf. "As planners, we need to understand how important our job is to the future. It's daunting, but it's exciting because it's a great opportunity to expand the influence of planning in a lot of what we do."

Adam Millard-Ball is a transportation planner and a doctoral student at Stanford University's Interdisciplinary Program in Environment and Resources. His research focuses on transportation and local climate policy. Contact him at adammb@pangea.stanford.edu.

Sidebar: If We Can Do It, So Can You

Sidebar: Green Roofs: A Way to Start Small

Sidebar: Focus on Environmental Analysis

Resources

Images: Top — Local entertainer Bill Mettler speaks at a Step It Up rally in Philadelphia in April 2007, — one of many across the U.S., where participants urged Congress to cut carbon emissions. Photo by Sylvia Lewis. Bottom — In June 2007, Chicago launched its "Cool Globes: Hot Ideas for a Cooler Planet" public art project. One hundred globes, including this one encouraging green government, are on display along the lakefront. Photo by Meghan Stromberg.

Local sources

ICLEI's Cities for Climate Protection Campaign: www.iclei.org/index.php?id=1118

U.S. Mayors Climate Protection Agreement and best practices guides: www.seattle.gov/mayor/climate and www.usmayors.org/climateprotection.

Cool Cities Campaign: www.coolcities.us and www.coolmayors.org.

Center for Clean Air Policy Transportation Emissions Guidebook: www.ccap.org/safe/guidebook.html.

King County 2007 Climate Change Plan: www.metrokc.gov/exec/news/2007/0207warming.aspx and www.metrokc.gov/exec/news/2007/pdf/ClimatePlan.pdf.

King County's Climate Impacts Group guidebook on how to plan for global warming: www.metrokc.gov/exec/news/2007/0420guidebook.aspx.

State sources

New Jersey has been studying targets for greenhouse gas emissions and green building technologies. Information on these topics is available from the E.J. Bloustein School of Planning and Public Policy at Rutgers University: www.njssi.org and http://greenbuilding.rutgers.edu.

National sources

U.S. Environmental Protection Agency: www.epa.gov/climatechange/wycd/stateandlocalgov/local_resources.html.

APA's 2007 Federal Policy & Program Briefing (September 30 to October 2 in Washington, D.C.) will feature a daylong forum on global warming, energy, and environmentally friendly development: www.planning.org/policyconference.

Institute for Local Self-Reliance report: www.newrules.org/de/pioneers.pdf.

APA Policy Guide on Global Warming: A draft APA policy guide on global warming is in the works. It will be posted on www.planning.org. APA Advocate update on legislative and policy issues: www.planning.org/apaadvocate.

Audio recordings of 2007 National Planning Conference sessions (www.planning.org/store/audiotapes.htm): Climate Change and Sustainable City Design, with Edward J. Blakely, Alex Hinds, Margaret Sohagi, and Kenneth C. Topping; Planning for a Disaster-Resistant Community with Nancy Carpenter, Hibak A. Hersi, James C. Struve, and Kenneth C. Topping; and Creating Sustainable Communities with Nature and Culture, with Ken M. Hughes and Karen S. Walz.

Reading

Environmental Planning Handbook, by Tom Daniels and Katherine Daniels. APA Planners Press, 2003.

Planning for the Unexpected, by Suzanne Frew, Laurie Johnson, and Laura Samant, APA Planning Advisory Service, PAS 531, 2005.

The Land Use/Transportation Connection, by Terry Moore, Paul Thorsnes, and Bruce Appleyard. APA Planning Advisory Service, PAS 546/547, 2007. Available at APA's PlanningBooks.com.

©Copyright 2007 American Planning Association All Rights Reserved

American Planning Association
Making great communities happen

Print Now

August/September 2007

If We Can Do It, So Can You

By Mikaela Engert

Keene, New Hampshire, may not be the first place that comes to mind when people think of cities that are cutting their greenhouse gas emissions and conserving energy. That's okay. We won't hold it against you. Despite being a small municipality (pop. 23,000) in a traditionally conservative state, Keene is actively planning for a different future — one that includes global warming.

Keene has already experienced predicted climate change impacts. Many parts of the city were flooded in 2005 from frequent, heavy rains, with resulting damage to homes, bridges, and roadways. Besides being vulnerable to high winds, ice storms, snowfall, and rainfall heavy enough to damage property and infrastructure, Keene could also see disruptions in tourism, loss of seasonal jobs, shifts in local food supplies, and irrevocable damage to natural resources as a result of climate change.

Both residents and local officials recognize that the community can't just sit back and hope someone else will fix the problem. Identifying and planning for the opportunities and vulnerabilities that arise from a changing climate will ultimately put Keene in a better position to ensure its continued economic, social, and environmental viability.

Five years before the flood — in April 2000 — with the support of the mayor and city council, the city joined the Cities for Climate Protection Campaign of ICLEI-Local Governments for Sustainability. In 2004, Keene adopted a greenhouse gas emission reduction action plan that commits the city to reducing its emissions by 20 percent by the year 2015. As a result, Keene has actively pursued measures to reduce its carbon footprint, as well as to cultivate cross-departmental and community relationships to ensure the long-term success of its action plan. Together, these steps have made the city a climate change leader in New Hampshire.

To cut down on emissions and conserve energy, the city uses biodiesel for municipally owned diesel vehicles and machinery; it has installed a landfill methane recovery system that provides energy to operate the city's recycling and solid waste transfer facility; it operates a geothermal pump system to heat and cool the public works facility; and it has replaced traditional incandescent traffic signals with LED (light emitting diode) signals, which are more energy efficient. These measures are just an example of some of the emissions-reducing programs that Keene has spearheaded.

In addition, the city has a recycling program in all city buildings, uses bicycles for downtown and neighborhood police patrols, and has adopted an anti-idling policy for non-emergency city vehicles. By implementing these measures, the city has been able to reduce its energy consumption and reduce its growth in total greenhouse gas emissions.

What's next?

The city is now collecting data to update its emissions inventory to measure progress and identify new reduction measures. We are also studying the feasibility of using small-scale wind generation and micro-hydro power for municipal buildings, exploring whether to build a municipal biodiesel production facility, implementing an environmentally preferable purchasing program, establishing an urban forestry program (to maintain and replace city trees and to assist in carbon sequestration), and making energy efficiency upgrades to existing city buildings through an energy service company performance contract.

Keene is doing its part to fight climate change not only through mitigation but through adaptation as well. On the adaptation side of the equation, the city was approached by ICLEI to assist in testing and refining

a new program, Climate Resilient Communities. This program will help local governments assess and rank vulnerabilities to climate change, and then identify ways to adapt to the impacts and costs associated with climate change.

In Keene, the CRC program will help to integrate climate preparedness strategies into the city's existing comprehensive master planning efforts and capital improvement program, thereby anticipating and reducing the costs associated with natural disaster relief, infrastructure improvements, and other climate induced changes.

"Once again, Keene is leading the way in the state of New Hampshire in addressing the issue of climate change," says Keene's Mayor Michael Blastos. "We hope that other communities- — large and small — will be inspired by our actions and planning efforts to reduce greenhouse gas emissions and to identify ways in which the community can adapt to the expected impacts associated with climate change."

As the first pilot city for the climate change adaptation program, Keene will help lay the groundwork for other communities across the U.S. and around the world with their efforts to become more resilient. Last year, on behalf of Mayor Blastos, city council member James Duffy attended a meeting in Anchorage, Alaska, where participants, including 30 mayors, witnessed the devastating impacts of climate change firsthand, from retreating glaciers to insect-infested forests.

"When the leaders of our cities gathered in Alaska, we demonstrated the ability to take responsibility for our present and our future. That is the only true purpose any community, any government, can serve," says Duffy.

It is expected that CRC will extend municipal planning efforts beyond disaster preparedness to embrace changes in policy, infrastructure, capital improvements, building and development codes, and economic development strategies — all aimed at making communities less vulnerable to the impacts of climate change.

Mikaela Engert is a city planner for the city of Keene, New Hampshire, and guides the city's implementation of its greenhouse gas reduction action plan and the formulation of its climate adaptation plan.

Images: Witcome Mill Road in Keene, New Hampshire, was damaged by floodwaters in 2005. Officials expect storm severity and frequency to increase due to climate change. Photo courtesy David Bergeron.

©Copyright 2007 American Planning Association All Rights Reserved

American Planning Association
Making great communities happen

Print Now

August/September 2007

Green Roofs: A Way to Start Small

By Corry Buckwalter Berkooz

An increasing number of U.S. cities now require green roofs in new construction projects — partly to help mitigate global warming. Green roofs slow the flow of rainwater into a stormwater system, reduce the energy needed for heating and cooling, and diminish urban heat island effects. More than two million square feet of Chicago's rooftops have been planted with low-growing sedums, native grasses, herbs, and shrubs. Minneapolis, Boston, and other large cities have various "green" requirements as well.

But even medium-size cities that do not have incentives in place have found innovative ways to encourage construction of green roofs.

Ann Arbor, Michigan (pop. 114,000), prides itself on being an eco-friendly, bike-supportive, cultural hub with five colleges and universities, including the University of Michigan. The city has an ambitious alternative energy savings plan to significantly reduce its climate footprint. The goal is to use green energy for 30 percent of its municipal operations by 2010.

Mayor John Hieftje is a great supporter of green roofs as part of Ann Arbor's energy savings plan, but he faces constraints. "One of the hurdles we face is that in Michigan the local building codes cannot exceed the state building code, so we can't mandate green roofs in any way," he says.

Despite limited regulatory authority, local planners, developers, citizens, and designers are encouraging green rooftops in Ann Arbor. Architects and landscape architects educate their clients on green roof benefits. Planning commission members suggest green roofs in site plan reviews as a way to manage stormwater runoff. Building owners want the payback in energy savings. This collective push is causing a flurry of construction activity in the city.

Nine green roofs in the Ann Arbor area are planned, under construction, or already built. Sites include a residence, a public library, educational institutions, office buildings, and an appliance store. Mark Lloyd, planning and development services manager, explains that "the city is happy to be a part of that trend; there will be more demand for green roofs as projects with very little open space meet obligations for stormwater retention needs."

The first public building to be fitted out with a green roof was a branch library. Malletts Creek Branch Library, a part of the Ann Arbor District Library system, was built in 2004 in adjacent Pittsfield Township with a grant from the U.S. Environmental Protection Agency. "It will take 12 to 15 years to pay off the green roof project (in energy savings), which isn't bad for what is considered a 40-year building," says library director Josie Parker.

Malletts Creek's green roof covers the building's entire roof structure and measures 16,000 square feet. Maintenance is easy, according to Parker. Landscapers weed the roof only twice a year because the sedums crowd out unwanted plants. Rainfall has been sufficient to meet water needs. Malletts Creek does not rely on its green roof for stormwater runoff mitigation, instead relying on an extensive ground level bioswale system.

Jerry Hancock, Ann Arbor's Natural Resources and Environmental Planning Coordinator, conducts stormwater reviews for new construction in the city. He appreciates a green roof's ability to hold a "first flush" (small) rainstorm event. "There are two ways to assess how much a green roof affects storm water," Hancock says. "First is to take the volume of water that the roof can handle and subtract that amount from detention requirements. The second method is to modify the runoff coefficient of the roof."

Two years ago, Hancock approved a site plan for an appliance superstore on a small lot. The building was to be equipped with a 13,000-square-foot green roof.

This May the GreenGrid Company installed modular units on the roof of Big George's Home Appliance Mart, on the west side of Ann Arbor. Mark Bishar, the store owner, describes himself as "an environmental guy," but he looks closely at costs.

At $80,000, the upfront costs of building a green roof seem high to Bishar, but the roof saves money by reducing the size of the stormwater management system for the site ($30,000 for the underground detention system with the green roof). A civil engineer estimates that without the green roof, the detention system would cost twice as much, according to Bishar. But the stormwater management benefits aren't the only draw.

"A green roof saves energy; that's its big selling point," Hancock says. The original Big George's building had heating and cooling costs of about $12,000 a month. The new structure and green roof will be much more efficient (cutting costs by 30 percent), Bishar estimates.

Now under construction is the Stephen M. Ross School of Business at the University of Michigan. When completed in the fall of 2008, the building will have a 20,000-square-foot green roof with 12 varieties of sedum plants. According to Neal Kessler, senior landscape architect with the Ann Arbor consulting firm of JJR, the university was initially sold on the green roof because of its aesthetics; it is visible from multiple points inside the building complex. After many discussions about green roofs, Kessler says the university "feels really good about what they are doing" for the environment, which may lead to more green roof converts in Ann Arbor.

On a final note, many sedums, grasses, and herbs for Ann Arbor's green roofs are grown in Michigan, giving economic development a needed boost.

Corry Buckwalter Berkooz is an environmental writer in Ann Arbor. She was formerly planning director of Schuyler County, New York.

Images: Nashville Public Square features a 2.25–acre green roof deck, built over five levels of parking. Photo Hawkins Partners, Inc.

©Copyright 2007 American Planning Association All Rights Reserved

American Planning Association
Making great communities happen

Print Now

August/September 2007

Focus on Environmental Analysis

The threat of legal action may be another reason for planners to consider the climate effects of plans and new development, following a series of lawsuits over environmental impact analysis.

Most of the action to date has taken place on the West Coast, under the California Environmental Quality Act (CEQA). In April, state attorney general Jerry Brown filed suit against San Bernardino County, east of Los Angeles, for failure to look at climate impacts in the environmental impact report for its newly adopted general plan.

Earlier lawsuits on similar grounds have been filed by two environmental nonprofits, the Center for Biological Diversity and the Natural Resources Defense Council, against the city of Banning, California, and the state Reclamation Board, respectively.

California legislation adopting targets for reducing emissions gives "great credence to the argument that climate change should be addressed during the CEQA review process," concludes a draft white paper from the Association of Environmental Professionals. It suggests that "ad hoc methods and individual judgment" will be needed until regulatory guidance is issued or legal challenges are resolved.

"If you are doing any controversial development, it's just imprudent not to include a reasonable climate section in your EIR," says Michael Wara, a San Francisco-based climate and land-use attorney at Holland+Knight. Besides quantifying greenhouse gas emissions from traffic and energy use, planners should look at impacts on carbon sinks such as forests and streambeds, along with increased risks from floods and wildfires, he advises.

Local governments, in turn, should consider making a statement of overriding considerations when approving major projects, Wara adds. Under California law, such statements allow plans or projects to proceed, even if significant environmental impacts are not mitigated, based on competing objectives such as housing needs.

In New England, meanwhile, state-funded and large private projects subject to the Massachusetts Environmental Policy Act are now required to quantify greenhouse gas emissions. The new policy, announced in April, also requires mitigation measures such as energy efficiency, green roofs, and transportation demand management.

©Copyright 2007 American Planning Association All Rights Reserved

American Planning Association
Where great communities happen

Print Now

August/September 2007

The Urban Form and Climate Change Gamble

How transportation and land development affect greenhouse gas emissions.

By Lawrence D. Frank, Sarah Kavage, and Bruce Appleyard, AICP

Call it whatever you want: climate change, global warming, or as in Europe, "climate chaos." Just recognize a few things: The world's climate is changing, humans are at least partially responsible, and we as planners have an opportunity — and a responsibility — to respond.

April 2007 may be the month that really got our attention. On April 2, the U.S. Supreme Court handed down a ruling underscoring public agency responsibility to reduce greenhouse gas emissions. In this "tailpipe" case *(Massachusetts vs. EPA)*, the court rejected the U.S. Environmental Protection Agency's claim that the Clean Air Act could not be used to regulate carbon dioxide emissions from vehicles. Going beyond the plaintiffs' request, the Court surprised many by citing the scientific evidence directly linking tailpipe emissions to global warming.

According to Trip Pollard, senior attorney for the Southern Environmental Law Center, the decision "sends a clear message that action is needed." Planners and politicians have a leading role to play in reducing energy consumption from personal travel — by investing in more fuel-efficient forms of transportation and land-use patterns that support those options.

On April 6, the Intergovernmental Panel on Climate Change — a global group of scientists created in 1988 by the United Nations Environment Programme and the World Meteorological Organization — released the second of four assessment reports it will issue this year. The April report stated unambiguously that global warming is already harming the environment.

Impacts include more extreme weather patterns, such as drought, heat waves, and flooding; more catastrophic weather events such as hurricanes and tropical storms; the melting of glaciers and polar ice sheets; and a rise in sea level. These changes will lead to displacement of people living in coastal areas and on low-lying islands, and they will destroy habitat and species. Potentially 25 to 30 percent of the world's plant and animal species are at risk of extinction, according to the second IPCC report.

According to NASA climatologist James Hansen, the next 10 years provide a critical window of opportunity before we reach a tipping point. After that, mitigating global warming will be increasingly difficult and the impacts more severe.

Projections suggest the need to reduce the absolute level of greenhouse gas emissions by 80 percent by 2050. Emissions from automobiles and light trucks are a large and growing share of overall greenhouse gas emissions. Strategies to reduce emissions from personal transportation will very likely need to do two things: reduce energy use per unit of distance traveled and decrease per capita distances traveled. Although improvements in fuel and vehicle technology can help, land-use and transportation planning that reduces vehicle demand is crucial, especially in light of population growth, if we are to achieve these goals.

Policy framework

In 1992, the international community convened the United Nations Framework Convention on Climate Change to develop ways to mitigate global greenhouse gas emissions. The agreement negotiated by the UNFCCC became the Kyoto Protocol, adopted in 1997. That agreement became effective in 2005. It set binding targets for developed nations to reduce greenhouse gas emissions by seven percent below 1990 levels; the target date is 2012.

However, it is unlikely that those targets will be met under the current Kyoto framework. The U.S., the

nation with the highest per capita emissions of greenhouse gas emissions, signed the Kyoto Protocol but has refused to ratify the treaty. China is the second largest worldwide generator of greenhouse gases, yet it is considered a developing nation under Kyoto, and is exempt.

In the absence of national leadership, efforts by a number of U.S. states, regions, and cities have put policies or other actions in place that meet the requirements of the Kyoto Protocol. Ron Sims, executive of King County, Washington, has established numerous initiatives to address climate change through transportation investments and land use. Seattle Mayor Greg Nickels, alarmed at low levels of snowfall in the Cascade Mountains, Seattle's main water source, drafted the U.S. Mayors Climate Protection Agreement, which 435 mayors have signed to date.

Californians recently voted in the Global Warming Solutions Act, the first enforceable statewide program in the nation. The law caps California's greenhouse gas emissions at 1990 levels by 2020. Mandatory caps will begin in 2012 for significant sources and ratchet down to meet the 2020 goals.

Looking at the long term

According to data from the U.S. Department of Energy's 2005 Annual Energy Outlook, the transportation sector accounted for 32 percent of all U.S. carbon dioxide emissions in 2002 — the largest share. The Environmental Protection Agency reports that most of the increase in carbon dioxide emissions between 1990 and 2000 came in the transportation sector, more than three-fifths of it from passenger cars and light trucks: vans, pickups, minivans, and sports utility vehicles.

Any policy that seeks to reduce transportation-related carbon dioxide emissions will require some combination of the following: better vehicle fuel technology, increased vehicle economy, and reducing travel demand.

• Fuels: Biofuels (ethanol, biodiesel) can be encouraged as alternatives to petroleum-based fuels because they emit less carbon dioxide per gallon. Each gallon of gasoline weighs about six pounds in the tank but turns into about 20 pounds of carbon dioxide in the atmosphere.

• Vehicle efficiency: Regulations and incentives for electric, hybrid, or other low-emission vehicles are the primary policy tools to address vehicle efficiency. An SUV emits one ton of carbon every 1,300 miles, compared with some hybrid cars that can go more than four times as far (6,000 miles) for that much carbon.

• Travel demand: This measure is often determined by the vehicle miles traveled or vehicle hours traveled. Demand for car travel can be decreased in several ways, including transit investments, better land-use planning and design, transportation demand management, and road pricing.

The big gamble

For policy makers, understanding which of these policy levers to pull — and how hard to pull them — is both a political and a global warming gamble. The U.N. Framework Convention on Climate Change documented in a 2003 report that most current policies that address global warming focus on technological fixes such as vehicle and fuel efficiency, partly because this focus has been far more politically acceptable than behavior modification such as reining in car travel.

However, in the U.S. and around the world, travel demand is increasing much faster than a technology-and-fuel solution can handle. On the technology side, ethanol and biodiesel, while an improvement, are still carbon-intensive fuels that require substantial amounts of petroleum to produce. On the fuel side, VMT and land consumption have outstripped improvements in fuel economy. In fact, growth in fuel economy is barely keeping up with growth in population.

In two scenarios tested in collaboration with the Center for Clean Air Policy — a Washington-based nonprofit — we looked at the changes needed to reduce greenhouse gas emissions by 80 percent from current levels in the Puget Sound region by 2050, given projected population increases. The "medium technology" scenario, which increased fuel efficiency to 48 miles per gallon fleetwide and reduced greenhouse gas emissions to 15.7 pounds per gallon, would still require a 61 percent decrease in VMT per capita to meet the target.

Even an "aggressive technology" scenario, which assumes 75 miles per gallon and cuts greenhouse gas emissions per gallon of fuel nearly in half, would still need to cut per capita VMT by nearly 20 percent. According to estimates by the Center for Clean Air Policy, this aggressive scenario requires a 287 percent increase in fuel economy fleetwide. A turnover in the fleet takes nearly 20 years, and it takes time to develop these new fuel-efficient vehicles and to put them into production. Unfortunately, fuel economy has been flat for over a decade.

This large gap also makes it clear that reductions in vehicle demand must be part of any serious strategy to address climate change. Pricing efforts, such as road or parking pricing, and demand management strategies, such as worksite transit passes, are a next step and can be implemented relatively quickly compared to changes in the built environment.

However, incentives and disincentives can do little to effect change on their own unless people have reasonable alternatives to driving — such as an efficient transit system for regional travel and land-use patterns that support walking and bicycling for local trips.

Urban form and emissions

Planners understand that typical post-World War II development patterns in the U.S. — low-density, disconnected, single-use development and inadequate transit — oblige people to drive greater distances and make more trips by car. Sprawling urban regions not only encourage automobile use — they require it. Thus many Americans rely on their cars for nearly every commute; shopping, eating, and entertainment trips; and even recreational trips to a park.

In contrast, compact communities with a mix of land uses and a highly connected street network are associated with fewer vehicle miles and trips and more bicycling and walking per capita. They have also been linked to lower per capita levels of other emissions (such as ozone), and, more recently, to lower per capita carbon dioxide levels.

Land use and transportation are connected at both the regional and neighborhood scales.

Alan Pisarski's book, *Commuting in America*, shows that people often commute regionally — from suburb to center city, from center city to suburb, and between suburbs. Commuting trips are generally the longest regular trips that most people make, and they often make them alone. Having fast and reliable transit connections between regional centers could lead to relatively large reductions in per capita vehicle miles and hours of travel.

At the neighborhood level, places that support walking and bicycling will help to reduce the need for cars for shorter trips that are unrelated to work: errands, trips to school, or recreational trips.

In the first phase of the HealthScape study in King County, Washington, we tested the relationships between various land-use characteristics, travel behavior, and carbon dioxide emissions in the Seattle area. Although some researchers have begun to look at the connection between land-use patterns and greenhouse gas generation, few have taken a detailed look at the specific land-use characteristics that are related to carbon dioxide emissions.

The HealthScape analysis relied on travel information from more than 6,000 households in the 1999 Puget Sound Regional Household Activity Survey. To estimate the level of greenhouse gas emissions and associate these emissions with urban form, we worked with the Center for Clean Air Policy to create a method of breaking vehicle trips into links. Emissions levels were assessed for each link of each trip in the regional survey based on the road type (local, collector, arterial, freeway, etc.) and time of day.

This approach, described in detail in "Many Pathways from Land Use to Health," published in the Winter 2006 issue of the *Journal of the American Planning Association*, is a much more detailed measurement than the standard methodology, which uses a simple average speed for each trip. Further, this approach accounted for engine operation such as increased emissions during warm-up periods or "cold starts."

The emissions measures for each trip were linked to each household's neighborhood walkability, as measured by the level of residential density, land-use mix, and intersection density within a quarter-mile

walking distance of each household location in the regional survey. We found that, controlling for demographics, vehicle ownership, and distance to transit, people who lived in highly walkable areas generated less carbon dioxide — primarily because they traveled fewer miles per capita.

When we repeated the same analysis of urban form variables and also controlled for per capita VMT, we found that urban form still explained some variation in greenhouse gas emissions above and beyond its more direct relationship with VMT. We assume this to be due to systematic differences in average speed, vehicle occupancy rates, and differences in emissions across modes of travel.

To illustrate what changes in land use might mean for carbon dioxide emissions, we compared the land-use patterns and mode share of two areas in the Seattle region: Queen Anne, an older, mixed use neighborhood in central Seattle, and North Redmond, a residential neighborhood in the suburb of Redmond, about 15 miles from downtown Seattle. In Queen Anne, residents walked more and used transit more often; they also drove less.

When considering the scale of changes needed to reduce driving, these two communities serve as a reminder that major differences in urban form exist at the regional level — and creating more neighborhoods like Queen Anne could have a tangible impact on carbon dioxide emissions and vehicle demand.

How do alternative approaches to land development and transportation investments affect climate change? We will be examining this question in phase two of King County's HealthScape project. Research results from phase one are being incorporated into a modeling tool that can assess the relative climate change impacts and benefits of different approaches to land development, street network design, and transportation investments. A report on the findings is expected next spring.

The next battles

In addition to planning for more walkable areas at the local level, urban regions should coordinate land-use and transportation planning and make substantial investments in transit service, particularly in existing centers. Planners can help create better connections between local travel modes (bicycling, walking) and regional ones (transit).

Deciding where to begin to fill the gaps in current transit, walking, and bicycling infrastructure will be important, as will deciding how to sequence investments within corridors in relationship to existing and projected needs. Urban growth boundaries, urban service areas, distance-based impact fees, creative parking strategies, and infrastructure requirements will also help to reduce reliance on private vehicles and lower per capita carbon dioxide emissions.

Despite the nation's car culture, a number of recent studies have documented an increasing demand for more walkable environments. Household characteristics are changing, with smaller families and more baby boomers wanting to live in places where they can walk and use transit. The research has also documented other benefits to more compact, walkable urban regions, such as reduced per capita air pollutants and lower obesity rates, which are otherwise becoming serious public health concerns.

In "Leadership in a New Era," which appeared in the *Journal of the American Planning Association* last year, Arthur C. Nelson, FAICP, argued that over half of the built environment in the U.S. 25 years from now will be built from today forward, giving planners "an unprecedented opportunity to shape the landscape."

According to the IPCC scientists, we are also approaching a cliff — namely, our last chance to curb global climate change; any serious effort needs to substantially reduce the current demand for vehicle travel. As it happens, a growing number of state and local governments are recognizing this need. A first good step is to simply get out of the way. Planners should act quickly and decisively to remove the regulatory barriers (as argued by Jonathan Levine in his recent book, *Zoned Out*) and make it legal to build communities that are less auto reliant and meet the growing demand for a more walkable, sustainable future.

Lawrence D. Frank is the J. Armand Bombardier Chair of Sustainable Transportation Systems at the

University of British Columbia, senior nonresident fellow at the Brookings Institution, and president of Lawrence Frank and Company. Sarah Kavage is special projects manager at Lawrence Frank and Company. Bruce Appleyard is the coauthor of the recently released, updated version of The Land Use/Transportation Connection *(Planning Advisory Service Report 546/547). The authors thank Steve Winkelman, transportation manager at the Center for Clean Air Policy, for his work on vehicle demand and climate change impacts, which was invaluable in the development of this article.*

Sidebar: There's Hope, But We'd Better Get Started

Web-only Sidebar: The Built Environment Dimensions of Travel Behavior

What Still Needs to Be Studied

• Household carbon footprints. Multifamily buildings are more energy efficient than single-family houses: They produce fewer household carbon dioxide emissions due to lower VMT, and they conserve heat by sharing walls. However, we still need to study household heating, a large source of carbon dioxide emissions.

• Regional location versus community design. Although researchers know that both regional location of housing and jobs and neighborhood-scale community design affect carbon dioxide emissions, there has been no comprehensive examination of both factors.

• Effects of programmatic strategies. We need to understand how demand management, pricing, and parking management can reduce per capita carbon dioxide emissions in tandem with land-use changes and transit service investments.

• Impacts of transit investment. The potential reductions in carbon dioxide from transit service increases are not well understood or measured, especially since more transit service means more carbon emissions (from the transit vehicles themselves).

Resources

Online

For more on the emissions methodology described in this article, see www.planning.org/japa/pdf/JAPAFrank06.pdf.

The King County HealthScape project (formerly LUTAQH): www.metrokc.gov/exec/news/2006/pdf/LUTAQHupdated.pdf.

Also see: the Center for Clean Air Policy: www.ccap.org.

The Intergovernmental Panel on Climate Change: www.ipcc.ch.

U.K. Treasury Report, "The Economics of Climate Change" (the Stern Report): www.hm-treasury.gov.uk.

National Resources Defense Council: www.nrdc.org.

Japan's Environment Ministry Recommends Urban Centralization to Curb Global Warming: www.japanfs.org/db/1815-e

More

Current court cases addressing greenhouse gas emissions: www.warminglaw.com.

ICLEI — Local Governments for Sustainability: www.iclei.org.

The Land Use/Transportation Connection. Planning Advisory Service Report Nos. 546/547: www.PlanningBooks.com.

City Parks Forum briefing paper on climate change management: www.planning.org/cpf/briefingpapers.htm.

U.S. Green Building Council: www.usgbc.com.

©Copyright 2007 American Planning Association All Rights Reserved

American Planning Association
Making great communities happen

Print Now

August/September 2007

There's Hope, But We'd Better Get Started

By Fred Ludwig

We humans very likely created this mess, but we have the ability to clean it up — and some of the cleanup tasks can be done locally. That is the message of three reports issued this year by the Intergovernmental Panel on Climate Change.

With hundreds of authors and 2,500 reviewers from around the world, the IPCC reports have the weight of authority behind them. Teams of scientists have been at work on the latest series of IPCC reports since 2004.

A range of engineering and behavioral solutions is offered in the latest summary report, issued in May, as well as in final drafts of the longer version that will expand on that summary. Throughout the documents, researchers note the benefits of incorporating sustainable growth across a broad range of policies.

"We can do this. The solutions exist," says Annie Strickler, spokesperson for ICLEI — Local Governments for Sustainability, a Toronto-based organization with about 550 government and organizational members worldwide.

According to the May IPCC summary, more energy efficient buildings could avert 30 percent of projected emissions by 2030. A table of options includes improved insulation, alternative refrigeration fluids, more efficient appliances, solar technology, and intelligent meters that provide feedback.

One drawback is that builders must find a way to pass some of the higher up front costs along to home buyers — and home buyers typically resist, says IPCC member Billy Pizer, a senior fellow at Resources for the Future, a research organization based in Washington, D.C. "Because of these [market] failures, I think the only way to get at this sort of opportunity is through building codes," says Pizer.

Local officials must take the lead, says IPCC member Charles Kolstad, professor of environmental economics at the University of California, Santa Barbara. "Nobody else is essentially in charge of the development of housing stock."

The IPCC summary also lists transportation improvements, including more carpooling, mass transit, fuel-efficient vehicles, and urban planning that reduces the need for travel. In waste management, it cites opportunities in landfill methane recovery and composting of organic waste.

Such opportunities notwithstanding, the summary says that local and regional efforts have limited impact on their own. Significant progress requires national action, the IPCC says. In the U.S., an accident of timing provides new political cover for policy changes. The appearance of the IPCC report on the heels of former Vice President Al Gore's Academy Award-winning film, *An Inconvenient Truth*, gave them wider currency with the public.

Despite the vastness of the subject, each summary is no more than three dozen pages. The summaries involved some political compromise — and complaints that governments intervened to water down some conclusions. The groups also are working on much longer versions to be released later.

The three summaries are:

• "The Physical Science Basis," issued in February. Human-caused greenhouse gases "very likely" caused most of the increase in global temperatures since the mid-20th century. Eleven of the last 12 years rank among the warmest on record (since 1850). Estimated sea levels rose more than half a foot in the 20th

century. Changes include increases in North Atlantic hurricane intensity since about 1970; more intense and longer droughts; decline of mountain snow cover; more precipitation in eastern North America; and more heavy storms over most land areas. Further sea-level rise of seven to 23 inches in the 21st century is projected. Future hurricanes are likely to be more intense.

• "Impacts, Adaptation and Vulnerability," issued in April. In the future, there will be greater risk of drought, water supply shortages, species extinction, wetlands damage, and flooding. North America projections include smaller snowpack and lower summer flows in the western mountains; problems in forests from pests, diseases, and fire; more heat waves; and more stress on coastal communities and habitats.

• "Mitigation of Climate Change," issued in May. There are choices to be made between the economic costs of rapidly reducing emissions now and the environmental costs of delaying. The energy supply sector had a 145 percent increase in greenhouse emissions between 1970 and 2004, the largest of any sector. Upgrades of energy infrastructure in industrialized nations can limit emissions. Options from existing and emerging technologies include renewable energy, nuclear power, and sequestration of carbon dioxide.

A fourth report due out in November will integrate information from the three reports. The summaries are available at www.ipcc.ch.

Fred Ludwig is a freelance writer in Chicago.

Images: Tasseled sugarcane growing in Canal Point, Florida. The Intergovernmental Panel on Climate Change says that using renewable fuels is one way to cut carbon emissions. Photo Scott Bauer/USDA.

©Copyright 2007 American Planning Association All Rights Reserved

American Planning Association
Making great communities happen

Print Now

August/September 2007

The Built Environment Dimensions of Travel Behavior

By Bruce Appleyard, AICP
Copyright by the author

First inspired by Robert Cervero and Kara Kockelman's study "Travel Behavior and the 3 Ds," travel behavior research associated with the built environment has generated multiple dimensions.

While reviewing research and literature for the PAS Report, *The Transportation/Land-use Connection* and talking with experts, I came to a greater understanding of the finer details of the complex relationship between these dimensions of the built environment and lowering auto dependency. This compelled me to create a more concise guide to how exactly these dimensions affect walking and driving rates, thus creating greater opportunities for transit ridership, bicycle travel, and walking.

There are four primary built environment dimensions that are influential at the neighborhood/station area level. They are *Distance, Design, Diversity,* and *Density,* and they most strongly influence rates of walking for transportation purposes.

At the regional level, the built environment is most influential at reducing driving rates through the dimension known as *Destinations* (or regional level accessibility of important work, learn, and play opportunities from one's home). Reid Ewing and Robert Cervero's 2001 synthesis of built environment and travel research found this "regional accessibility" dimension to be the most influential component of the built environment at lowering auto use. It should be kept in mind that most experts might find these dimensions to be more influential if they were coupled with proper pricing for congestion and parking, which suggest another "D," *Discouraging* driving.

However, these built environment dimensions have often been lumped together, with *density* most often used as a primary indicator of walkability, transit ridership, and lower auto use. This makes some sense as density is a convenient, even elegant, proxy measure. First, density is a relatively easy measure to gather, calculate, and compare across urban areas. Second, density is often accompanied by mixed use (diversity) and walkable distances that are at least functionally well designed, as well as other factors that make walking and auto-alternatives competitive (good transit service, scarcity of free parking). Density also makes diversity and walkable distances economically compatible.

First and foremost, *distance*, both real and perceived, has the strongest, most direct influence on whether one decides to walk. Therefore, the influence of the other Ds on walking occurs primarily through their influence on *Distance* as follows:

Design (including function, form, and experiential quality), has an indirect influence on walking via its influence on a person's perception of distance, whether accurate, exaggerated, or encouraging. For example:

> *Functional design* helps a walker overcome distance by providing adequate, safe, and direct paths and crosswalks.
>
> *Design form* helps a walker overcome distance by raising the quality and attractiveness of the walking experience through attractive placemaking, feelings of safety, and comfort. While important, it is perhaps weaker than the *functional* aspect of *design*.
>
> Combined, *function* and *form* define the *experiential quality* of the walking trip (e.g., ability to overcome real and/or perceived threats to safety from traffic or crime.)

Diversity has a direct relationship with distance, by placing important destinations closer together —

people to support businesses, services, bus stops, parks, schools — and thus has an indirect influence on walking. Diversity may also affect the experiential quality of the walking trip.

In the end, while it is most often used to as the primary measure of the built environment to determine the walkability, transit ridership, and hence driving rates an area, *density* is actually associated indirectly with walking via distance. In sum, density is a proxy measure for proximity, and more powerfully so when coupled with *Diversity* and *Distance*.

©Copyright 2007 American Planning Association All Rights Reserved

American Planning Association
Making great communities happen

Print Now

August/September 2007

Cooling Global Warming

By Lora A. Lucero, AICP

The state and local response to global warming has been gaining momentum and visibility in the past year or two. Most of the methods to control greenhouse gas (GHG) emissions generally fall into three categories: energy efficiency and conservation, energy sources, and carbon sequestration.[1]

The first involves such measures as more stringent vehicle fuel economy standards and "changing land use patterns to reduce vehicle miles traveled by passenger vehicles and to increase trips by mass transit, bicycles and walking."[2] Energy efficiency also includes "green buildings" and more efficient home appliances and office equipment. The second category — energy sources — focuses on finding alternatives to oil and gas, such as wind, solar, and biomass.

The third category — carbon sequestration — involves finding ways to either biologically sequester carbon using the natural function of plants to take up carbon dioxide through photosynthesis, or finding ways to capture and store carbon before it is emitted into the atmosphere.[3]

Federal Initiatives

110th Congress Responds to Global Warming. Dozens of energy and climate bills have been introduced, including the Zero-Emissions Building Act of 2007 (S.1059 introduced by Sen. Hillary Rodham Clinton (D-N.Y.)), which directs federal agencies to require all new federal buildings or major renovations of existing buildings to reduce carbon dioxide emissions by 50 percent compared to a 2003 baseline. The emissions reduction level would increase in future years until federal buildings become "zero-emissions" buildings by 2030.

Sen. John McCain (R-Ariz.) and Sen. Joseph Lieberman (D-Conn.) have introduced the Climate Stewardship and Innovation Act of 2007 (S.280), a new and improved version of the bill they offered in 2003 and 2005, to establish a National Greenhouse Gas Database to collect, verify, and analyze information on GHG emissions. It establishes a program for market-driven reduction of GHGs through the use of tradeable allowances. Sen. Jeff Bingaman (D-N.M.) and Sen. Pete Domenici (R-N.M.) have introduced the Energy Efficiency Promotion Act (S.1115), aimed at reducing the use of fossil fuels by improving efficiency of vehicles, buildings, home appliances, and industrial equipment.

Sen. Barbara Boxer (D-Calif.) and Sen. Dianne Feinstein (D-Calif.) introduced in May the Marine Vessel Emissions Reduction Act of 2007, which directs the EPA to reduce the significant pollution emitted by oceangoing vessels at America's ports. Sen. Feinstein reintroduced the Ten-in-Ten Fuel Economy Act (S.357), which would raise the fuel economy standard for passenger cars from 25 to 35 mpg over the next 10 years, and — for the first time — would require improvements in fuel efficiency for medium and heavy-duty trucks.

President Bush Issues Greenhouse Gas Executive Order. In response to the Supreme Court's ruling on April 2 in *Massachusetts v. EPA*, President Bush announced his executive order calling for cooperation among federal agencies to find a way to begin regulating vehicle emissions by the time he leaves office based on his "Twenty in Ten" goal — cutting U.S. gasoline consumption by 20 percent over the next 10 years.

State Initiatives

Environmental Defense reports that more than 300 global warming bills have been filed in 40 states, and more than 400 mayors have committed to reducing GHG emissions in their cities.

The State Response to Climate Change: 50 State Survey. Pace Law School Center for Environmental Legal

Studies completed a comprehensive survey of state legislation, rules, and executive orders that specifically address climate change as of the end of March 2006. The survey is contained in a new book from the American Bar Association, GLOBAL CLIMATE CHANGE AND U.S. LAW (Michael B. Gerrard, ed., April 2007). The 50-state survey is available at www.abanet.org/abapubs/globalclimate/stateupdate4-30-07.pdf. The survey found that nearly all 50 states have adopted some climate change measures, that a number of regional initiatives are occurring, and that "a growing number of states are adopting renewable portfolio standards and many states are poised to adopt California's greenhouse gas emissions standards for motor vehicles."

Regional Greenhouse Gas Initiative (RGGI). New York Gov. George Pataki kicked off this initiative in 2003, which includes 10 states in the Northeast (Connecticut, Delaware, Maryland, Massachusetts, Maine, New Hampshire, New Jersey, New York, Rhode Island, and Vermont) that have joined together to reduce GHG emissions from utilities. Mandatory emission reduction targets will take effect on January 1, 2009. The RGGI is developing a cap and trade program similar to the European Union's Emissions Trading System. See www.rggi.org.

The Climate Registry. Thirty-one states, representing 70 percent of the country's population, announced a multistate and tribe collaboration aimed at developing and managing a common GHG emissions reporting system. See www.theclimateregistry.org.

California's AB 32. The Global Warming Solutions Act of 2006 — introduced by Assembly Speaker Fabian Nunez (D-Los Angeles) and signed by Gov. Schwarzenegger, codifies the state's goal of requiring the state's global warming emissions to be reduced to 1990 levels by 2020 through an enforceable statewide cap on global warming emissions to be phased in starting in 2012. Since California is the world's 12th largest source of CO2, the impacts of this cap will be significant and establish a model for other states to follow. AB 32 requires the California Air Resources Board (CARB) to develop regulations and market mechanisms to reach the state's goals. CARB is also required to convene an Environmental Justice Advisory Committee and an Economic and Technology Advancement Advisory Committee.

California wants stricter auto emissions control. California has requested a waiver from the EPA to allow the state to set tougher standards, phased in over time, to cut vehicle emissions in the state by 30 percent by 2016. Vehicles account for 41 percent of the GHG emissions in the state. Gov. Schwarzenegger has threatened to sue the EPA if a decision on its request is not made by October 25, a request made 16 months ago. Eleven other states have joined California's request and have set the same stricter vehicle emissions standards.

Western states form carbon trading market. In February 2007, five U.S. western states joined together to form a carbon trading market that lets polluters buy "carbon credits" from cleaner and greener companies. In April, British Columbia joined the bloc.

Massachusetts strengthens the state's mini-NEPA. In late April, Massachusetts Gov. Deval Patrick announced a major change in the state's environmental review process. Developers planning projects large enough to warrant a state environmental review will have to assess how the projects contribute to global warming, including both direct impacts such as smokestacks and heating with fossil fuels, and indirect impacts such as thousands of workers driving to a new office park.

Global warming and CEQA. California's attorney general has filed a CEQA claim against San Bernardino County for failing to address the effects of global warming in its environmental impact report for its general plan update. The Center for Biological Diversity filed suit first on April 11, 2007, challenging the county's general plan, which was updated to accommodate a projected 25 percent increase in population growth by 2030. The attorney general argues that the county failed to analyze the effects of the increase in GHG emissions created by the projected growth or the necessary GHG reductions required by AB 32.

New Mexico's Renewable Energy Transmission Authority (RETA). The New Mexico Legislature approved HB 188 in 2007, creating the nation's first Renewable Energy Transmission Authority to develop electric transmission with an emphasis on renewable energy development for export to out-of-state markets.

Local Initiatives

Neal Peirce notes that "cities may cover less than one percent of the earth's surface, but they generate 80 percent of the globe's heat-trapping greenhouse gases. Cities can take quicker, more inventive steps to curb emissions than cumbersome or politically encumbered national bureaucracies."[4]

Berkeley voters pass Measure G. Measure G establishes a goal of 80 percent reduction in GHG emissions by 2050 and advises the mayor to work with the community to develop a plan for council adoption which sets a 10-year emissions reduction target and identifies actions for the city and its residents to take to achieve both the 10-year target and the ultimate goal of 80 percent reduction in emissions. The city has one of the most comprehensive efforts to address climate change (www.cityofberkeley.info/sustainable). In addition to converting city vehicles and buildings to meet conservation goals, the city requires landlords to give their tenants free transit passes and is considering adopting an assessment district that would pay for installation of solar panels and then tack the costs on to the property tax bills over the course of 30 years.

New York's PlaNYC. Mayor Michael Bloomberg proposes to reduce GHG emissions by 30 percent by 2030 rather than the currently projected 25 percent increase by using many different techniques as congestion pricing; energy rehabbing of existing buildings; roadway landscaping and the planting of one million trees; "green" building standards for all new buildings; and cleaning up all of the city's power plants and contaminated brownfields to help create areas for 250,000 additional housing units, among other ideas.

In May, Bloomberg announced that the Taxi and Limousine Commission will implement new emissions and mileage standards for yellow taxicabs that will lead to a fully hybrid fleet by 2012. The new standards will be phased in over a four-year period and will reduce the carbon emissions of New York City's taxicab and for-hire vehicle fleet by 50 percent during the next decade, which will also save individual operators an average of $10,000 a year in fuel costs (www.nyc.gov/html/planyc).

U.S. Mayors' Climate Protection Agreement. After the Kyoto Protocol Agreement took effect in February 2005 without the support of the U.S., Seattle Mayor Greg Nickels issued a challenge to his fellow U.S. mayors to address climate change locally. (See www.seattle. gov/mayor/climate.) The U.S. Mayors' Climate Protection Agreement was passed unanimously in June 2005 (www.seattle.gov/mayor/climate/PDF/Resolution_FinalLanguage_06-13-05.pdf). As of May 23, 2007, 522 mayors representing over 65 million Americans have accepted the challenge to meet or exceed Kyoto Protocol targets for reducing global warming pollution. The *Climate Action Handbook* was prepared by ICLEI, Local Governments for Sustainability, in partnership with the City of Seattle and the U.S. Conference of Mayors. It includes actions and tools, as well as best practices and resources for addressing climate change at the local level (www.iclei.org/documents/USA/documents/CCP/Climate_Action_Handbook-0906.pdf).

Salt Lake City Green. Salt Lake City's goal is to reduce GHG emissions by three percent per year for the next 10 years, with a long-term goal of reducing emissions 70 percent by 2040. The city's Action Plan, at www.slcgreen.com/CAP/default.htm, provides a detailed list of actions and initiatives the city has undertaken and will pursue to meet its goal.

London CO2 — Action Today to Protect Tomorrow. London Mayor Ken Livingstone released his Action Plan in February 2007. It is included here because it could well become a model for U.S. cities: www.london.gov.uk/mayor/environment/climatechange/ccap/index.jsp.

Private Initiatives

Chicago Climate Exchange. "Chicago Climate Exchange (CCX) is the world's first and North America's only legally binding rules-based greenhouse gas emissions allowance trading system, as well as the world's only global system for emissions trading based on all six greenhouse gases. CCX members are leaders in greenhouse gas management and represent all sectors of the global economy, as well as public sector innovators. Reductions achieved through CCX are the only reductions in North America being achieved through a legally binding compliance regime, providing independent third party verification provided by NASD and price transparency." See www.chicagoclimatex.com.

Bank loans. President Bill Clinton has garnered commitments from five major global banking institutions

to lend city government and landlords about $5 billion in energy efficiency loans to replace heating, cooling, and lighting systems, to seal and upgrade windows, and to install sensors to make lighting and air conditioning more efficient. The savings in energy costs will pay back the initial investments. (New York Times, May 17, 2007).

U.S. Climate Action Partnership. A group of businesses and environmental organizations have come together to press the federal government to enact strong legislation to require significant reductions in GHG emissions. The members include Alcan Inc., Alcoa, American International Group, Inc. (AIG), Boston Scientific Corporation, BP America Inc., Caterpillar Inc., ConocoPhillips, Deere & Company, The Dow Chemical Company, Duke Energy, DuPont, Environmental Defense, FPL Group, Inc., General Electric, General Motors Corp., Johnson & Johnson, Marsh, Inc., National Wildlife Federation, Natural Resources Defense Council, The Nature Conservancy, PepsiCo, Pew Center on Global Climate Change, PG&E Corporation, PNM Resources, Shell, Siemens Corporation, and the World Resources Institute.

They issued "A Call for Action" (16-page report available at www.us-cap.org/ClimateReport.pdf), which includes their recommendations to: (1) Establish a cap and trade system that places specified limits on GHG emissions. (2) Establish short and mid-term GHG emission targets. (3) Establish a national inventory and registry by legislation no later than the end of 2008. (4) Establish a federal technology research, development and demonstration and deployment program. (5) "Congress should encourage the Administration to engage in international negotiations with the aim of establishing commitments by all major emitting countries. The post-2021 global framework should establish international GHG markets, assist vulnerable populations in adapting to climate impacts, and boost support for climate-friendly technology in developing countries" (www.us-cap.org/).

Alliance for a Sustainable Built Environment. The Alliance for Sustainable Built Environments is a group of industry leaders who practice and are recognized for leadership in sustainability and are committed to delivering high performance sustainable solutions for the built environment. See www.greenerfacilities.org.

The 2030 Challenge. The challenge was initiated by architect Ed Mazria of Santa Fe, N.M., who asserts that buildings are the major source of demand for energy and materials that produce byproduct GHGs.

Mazria wants fellow architects and others in the building community to adopt the following targets: All new buildings, developments, and major renovations shall be designed to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 50 percent of the regional (or country) average for that building type. At a minimum, an equal amount of existing building area shall be renovated annually to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 50 percent of the regional (or country) average for that building type. The fossil fuel reduction standard for all new buildings shall be increased to: 60 percent in 2010; 70 percent in 2015; 80 percent in 2020; and 90 percent in 2025.

The goal is to be carbon-neutral in 2030 (using no fossil fuel GHG-emitting energy to operate). These targets may be accomplished by implementing innovative sustainable design strategies, generating on-site renewable power and/or purchasing (20 percent maximum) renewable energy and/or certified renewable energy credits. See www.architecture2030.org.

Notes

Reprinted with permission; *Zoning and Planning Law Report,* Vol. 30, No. 7 (July 2007)

1. Gerrard, Michael B., Ed. GLOBAL CLIMATE CHANGE AND U.S. LAW, AMERICAN BAR ASSOCIATION, 2007, at 15

2. Id. at 15.

3. Id. at 15–16.

4. Neil Peirce, *Global Warming: A State and Local Rescue?* WASHINGTON POST WRITERS GROUP, MAY 27, 2007. www.postwritersgroup.com/archives/ peir0527.html.

American Planning Association
Making great communities happen

Print Now

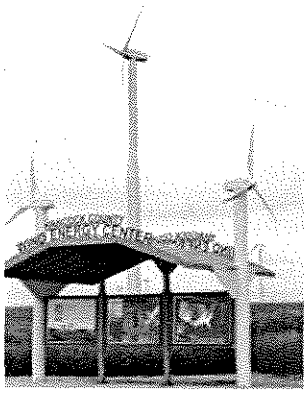
August/September 2007

Earth, Wind, and Fire

Renewable energy sources still have a long way to go in meeting our energy needs.

By George Homsy, AICP

Even the threat of global warming could not help Al Gore get around some inconvenient zoning.



The former vice president and author of *An Inconvenient Truth* wanted to install 33 solar panels on his home in upscale Belle Meade, Tennessee. A zoning prohibition against rooftop power generating equipment delayed him for months.

The city finally rewrote the code to allow solar panels in April, according to Gore spokesman Chris Song. However, the city placed restrictions on the location and color of the panels, reducing their efficiency.

Gore's hurdles symbolize the state of renewable energy in the U.S. today. Its use is growing, but it is far from reaching its full potential. From 1994 to 2005, the nation's appetite for electricity grew by almost 25 percent, according to the U.S. Energy Department's Energy Information Administration. Most of that growth was accommodated by new natural gas power plants. The renewable energy sector grew by 24 percent, but its share of the market remained fixed at just over two percent. That is a problem when it comes to global warming.

Today 40 percent of greenhouse gas emissions produced by the U.S. comes from electricity generation, according to the U.S. Environmental Protection Agency, while coal burning accounts for half of the nation's electricity, according to the Department of Energy. Coal also produces the most carbon dioxide, the biggest manmade contributor to global warming. For every million BTUs of energy produced from coal, 205 to 213 pounds of carbon dioxide are released into the atmosphere. Natural gas emits 117 pounds. Hydroelectric, wind, solar, and geothermal produce none. Neither does nuclear.

So if everyone, including President George Bush, declares global warming to be a problem, why does renewable energy seem stuck at two percent? The reasons include pricing, overcautious utilities, political favoritism, and good old-fashioned NIMBYism.

From hippie to mainstream

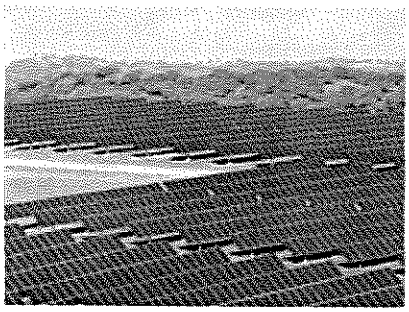
Optimistic renewable energy advocates say that the era of clean power is upon us. "As business people take a look at the long-term costs of energy, they continue to seek out alternatives," says Mark Culpepper, vice president of strategic marketing for SunEdison, which harnesses the sun for big box stores and distribution centers. "It has moved from a hippie technology to a mainstream technology."

Large companies are making significant investments in renewable power, according to Bentham Paulos, a program officer with the Energy Foundation, a San Francisco-based partnership of major donors that funds renewable energy. Over the long term, Paulos says, renewable energy such as solar or wind power will turn out to be a relatively low-risk investment for the companies "because the technologies are not subject to the fluctuations in the price of fuel, they are not subject to future emission regulations — which are going to be a big deal as concern over global warming increases — and you get your money back sooner."

Wind farms typically start generating power and bringing in revenue within the first six months after construction begins, Paulos points out. In contrast, coal and nuclear plants take five to seven years to build after the permitting process is complete.

Of the many different kinds of renewable power in the marketplace, hydroelectric is the biggest, producing three-quarters of the nation's renewable power, and solar and wind have matured and are slowly making headway. Biomass and geothermal are finding a growing niche. Even nuclear power boasts environmental credentials in a world worried about global warming. And then there are the experimental technologies that harness tides and waves.

Afternoon delight



The biggest sticking point in the growth of renewable energy is (and always has been) price. When you do not take the costs of pollution into account, electricity generated by coal (and we have a lot of coal in the U.S.) is pretty cheap. In coal-rich states such as West Virginia, the average retail price for power is only 5.14 cents per kilowatt hour. (This February, the national average retail electricity rate was 8.73 cents per kilowatt hour.)

The California Energy Commission estimated that in 2004, the cost to produce power from a new electricity generating facility would be 3.3 to 4.1 cents per kilowatt hour for coal, 6.0 cents for hydroelectric, 5.2 to 15.9 for natural gas, 4.6 for wind, and 13.5 to 42.7 cents for solar.

The price of wind power is now competitive, but solar seems less so. Is that true? To answer the question, it's important to remember that average prices tell only part of the story. A study of California pricing in 2001 found that peak power could reach $1.09 per kilowatt hour during a June afternoon — the very time when free solar energy shines.

Fuel prices sparked and then snuffed out the first modern attempt to harness the sun's power, according to energy historian Charles Smith, writing in *Technology Review*. In 1860, Auguste Mouchout started his solar research in response to France's dependence on coal. In 1878 he displayed a machine that concentrated the heat of the sun to make steam and power a refrigerator. "In spite of the seeming paradox," Mouchout wrote, "it was possible to utilize the rays of the sun to make ice."

By 1881, coal prices had dropped worldwide, Mouchout's backers disappeared, and his solar-powered engine faded into the sunset. However, his basic concept is still used today. In the southwestern U.S., nine concentrated solar plants produce about 354 megawatts of power by using mirrors to focus the sun's energy to produce steam, which spins a turbine and creates electricity.

More popular today are photovoltaic cells, which generate electricity directly from sunlight. Despite the higher cost of solar power, the annual number of solar cells in use grew tenfold from 1996 to 2005, according to the Energy Department. Further, more and more of them may soon be used on the rooftops of commercial and institutional buildings.

"If you think about it," says Culpepper, "a Staples or a Wal-Mart can beat up its vendors and get a good price on just about anything. The only place that isn't the case is energy."

Culpepper's firm helps Wal-Mart, Staples, and Kohls, among other companies, to stabilize energy costs through solar power. SunEdison installs and maintains its own photovoltaic panels on the vast rooftops of the big box stores and their distribution centers and sells the power back to the building owner at prices that are fixed for 10 or 20 years. Culpepper says solar power helps control costs and smoothes out peak power prices.

Don't blow in my backyard

Wind power is also growing in popularity. According to the Department of Energy, the costs of wind power have plummeted 85 percent over the last 20 years. Wind towers are going up in record numbers, according to the 2007 annual report of the American Wind Energy Association: 2,400 megawatts of power were installed in 2006 and over 3,000 megawatts will go up during 2007. Enough electricity is produced by wind nationwide to power nearly three million homes.

With a more mature industry have come investments by bigger companies and the mergers of many smaller ones, says Dan Albano, director of environmental and regulatory affairs of Global Winds Harvest, Inc.

Further, advances in tower siting science and turbine technology have mitigated many of the common worries about wind power: turbine noise and shadow flicker as well the effects on bird and bat migration. Still, the spread of wind power has been hampered in a couple of important ways.

"There's no way to get around it. At 300 feet tall, wind turbines tower over everything else," says Matt Allen, a visual assessment expert at Saratoga Associates, which helped New York State develop guidelines for assessing and mitigating the visual impacts of towers. Allen helps wind developers simulate what their towers will look like from different vantage points — a factor in environmental reviews.

"Some people think wind towers are majestic, almost like artistic sculptures. Others find them too industrial in rural settings. It's very subjective," says Allen.

Dan Albano says that concern about visual impact is the biggest hurdle to using wind power in some locations and that resistance has hardened in places where people have summer homes — in New York State and Colorado, for example. It's different in North Dakota, he says, because "most people there are still trying to make money from the land; it's more an issue of making sure you're getting as many turbines as your neighbor."

However, wind power has other problems in North Dakota, according to Albano. The price of power is relatively cheap there, making wind power less competitive, and the transmission grid is not as extensive as it could be. "Many areas with a good wind resource do not have easy access to the grid," he says, "and, since deregulation, you don't know who is going to take responsibility for upgrading and maintaining the transmission system."

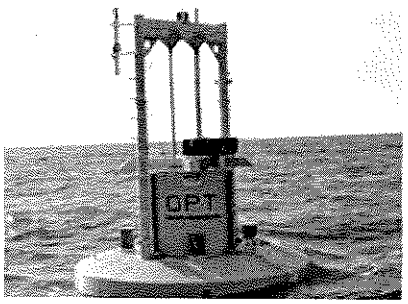
Most wind farms are located in rural areas, where one landowner can host multiple turbines. An exception is the urban wind farm established recently in Lackawanna, New York, outside of Buffalo. Steel Winds, a project of BQ Energy and UPC Wind, produces 20 megawatts of power, enough electricity for 7,000 homes. The eight 310-foot towers rise next to the shell of an old Bethlehem Steel plant. Eventually 32 turbines could go up on the former Superfund site.

"It's a great reuse of the land," says Matt Allen. "Unfortunately, many urban or industrial areas do not have such a good wind resource."

High-tech turbines catch more than wind these days. A handful of companies are trying to plant turbines on the bottom of the ocean in order to harvest water power. Rather than rely on the flows of rivers or dammed-up water, these projects are tapping the energy of the tides and waves.

Projects are in the development stage in Massachusetts, Rhode Island, New York, Massachusetts, Hawaii, California, and Washington. Already one company, Verdant Power, is tapping the tidal energy near New York City to power a grocery store and a garage. This year the company is installing six more turbines to generate a total of 200 kilowatts of power. The company's president told EnergyBulletin.net that if all goes well, Verdant would expand the system to 200 to 300 turbines, generating 10 megawatts of power by 2010.

The long view



When the Association for the Protection of the Adirondacks designed a new building in 2004, its goal was to reflect the group's position as one of New York's premier conservation organizations. "We wanted to be on the leading edge of being green," says Ken Rimany, director of operations.

The organization examined many options for its new offices, which were attached to the founder's historic home in Niskayuna, New York. It settled on a geothermal system despite heavy upfront costs.

Operating costs are significantly lower — because the cost of fuel is zero.

Rimany says the annual bill to heat and cool the group's offices dropped from $3.90 per square foot to the current $1.84 per square foot, although some of that savings comes from using other technology, such as programmable thermostats to manage the building's environment.

Another geothermal benefit: "You don't hear a thing," Rimany says, "and everything is out of sight." That is crucial in the organization's largely residential neighborhood.

Geothermal heat pumps work by using the earth as a source of both heat and cooling. Just a few feet underground, the temperature remains a steady 45 to 75 degrees Fahrenheit, depending on latitude. In the winter, geothermal heat pumps pull heat out of the ground through a heat exchanger connected to fluid-filled tubing that runs through boreholes in a backyard or under a parking lot. In the summer, the system pulls heat out of a building and dumps it back into the earth.

Lake source cooling is a variation on geothermal. Here the chilly waters at the bottom of a lake are pumped to a heat exchanger, and the cold is transferred to a chilled water supply loop that helps cool buildings. Cornell University uses the waters of Cayuga Lake to cool campus buildings. The $55 million project allowed the university to decommission several large chillers filled with chlorofluorocarbon and reduce cooling costs by 80 percent. The system is designed to last 75 to 100 years, and the university estimates it will save enough energy to power 2,500 homes annually.

In 2004, several downtown Toronto office buildings began to be cooled with a system that draws its cold water from deep in Lake Ontario, where the temperature is 39 degrees Fahrenheit. The system can cool 100 office towers and reduces cooling electricity usage by 90 percent, eliminating the need to produce 61 megawatts of power.

Deeper into the earth the temperatures start to rise dramatically because our planet has a molten core, which transmits its heat to the rocks above it. In the West, the earth's crust is thin enough to allow power plants to pump water through this superheated rock to create steam, which is brought to the surface to turn turbines. Other operations create power by tapping reservoirs of steam already trapped beneath the earth's surface.

In 2005, data compiled by the Geothermal Energy Association showed that 0.37 percent of U.S. electricity comes from geothermal plants, but in some places, such as California, geothermal accounts for five percent of electricity production. There are also geothermal power plants in Alaska, Hawaii, Nevada, and Utah. Another seven states have plants in various stages of development.

The organization estimates that geothermal energy plants can produce electricity in the western U.S. for about five cents per kilowatt hour. As with solar and wind power, the fuel for geothermal energy is free and inexhaustible. Unlike solar and wind, geothermal energy is available 24/7.

Biopower, a pre-fossil fuel

The name says it all. Fossil fuels are the remains of long dead plants and animals transformed over millions of years by the heat and pressure of the earth into coal, oil, and natural gas.

Biopower uses the biomass of today (i.e. plants) to help generate electricity. Most biopower facilities simply burn plants to produce steam. The key is to locate the plants near an abundant fuel supply. An example: Tamarack Energy plans three facilities in heavily forested parts of New England.

The Natural Resources Defense Council estimates that 39 million tons of crop residues go unused each year in the U.S. — enough to produce 7,500 megawatts of electricity. Another option is switchgrass, which is native to the American prairie, grows quickly, and produces little nitrogen runoff pollution.

Burning wood or other crops may not sound environmentally friendly, but today's high-efficiency burners release far fewer pollutants and greenhouse gases than coal plants do. Any greenhouse gases that are emitted can be offset by replanting fields with a new round of fuel crops, creating a closed loop of carbon.

In fact, one of the fastest ways to make a dent in our greenhouse gas emissions may be by co-firing — that is, getting traditional coal-fired plants to use biomass as well. The Department of Energy estimates that mixing coal with 15 percent biomass can cut greenhouse gas emissions by 18 percent.

Another biopower technology, called gasification, uses high temperatures and a low-oxygen environment to convert biomass into a gas that can be converted into other products or burned to produce power. Methane, produced by the natural decay of organic matter, is a source of biopower as well as a potent greenhouse gas. Instead of allowing it to escape from landfills, in some places it is captured and piped to a central point, where it is filtered and cleaned before burning.

Pig manure is yet another source of biopower. In ecologically sensitive environments, especially near water bodies, hog farmers cannot spread the manure as fertilizer. Frank Miller's company, Innovative Environmental Products, offers a technology that removes so much water from hog waste that the remaining solids can be burned to produce electricity. He touts this as a safe way to manage wastes and allow farmers to sell power back to the utility.

Greening nuclear power

Although it has been 11 years since a new nuclear reactor has come online in the U.S., this nation is the largest producer of nuclear power in the world. About 20 percent of U.S. electricity comes from nuclear plants. France, with a smaller overall energy appetite, gets 78 percent of its power from this source.

Concern over global warming has allowed the nuclear power industry to set itself up as an alternative energy because nuclear energy produces no greenhouse gas emissions. The Nuclear Energy Institute, an industry lobbying group, says that nuclear power has substituted for the production of over 680 million metric tons of carbon and is responsible for almost three-quarters of all emissions-free electricity produced in the nation. Utility and energy companies have told the federal Nuclear Regulatory Commission, which approves new reactors, to expect 28 applications for new reactors between 2007 and 2009.

To help smooth the resurgence, the commission has pre-approved four reactor designs, which are simpler and safer than the reactors of the 1970s, according to David McIntyre, a public affairs officer for the commission. He says the commission has the approval process down to just 42 months. In addition, for the past two years the Energy and Treasury departments have offered tax benefits to encourage the first handful of reactors to push forward.

A recurring problem is the disposal of high-level radioactive waste, especially spent nuclear fuel rods, which will stay toxic for tens of thousands of years. Today's nuclear plants must store their waste on-site until a central repository is completed.

The Energy Department has spent 20 years studying Nevada's Yucca Mountain as just such a repository. Nuclear waste would be stored underground in layered steel canisters for the next 10,000 years. Under its most optimistic timetable, the department hopes to begin receiving waste in 2018. However, the nuclear industry estimates that 78 nuclear plants will run out of room to store waste by 2010.

Government push

Even as renewable power prices come down, many utilities have barely tiptoed into the sector. Mark Culpepper says utilities prefer to stay with traditional generation techniques until pushed by fuel prices or government regulation.

For their part, governments are pushing renewable portfolio standards. Some 20 states have set deadlines for utilities to buy a certain amount of their power from renewable power sources. The sources, required amounts, and deadlines vary from state to state.

Many alternative energy advocates would like to see a national renewable portfolio standard. Bentham Paulos of the Energy Foundation says the most popular suggestions floating around Capitol Hill would require utilities to buy 15 or 20 percent of their power from renewable energy suppliers by 2020.

The other interesting trend is the increasingly distributed nature of the nation's power production. One vision for a distributed energy future can be seen in California's Million Roofs Initiative. Signed into law in August 2006 by Gov. Arnold Schwarzenegger, the program raises the cap on net metering — how much solar power households can sell back to a utility.

The program also requires home builders to offer solar panels as a standard option. It is estimated that the program will produce 3,000 megawatts of clean power and reduce the output of greenhouse gases by three million tons over the next 10 years.

A CBS-*New York Times* poll conducted in April found that 87 percent of Americans support the use of renewable energy sources, even with the caveat that they are more expensive and may be less reliable than other sources. Clearly renewable power has a long way to go in this country. But just as clearly, people want to push in that direction.

George Homsy is a city and regional planner for Saratoga Associates in Saratoga Springs, New York.

Sidebar: Growing Gasoline

Sidebar: The Charge of the Biodiesel Brigade

Images: Top — Turbines at the Hancock County Wind Energy Center in Garner, Iowa. Photo courtesy American Wind Energy Association. Middle — The 11-megawatt Serpa Solar Power Plant in Serpa, Portugal. Photo courtesy SunPower. Bottom — Ocean Power Technologies' PowerBuoy converts ocean wave energy into electric power. Photo Ocean Power Technologies Inc.

©Copyright 2007 American Planning Association All Rights Reserved