



# Technical Advisory

## **CEQA AND CLIMATE CHANGE: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review**

This technical advisory is one in a series of advisories provided by the Governor's Office of Planning and Research (OPR) as a service to professional planners, land use officials and CEQA practitioners. OPR issues technical guidance from time to time on issues that broadly affect the practice of CEQA and land use planning. The emerging role of CEQA in addressing climate change and greenhouse gas emissions has been the topic of much discussion and debate in recent months. This document provides OPR's perspective on the issue.

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### **I. PURPOSE**

General scientific consensus and increasing public awareness regarding global warming and climate change have placed new focus on the California Environmental Quality Act (CEQA) review process as a means to address the effects of greenhouse gas (GHG) emissions from proposed projects on climate change. Many public agencies—along with academic, business, and community organizations—are striving to determine the appropriate means by which to evaluate and mitigate the impacts of proposed projects on climate change. Approaches and methodologies for calculating GHG emissions and addressing the environmental impacts through CEQA review are rapidly evolving and are increasingly available to assist public agencies to prepare their CEQA documents and make informed decisions.

The Governor's Office of Planning and Research (OPR) will develop, and the California Resources Agency (Resources Agency) will certify and adopt amendments to the Guidelines implementing the California Environmental Quality Act ("CEQA Guidelines"), on or before January 1, 2010, pursuant to Senate Bill 97 (Dutton, 2007). These new CEQA Guidelines will provide regulatory guidance on the analysis and mitigation of GHG emissions in CEQA documents. In the interim, OPR offers the following informal guidance regarding the steps lead agencies should take to address climate change in their CEQA documents. This guidance was developed in cooperation with the Resources Agency, the California Environmental Protection Agency (Cal/EPA), and the California Air Resources Board (ARB).

## II. BACKGROUND

Climate change refers to any significant change in measures of climate, such as average temperature, precipitation, or wind patterns over a period of time. Climate change may result from natural factors, natural processes, and human activities that change the composition of the atmosphere and alter the surface and features of the land. Significant changes in global climate patterns have recently been associated with global warming, an average increase in the temperature of the atmosphere near the Earth's surface, attributed to accumulation of GHG emissions in the atmosphere. Greenhouse gases trap heat in the atmosphere, which in turn heats the surface of the Earth. Some GHGs occur naturally and are emitted to the atmosphere through natural processes, while others are created and emitted solely through human activities. The emission of GHGs through the combustion of fossil fuels (i.e., fuels containing carbon) in conjunction with other human activities, appears to be closely associated with global warming.

State law defines GHG to include the following: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (Health and Safety Code, section 38505(g).) The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide.

### Requirements of AB 32 and SB 97

Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006 (Nunez, 2006), recognizes that California is the source of substantial amounts of GHG emissions. The statute begins with several legislative findings and declarations of intent, including the following:

Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts 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 snow pack, 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. (Health and Safety Code, section 38501.)

In order to avert these consequences, AB 32 establishes a state goal of reducing GHG emissions to 1990 levels by the year 2020 (a reduction of approximately 25 percent from forecast emission levels) with further reductions to follow. The law requires the ARB to establish a program to track and report GHG emissions; approve a scoping plan for achieving the maximum technologically feasible and cost effective reductions from sources of GHG emissions; adopt early reduction measures to begin moving forward; and adopt, implement and enforce regulations – including market mechanisms such as “cap-and-trade” programs – to ensure the required reductions occur. The ARB recently adopted a statewide GHG emissions limit and an emissions inventory, along with requirements to measure, track, and report GHG emissions by the industries it determined to be significant sources of GHG emissions.

CEQA requires public agencies to identify the potentially significant effects on the environment of projects they intend to carry out or approve, and to mitigate significant effects whenever it is feasible to do so. While AB 32 did not amend CEQA to require new analytic processes to account for the environmental impacts of GHG emissions from projects subject to CEQA, it does acknowledge that such emissions cause significant adverse impacts to human health and the environment.

Senate Bill 97, enacted in 2007, amends the CEQA statute to clearly establish that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis. It directs OPR to develop draft CEQA Guidelines “for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions” by July 1, 2009 and directs the Resources Agency to certify and adopt the CEQA Guidelines by January 1, 2010.

## Requirements of CEQA

CEQA is a public disclosure law that requires public agencies to make a

good-faith, reasoned effort, based upon available information, to identify the potentially significant direct and indirect environmental impacts—including cumulative impacts— of a proposed project or activity. The CEQA process is intended to inform the public of the potential environmental effects of proposed government decisions and to encourage informed decision-making by public agencies. In addition, CEQA obligates public agencies to consider less environmentally-damaging alternatives and adopt feasible mitigation measures to reduce or avoid a project's significant impacts.

The lead agency is required to prepare an Environmental Impact Report (EIR), a Mitigated Negative Declaration, or equivalent document, when it determines that the project's impacts on the environment are potentially significant. This determination of significance must be based upon substantial evidence in light of all the information before the agency.

Although the CEQA Guidelines, at Appendix G, provide a checklist of suggested issues that should be addressed in an EIR, neither the CEQA statute nor the CEQA Guidelines prescribe thresholds of significance or particular methodologies for performing an impact analysis. This is left to lead agency judgment and discretion, based upon factual data and guidance from regulatory agencies and other sources where available and applicable. A threshold of significance is essentially a regulatory standard or set of criteria that represent the level at which a lead agency finds a particular environmental effect of a project to be significant. Compliance with a given threshold means the effect normally will be considered less than significant. Public agencies are encouraged but not required to adopt thresholds of significance for environmental impacts. Even in the absence of clearly defined thresholds for GHG emissions, the law requires that such emissions from CEQA projects must be disclosed and mitigated to the extent feasible whenever the lead agency determines that the project contributes to a significant, cumulative climate change impact.

We realize that perhaps the most difficult part of the climate change analysis will be the determination of significance. Although lead agencies typically rely on local or regional definitions of significance for most environmental issues, the global nature of climate change warrants investigation of a statewide threshold of significance for GHG emissions. To this end, OPR has asked ARB technical staff to recommend a method for setting thresholds which will encourage consistency and uniformity in the CEQA analysis of GHG emissions throughout the state. Until such time as state guidance is available on thresholds of significance for GHG emissions, we recommend the following approach to your CEQA analysis.

### III. RECOMMENDED APPROACH

Each public agency that is a lead agency for complying with CEQA needs to develop its own approach to performing a climate change analysis for projects that generate GHG emissions. A consistent approach should be applied for the analysis of all such projects, and the analysis must be based on best available information. For these projects, compliance with CEQA entails three basic steps: identify and quantify the GHG emissions; assess the significance of the impact on climate change; and if the impact is found to be significant, identify alternatives and/or mitigation measures that will reduce the impact below significance.

Lead agencies should determine whether greenhouse gases may be generated by a proposed project, and if so, quantify or estimate the GHG emissions by type and source. Second, the lead agency must assess whether those emissions are individually or cumulatively significant. When assessing whether a project's effects on climate change are "cumulatively considerable" even though its GHG contribution may be individually limited, the lead agency must consider the impact of the project when viewed in connection with the effects of past, current, and probable future projects. Finally, if the lead agency determines that the GHG emissions from the project as proposed are potentially significant, it must investigate and implement ways to avoid, reduce, or otherwise mitigate the impacts of those emissions. Although the scientific knowledge and understanding of how best to perform this analysis is rudimentary and still evolving, many useful resources are available (see Attachment 1).

Until such time as further state guidance is available on thresholds of significance, public agencies should consider the following general factors when analyzing whether a proposed project has the potential to cause a significant climate change impact on the environment.

#### Identify GHG Emissions

- Lead agencies should make a good-faith effort, based on available information, to calculate, model, or estimate the amount of CO<sub>2</sub> and other GHG emissions from a project, including the emissions associated with vehicular traffic, energy consumption, water usage and construction activities.
- Technical resources, including a variety of modeling tools, are available to assist public agencies to quantify GHG emissions. OPR recognizes that more sophisticated emissions models for particular types of projects are continually being developed and that the state-of-the-art quantification

models are rapidly changing. OPR will periodically update the examples of modeling tools identified in Attachment 2.

- There is no standard format for including the analysis in a CEQA document. A GHG/climate change analysis can be included in one or more of the typical sections of an EIR (e.g., air quality, transportation, energy) or may be provided in a separate section on cumulative impacts or climate change.

## Determine Significance

- When assessing a project's GHG emissions, lead agencies must describe the existing environmental conditions or setting, without the project, which normally constitutes the baseline physical conditions for determining whether a project's impacts are significant.
- As with any environmental impact, lead agencies must determine what constitutes a significant impact. In the absence of regulatory standards for GHG emissions or other scientific data to clearly define what constitutes a "significant impact", individual lead agencies may undertake a project-by-project analysis, consistent with available guidance and current CEQA practice.
- The potential effects of a project may be individually limited but cumulatively considerable. Lead agencies should not dismiss a proposed project's direct and/or indirect climate change impacts without careful consideration, supported by substantial evidence. Documentation of available information and analysis should be provided for any project that may significantly contribute new GHG emissions, either individually or cumulatively, directly or indirectly (e.g., transportation impacts).
- Although climate change is ultimately a cumulative impact, not every individual project that emits GHGs must necessarily be found to contribute to a significant cumulative impact on the environment. CEQA authorizes reliance on previously approved plans and mitigation programs that have adequately analyzed and mitigated GHG emissions to a less than significant level as a means to avoid or substantially reduce the cumulative impact of a project.

## Mitigate Impacts

- Mitigation measures will vary with the type of project being contemplated, but may include alternative project designs or locations that conserve energy and water, measures that reduce vehicle miles traveled



(VMT) by fossil-fueled vehicles, measures that contribute to established regional or programmatic mitigation strategies, and measures that sequester carbon to offset the emissions from the project.

- The lead agency must impose all mitigation measures that are necessary to reduce GHG emissions to a less than significant level. CEQA does not require mitigation measures that are infeasible for specific legal, economic, technological, or other reasons. A lead agency is not responsible for wholly eliminating all GHG emissions from a project; the CEQA standard is to mitigate to a level that is “less than significant”.
- If there are not sufficient mitigation measures that the lead agency determines are feasible to achieve the less than significant level, the lead agency should adopt those measures that are feasible, and adopt a Statement of Overriding Considerations that explains why further mitigation is not feasible. A Statement of Overriding Considerations must be prepared when the lead agency has determined to approve a project for which certain impacts are unavoidable. These statements should explain the reasons why the impacts cannot be adequately mitigated in sufficient detail, and must be based on specific facts, so as not to be conclusory.
- Agencies are encouraged to develop standard GHG emission reduction or mitigation measures that can be applied on a project-by-project basis. Attachment 3 contains a preliminary menu of measures that lead agencies may wish to consider. This list is by no means exhaustive or prescriptive. Lead agencies are encouraged to develop their own measures and/or propose project alternatives to reduce GHG emissions, either at a programmatic level or on a case-by-case review.
- In some cases GHG emission reduction measures will not be feasible or may not be effective at a project level. Rather, it may be more appropriate and more effective to develop and adopt program-level plans, policies and measures that will result in a reduction of GHG emissions on a regional level.

#### IV. ADDITIONAL LAND USE CONSIDERATIONS

CEQA can be a more effective tool for GHG emissions analysis and mitigation if it is supported and supplemented by sound development policies and practices that will reduce GHG emissions on a broad planning scale and that can provide the basis for a programmatic approach to project-specific CEQA analysis and mitigation.

Local governments with land use authority are beginning to establish policies that result in land use patterns and practices that will result in less energy use and reduce GHG emissions. For example, some cities and counties have adopted general plans and policies that encourage the development of compact, mixed-use, transit-oriented development that reduces VMT; encourage alternative fuel vehicle use; conserve energy and water usage; and promote carbon sequestration. Models of such developments exist throughout the state (see OPR climate change website for examples of city and county plans and policies, referenced in Attachment 1).

For local government lead agencies, adoption of general plan policies and certification of general plan EIRs that analyze broad jurisdiction-wide impacts of GHG emissions can be part of an effective strategy for addressing cumulative impacts and for streamlining later project-specific CEQA reviews.

International, national, and statewide organizations such as ICLEI (Local Governments for Sustainability), the Cities for Climate Protection, and the Clean Cities Coalition—to name just a few—have published guidebooks to help local governments reduce GHG emissions through land use planning techniques and improved municipal operations. Links to these resources are provided at the end of this advisory.

Regional agencies can also employ a variety of strategies to reduce GHG emissions through their planning processes. For example, regional transportation planning agencies adopt plans and programs that address congestion relief, jobs-to-housing balance, reduction of vehicle miles traveled (VMT), and other issues that have implications for GHG emission reductions.

State agencies are also tackling the issue of climate change. Some have adopted or support policies and programs that take climate change into account, including the Department of Water Resources' State Water Plan; the Department of Transportation's State Transportation Plan; and the Business, Housing and Transportation Agency's Regional Blueprint Planning Program. These efforts not only raise public awareness of climate change and how the State can reduce GHG emissions, but also offer specific information and resources for lead agencies to consider.

## V. NEXT STEPS

OPR has asked ARB technical staff to recommend a method for setting a threshold of significance for GHG emissions. OPR has requested that the ARB identify a range of feasible options, including qualitative and quantitative options.



OPR is actively seeking input from the public and stakeholder groups, as it develops draft CEQA Guidelines for GHG emissions. OPR is engaged with the Resources Agency and other expert state agencies, local governments, builders and developers, environmental organizations, and others with expertise or an interest in the development of the Guidelines.

OPR will conduct public workshops later this year to receive input on the scope and content of the CEQA Guidelines amendments. It is OPR's intent to release a preliminary draft of the CEQA Guidelines amendments for public review and comment in the fall. This will enable OPR to deliver a proposed package of CEQA Guidelines amendments to the Resources Agency as early as January 2009, well before the statutory due date of July 1, 2009.

We encourage public agencies and the public to refer to the OPR website at [www.opr.ca.gov](http://www.opr.ca.gov) for information about the CEQA Guidelines development process and to subscribe to OPR's notification system for announcements and updates.

For more information about this technical advisory and assistance in addressing the impacts of GHG emissions on the environment, please contact:

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## ATTACHMENTS

1. References and Information Sources
2. Technical Resources/Modeling Tools to Estimate GHG Emissions
3. Examples of GHG Reduction Measures

# Attachment I

## References and Information Sources

The following is a list of websites of organizations that can offer additional information regarding methods to characterize, quantify, assess and reduce GHG emissions. In addition, a list of useful resources and reference materials is provided on the subject of climate change and greenhouse gases.

### ORGANIZATIONS

- Governor's Office of Planning and Research  
<http://www.opr.ca.gov>
- California Climate Action Team  
[http://www.climatechange.ca.gov/climate\\_action\\_team/](http://www.climatechange.ca.gov/climate_action_team/)
- California Climate Change Portal  
<http://www.climatechange.ca.gov>
- California Air Resources Board Climate Change Website  
<http://www.arb.ca.gov/cc/cc.htm>
- California Climate Action Registry  
<http://www.climateregistry.org/>
- California Department of Water Resources, Climate Change and California Water Plan Website  
<http://www.waterplan.water.ca.gov/climate/>
- California Energy Commission Climate Change Proceedings  
[http://www.energy.ca.gov/global\\_climate\\_change/index.html](http://www.energy.ca.gov/global_climate_change/index.html)
- California Public Utilities Commission, Climate Change Website  
[http://www.cpuc.ca.gov/static/energy/electric/climate+change/\\_index.htm](http://www.cpuc.ca.gov/static/energy/electric/climate+change/_index.htm)
- Green California Website  
<http://www.green.ca.gov/default.htm>
- Western Climate Initiative  
<http://www.westernclimateinitiative.org>

- California Air Pollution Control Officers Association  
<http://www.capcoa.org>
- Local Governments for Sustainability (ICLEI)  
<http://www.iclei.org/>
- ICLEI Cities for Climate Protection (CCP)  
<http://www.iclei.org/index.php?id=800>
- United Nations Framework Convention on Climate Change  
<http://unfccc.int/2860.php>
- Intergovernmental Panel on Climate Change  
<http://www.ipcc.ch>
- United States Environmental Protection Agency  
<http://www.epa.gov/climatechange/>
- City of Seattle U.S. Mayors Climate Protection Agreement  
<http://www.seattle.gov/mayor/climate/>
- Mayors for Climate Protection  
<http://www.coolmayors.com>
- U.S. Conference of Mayors Climate Protection Web Page  
<http://usmayors.org/climateprotection>
- Institute for Local Government California Climate Action Network  
<http://www.ca-ilg.org/climatechange>

## STATUTES, REGULATIONS, AND EXECUTIVE ORDERS

- SB 97  
[http://opr.ca.gov/ceqa/pdfs/SB\\_97\\_bill\\_20070824\\_chaptered.pdf](http://opr.ca.gov/ceqa/pdfs/SB_97_bill_20070824_chaptered.pdf)
- SB 97 Governor's Signing Message  
<http://opr.ca.gov/ceqa/pdfs/SB-97-signing-message.pdf>
- AB 32  
[http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab\\_0001-0050/ab\\_32\\_bill\\_20060927\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf)
- AB 1493  
[http://www.leginfo.ca.gov/pub/01-02/bill/asm/ab\\_1451-1500/ab\\_1493\\_bill\\_20020722\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/01-02/bill/asm/ab_1451-1500/ab_1493_bill_20020722_chaptered.pdf)

- Regulations implementing AB 1493  
<http://www.arb.ca.gov/regact/grnhsgas/revfro.pdf> and <http://www.arb.ca.gov/regact/grnhsgas/revtp.pdf>
- SB 1368  
[http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb\\_1351-1400/sb\\_1368\\_bill\\_20060929\\_chaptered.pdf](http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb_1351-1400/sb_1368_bill_20060929_chaptered.pdf)
- Executive Order S-01-07 regarding low carbon standard for transportation fuels  
<http://gov.ca.gov/index.php?/executive-order/5172/>
- Executive Order S-20-06 regarding implementation of AB 32  
<http://gov.ca.gov/index.php?/executive-order/4484/>
- Executive Order S-3-05 regarding greenhouse gas goals  
<http://gov.ca.gov/index.php?/executive-order/1861/>
- Executive Order S-20-04 regarding energy conservation by state  
<http://gov.ca.gov/index.php?/executive-order/3360/>

## REPORTS

- OPR List of Environmental Documents Addressing Climate Change  
[http://opr.ca.gov/ceqa/pdfs/Environmental\\_Assessment\\_Climate\\_Change.pdf](http://opr.ca.gov/ceqa/pdfs/Environmental_Assessment_Climate_Change.pdf)
- OPR List of Local Plans Addressing Climate Change  
[http://opr.ca.gov/ceqa/pdfs/City\\_and\\_County\\_Plans\\_Addressing\\_Climate\\_Change.pdf](http://opr.ca.gov/ceqa/pdfs/City_and_County_Plans_Addressing_Climate_Change.pdf)
- *Climate Action Team Proposed Early Action Measures to Mitigate Climate Change in California*, April 2007  
[http://www.climatechange.ca.gov/climate\\_action\\_team/reports/2007-04-20\\_CAT\\_REPORT.PDF](http://www.climatechange.ca.gov/climate_action_team/reports/2007-04-20_CAT_REPORT.PDF)
- California Air Resources Board, *Early Action Items to Mitigate Climate Change in California*, October 2007  
[http://www.arb.ca.gov/cc/ccea/meetings/ea\\_final\\_report.pdf](http://www.arb.ca.gov/cc/ccea/meetings/ea_final_report.pdf)
- California Air Resourced Board, *Draft Greenhouse Gas Inventory*, November 2007  
[http://www.arb.ca.gov/cc/inventory/data/tables/rpt\\_Inventory\\_IPCC\\_All\\_2007-11-19.pdf](http://www.arb.ca.gov/cc/inventory/data/tables/rpt_Inventory_IPCC_All_2007-11-19.pdf)
- *Climate Action Team Report to the Governor and Legislature*, March 2006,  
[http://www.climatechange.ca.gov/climate\\_action\\_team/reports/index.html](http://www.climatechange.ca.gov/climate_action_team/reports/index.html)

- California Climate Change Center, *Our Changing Planet: Assessing the Risks to California - Summary Report*  
<http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF>  
Detailed reports available at: [http://www.climatechange.ca.gov/biennial\\_reports/2006report/index.html](http://www.climatechange.ca.gov/biennial_reports/2006report/index.html)
- California Energy Commission, *2007 Integrated Energy Policy Report Update*  
<http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF>
- California Department of Water Resources, *Progress on Incorporating Climate Change into Management of California's Water Resources*  
<http://baydeltaoffice.water.ca.gov/climatechange/DWRClimateChangeJuly06.pdf> - pagemode=bookmarks&page=1
- *Climate Action Program at Caltrans*, December 2006  
<http://www.dot.ca.gov/docs/ClimateReport.pdf>
- California Air Pollution Control Officers Association, *CEQA & Climate Change*, January 2008  
<http://www.capcoa.org/ceqa/CAPCOA%20White%20Paper%20-%20CEQA%20and%20Climate%20Change.pdf>
- West Coast Governors' Global Warming Initiative, November 2004  
[http://www.climatechange.ca.gov/westcoast/documents/2004-11\\_final\\_report/2004-11-18\\_STAFF\\_RECOMMENDS.PDF](http://www.climatechange.ca.gov/westcoast/documents/2004-11_final_report/2004-11-18_STAFF_RECOMMENDS.PDF)
- Western Climate Initiative Work Plan, October 2007  
<http://www.westernclimateinitiative.org/ewebeditpro/items/O104F13792.pdf>
- California Climate Change Center, University of California at Berkeley, *Managing Greenhouse Gas Emissions in California*, 2007  
[http://calclimate.berkeley.edu/managing\\_GHGs\\_in\\_CA.html](http://calclimate.berkeley.edu/managing_GHGs_in_CA.html)
- U.S. Conference of Mayors, *Energy & Environment Best Practices*  
<http://www.usmayors.org/climateprotection/AtlantaEESummitCDROMVersion.pdf>
- *U.S. Mayors Climate Protection Agreement Climate Action Handbook*, 2006  
<http://www.seattle.gov/climate/docs/ClimateActionHandbook.pdf>
- Natural Capitalism Solutions *Climate Protection Manual for Cities*, June 2007  
<http://www.climatemanual.org>

- National Governor's Association Center for Best Practices *Growing with Less Greenhouse Gases*, November 2002  
<http://www.nga.org/cda/files/112002ghg.pdf>
- National Governor's Association Center for Best Practices *State and Regional Greenhouse Gas Initiatives*, October 2006  
<http://www.nga.org/Files/pdf/0610GREENHOUSE.PDF>
- United States Climate Change Program *The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States*, May 2008  
[http://www.usda.gov/oc/global\\_change/sap\\_2007\\_FinalReport.htm](http://www.usda.gov/oc/global_change/sap_2007_FinalReport.htm)



# Attachment 2

## Technical Resources/Modeling Tools to Estimate GHG Emissions

| TOOL                                                                                                                   | AVAILABILITY                                                                                                                                       | SCOPE<br>LOCAL/<br>REGIONAL                                                                       | SCOPE<br>TRANSPORTATION/<br>BUILDINGS                                                                                                                                                                                                                      | DATA INPUT<br>REQUIREMENTS                                                                                                                                                                 | DATA<br>OUTPUT                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>URBEMIS</b>                                                                                                         | <ul style="list-style-type: none"> <li>Download</li> <li>Public domain (free)</li> </ul>                                                           | <ul style="list-style-type: none"> <li>Local project level</li> </ul>                             | <ul style="list-style-type: none"> <li>Transportation</li> <li>Some building (area source) outputs</li> <li>Construction</li> </ul>                                                                                                                        | <ul style="list-style-type: none"> <li>Land use information</li> <li>Construction, area source, and transportation assumptions</li> </ul>                                                  | <ul style="list-style-type: none"> <li>CO<sub>2</sub> (pounds per day)</li> <li>Mitigation impacts</li> </ul>  |
| <b>Clean Air and Climate Protection (CACP) Software</b>                                                                | <ul style="list-style-type: none"> <li>Download</li> <li>Available to public agencies (free)</li> </ul>                                            | <ul style="list-style-type: none"> <li>Local project level</li> </ul>                             | <ul style="list-style-type: none"> <li>Buildings</li> <li>Communities</li> <li>Governments</li> </ul>                                                                                                                                                      | <ul style="list-style-type: none"> <li>Energy usage</li> <li>Waste generation and disposal</li> <li>Transportation fuel usage or VMT</li> </ul>                                            | <ul style="list-style-type: none"> <li>CO<sub>2</sub>e (tons per year)</li> </ul>                              |
| <b>Sustainable Communities Model (SCM)</b>                                                                             | <ul style="list-style-type: none"> <li>Custom model</li> </ul>                                                                                     | <ul style="list-style-type: none"> <li>Regional</li> <li>Scalable to site level</li> </ul>        | <ul style="list-style-type: none"> <li>Transportation</li> <li>Buildings</li> <li>Neighborhoods</li> <li>Master planned communities</li> </ul>                                                                                                             | <ul style="list-style-type: none"> <li>Location and site specific information</li> <li>Transportation assumptions</li> <li>On-site energy usage</li> </ul>                                 | <ul style="list-style-type: none"> <li>CO<sub>2</sub>e (tons per year)</li> </ul>                              |
| <b>Internet-accessed Planning for Community Energy, Economic and Environmental Sustainability I-PLACE<sup>3</sup>S</b> | <ul style="list-style-type: none"> <li>Web-based</li> <li>Small access fee</li> <li>Full model now available in eight CA counties</li> </ul>       | <ul style="list-style-type: none"> <li>Regional</li> <li>Scalable to site level</li> </ul>        | <ul style="list-style-type: none"> <li>Transportation</li> <li>Housing</li> <li>Land Use</li> <li>Buildings</li> <li>Energy</li> <li>Economics</li> </ul>                                                                                                  | <ul style="list-style-type: none"> <li>Parcel level land use data (ability to work with less data)</li> <li>Project-level data for alternative comparisons</li> </ul>                      | <ul style="list-style-type: none"> <li>CO<sub>2</sub> (any quantity over any time)</li> </ul>                  |
| <b>Climate Action Registry Reporting On-Line Tool (CARROT)</b>                                                         | <ul style="list-style-type: none"> <li>Web-based</li> <li>Available to Registry members</li> <li>General public can view entity reports</li> </ul> | <ul style="list-style-type: none"> <li>Regional, scalable to entity and facility level</li> </ul> | <ul style="list-style-type: none"> <li>General Reporting and Certification Protocols               <ul style="list-style-type: none"> <li>Transportation</li> <li>Buildings/facilities</li> </ul> </li> <li>Specific protocols for some sectors</li> </ul> | <ul style="list-style-type: none"> <li>Mobile source combustion (VMT or fuel usage)</li> <li>Stationary combustion (fuel usage)</li> <li>Indirect emissions (electricity usage)</li> </ul> | <ul style="list-style-type: none"> <li>Each GHG and CO<sub>2</sub>e (tons per year)</li> </ul>                 |
| <b>EMFAC</b>                                                                                                           | <ul style="list-style-type: none"> <li>Download</li> <li>Public domain (free)</li> </ul>                                                           | <ul style="list-style-type: none"> <li>Statewide</li> <li>Regional (air basin level)</li> </ul>   | <ul style="list-style-type: none"> <li>Transportation emission factors</li> </ul>                                                                                                                                                                          | <ul style="list-style-type: none"> <li>Travel activity data to calculate CO<sub>2</sub> from projects.</li> </ul>                                                                          | <ul style="list-style-type: none"> <li>CO<sub>2</sub> and methane (grams per mile) emission factors</li> </ul> |

VMT = Vehicle miles traveled

eCO<sub>2</sub> = Carbon dioxide equivalent emissions

**Note:** This is not meant to be a definitive list of modeling tools to estimate climate change emissions impacts. Other tools may be available.

## Description of Modeling Tools

### URBEMIS

The Urban Emissions Model is used extensively during the CEQA process by local air districts and consultants to determine the impacts of projects on criteria pollutants. It was recently updated to calculate CO<sub>2</sub> emissions as well. Future updates will include additional greenhouse gases. URBEMIS uses the ITE Trip Generation Rate Manual and the Air Resources Board's (ARB) motor vehicle emissions model (EMFAC) to calculate transportation-related CO<sub>2</sub> emissions and ARB's OFFROAD2007 model for CO<sub>2</sub> emissions from off-road equipment. Area source outputs include natural gas use, landscaping equipment, consumer products, architectural coatings, and fireplaces. It also estimates construction impacts and impacts of mitigation options. Web site: <http://www.urbemis.com>.

### Clean Air and Climate Protection (CACP) Software

This tool is available to state and local governments and members of ICLEI, NACAA, NASEO and NARUC to determine greenhouse gas and criteria pollutant emissions from government operations and communities as a whole. The user must input aggregate information about energy (usage), waste (quantity and type generated, disposal method, and methane recovery rate) and transportation (VMT) for community analyses. CACP uses emission factors from EPA, DOE, and DOT to translate the energy, waste and transportation inputs into greenhouse gas (in carbon dioxide equivalents) and criteria air pollutant emissions. If associated energy, waste and transportation reduction are provided, the model can also calculate emission reductions and money saved from policy alternatives. Web site: <http://cacpsoftware.org>.

### Sustainable Communities Model (SCM)

This model quantifies total CO<sub>2</sub>e emissions allowing communities the ability to optimize planning decisions that result in the greatest environmental benefit for the least cost. Total CO<sub>2</sub>e emissions are based on emissions from energy usage, water consumption and transportation. The model provides an interactive comparison of various scenarios to provide environmental performance, economic performance, and cost benefit analysis.

Web site: [www.ctg-net.com/energetics/documents/doc\\_SCM\\_070731.pdf](http://www.ctg-net.com/energetics/documents/doc_SCM_070731.pdf)

### I-PLACE<sup>3</sup>S

This model is an internet-accessed land use and transportation model designed specifically for regional and local governments to help understand how their growth and development decisions can contribute to improved sustainability. It estimates CO<sub>2</sub>, criteria pollutant and energy impacts on a neighborhood or

regional level for existing, long-term baseline and alternative land use plans. The data input requirements are extensive and require a fiscal commitment from the Metropolitan Planning Organization and its member local governments. Once the data is available, the IPLACES tool can be developed for that region relatively quickly, in approximately one week. The benefits include a multifunctional tool that provides immediate outputs to compare alternatives during public meetings, multilevel password protected on-line access, as well as providing access for local development project CEQA analyses. This tool also supports regional travel models and integrated land use and transportation assessments. Web site: [http://www.sacregionblueprint.org/sacregionblueprint/the\\_project/technology.cfm](http://www.sacregionblueprint.org/sacregionblueprint/the_project/technology.cfm) and <http://www.places.energy.ca.gov/places>

### CARROT

The California Climate Action Registry offers the Climate Action Registry Reporting On-Line Tool (CARROT) for Registry members to calculate and report annual greenhouse gas (GHG) emissions. CARROT calculates direct and indirect GHG emissions for the following emission categories by source: stationary combustion, process emissions, mobile source combustion, fugitive emissions and electricity use by source. It calculates emissions using entity collected data such as fuel purchase records, VMT and utility bills. While reporting and certification through CARROT is only available to members, the public may access entity reports online. Reporting protocols are also available to the public, including the General Reporting Protocol ([www.climateregistry.org/docs/PROTOCOLS/GRP%20V2-March2007\\_web.pdf](http://www.climateregistry.org/docs/PROTOCOLS/GRP%20V2-March2007_web.pdf)) and cement, forestry and power/utility sector protocols. Additional sector protocols are under development. Website: [www.climateregistry.org/CARROT/](http://www.climateregistry.org/CARROT/)

### EMFAC

The Air Resources Board's EMISSION FACTORS (EMFAC) model is used to calculate emission rates from all motor vehicles in California. The emission factors are combined with data on vehicle activity (miles traveled and average speeds) to assess emission impacts. The URBEMIS model described above uses EMFAC to calculate the transportation emission impacts of local projects. Web site: <http://www.arb.ca.gov/msei/onroad/onroad.htm>

# Attachment 3

## Examples of GHG Reduction Measures

The following are examples of measures that have been employed by some public agencies to reduce greenhouse gas emissions, either as general development policies or on a project-by-project basis. These are provided for illustrative purposes only.

### LAND USE AND TRANSPORTATION

- Implement land use strategies to encourage jobs/housing proximity, promote transit-oriented development, and encourage high density development along transit corridors. Encourage compact, mixed-use projects, forming urban villages designed to maximize affordable housing and encourage walking, bicycling and the use of public transit systems.
- Encourage infill, redevelopment, and higher density development, whether in incorporated or unincorporated settings
- Encourage new developments to integrate housing, civic and retail amenities (jobs, schools, parks, shopping opportunities) to help reduce VMT resulting from discretionary automobile trips.
- Apply advanced technology systems and management strategies to improve operational efficiency of transportation systems and movement of people, goods and services.
- Incorporate features into project design that would accommodate the supply of frequent, reliable and convenient public transit.
- Implement street improvements that are designed to relieve pressure on a region's most congested roadways and intersections.
- Limit idling time for commercial vehicles, including delivery and construction vehicles.

### URBAN FORESTRY

- Plant trees and vegetation near structures to shade buildings and reduce energy requirements for heating/cooling.
- Preserve or replace onsite trees (that are removed due to development) as a means of providing carbon storage.

## GREEN BUILDINGS

- Encourage public and private construction of LEED (Leadership in Energy and Environmental Design) certified (or equivalent) buildings.

## ENERGY CONSERVATION POLICIES AND ACTIONS

- Recognize and promote energy saving measures beyond Title 24 requirements for residential and commercial projects
- Where feasible, include in new buildings facilities to support the use of low/zero carbon fueled vehicles, such as the charging of electric vehicles from green electricity sources.
- Educate the public, schools, other jurisdictions, professional associations, business and industry about reducing GHG emissions.
- Replace traffic lights, street lights, and other electrical uses to energy efficient bulbs and appliances.
- Purchase Energy Star equipment and appliances for public agency use.
- Incorporate on-site renewable energy production, including installation of photovoltaic cells or other solar options.
- Execute an Energy Savings Performance Contract with a private entity to retrofit public buildings. This type of contract allows the private entity to fund all energy improvements in exchange for a share of the energy savings over a period of time.
- Design, build, and operate schools that meet the Collaborative for High Performance Schools (CHPS) best practices.
- Retrofit municipal water and wastewater systems with energy efficient motors, pumps and other equipment, and recover wastewater treatment methane for energy production.
- Convert landfill gas into energy sources for use in fueling vehicles, operating equipment, and heating buildings.
- Purchase government vehicles and buses that use alternatives fuels or technology, such as electric hybrids, biodiesel, and ethanol. Where feasible, require fleet vehicles to be low emission vehicles. Promote the use of these vehicles in the general community.
- Offer government incentives to private businesses for developing buildings with energy and water efficient features and recycled materials. The incentives can include expedited plan checks and reduced permit fees.
- Offer rebates and low-interest loans to residents that make energy-saving improvements on their homes.

- Create bicycle lanes and walking paths directed to the location of schools, parks and other destination points.

### **PROGRAMS TO REDUCE VEHICLE MILES TRAVELED**

- Offer government employees financial incentives to carpool, use public transportation, or use other modes of travel for daily commutes.
- Encourage large businesses to develop commute trip reduction plans that encourage employees who commute alone to consider alternative transportation modes.
- Develop shuttle systems around business district parking garages to reduce congestion and create shorter commutes.
- Create an online ridesharing program that matches potential carpoolers immediately through email.
- Develop a Safe Routes to School program that allows and promotes bicycling and walking to school.

### **PROGRAMS TO REDUCE SOLID WASTE**

- Create incentives to increase recycling and reduce generation of solid waste by residential users.
- Implement a Construction and Demolition Waste Recycling Ordinance to reduce the solid waste created by new development.
- Add residential/commercial food waste collection to existing greenwaste collection programs.