



# Climate Action Plan



Strategy and Framework Document

Adopted November 9, 2011

This page left blank intentionally.

# ACKNOWLEDGEMENTS

## SACRAMENTO COUNTY SUSTAINABILITY TEAM

Cecilia Jensen, Sustainability Program Manager  
Dave Defanti, Senior Planner,  
Climate Action Plan Project Manager  
Peter Ucovich, Senior Planner  
Sonia Saini, Intern  
Ashley Lucas, Administrative Assistant

## SACRAMENTO COUNTY DEPARTMENT ADVISORY TEAM AND KEY CONTRIBUTORS

### Municipal Services Agency

#### Department of Animal Care and Regulation

Laura Badeker, Senior Dispatcher

#### Department of Building and Code Enforcement

Steve Pedretti, Director

Bob Davison, Manager, Infrastructure Finance

#### Department of County Regional Parks

Janet Baker, Director

#### Department of Transportation (SACDOT)

Mike Penrose, Director

Reza Moghissi, Chief, Maintenance and Operations

Dean Blank, Principal Civil Engineer

Rizaldy Mananquil, Principal Civil Engineer

Jerry Budziszewski, Traffic Signal and Street Lighting Manager

Jose Corona, Traffic Signal and Street Lighting Supervisor

Russ Childers, Senior Civil Engineer

Doug Mass, Senior Transportation Engineer

John Ronkowski, Senior Highway Maintenance Manager

#### Department of Waste Management and Recycling

Paul Philleo, Director

Keith Goodrich, Principal Civil Engineer

Timothy Israel, Senior Civil Engineer

Rajesh Lathigara, Solid Waste Planner II

## Department of Water Resources and Sacramento County Water Agency

Michael Peterson, Director

Herb Neiderberger, Division Chief

Kerry Schmitz, Principal Engineer, Water Supply

George Booth, Senior Civil Engineer

Mike Crooks, Senior Civil Engineer

Darrell Eck, Senior Civil Engineer, Water Supply

Dave Underwood, Senior Civil Engineer

Forrest Williams, Senior Civil Engineer, Water Supply

Amy De La Salle, Associate Civil Engineer

Keith Hall, Associate Civil Engineer

Dave Tamayo, Environmental Specialist IV

### Internal Services Agency

#### Department of General Services

Michael Morse, Director

Daniel Mendonsa, Energy Program Manager

James Collins, Chief, Fleet Services Division

Jose Trujillo, Support Services Manager

### Countywide Services Agency

#### Department of Agricultural Commissioner

Frank Carl, Agricultural Commissioner

#### Department of Health and Human Services

Teri Duarte, WIC Program Director

#### Environmental Management Department

Val Siebal, Director

### Sacramento County Airport System (SCAS)

Hardy Acree, Director

Carl Mosher, Deputy Director, Planning & Environment

Glen Rickelton, Airport Manager, Planning and Environment

Greg Rowe, Senior Environmental Analyst

Bree Taylor, Noise Officer

## ACKNOWLEDGEMENTS (continued)

### SACRAMENTO COUNTY DEPARTMENT ADVISORY TEAM AND KEY CONTRIBUTORS (continued)

#### Community Planning and Development

Leighann Moffitt, Planning Division Manager  
Tricia Stevens, Principal Planner, Planning  
Cindy Storelli, Principal Planner, Planning  
Joyce Horizumi, Director, Environmental Review and Assessment  
Antonia Barry, Deputy Director, Environmental Review and Assessment  
Lauren Hocker, Associate Environmental Analyst, Environmental Review and Assessment  
Clark Whitten, Economic Development  
Ryan Bailey, Economic Development  
Duane O'Donnell, Economic Development  
June Livingston, Economic Development

#### Office of Communications and Information Technology (OCIT)

David Villanueva, Director  
Chris Andis, Communications and Media Office Director  
Jeff Leveroni, Information Technology, Division Chief  
Alan Douma, Principal Administrative Analyst  
Betsy Braziel, Communications Media Officer III  
Brenda Bongiorno, Communications Media Officer I

#### Regional, Statewide and Federal Entities

Sacramento Regional County Sanitation District  
Sacramento Air Quality Management District  
Sacramento Area Council of Governments  
Sacramento Municipal Utilities District  
Valley Vision  
California Energy Commission  
U.S. Department of Energy

#### Other Contributors and Consultants

Sam Pierce, The Energy Alliance Association, Santa Rosa, California  
Eros Blankenbecler, The Energy Alliance Association, Santa Rosa, California  
Carmel Brown, CKB Environmental Consulting, Inc.  
Melinda Lang, mlangdesign (layout and graphic design)  
Alison Tucker, Tucker and Associates (technical editing)



All Sacramento County department heads met together in Fall 2008 to collaborate about potential climate change impacts and sustainable solutions; that meeting provided valuable information for development of this plan.

#### FUNDING AND OTHER RESOURCES

Development of this Climate Action Plan – Strategy and Framework Document (including the original 2009 draft) was made possible by a U.S. Department of Energy (DOE) Energy Efficiency Block Grant; funding provided by the Department of Water Resources, the Sacramento County Airport System, and the Sacramento Regional County Sanitation District (SRCSD); and the generous contributions of staff time and resources by the many County departments and partners listed above.

#### THIS DOCUMENT AVAILABLE IN ALTERNATE FORMATS

In keeping with the County's sustainability goals and our efforts to save resources and reduce waste, this document has been created in an electronic format, with bookmarks to facilitate navigation and allow duplex printing of single chapters. If you have a disability and the format of this or any material on our web site interferes with your ability to access some information, please email the County of Sacramento webmaster at: [dgsweb@sacounty.net](mailto:dgsweb@sacounty.net). The webmaster will refer your request to the appropriate Department or program for assistance.

# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY</b>	1
<b>CHAPTER 1 – THE COUNTY’S ROLE IN ADDRESSING A CHANGING CLIMATE AND SUSTAINABILITY</b>	
Introduction	11
Key Legislative and Regulatory Mandates	12
A Changing Climate and its Impacts	13
The County’s Authority and Functions in Addressing Climate Change	14
Climate Change in the Context of Broader Sustainability Issues	15
The County’s Leadership on Sustainability	16
Strategy for Addressing Climate Change and Sustainability	17
A Tiered Approach to the Climate Action Plan	18
Future Work	18
<b>CHAPTER 2 – SACRAMENTO COUNTY’S CONTRIBUTION AND VULNERABILITY TO CLIMATE CHANGE</b>	
Introduction	19
Sacramento County’s Carbon Footprint	20
Relative Comparisons of Jurisdictional Per Capita GHG Emissions in the County and the State	27
Sacramento County’s Emission Reduction Targets	28
Reporting and Registering GHG Emissions	28
Vulnerability to Climate Change	29
<b>CHAPTER 3 – ACTIONS TO ADDRESS CLIMATE CHANGE</b>	
3.1 Introduction	31
3.2 Transportation and Land Use	32
3.3 Energy	44
3.4 Water	54
3.5 Waste Management and Recycling	68
3.6 Agriculture and Open Space	78
<b>GLOSSARY</b>	89
<b>REFERENCES</b>	94

## TABLE OF CONTENTS (continued)

### LIST OF FIGURES

Figure ES-1: Unincorporated Sacramento County GHG Emissions for 2005 by Sector	3
Figure ES-2: Sacramento County Government GHG Emissions for 2005	4
Figure 2-1: Sacramento County GHG Emissions for 2005 by Sector	20
Figure 2-2: Unincorporated Sacramento County GHG Emissions for 2005 by Sector	22
Figure 2-3: Sacramento County Government GHG Emissions for 2005	25
Figure 2-4: Per Capita GHG Emissions for Cities and Unincorporated County in Sacramento County for Major Sectors	27
Figure 2-5: Per Capita GHG Emissions of Major U.S. Cities and U.S. as a Whole	28
Figure 3-1: Composition of Unincorporated County Waste Disposed, 1990	71
Figure 3-2: Solid Waste Diversion in Unincorporated Sacramento County (with 2020 projection)	71

### LIST OF TABLES

Table 2-1: Sacramento County GHG Emissions for 2005 by Sector	21
Table 2-2: Unincorporated Sacramento County GHG Emissions for 2005 by Sector	23
Table 2-3: Sacramento County Government GHG Emissions for 2005 by Government Operations Sector	26
Table 2-4: Potential Climate Change-Related Impacts to Sacramento County Human, Natural, and Built Systems	30
Table 3-1: Transportation and Land Use Sector - Summary of Existing and Potential Actions	42
Table 3-2: Energy Sector - Summary of Existing and Potential Actions	52
Table 3-3: Water Sector - Summary of Existing and Potential Actions	66
Table 3-4: Solid Waste Diversion in Unincorporated Sacramento County	70
Table 3-5: Waste Management and Recycling Sector - Summary of Existing and Potential Actions	77
Table 3-6: Agriculture and Open Space Sector - Summary of Existing and Potential Actions	88



## EXECUTIVE SUMMARY

# Sacramento County Climate Action Plan Strategy and Framework Document



Photo: Rob Thompson

“Sustainability is meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

—United Nations World Commission on Environment and Development.



Photo: Sacramento Splash

## INTRODUCTION

Sacramento County envisions a sustainable future with efficient resource use, a strong economy (including a robust green economy) and excellent quality of life for all its community members. This document, the first component of the County’s Climate Action Plan, is a key step in realizing that vision. It describes the strategy and framework for the County’s program to mitigate impacts and adapt to a changing climate. Taking action to address climate change now is consistent with California law, dovetails with the County’s ongoing efforts toward improved efficiency, and is essential to ensuring a sustainable future.

Climate change presents a significant threat to society. While natural variations have altered the climate significantly in the past, it is very unlikely that the changes in climate observed since the mid-20th century can be explained by natural processes alone. The vast majority of scientists agree that human activity, particularly the generation of greenhouse gases, is contributing to our changing climate.

Greenhouse gases trap heat in the atmosphere, causing Earth’s average temperatures to rise and leading to shifts in weather patterns that can have profound impacts. The West Coast of the United States, including California, has been shown to be particularly vulnerable to environmental, economic and societal implications. The Sacramento area is projected to have more extreme heat waves, and less overall precipitation yet more extreme storms. These changes present challenges such as decreased water supply, increased flooding risks, stresses to the agricultural industry, increased fire risks, degraded air and water quality, impaired terrestrial and aquatic habitat, and negative public health impacts.

# CLIMATE ACTION PLAN

California's landmark Global Warming Solutions Act of 2006, Assembly Bill 32 (AB 32), requires the state to reduce greenhouse gas (GHG) emissions to 1990 levels by the year 2020. This is the first step towards meeting the longer term goal of 80% reduction in GHG emissions below 1990 levels by 2050 (Executive Order S-3-05), as urged by international scientists. Sacramento County and other local governments play an integral role in meeting the AB 32 mandate as well as preparing for the consequences of a changing climate.

This Sacramento County Climate Action Plan (CAP)- Strategy and Framework Document presents a framework for reducing greenhouse gas (GHG) emissions and managing water and other resources to best prepare for a changing climate. It defines an overall strategy to address climate change, including:

- Reducing GHG emissions associated with the County's own operations as well as taking actions that facilitate GHG emissions reduction in the community
- Establishing priorities based on a number of factors, such as cost-effectiveness and co-benefits
- Addressing projected vulnerabilities associated with climate change where cost-effective or required
- Working collaboratively with other jurisdictions and leveraging existing programs and resources

Local governments are essential partners in achieving California's goals to reduce greenhouse gas emissions. They have broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect greenhouse gas emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations.

—California Air Resources Board AB 32 Scoping Plan, May 2009

This document summarizes actions the County has already taken within its jurisdictional control and identifies a menu of future actions. It summarizes background information, including the legislative history and environmental issues driving the need for the plan and how it dovetails with the County's commitment to sustainability.

## SACRAMENTO COUNTY'S GHG INVENTORY AND EMISSIONS REDUCTION TARGET

The California Air Resources Board (CARB), the lead agency for implementing AB 32, recommended in their 2008 Scoping Plan that local governments adopt the same GHG reduction target for municipal operations as the target proposed for State government operations, namely a 15% reduction in emissions from current levels by the year 2020. In addition, the CARB 2008 Scoping Plan recommended that local governments move towards establishing the same reduction goals for community-based emissions. These GHG reduction goals for local government will help place California on the path to meeting the longer term goal of an 80% reduction in emissions below 1990 levels by 2050.

In June 2009, Sacramento County worked with other local agencies in the county to complete an inventory to assess GHG emission sources and quantities using data from 2005. This 2005 baseline approximates the "current levels" of emissions referenced in the CARB scoping plan. Those emissions are reported and discussed in this plan (see Chapter 2) in three categories: 1) entire county (referred to as "countywide"), 2) unincorporated county area, and 3) Sacramento County government operations. The inventory provides useful information for selecting and prioritizing actions to reduce emissions, and it serves as a baseline for measuring progress toward meeting the AB 32 target. The original 2009 data and updated 2011 data for some of the sectors was used to prepare this plan.

Based on the 2005 emissions inventory presented in this plan, Sacramento County's target is to reduce community emissions from the unincorporated county from 4,987,668 to 4,337,103 (about 650,600) metric tons of CO<sub>2</sub>e and government emissions from its own operations from 119,466 to 103,883 (about 15,600) metric tons of CO<sub>2</sub>e. The underlying inventory and the 2020 reduction targets will be refined during development of subsequent components of the Sacramento County CAP.

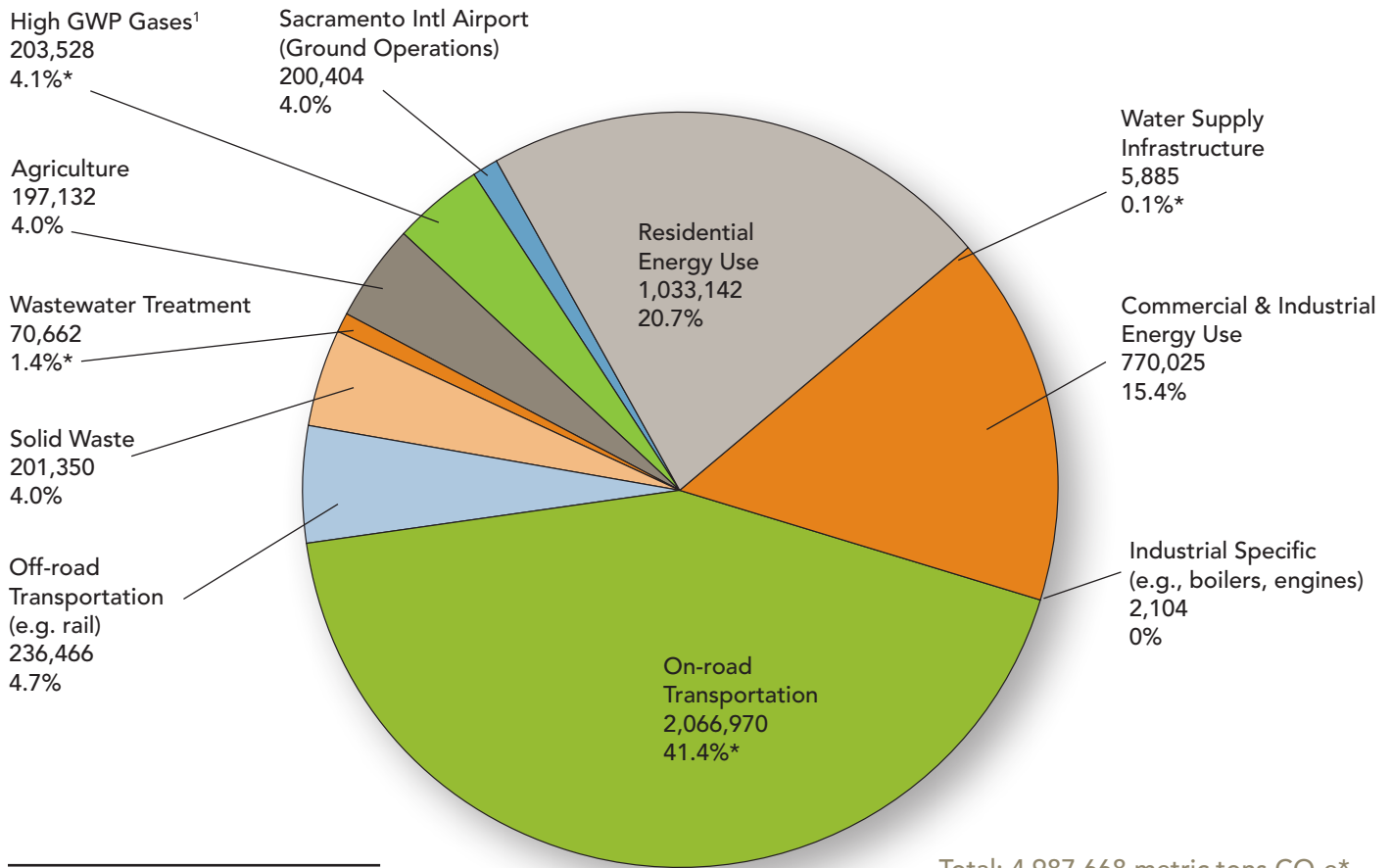


Just as it is in the U.S. and California, energy consumption (for transportation and for heating, cooling, and other power needs in buildings) is by far the greatest source of GHG emissions in Sacramento County. As shown in Figure ES-1, for the unincorporated county, over 40% of the 2005 baseline GHG emissions were from cars, trucks, and other on-road vehicles, while over one third (36%) were from residential and commercial/ industrial electricity and natural gas use.



The GHG inventory results for the unincorporated portion of Sacramento County showed that in 2005, over 40% of GHG emissions came from on-road transportation-related energy use and about 36% of emissions came from electricity and natural gas use in homes and businesses.

**FIGURE ES-1**  
Unincorporated Sacramento County GHG Emissions for 2005 by Sector (metric tons CO<sub>2</sub>e)



1. High global warming potential (GWP) gases are mostly man-made gases (e.g., fluorinated gases) used in industrial processes. They typically have much longer atmospheric lifetimes and much stronger radiative forcing properties than carbon dioxide.

Source: 2005 Countywide GHG Inventory, June 2009, except data noted with (\*) was updated in February 2011.

# CLIMATE ACTION PLAN

The total 2005 baseline GHG emissions from County government operations are estimated at 119,466 metric tons CO<sub>2</sub>e.

As shown in Figure ES-2, the following are the most significant sources:

- 47% of emissions are associated with energy used in County government buildings
- 31% of emissions are from operation of the Sacramento International Airport (excluding airline aircraft, which are not under the control of the County)
- 21% of emissions are associated with the County's vehicle fleet

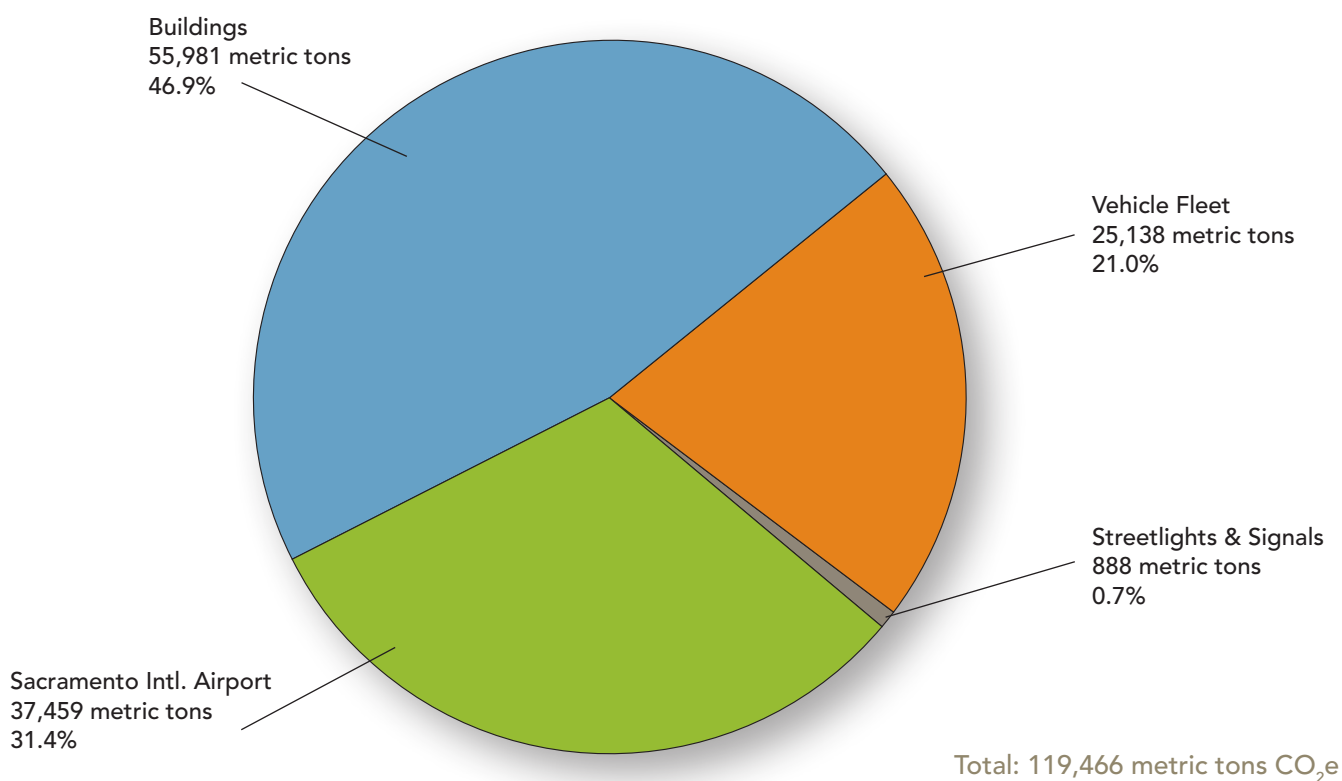
Data was not available to estimate waste generated from County operations.



Almost 70% of the 2005 baseline emissions from County government operations are associated with energy used in buildings and operation of the County fleet combined. (Source: County DGS)

**FIGURE ES-2**


Sacramento County Government GHG Emissions for 2005 (metric tons CO<sub>2</sub>e)



## ACTIONS TO ADDRESS CLIMATE CHANGE

This Plan describes actions that the County has already taken or could take in the future to reduce GHG emissions and adapt to a changing climate, while being more resource efficient, saving energy and money, and creating jobs. In addition, most of the actions provide important co-benefits such as improved air and water quality and public health.

Actions are presented in this plan in five sectors, shown below with corresponding goals for each sector.

 <p>Transportation and Land Use</p>	<ul style="list-style-type: none"> <li>• Increase the average fuel efficiency of County-owned vehicles powered by gasoline and diesel and encourage increased fuel efficiency in community vehicles</li> <li>• Increase use of alternative and lower carbon fuels in the County vehicle fleet and facilitate their use in the community</li> <li>• Reduce total vehicle miles traveled per capita in the community and the region</li> </ul>
 <p>Energy</p>	<ul style="list-style-type: none"> <li>• Improve energy efficiency of existing and new buildings in the unincorporated County</li> <li>• Improve energy efficiency of County infrastructure operation (roads, water, waste, buildings, etc)</li> <li>• Decrease use of fossil fuels by transitioning to renewable energy sources</li> </ul>
 <p>Water</p>	<ul style="list-style-type: none"> <li>• Achieve 20% reduction in per capita water use levels by 2020</li> <li>• Emphasize water use efficiency as a way to reduce energy consumption</li> <li>• Increase energy efficiency related to water system management</li> <li>• Strive to reduce uncertainties in water reliability and quality by increasing the flexibility of the water allocation and distribution system to respond to drought conditions and encouraging redundancy in water storage, supply, and treatment systems</li> <li>• Elevate the importance of floodplain and open space protection as a means of protecting water quality and habitat, sequestering carbon, and providing groundwater recharge opportunities</li> </ul>
 <p>Waste Management and Recycling</p>	<ul style="list-style-type: none"> <li>• Promote reduction in consumption</li> <li>• Maximize waste diversion, composting, and recycling through expanding residential and commercial programs</li> <li>• Reduce methane emissions at Kiefer Landfill</li> </ul>
 <p>Agriculture and Open Space</p>	<ul style="list-style-type: none"> <li>• Protect important farmlands, rangelands and open space from conversion and encroachment and maintain connectivity of protected areas</li> <li>• Educate the local agricultural community about the impacts of climate change and support efforts to promote sustainable practices</li> <li>• Promote water conservation to ensure reliable and sufficient water supplies for crop irrigation and livestock needs</li> <li>• Implement policies and programs which increase demand for locally grown and processed agricultural commodities</li> <li>• Achieve a net gain in the size, health, and diversity of protected open space and the local urban forest, encouraging native species wherever practical</li> <li>• Ensure community understanding of and appreciation for open space, parks, and trees both as a vital part of the region's character and as a greenhouse gas-reduction strategy</li> </ul>

# CLIMATE ACTION PLAN



## Transportation and Land Use

Since transportation accounts for more greenhouse gas emissions than any other sector in the County, reducing transportation-related GHG emissions is critical. Vehicle emissions are determined by three factors: vehicle fuel efficiency, the type of fuel used (for example, natural gas burns cleaner and produces less harmful GHG emissions than gasoline or diesel), and vehicle miles traveled (VMT). Actions that reduce transportation GHG emissions typically yield other benefits such as improved air quality and a healthier community lifestyle.

There are many factors over which County government has no or limited control, such as auto fuel efficiency, alternative fuels, or choices that individual residents make regarding transportation use. However, the County influences emissions from transportation in several ways. As the land use planning authority for the unincorporated county, Sacramento County determines land use patterns, which in turn affect transportation patterns and therefore associated GHG emissions. The County also plans and oversees roads and pedestrian and bicycle facilities in the unincorporated portion of the county. The road, trail, and bicycle systems influence people's mode of travel as well as traffic flow (flowing traffic generates less emissions than does stop-and-go traffic). In addition, Sacramento County owns and controls a large fleet of cars, trucks, and heavy equipment; owns and operates four airports, including the Sacramento International Airport; and manages the aviation activities at McClellan Airport through its Economic Development Department.



Transportation accounts for nearly half of the GHG emissions for the entire County and similarly, nearly half of the emissions for the unincorporated portion of the county.

This Plan identifies a number of ways the County has already reduced GHG emissions related to transportation or is planning such reductions. For example, Sacramento County:

- Increased fuel efficiency and alternative fuel use in its own fleets (almost ten percent of the vehicle fleet is hybrid/alternative fuel compared with about one percent in 2005)
- Facilitates the use of alternative fuel vehicles by operating natural gas fueling stations and providing electric vehicle chargers at its downtown garage
- Reduced vehicle miles traveled by its employees and customers by providing carpool/transit incentives for its employees and decentralizing its customer service centers
- Created a Sustainable Infill Program and began preparing master plans for redevelopment and revitalization of three of the fourteen commercial corridors (e.g., North Watt Avenue) as transit-oriented, smart growth projects

This Plan also identifies a number of additional actions the County could take to reduce transportation-related GHG emissions such as:

- Continuing conversion of the County's fleet to vehicles that are more fuel efficient and use alternative fuels
- Increasing designated parking in County-owned parking lots for alternative fuel vehicles and amending the zoning code to require dedicated parking for carpools and alternative fuel vehicles in retail and other commercial projects
- Promoting transit-oriented development to reduce reliance on cars as the primary mode of travel
- Implementing projects to facilitate and encourage more walking and biking





## Energy

After transportation, energy used in homes and businesses (for heating, cooling, lighting, etc.) is the next largest source of GHG emissions in Sacramento County. The emissions produced depend on the amount and type of energy used (e.g., electricity or natural gas) and the primary energy source used to create the power. Most energy GHG emissions are created from fossil fuels; of those, natural gas burns the cleanest. Electricity produced by renewable energy sources (e.g., hydroelectric, wind, or solar) produces negligible greenhouse gases.

Sacramento County directly influences energy used in its own facilities, and to some degree in its leased facilities. It also can influence energy used in new and remodeled buildings throughout the unincorporated County through requirements in the planning and building permit processes. It currently does not have the ability to influence energy use in existing buildings, which account for a large share of the building stock in the unincorporated county, and presumably emissions produced.

The County has taken a number of steps to improve energy efficiency and to promote renewable energy sources. For example, the County:

- Improved the energy efficiency of its own operations such as through its Green Information Technology (IT) program, upgrading 10 of its buildings, converting the lighting in most of its traffic signals to light-emitting diode (LED), and implementing green building standards in several County buildings currently being or recently constructed
- Collaborates with the Sacramento Municipal Utility District (SMUD), cities within the County, and regional partners to pursue grant funding for energy efficiency and renewable energy programs and projects

Energy used in homes and businesses (for heating, cooling, and lighting) accounts for almost 40% of the GHG emissions for the entire County and similarly, almost 40% of the emissions for the unincorporated portion of the county.



- Partnered with the City of Sacramento in 2010 to establish a regional green building task force which published green building recommendations that apply to new and existing buildings

This Plan identifies additional ways the County could improve energy efficiency and promote renewable energy sources. For example, Sacramento County could:

- Implement actions recommended by the 2010 Green Building Task Force, including adoption of a green building ordinance
- Continue to pursue the authority and means to establish financial assistance programs for property owners to fund solar and energy efficiency projects for existing residential and commercial properties
- Further improve the energy efficiency of its own buildings and operations by conducting energy audits and eventually upgrading all buildings and operations
- Ensure that by 2020, 33% of the County's electricity purchases come from renewable sources (consistent with the CARB 2008 Scoping Plan for AB 32 compliance)

# CLIMATE ACTION PLAN



## Water

Energy and water are interconnected; energy is used to pump, treat, and deliver water supplies and treat wastewater and water is used to produce energy (both directly through hydroelectric plants and indirectly for cooling at thermoelectric power plants). Therefore, improving water efficiency will reduce energy demand and likewise, improving energy efficiency will reduce water demand.

Effective water management is also essential given the predicted risks of increased droughts, increased flooding (due to more extreme, though less-frequent storm events), and potential water quality problems associated with rising sea levels and salt water intrusion into the Sacramento-San Joaquin Delta. All of these climate change-related risks come at a time when the State is already challenged to provide enough water to meet the needs of its growing population.

The Sacramento County Water Agency (SCWA), one of over 20 water purveyors in the county, supplies drinking water to about 180,000 residents using surface and groundwater resources. The County's Department of Water Resources (County DWR) operates and maintains the SCWA's water supply infrastructure, as well as the stormwater drainage/flood control system in the unincorporated county.

Sacramento County has taken a number of actions to reduce GHG emissions, improve water reliability, protect water quality, and reduce flooding risks. For example:

- SCWA is increasing and improving reliability of future water supplies through construction of the new Vineyard Conjunctive Use Water Treatment Plant.
- SCWA adopted a water efficient landscape ordinance, intended to help achieve compliance with the state's mandate of 20% per capita reduction in water use by 2020 and promotes water conservation through metered billing, a tiered rate structure, customer education and water audits.

Water-related GHG emissions (not including wastewater treatment) represent a very small fraction (0.2%) of the GHG emissions for the entire County and similarly, 0.1% of the emissions for the unincorporated portion of the county.



- SCWA partners with the SRCSD on the recycled water program, whereby the SRCSD produces the recycled water at the regional wastewater treatment plant and the SCWA distributes the water to some of its customers for non-potable uses such as irrigation.
- The County DWR established the award-winning River Friendly Landscaping Program to promote practices with many environmental benefits, including reduced water use, improved water and air quality, and decreased GHG emissions.
- The County encourages development projects to incorporate low impact development (LID) features that reduce runoff and promote infiltration and groundwater recharge, and installed demonstration features in its new Animal Care facility.
- The County is participating in the process to address climate protection goals, objectives and targets in the updated Integrated Regional Water Management Plan (IRWMP) for the American River Basin region.

This plan also identifies future actions the County could take with respect to water resources such as:

- Conducting water audits/efficiency studies at County operations and facilities (likely in conjunction with the energy audits mentioned previously for the Energy section)
- Adopting policies and standards for urban runoff, rainwater and graywater (also known as grey water) reuse, consistent with state recommendations and guidance
- Working with others in the region to study expanded groundwater and surface water storage opportunities and sea-level rise impacts, and conducting monitoring to improve dam operations for drinking water storage while minimizing flood risks





## Waste Management and Recycling

Sacramento County provides comprehensive waste management in the unincorporated area through its Department of Waste Management & Recycling (DWMR). This includes waste collection services provided to 155,000 residential customers. Through the Sacramento Regional Solid Waste Authority (SWA), a joint powers agency created by the County and the City of Sacramento, the County contracts with franchised haulers to collect commercial solid waste and recyclables. In addition, the County operates Kiefer Landfill, a regional facility which accepts wastes from residents and businesses throughout the county, including the incorporated cities. Kiefer is the only active municipal solid waste disposal facility in Sacramento County. The County also owns and operates the North Area Recovery Station (NARS), a transfer facility where waste and recyclables are sorted prior to reuse or disposal at Kiefer or elsewhere.



In 2005, the County began changing the type of fuel used for its solid waste collection fleet, increasing the amount of low-carbon fuel and decreasing the amount of high-carbon fuel purchased each year. From 2005 to 2009, the amount of carbon dioxide emitted from fuel use dropped by about 3,800 metric tons.

Solid waste management accounts for 6% of the GHG emissions for the entire county and 4% of the emissions for the unincorporated portion of the county.

Sacramento County already reduces GHG emissions associated with waste management in a number of significant ways. For example:

- The County diverts almost 70% of its waste from landfills through waste reduction and recycling programs. (2009 data)
- Much of the County's waste collection fleet is powered by alternative fuels. Of the County's 127 waste collection vehicles used in the unincorporated areas, 103 are liquified natural gas (LNG), and 18 are dual-fuel vehicles running on 80% LNG and 20% diesel.
- A great deal of the landfill gas generated at Kiefer Landfill is collected and converted to energy at a plant that delivers 14 megawatts of green electricity to SMUD, enough to power almost 9,000 homes.
- The County has an active outreach and education program to train residents about how to compost at home and educate residents and businesses about the community and environmental benefits of waste reduction and recycling. These efforts are indirectly helping to reduce GHG emissions by decreasing waste hauling trips and associated vehicle miles traveled.



In terms of future opportunities, the County is working with the SWA to design and locate a suitable site for a new composting facility which will expand the region's capacity to process organic waste.

# CLIMATE ACTION PLAN



## Agriculture and Open Space

Agricultural practices such as livestock digestion, manure management and fertilizer use contribute to the County's GHG emissions. However, crops and orchards, as well as trees and vegetation in open space, can have a positive impact by removing carbon dioxide (the main greenhouse gas) from the atmosphere. In addition, certain crops can be used to create biofuels, which produce fewer GHGs than fossil fuels when burned. A changing climate is expected to stress the vital agricultural industry in Sacramento County, due to higher air temperatures, new pest problems, reduced or variable water supplies, and other factors. All of this comes at a time when the industry is already under heavy economic strain.

Related to agriculture and open space, several County departments have a role to play in reducing impacts and preparing for a changing climate. The County Agricultural Commissioner delivers annual crops reports and other services to farmers and ranchers and provides consumer and environmental protection services such as regulating pesticide use in the county. Community Planning & Development and Sacramento County Regional Parks influence open space in the county through habitat conservation planning and through management of the 15,000-acre countywide system of parks, recreational sites, trails, waterways, and open space, including the American River Parkway. The County's General Plan sets a strong policy for continued protection of agriculture, open space and other natural resources in Sacramento County. The Agriculture, Conservation and Open Space and Land Use Elements of the General Plan contain a number of key strategies, including rigorous standards that must be met in situations where agricultural or open space is proposed for conversion to urban uses.



Mighty Oak in the American River Parkway (Photo: Rob Thompson)

GHG emissions from agricultural operations (mainly associated with livestock and fertilizer use) account for almost 2% of the GHG emissions for the entire County and 4% of the emissions for the unincorporated portion of the county.

Sacramento County has already taken steps to address sustainability in the agriculture and open space sector. For example, the County:

- Collaborates with several groups to support sustainable agriculture, which lowers agricultural GHG emissions while yielding other benefits such as reduction or elimination in fertilizer and pesticide use and improved water quality and community health
- Is leading the effort with several other agencies and organizations to develop a South Sacramento Habitat Conservation Plan (SSHCP), to facilitate conservation while accommodating growth in the 341,270-acre SSHCP area
- Promotes the preservation of various tree species through ordinances, and requires landscaping in new development
- Works with the Sacramento Tree Foundation to expand the urban forest and optimize the benefits of tree canopies

This plan identifies a number of additional actions related to agriculture and open space that could reduce greenhouse gases. For example, Sacramento County could:

- Further promote sustainable agricultural practices and availability of locally-grown foods for county residents
- Quantify the carbon sequestration/GHG emission reduction and other benefits of the County's urban forest and open space areas
- Work with the Sacramento Tree Foundation, local watershed councils and others to develop new programs and secure additional funding for planting trees in public rights-of-way
- Encourage residents, businesses, agencies, and institutions to invest in greenhouse gas-reducing projects that sequester carbon to offset their personal or business greenhouse gas emissions

## CHAPTER 1

# The County's Role in Addressing a Changing Climate and Sustainability



The Laguna Creek Watershed in Sacramento County supports a diverse ecosystem which is susceptible to changes in temperature, rainfall and runoff (Sacramento County Kiefer Landfill in background). (Photo: County DWMR)

## Introduction

This *Sacramento County Climate Action Plan (CAP)-Strategy and Framework Document* presents a framework for reducing greenhouse gas (GHG) emissions and managing resources to best prepare for a changing climate. It outlines the County's goals and overall strategies. The plan also summarizes background information, including the legislative history and environmental issues driving the need for the plan and how it dovetails with the County's commitment to sustainability.

This document is the first tier of the County's Climate Action Plan. It sets the foundation for the *Sacramento County Government Operations CAP* (currently in development) and likely a *Community-Wide CAP*. The other components would take the next step in identifying and prioritizing recommended actions and associated implementation plans.

### A Tiered Approach for Climate Action

The County is using a tiered approach to develop its Climate Action Plan. This *Strategy and Framework Document* represents the first tier. It provides background and context, describes the 2005 baseline greenhouse gas (GHG) emission inventory and targets for reducing emissions to meet regulatory mandates, and outlines County actions to reduce impacts. The next tier, the *Sacramento County Government Operations Climate Action Plan*, will identify and prioritize actions related to the operation of County-owned facilities, vehicles, equipment and infrastructure based on a more detailed and accurate analysis of GHG emissions and sources. Finally, the *Sacramento County Community-Wide Climate Action Plan* would identify and facilitate actions on the part of the community to reduce emissions and prepare for the projected impacts of a changing climate.

# CLIMATE ACTION PLAN

## Key Legislative and Regulatory Mandates

### Assembly Bill 32 (AB 32)

In September 2006, Governor Schwarzenegger signed AB 32, the Global Warming Solutions Act of 2006. This landmark bill requires California to reduce GHG emissions to 1990 levels by the year 2020. (For more about GHGs and climate change, see the section later in this chapter entitled *A Changing Climate and its Impacts*.) The California Air Resources Board (CARB) is the lead agency for implementing AB 32 and has developed a plan (CARB 2008 Scoping Plan) describing what local governments and others should do to help meet the AB 32 target. Local governments play an integral role in achieving the target emission reductions through their discretionary land use and transportation planning authority as well as in other sectors such as energy, waste reduction and recycling, and water use. (This is discussed in more detail in Chapter 3.)

### California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) requires that a project's potential environmental impacts be considered and ways to mitigate those impacts be identified before approving actions that could harm the environment (for example, before approving a development project or adopting a County land use plan). When impacts could be significant, an Environmental Impact Report (EIR) is prepared and is circulated to obtain input from the public and other agencies. The need to consider greenhouse gas related impacts is presenting a new challenge under CEQA, but rulings from the state attorney general's office reinforce the need to do so.

The EIR prepared for the update of the Sacramento County General Plan (General Plan) identified the need for a Sacramento County Climate Action Plan. The General Plan is the overarching County land use document and the blueprint for the County's future. Its planning horizon is the year 2030, and includes a goal to help achieve the state's target per AB 32. Sacramento County also recognizes the environmental and administrative benefits of a "big picture" approach to climate change for the General Plan update rather than addressing climate change on a project by project basis.

"The general planning process presents a powerful opportunity to carefully consider and shape future land use patterns and ensure that development is consistent with AB 32. As the Air Resources Board noted in its recent AB 32 Scoping Plan, local governments are essential partners in achieving California's goals to reduce greenhouse gas emissions."

—Governor Edmund G. Brown, Jr.  
(speaking in 2009 as Attorney General)

### Senate Bill 375 (SB 375)

SB 375, enacted in 2009, links land use and transportation planning with AB 32 implementation. SB 375 establishes a process for developing regional GHG emission targets aimed at reducing vehicle miles traveled (VMT). SB 375 also requires all metropolitan planning organizations, including the Sacramento Area Council of Governments (SACOG), to align their regional transportation, housing, and land use plans and prepare a "sustainable communities strategy" to conform with the regional GHG target.

In fall 2010, CARB assigned targets to SACOG to reduce GHG emissions for cars and light duty truck trips in the Sacramento region. SACOG is now working with the local agencies to develop a sustainable communities strategy for meeting those targets, if feasible. If not feasible to meet the target, an alternative planning strategy will be prepared which documents what additional changes or resources would be needed to achieve the target. The resultant strategy will be part of the updated Metropolitan Transportation Plan (MTP), anticipated for completion at the end of 2011. The MTP must be internally consistent, including only spending transportation funds on projects included in the MTP. In addition, residential and transit projects that are consistent with the MTP may benefit from a streamlined CEQA process. In this sense, SB 375 will impact future land use, transportation and housing planning in the county, but the bill does not change the County's land use authority.



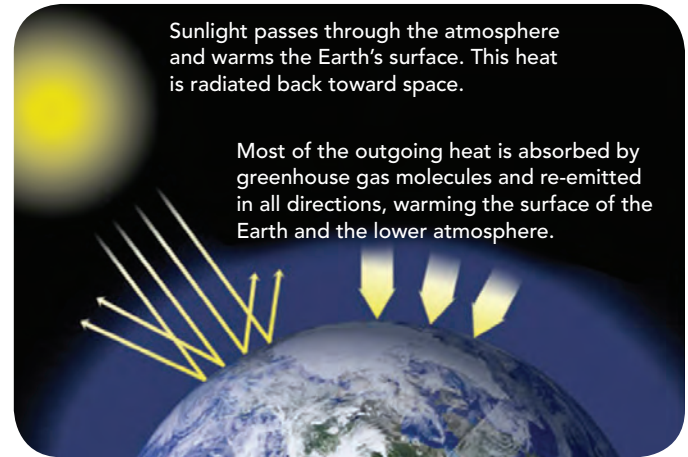
## A Changing Climate and its Impacts

The vast majority of scientists agree that climate change presents a significant threat to society. While natural variations have altered the climate significantly in the past, it is very unlikely that the changes in climate observed since the mid-20th century can be explained by natural processes alone. Scientists agree that human activity, particularly the generation of greenhouse gases, is contributing to our changing climate. These gases are released into the atmosphere and act as global insulators. Energy from the sun warms the earth's surface, which in turn, radiates heat back toward space. But accumulated greenhouse gases in the atmosphere absorb and trap the heat, causing temperature to rise.

Many greenhouse gases, such as water vapor, carbon dioxide, methane and nitrous oxide, occur naturally in our environment, but scientists have measured steady increases in most of these gases (all but water vapor in the list above) since the mid-1700s, when the industrial revolution began.

*Carbon dioxide (CO<sub>2</sub>)*, by far the most commonly emitted greenhouse gas, is released primarily by burning of fossil fuels (e.g., oil, coal and natural gas). It is also emitted from chemical reactions in industrial processes, such as in the manufacture of cement. *Methane (CH<sub>4</sub>)*, another common greenhouse gas, is generated through the natural decomposition of wastes in municipal landfills, and is also a product of livestock and agricultural operations.

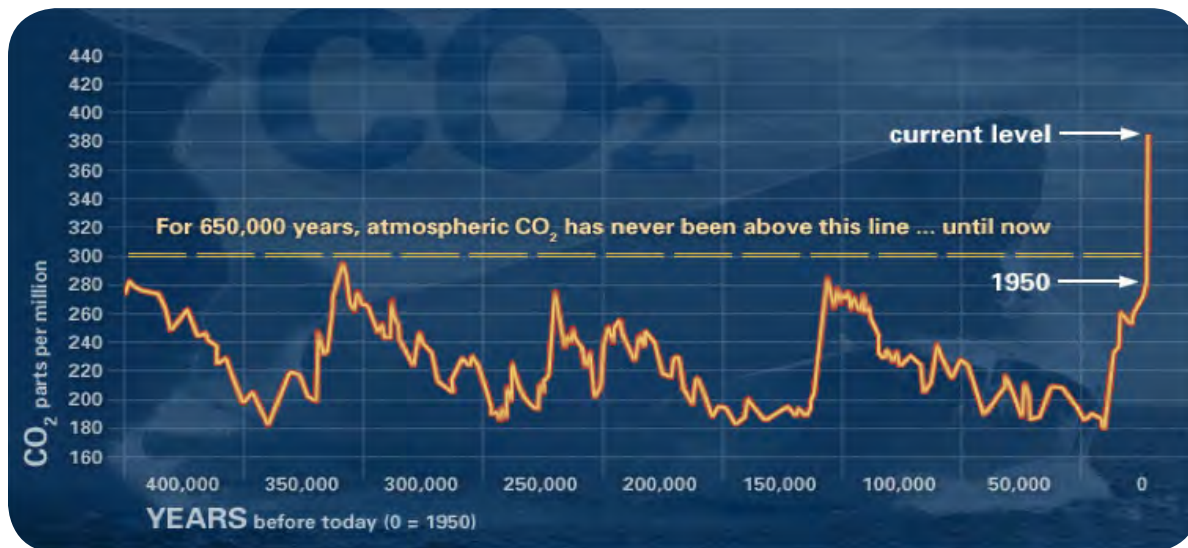
## THE GREENHOUSE EFFECT



A layer of greenhouse gases – primarily water vapor, and including much smaller amounts of carbon dioxide, methane and nitrous oxide – act as a thermal blanket for the Earth, absorbing heat and warming the surface to a life-supporting average of 59 degrees Fahrenheit (15 degrees Celsius). (Source: NASA)

For information about global climate change (including regional predictions) visit the website of the Intergovernmental Panel on Climate Change (IPCC): <http://www.ipcc.ch/index.htm> and NASA's web site: <http://climate.nasa.gov/>

## HISTORIC FLUCTUATIONS AND RECENT INCREASES IN ATMOSPHERIC GREENHOUSE GASES



This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO<sub>2</sub> has increased since the Industrial Revolution. (Source: NOAA)

# CLIMATE ACTION PLAN

Energy consumption (for transportation as well as for heating, cooling and lighting in buildings) is by far the greatest source of GHG emissions in the United States as a whole, as well as in California and Sacramento County. The quantity of emissions produced depends on the amount and type of energy used. Currently, fossil fuels provide most of the energy used in the U.S.; of these, coal produces the most GHGs and natural gas the least. Non-fossil fuel energy sources such as hydroelectric, wind, and solar power result in negligible GHG emissions.

Mitigating for the effect of greenhouse gases on our climate by reducing GHGs is required and essential, and will help, but some degree of climate change is irreversible. Measurable increases in temperature have already occurred and have set in motion other changes, such as weather patterns. The California snowpack is expected to decline significantly as more precipitation falls as rain instead of snow. The Sacramento region is projected to have more frequent, longer, and more-extreme heat waves and longer periods of drought. Despite predictions for less overall precipitation, the region is also projected to have more extreme storms. These changes, in turn, translate into other challenges such as:

- Decreased water supply
- Greater risks of flooding
- Increased fire risk
- Impaired air and water quality
- Spread of pests and infectious diseases into new areas
- Impacts to public health and safety associated with all of the above, including higher mortality rates

Sacramento County is particularly vulnerable to the potential impacts of climate change given the region's already high summer temperatures, flooding risks, and water supply challenges. The extensive Sacramento-San Joaquin Delta levee system could suffer significant and irreversible damage with a resultant loss of life and economy. Sacramento County's agriculture industry may be impacted by changes in temperature and rainfall patterns and an increase in pests and diseases.



Sacramento County's agriculture industry may be impacted by changes in temperature and rainfall patterns and an increase in pests and diseases. (Photo: Wikimedia Commons)

## The County's Authority and Functions in Addressing Climate Change

Sacramento County recognizes that local governments are on the front line, both in reducing GHG emissions and preparing the community for the impacts of a changing climate. For example:

- Sacramento County has direct authority over land use decisions within the unincorporated County (cities make those decisions in the incorporated areas.) Land use patterns have a direct impact on transportation needs and options, which, in turn, affect energy consumed and GHG emissions associated with transportation. Land use planning also plays a role in adapting to climate change.



- Sacramento County has direct authority over approving new building and development projects in the unincorporated County (cities make those decisions in the incorporated areas); building and development standards directly affect the energy and water efficiency of new buildings. The County can also affect other areas that relate to climate change. For example, development standards require flood control measures and encourage low impact development practices which reduce runoff and mimic the natural water balance on developed sites. Landscaping and tree preservation requirements for development projects can affect the number of trees—which provide shade and also sequester carbon.
- Sacramento County provides essential services to the community related to emergency preparation, flood response, social services, water supply, solid waste management, and roads. Projected impacts from climate change will increase the demand for many of these services. In addition, how the services are carried out can affect resource use and County GHG emissions.



- Sacramento County sets an example for the community by ensuring that new government facilities are as sustainable as possible and its employees perform their jobs and manage facilities and operations in a sustainable manner.

“Sustainability is meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

—United Nations World Commission on Environment and Development.

### Climate Change in the Context of Broader Sustainability Issues

Sacramento County is dedicated to improving the livability and quality of life for all its community members now and in the future. Addressing the myriad of challenges posed by population growth, escalating demands on finite resources, increasing costs, and the impacts of a changing climate requires a shift in long-standing practices and thinking related to development and consumption. Cost-saving measures must be undertaken to use resources more efficiently, streamline systems, and reduce demand on natural resources such as non-renewable energy sources, water, and land. Many of the actions the County should take (such as those aimed at conserving non-renewable energy sources and conserving water) are necessary for a sustainable future regardless of the state’s climate change mandates.

Most of the actions that address a changing climate provide multiple benefits beyond those directly related to the specific issue addressed (such benefits are referred to as co-benefits). For example, actions that reduce GHG emissions can also reduce emissions of conventional air quality pollutants, translating to public health benefits. Also, clean energy policies can provide a powerful economic stimulus.<sup>2</sup> As yet another example, planting or preserving trees reduces GHGs in the atmosphere (by sequestering carbon dioxide), cleans the air (by emitting oxygen), provides shade (mitigating harmful impacts of hot summers), intercepts and evapotranspires stormwater, provides habitat, and increases aesthetic value for the community.

2. See [http://www.ucsusa.org/global\\_warming/solutions/big\\_picture\\_solutions/california-and-western-states-global-warming-101.html](http://www.ucsusa.org/global_warming/solutions/big_picture_solutions/california-and-western-states-global-warming-101.html). As explained there, “Multiple studies modeling the economic impacts of California’s global warming policies project economic benefits, above and beyond the clear public health and environmental co-benefits of reducing global warming pollution.”

# CLIMATE ACTION PLAN

## The County's Leadership on Sustainability

Sacramento County is committed to providing the leadership needed to facilitate the transition towards a sustainable future where economic growth and prosperity can be achieved while enhancing, protecting, and conserving quality of life, natural resources and open space. First and foremost, Sacramento County is taking steps to incorporate sustainable practices into County operations and programs. It is recognized that wise investments in innovative solutions to conserve resources and increase efficiencies will yield economic returns.

In a time of dwindling economic resources, regional leadership and collaboration are essential to meet the regulatory GHG reduction goals. Sacramento County has been a leader in creating and fostering regional partnerships to leverage limited resources and in implementing several energy efficiency measures to save money. Here are just a few examples of how Sacramento County has taken a proactive approach to educate, secure and share resources, and promote coordination and consistency in efforts to reduce greenhouse gas emissions and prepare for the future:

- In 2008, Sacramento County partnered with the Sacramento Municipal Utility District (SMUD) to create the Sacramento Area Green Partnership (SAGP), a collaborative of local utilities, government agencies, utilities, special districts, and others that provides a forum for regional information sharing on climate change issues. The SAGP pursued grants and arranged for local agency cost-sharing matches to complete the first countywide emissions inventory.
- Sacramento County is a founding member of Climate Communities, a national coalition of cities and counties established in 2007 that seeks to influence federal climate policy and secure funding for local governments for climate protection efforts.

- In 2008, Sacramento County joined other counties in the state and across the nation in signing the Cool Counties Climate Change Stabilization Declaration. This commitment calls for a reduction in unincorporated county and government emissions consistent with California's regulatory targets and involves working with regional partners to develop and implement plans to reduce emissions and build resilience to the projected impacts of climate change.
- Sacramento County Airports System is one of the first 15 airport systems in the U.S. to sign the "Aviation Industry Commitment to Action on Climate Change" declaration in April 2008.

Chapter 3 describes many other actions that the County has taken to address climate change and ensure a sustainable future.



The new International Terminal B at the Sacramento International Airport (shown here under construction in 2010) was designed with green building features to achieve LEED certification. (Photo: SCAS)

“The Sacramento Green Partnership is helping to ensure that the public agencies within Sacramento County are sharing the best information about climate change and greenhouse gas reduction strategies, and building consistency in their planning efforts.”

—Kristine Mazzei, Valley Vision/Green Capital Alliance

## Strategy for Addressing Climate Change and Sustainability

Sacramento County's overall strategy for addressing climate change and sustainability is to:

- Work collaboratively with stakeholders (including other jurisdictions in the region, local utilities like SMUD and Pacific Gas & Electric (PG&E), special districts such as the Sacramento Metropolitan Air Quality Management District (SMAQMD), state agencies such as the CARB, the development community and environmental organizations) towards achieving the AB 32 emission reduction target for the entire county.
- Continue to track and update GHG emission inventories as needed to identify the sources and quantities of GHGs and measure progress toward reduction goals.
- Lead by example by reducing GHG emissions associated with the County's own operations. This includes completing a more detailed analysis of GHG emissions using data supplied by County departments and publishing the *Sacramento County Climate Action Plan (CAP) for Government Operations* to identify and prioritize future actions.
- Consider preparation of a *Sacramento County Community-Wide Climate Action Plan* that would identify and facilitate actions on the part of the community to mitigate GHG emissions and prepare for the projected impacts of a changing climate. This component of the County CAP would entail community outreach and participation.
- For both government and community-wide actions, establish priorities for actions that reduce GHGs considering the baseline and subsequent emissions inventories, cost-effectiveness, ease of implementation, and the extent to which the actions produces other benefits besides those related to climate change.
- Leverage the County's and community's existing climate change-related programs, investments and accomplishments, and seek to do more with existing resources.



Groundwater pumping and distribution systems are energy intensive and strategies for future operation should focus on maximizing efficiencies and ensuring reliable supplies in the face of an uncertain climatic future. (Photo: [www.aquaforia.org](http://www.aquaforia.org))

- Address projected vulnerabilities associated with climate change. As resources allow or as required, implement cost-effective actions that would lessen the projected impacts or yield other benefits. In particular, take steps to conserve and effectively manage water resources, which are essential for growth but are already limited.
- Practice adaptive management. Add, suspend, or modify implementation measures as appropriate based on on-going evaluations and priority setting.



# CLIMATE ACTION PLAN

## A Tiered Approach to the Climate Action Plan

### Tier 1: Strategy and Framework Document

This document is the foundation for the CAP components which follow. In addition to providing the necessary background and context, this Plan summarizes actions that the County has already taken, is taking now, or can take in the future to address climate change. The actions involve both mitigating/reducing GHG emissions and proactively addressing regional adaptation challenges—such as reduced water supply. Also, the Plan describes County actions related to its own operations as well as those that affect GHG emissions within the broader community that it serves.

With respect to County government operations, this Plan focuses on actions that save money, conserve resources such as energy and water, and provide opportunities to use more renewable energy in building operation and vehicle fleet management. The plan identifies existing programs, investments, initiatives, and accomplishments that Sacramento County has already made and calls for County departments to strive to do more with existing limited resources. Integration of sustainability measures into policies and practices is an important goal and is expected to result in cost efficiencies down the road.

To address community-wide GHG emissions (which are primarily associated with energy used in transportation and buildings not operated by the County) as well as resource use, the plan describes actions the County can take in its role as a land use planning authority and service provider. This Plan describes what the County can do to effectively integrate climate protection into planning and resource management and to lead the way in establishing regional green building policies and regulations. Existing innovative planning strategies such as the County's sustainable infill program will promote smart and pedestrian-friendly "green" communities, while curbing vehicle emissions and revitalizing the local economy.

To control emissions in the County that are generated by activities outside of Sacramento County's jurisdiction (such as wastewater treatment or regional transit), the plan identifies potential ways to work (or continue working) collaboratively with regional partners to seek and implement solutions.



### Tier 2: County Government Operations and Community-wide Plans

The County is now preparing the *Sacramento County Government Operations Climate Action Plan* to identify and prioritize County actions related to the operation of County-owned facilities, vehicles, equipment and infrastructure. Preparation of that plan involves extensive internal data collection and reporting and economic modeling to inform decisions that will ensure a favorable return on investment for the GHG reduction and other benefits provided.

Next, the County could prepare a *Sacramento County Community-Wide Climate Action Plan* to identify and facilitate actions on the part of the community to mitigate GHG emissions and prepare for the projected impacts of a changing climate. During the process, the County would seek feedback and input from community stakeholders regarding actions needed to address climate change. Sacramento County can assert its leadership but cannot meet the GHG emission reduction targets of AB 32 without the support and involvement of businesses, residents, and other stakeholders.

### Future Work

- The County will work with the other agencies in the county to refine GHG emission inventories and projections.
- The County intends to quantify and report progress towards reducing GHG emissions and meeting the state mandates through implementation of the Sacramento County CAP. This will likely involve preparation of progress reports for the Board of Supervisors and the community, and revisions to the County CAP components as warranted.

## CHAPTER 2

# Sacramento County's Contribution and Vulnerability to Climate Change



Climate change, sea level rise and other factors such as earthquakes pose a threat to the stability of river levees which protect valuable farmland and transportation infrastructure in the southeastern portion of Sacramento. (Photo: US Army Corps of Engineers Digital Visual Library - Wikimedia Commons)

### Introduction

Sacramento County contributes to greenhouse gas generation in the course of delivering services to the community and constructing and operating essential buildings, roads and infrastructure. Residents in the unincorporated area likewise add to GHG emissions through everyday activities such as driving cars and using electricity in their homes and work places. These emissions, combined with those generated by businesses, industries, agriculture and those visiting or traveling through the county, comprise the Sacramento County inventory. This chapter quantifies the County's baseline contribution and shows the contribution of GHG emissions by the various sources. Understanding these relationships is the essential first step in charting a course of action to reduce GHGs consistent with the state's regulatory goals.

The inventory results presented in this chapter are being used now to prepare the *Sacramento County CAP for Government Operations*. In the future, the County will continue to reference the data to track and measure its progress in meeting the targeted GHG reductions and will periodically refine the emissions inventory as needed, for example, to incorporate new data or take advantage of more sophisticated analysis tools.

This chapter also discusses the County's vulnerability to climate change, in terms of expected changes to temperature and precipitation and likely impacts on energy demand, water supply and public health. This information is also being used to inform the process of preparing the other CAP components.

"Warmer temperatures, altered patterns of precipitation and runoff, and rising sea levels are increasingly compromising the ability to effectively manage water supplies, floods and other natural resources. Adapting California's water management systems in response to climate change presents one of the most significant challenges of this century."

—California Department of Water Resources, "Managing an Uncertain Future", 2008

# CLIMATE ACTION PLAN

## Sacramento County's Carbon Footprint

The amount of greenhouse gases that an individual, entity, process or product directly or indirectly emits is referred to as its carbon footprint. Because carbon dioxide is the most prominent GHG in the atmosphere, it is commonly used as the metric for measuring GHG emissions (other GHG emissions, such as methane, are typically converted to "equivalent CO<sub>2</sub>" or "CO<sub>2</sub>e"). This is useful for standardizing and comparing emissions from different sources and across sectors.

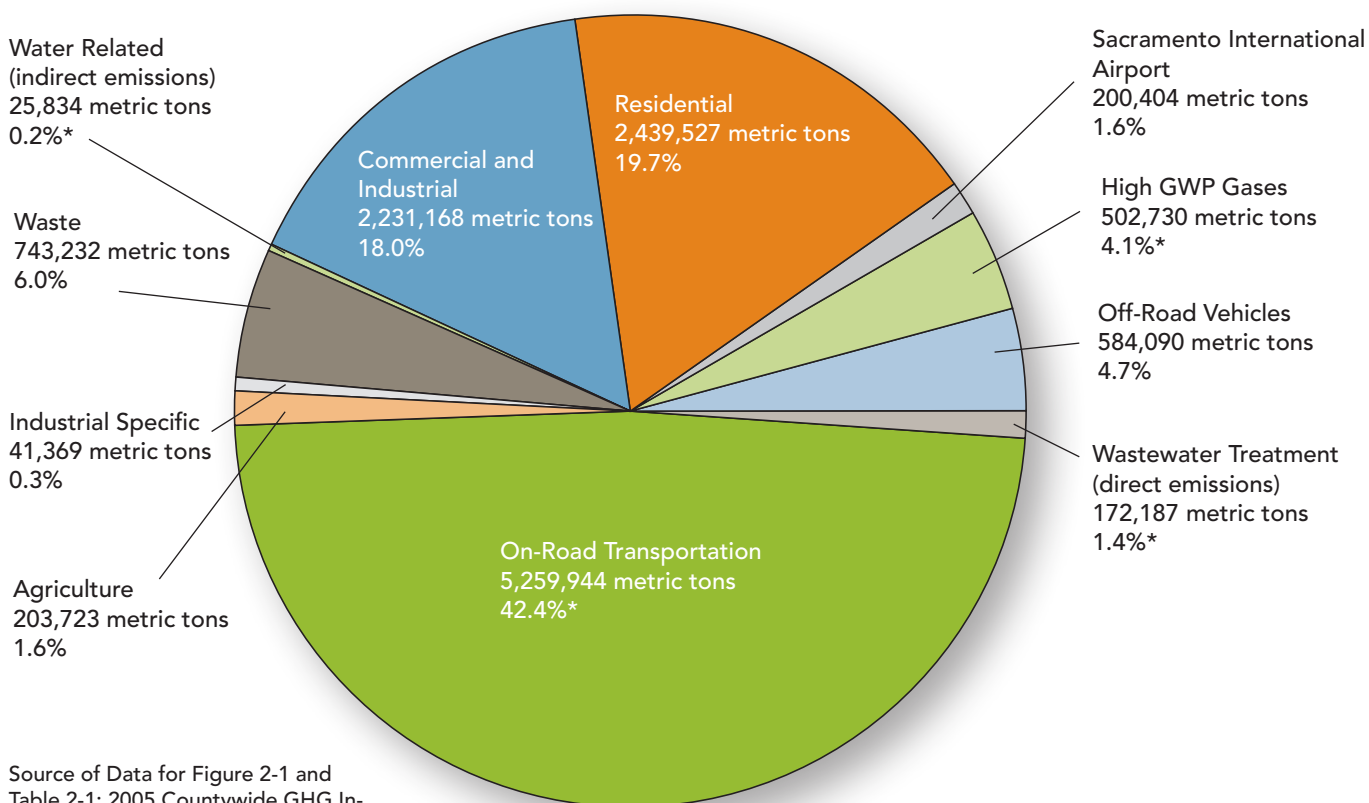
The first step in developing a plan to reduce a community's carbon footprint is to inventory the sources and amount of greenhouse gases generated by the community. The County prepared an inventory of unincorporated County emissions for the year 2005. The year 2005 was chosen as a "baseline" because the CARB selected the same year for its 2008 Scoping Plan, and it was also a year for which the County could supply the most complete data set. In some cases,

where data was not available, 2006 data was used. Consistent with other agencies in the country and state, the County's inventory was completed using the Local Governments for Sustainability (ICLEI) Clean Air and Climate Protection (CACCP) software and following the Intergovernmental Panel on Climate Change (IPCC) and ICLEI protocols.

The original inventory for the County and the incorporated cities in the county was published in June 2009. (Sacramento County, 2009). Additional refinements were published for several sectors in February 2011 (Fehr and Peers, 2010 and SMUD, 2011). This CAP reports GHG emissions from the original 2009 inventory with updated 2011 data for the following four sectors: on-road transportation, wastewater treatment, water-related and high global warming potential.

The published inventory reports are available on the County's Sustainability Program website (<http://www.sustainability.sacounty.net/>).

**FIGURE 2-1**  
Sacramento County GHG Emissions for 2005 by Sector (metric tons CO<sub>2</sub>e)



Total: 12,404,208 metric tons CO<sub>2</sub>e

Source of Data for Figure 2-1 and Table 2-1: 2005 Countywide GHG Inventory, June 2009, except data noted with (\*) was updated in February 2011.



This chapter presents estimated countywide GHG emissions first, followed by emissions broken out for the unincorporated County, then emissions from Sacramento County's government operations. A comparison of per capita emissions between all the jurisdictions in the county is also presented.

### Countywide Inventory

The total 2005 countywide GHG emissions are estimated at over 12 million metric tons CO<sub>2</sub>e (see Figure 2-1 and Table 2-1). These estimates are based on the 2005 inventory report (Sacramento County, 2009) with updated data for four sectors provided in 2011 (SMUD, 2011).



On-road transportation (e.g., cars and trucks) accounts for the largest share (over 40%) of 2005 GHG emissions in Sacramento County. (Photo: Sacramento Bee)

**TABLE 2-1**  
Sacramento County GHG Emissions for 2005 by Sector

Sector	Description	CO <sub>2</sub> e (metric tons)	Percent
On-Road Transportation	Fuel consumption for cars, trucks, etc.	5,259,944	42.4*
Residential Energy Use	Electricity, natural gas and wood consumption (fire-place burning) in residences	2,439,527	19.7
Commercial and Industrial Energy Use	Electricity, natural gas and fuel consumption in commercial and industrial facilities	2,231,168	18.0
Waste	Solid waste generation and waste-in-place (waste in landfills accumulated over the landfill's lifetime)	743,232	6.0
Off-Road Transportation	Fuel consumption for construction equipment, boats, rail operation, etc.	584,090	4.7
High Global Warming Potential (GWP) Gases	Use of man-made gases (such as Refrigerant use (fluorinated refrigerant gases), mainly created for specific industrial processes	502,730	4.1*
Agriculture	Livestock, manure management and fertilizer use	203,723	1.6
Sacramento International Airport	Ground operations (excludes aircraft)	200,404	1.6
Wastewater Treatment	Chemical and biological treatment of wastewater	172,187	1.4*
Industrial-Specific	Electricity, natural gas and fuel consumption for large stationary point-sources (boilers, incinerators and internal combustion engines)	41,369	0.3
Water-Related	Electricity, natural gas and fuel consumption for operation of water supply and irrigation infrastructure	25,834	0.2*
<b>Total</b>		<b>12,404,208</b>	<b>100</b>

Source: Sacramento County 2009, Fehr and Peers 2010, SMUD 2011

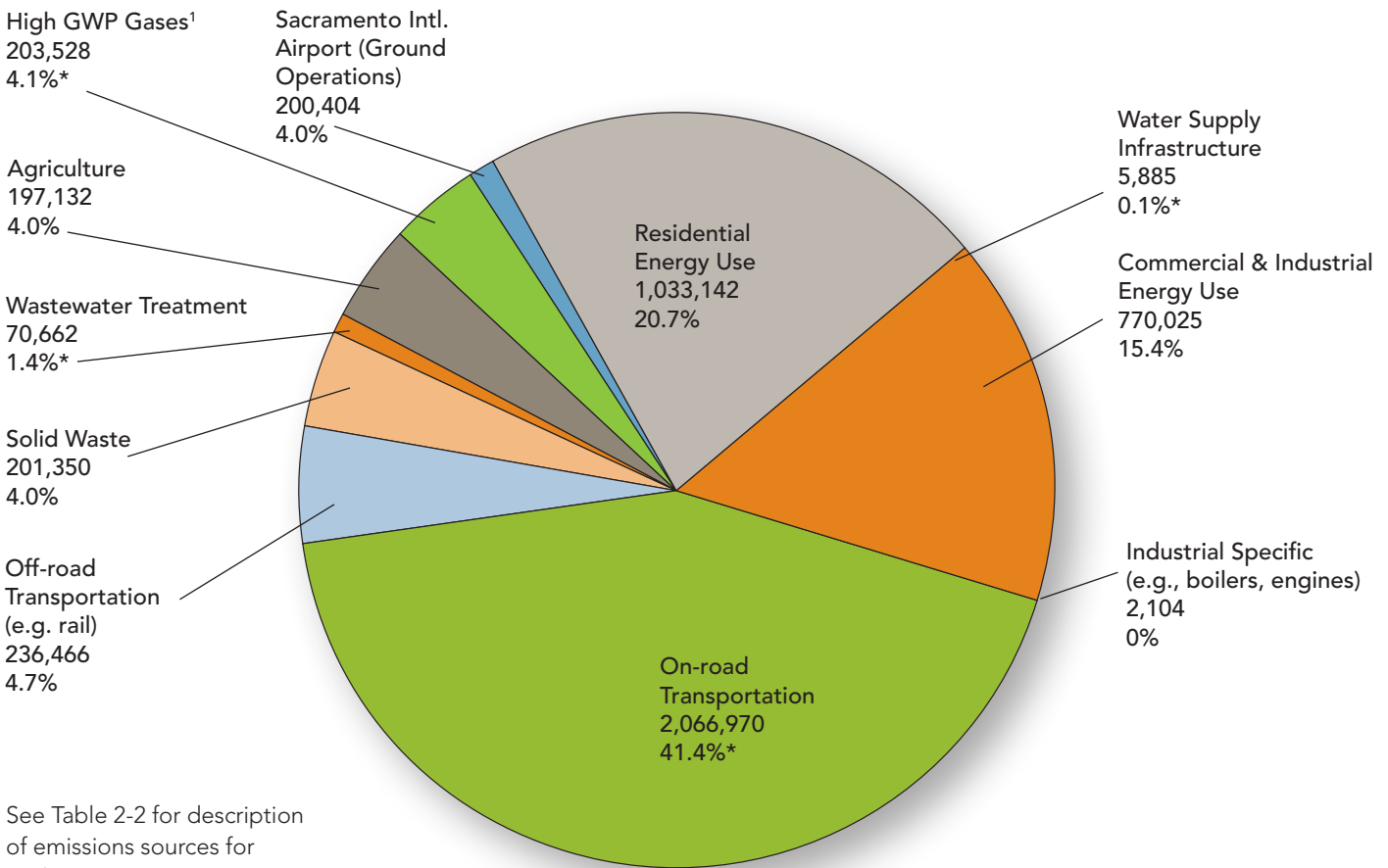
# CLIMATE ACTION PLAN

## Unincorporated Sacramento County Inventory

The estimated 2005 GHG emissions from the unincorporated county total almost 5 million metric tons CO<sub>2</sub>e; about 40% of all countywide emissions. Figure 2-2 and Table 2-2 show the contributions of each sector. On-road transportation accounted for over 40% the overall emissions and is the largest contributing sector to overall emissions, followed by energy use in the residential, commercial and industrial sectors (36% combined).

The estimated 2005 GHG emissions from the unincorporated county total almost 5 million metric tons CO<sub>2</sub>e; about 40% of all countywide emissions.

**FIGURE ES-1**  
Unincorporated Sacramento County GHG Emissions for 2005 by Sector (metric tons CO<sub>2</sub>e)



Total: 4,987,668 metric tons CO<sub>2</sub>e\*

1. High global warming potential (GWP) gases are mostly man-made gases (e.g., fluorinated gases) used in industrial processes. They typically have much longer atmospheric lifetimes and much stronger radiative forcing properties than carbon dioxide.

Source of Data for Figure 2-2 and Table 2-2: 2005 Countywide GHG Inventory, June 2009, except data noted with (\*) was updated in February 2011.

**TABLE 2-2**  
**Unincorporated Sacramento County GHG Emissions for 2005 by Sector**

Sector	Description of Emission Sources	CO <sub>2</sub> e (metric tons)	Percent
Industrial-Specific	Electricity, natural gas and fuel consumption for large stationary point-sources (boilers, incinerators and internal combustion engines)	2,104	0.0
Water Supply Infrastructure	Electricity, natural gas and fuel consumption for operation of water supply and irrigation infrastructure	5,885	0.1
Wastewater Treatment	Chemical and biological treatment of wastewater	70,662	1.4
Agriculture	Livestock, manure management and fertilizer use	197,132	4.0
Sacramento International Airport	Ground operations (excludes aircraft)	200,404	4.0
Solid Waste	Solid waste generation and waste-in-place (waste in landfills accumulated over the landfill's lifetime)	201,350	4.0
High GWP gases	Use of man-made gases (such as Refrigerant use (fluorinated refrigerant gases), mainly created for specific industrial processes)	203,528	4.1
Off-Road Transportation	Fuel consumption for construction equipment, boats, rail operation, etc.	236,466	4.7
Commercial and Industrial Energy Use	Electricity, natural gas and fuel consumption in commercial and industrial facilities	770,025	15.4
Residential Energy Use	Electricity, natural gas and wood consumption (fireplace burning) in residences	1,033,142	20.7
On-Road Transportation	Fuel consumption for cars, trucks, etc.	2,066,970	41.4
<b>Total</b>		<b>4,987,668</b>	<b>100</b>

Source: Sacramento County 2009, Fehr and Peers 2010, SMUD 2011

The following highlights the main results of the inventory for the unincorporated portion of Sacramento County, along with key assumptions, sources and limitations of data:

- Consistent with national and statewide data, on-road transportation (burning of diesel/gasoline in cars, trucks and buses) is the largest source of all emissions (just over 40%) for the unincorporated area. Emissions from on-road vehicle use, including heavy-duty trucks and buses, were quantified by ICF in June 2009 using average annual VMT data for 2005 obtained from Caltrans. The data was later updated in 2010 based on updated estimates provided by Fehr and Peers using the transportation origin/destination modeling methodology consistent with the statewide Regional Targets Advisory Committee (Milam and Donkor 2010). Emissions from aircraft and rail operations were not included in this inventory.
- Off-road transportation GHG emissions (e.g., from boats, construction equipment and lawn and garden equipment) were calculated to be almost 5% of the unincorporated county total using a CARB air quality model and apportioning the results to the various jurisdictions in the county based on 2005 population data.
- Residential and commercial/industrial electricity and natural gas use is responsible for just over one-third (36%) of the total GHG emissions for the unincorporated area. This is based on available residential and commercial (includes industrial) utility records and data supplied by the air district for residential wood burning. Emissions from non-utility based private fuel consumption such as propane, diesel generators, and bottled natural gas could not be quantified, but emissions from these sources are assumed to be negligible.

# CLIMATE ACTION PLAN



Transportation-related and residential energy use are responsible for about 70% of greenhouse gas emissions in unincorporated Sacramento County.



Photo: SMUD

- GHG emissions associated with waste management in the unincorporated county account for 4% of the total emission and include generation of solid waste from the community as well as waste-in-place (emissions from waste accumulated in a landfill over its lifetime) at the Kiefer Landfill operated by the County and the closed Elk Grove Landfill. Community-wide waste generation emissions for the entire county were roughly estimated as part of the original 2005 inventory using available waste generation data for four of the jurisdictions in the county. The waste-in-place estimates were based on waste stream profile information obtained from the County, CalRecycle and U.S. EPA.
- GHG emissions of high global warming potential (GWP) gases in the unincorporated county, which are largely the result of refrigerants and, to a lesser extent, electrical utility transmission and distribution equipment, account for 4% of the total emissions. These figures were calculated based on statewide trends and apportioned based on jurisdictional population.
- Agricultural GHG emissions, representing 4% of the unincorporated emissions total, are based on estimates of the methane, nitrous oxide and other gases produced during livestock (cattle and swine) digestion and manure management, dairy operations, and fertilizer use. Data was not available to quantify emissions from soil and crop management, including direct emissions from operating farm equipment and burning fields, and indirect emissions from water use.
- GHG emissions associated with domestic wastewater treatment were estimated at just over 1% of the total emissions for the unincorporated area, based on per capita data obtained from the state. (Note that climate action measures related to wastewater emissions will be identified and implemented by the SRCSD and are not addressed in this Plan.)
- Water-related GHG emissions are negligible, representing 0.1 percent of all unincorporated area emissions and include emissions from electricity and natural gas consumption for water supply and irrigation infrastructure and wastewater collection and treatment. Data for these calculations was obtained from the County DWR and SMUD and PG&E utility records. (Note that climate action measures related to wastewater collection and treatment will be identified and implemented by the SRCSD and are not addressed in this Plan.)

### County Government Inventory

The total 2005 GHG emissions from County government operations are estimated at over 119,000 metric tons CO<sub>2</sub>e. As illustrated on Figure 2-3, and presented in Table 2-3 on the next page, operation of County-owned buildings and ground operations at the Sacramento International Airport account for the largest share of the emissions, followed by operation of the County fleet.

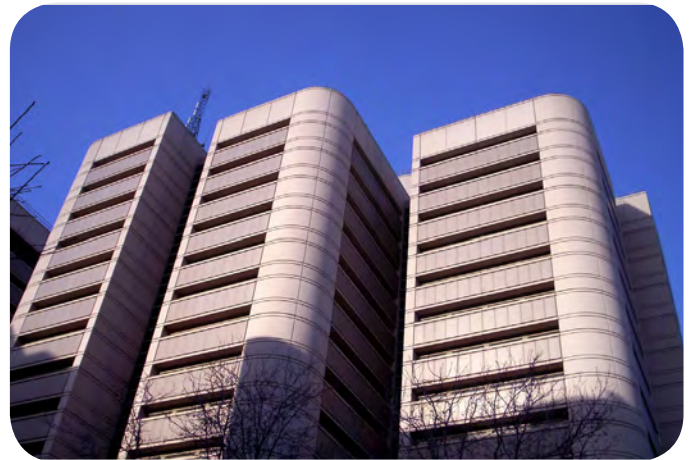
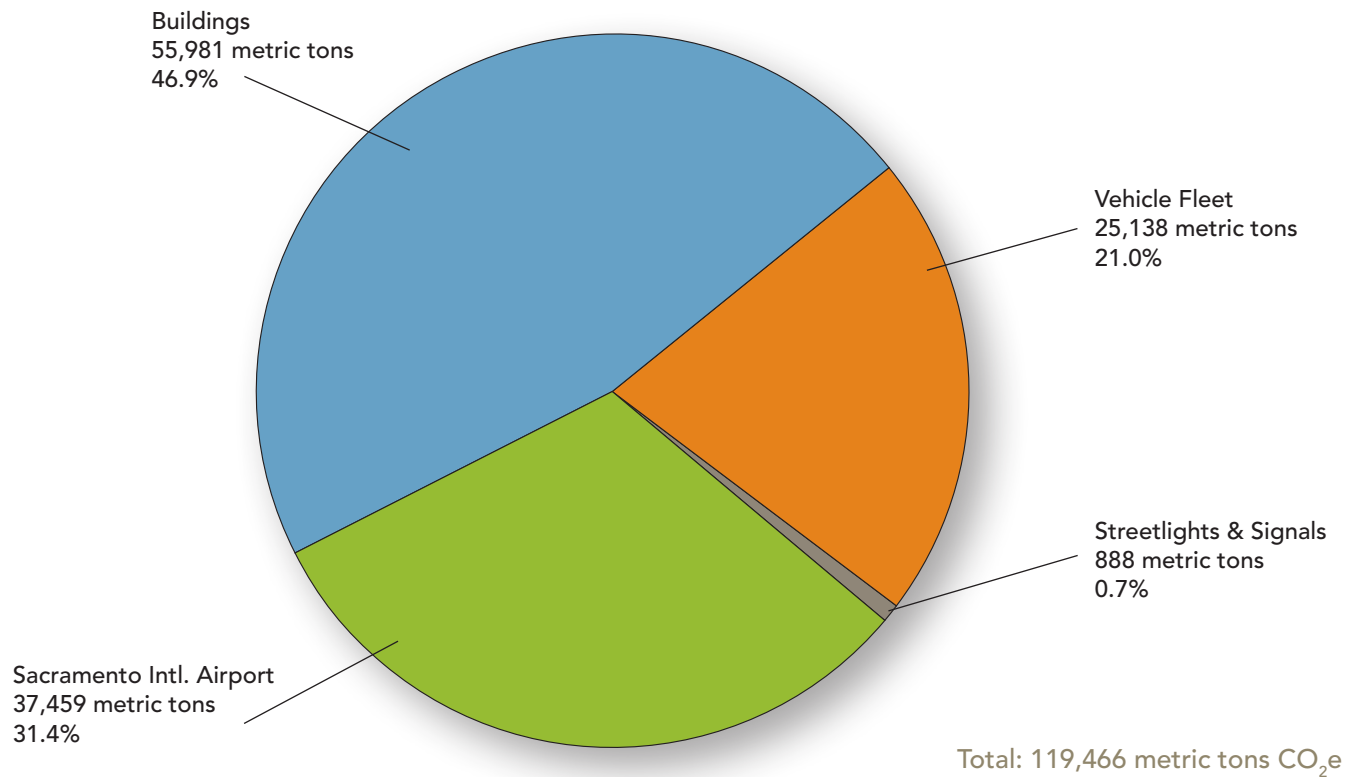


Photo: Sacramento County Sheriff

**FIGURE 2-3**  
Sacramento County Government GHG Emissions for 2005 (metric tons CO<sub>2</sub>e)





# CLIMATE ACTION PLAN

**TABLE 2-3**  
Sacramento County Government Emissions for 2005 by Government Operations Sector

Sector	Description	CO <sub>2</sub> e (metric tons)	Percent
Building Energy Use	Electricity, natural gas and fuel consumption in County government facilities	55,981	46.9
Sacramento International Airport	Ground operations (no aircraft emissions)	37,459	31.4
Vehicle Fleet	Fuel consumption (gas, diesel) for government cars, light trucks and heavy vehicles/equipment	25,138	21.0
Streetlight and Traffic Signal Energy Use	Electricity consumption for streetlights and signals	888	0.7
<b>Total</b>		<b>119,466</b>	<b>100</b>

Source: Sacramento County 2009

The following highlights the primary results of the County government inventory, along with key assumptions, sources of data and limitations:

- Operation of County government buildings accounts for the largest share of the total government emissions at 47%, based on data obtained from Sacramento County’s Energy Manager.
- The airport emissions represent about 31% of the total government emissions, the second largest source of emissions. This is based on ground operations (ground support equipment, roadways, parking) data reported in the EIR for the 2007 Sacramento International Airport Master Plan (Terminal B expansion). Aircraft emissions are excluded because the County does not have control over aircraft technology (aircraft are owned and operated by private airline companies and regulated by the Federal Aviation Administration).
- Operation of the County fleet is responsible for 21% of all government GHG emissions.
- Operation of streetlights and traffic signals (emissions from the electricity used in county-owned streetlights and signals) is a very small portion of the total (less than 1%).

Data for employee commute and waste generation from County operations were not available for the 2005 inventory; however, employee commute data was compiled in 2010 and is being used to refine the inventory for use in preparing the *County CAP for Government Operations*. Also, emissions associated with water use in buildings, landscaping and field operations were not included in this government inventory, because depending on the locations of these facilities and operations, water supply may not be under the direct jurisdiction of the County. There are over 20 water purveyors in the County and many County buildings are located in another purveyor’s service area. Consequently, electricity and natural gas consumption from water/sewage-related activities associated with County government operations are accounted for in the jurisdiction-specific inventories.

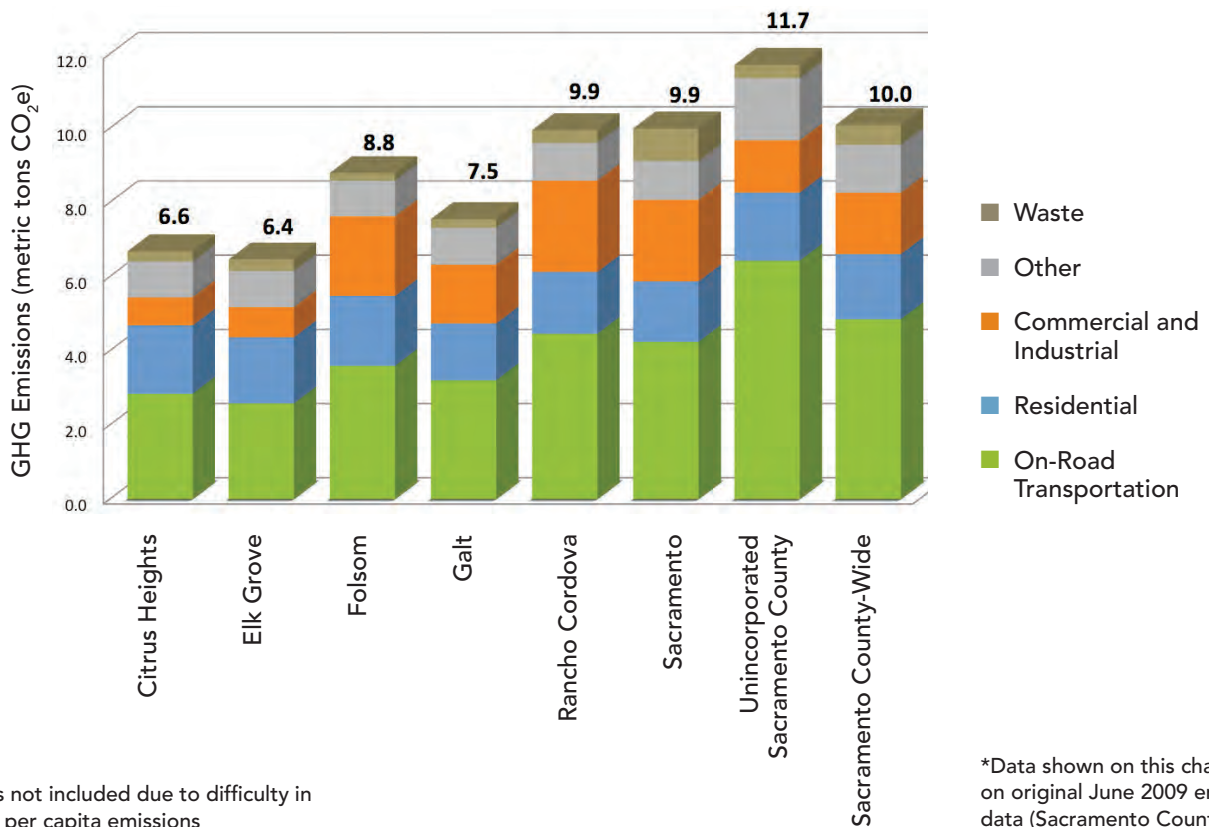
### Relative Comparisons of Jurisdictional Per Capita GHG Emissions in the County and the State

The 2005 baseline inventory concluded that the transportation sector is the largest contributor of GHG emissions for all jurisdictions in the county, followed by energy use (residential, commercial and industrial). Figure 2-4 compares the per capita emissions for the main sectors for each of the jurisdictions, based on estimated emissions and 2005 population data. The data shows the unincorporated county had the highest per capita GHG emissions, likely due to the larger amount of on-road transportation emissions (more highway miles) in the unincorporated area than in the cities.

The annual per capita emissions of 10 metric tons CO<sub>2</sub>e for Sacramento County are similar to that of other California jurisdictions, but much lower than the average per capita emissions of 24.5 metric tons CO<sub>2</sub>e for the U.S.

—Sacramento County, 2009

**FIGURE 2-4**  
Per Capita GHG Emissions for Cities and Unincorporated County in Sacramento County for Major Sectors (metric tons CO<sub>2</sub>e)\*



Isleton was not included due to difficulty in estimating per capita emissions

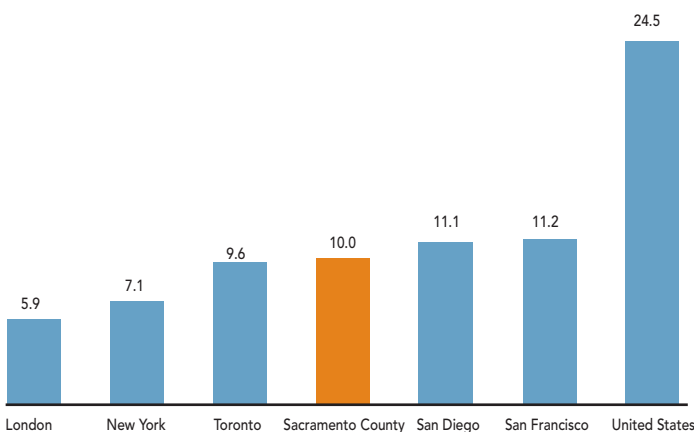
# CLIMATE ACTION PLAN

For the County as a whole (all cities combined with the unincorporated area), the study concluded that the annual countywide per capita emissions (10 metric tons CO<sub>2</sub>e per person) are similar to that of other California jurisdictions, but much lower than the average per capita emissions of 24.5 metric tons CO<sub>2</sub>e for the U.S. See Figure 2-5.

The Countywide per capita emissions approach AB32's goal of approximately 9.7 metric tons CO<sub>2</sub>e necessary to achieve 1990 GHG levels by 2020 for the state of California (Sacramento County, 2009).

**FIGURE 2-5**

**Per Capita GHG Emissions of Major U.S. Cities and U.S. as a Whole (metric tons CO<sub>2</sub>e)\***



\*Data shown on this chart based on original June 2009 emissions data (Sacramento County, 2009)

Based on its 2005 emissions inventory, Sacramento County's target is to reduce community emissions from the unincorporated county by about 650,600 metric tons of CO<sub>2</sub>e and government emissions by about 15,600 metric tons of CO<sub>2</sub>e.

## Sacramento County's Emissions Reduction Targets

The CARB's 2008 Scoping Plan recommends that local governments adopt GHG reduction targets for their municipal operations that align with the target proposed for State government operations which is a 15% reduction in emissions from current levels by the year 2020. (In this case, the County's 2005 baseline is used to approximate "current levels".) In addition, the CARB Scoping Plan recommends that local governments move towards establishing that same goals for community-based emissions. These GHG reduction goals for local government will help place California on the path to meeting the longer term goal of an 80% reduction in emissions below 1990 levels by 2050.

Based on the 2005 emissions inventory presented in this plan, Sacramento County's target is to reduce community emissions from the unincorporated county from 4,987,668 to 4,337,103 (about 650,600) metric tons of CO<sub>2</sub>e and government emissions from its own operations from 119,466 to 103,883 (about 15,600) metric tons of CO<sub>2</sub>e. The underlying inventory and the 2020 reduction targets will be refined during development of subsequent components of the Sacramento County CAP.

## Reporting and Registering GHG Emissions

The County joined the California Climate Action Registry (Registry) in December 2006 and has since earned the Registry's distinction of Climate Action Leader™. The Registry is non-profit public/private partnership that serves as a voluntary GHG registry to encourage early actions to reduce GHG emissions. As a registry participant, the County submits its annual GHG emissions for public reporting following certification using Registry standards and protocols by an independent, State approved third party verifier. Emissions include direct emissions from stationary, mobile, process and fugitive sources, as well as indirect emissions associated with electricity use.

As required by AB 32, the CARB has developed standards and protocols for reporting and verifying GHG emissions. The agency has incorporated the standards and protocols developed by the Registry where appropriate and to the maximum extent feasible.

## Vulnerability to Climate Change

In addition to reducing GHG emissions, Sacramento County needs to prepare for and adapt to a changing climate. Even if the County were to offset all of its emissions, there are predicted and irreversible climatic changes in store that will adversely impact the County if steps are not taken to prepare for and adapt to the changes.

The projected impacts of climate change will vary geographically. Projected impacts to the Sacramento region include:

- **Variable Precipitation** – Reduced Sierra snowpack, earlier snow melt, higher stream and river flows, and extended drought periods punctuated by intense precipitation events
- **Heat Waves** – More frequent, longer, and more-extreme heat waves and associated health impacts. If temperatures increase to the higher end of the predicted range, then the average July temperature in Sacramento will increase from 94 to 102 degrees and could get as hot as 122 degrees in an extreme event
- **Wildfires** - Increased wildfire risk and associated air quality and health problems
- **Air Quality** – Increased production of air pollutants, especially ozone, due to higher air temperatures
- **Water Supply** – Decreased water supply with implications for community residents, agriculture and the environment (terrestrial and aquatic species and habitat)
- **Flooding** – Greater risks of flooding due to more extreme storm events and due to levee stress from rising sea levels
- **Water Quality** – Potential water quality problems associated with sea level rise (e.g., increased salinity in receiving waters) and higher river and stream flows (e.g., increased turbidity and pollutants carried in sediment)
- **Natural Ecosystem** – Degraded in-stream, riparian and terrestrial habitat as a result of heat waves, droughts, flooding, higher in-stream flows and impaired water and air quality
- **Agriculture** – Decreased production from livestock and crops sensitive to temperature increases and decreased water supply, and increase in various pests

A changing climate has the potential to induce stresses to the human, built, and natural systems within the Sacramento region. Table 2-5 identifies some of the current and expected impacts to various systems. The actions in Chapter 3 are designed to address these vulnerabilities.



Climate change can have severe impacts on the agricultural industry (Photo: Wikimedia Commons)



# CLIMATE ACTION PLAN

**TABLE 2-4**  
Potential Climate Change-Related Impacts to Sacramento County Human, Natural, and Built Systems

Vulnerable Sector/System	Current and Expected Impacts
Agriculture	<p>Multiple and interacting stresses including:</p> <ul style="list-style-type: none"> <li>• Decreased water supply</li> <li>• Invasive noxious weeds</li> <li>• Decreased chill hours and earlier ripening periods (particular impacts to wine grapes)</li> <li>• Stress on dairy cows reducing milk production</li> <li>• Increased threats from pests and pathogens</li> </ul>
Public Health and Safety	<ul style="list-style-type: none"> <li>• Increased brushfire/wildfire potential</li> <li>• Diminished air quality (Higher temperatures increase frequency, duration, and intensity of conditions conducive to air pollution formation. Fires increase pollutants)</li> <li>• Risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress due to temperature increases and heat waves. This could disproportionately affect the poor who may lack access to air conditioning and medical assistance</li> <li>• Increased risk of vector transmitted disease</li> <li>• Increased risk of food-borne illnesses, and threats to food availability as a result of agricultural pests and diseases</li> <li>• Public safety risks from increased flooding</li> <li>• Adverse drinking water quality impacts from increased flooding, runoff, and erosion following intense precipitation</li> </ul>
Energy Supply	<ul style="list-style-type: none"> <li>• Power outages due to potential reduction in hydropower and increased demand</li> <li>• Higher temperatures will increase electricity demand due to higher air conditioning use</li> <li>• Reduced reliability of energy supply</li> </ul>
Levees	<ul style="list-style-type: none"> <li>• Levee stresses due to increased sea level rise; vulnerable levees in the Delta; stormwater management due to faster snowmelt or increased precipitation</li> </ul>
Water Supply	<p>Decreased supply due to:</p> <ul style="list-style-type: none"> <li>• Reduced snowpack in the Sierras (more precipitation will fall as rain instead of snow, and snow will melt earlier, reducing the snowpack by as much as 79-90 percent)</li> <li>• More frequent droughts</li> <li>• Potential for increased salinity in Delta water (sea level rise could result in salt water intrusion)</li> <li>• Diminished groundwater and lowered cones of depression</li> <li>• Increased demands due to even hotter, drier summers coupled with projected population growth</li> </ul>
Natural Ecosystem	<ul style="list-style-type: none"> <li>• Damage to/loss of special status species</li> <li>• Impacts to vegetation from pests, diseases, and fire</li> <li>• Shifting vegetation as natural habitats are altered</li> <li>• Changes in lake and stream ecology – increased water temperatures create stress on cold water species (e.g., trout and salmon)</li> </ul>
Transportation Infrastructure	<ul style="list-style-type: none"> <li>• Road buckling during heat waves</li> <li>• Increased need to manage brush fires along roadways</li> <li>• Erosion around bridge footings from increased flooding</li> </ul>
Recreation	<ul style="list-style-type: none"> <li>• More frequent drought conditions will impact river levels and water recreation</li> <li>• Species loss affecting hunting, fishing, and bird watching</li> <li>• Reduced predictability of outdoor events</li> </ul>

## CHAPTER 3

# Actions To Address Climate Change



The actions described in this Plan (such as those intended to conserve non-renewable energy sources and conserve water) are necessary for a sustainable future regardless of the state’s climate change regulations.

### 3.1 INTRODUCTION

This chapter of the *Sacramento County Climate Action Plan-Strategy and Framework Document* describes actions already being taken by the County and possible future actions to address climate change and meet regulatory targets. The actions are intended to reduce GHG emissions and help the County prepare for and adapt to the projected impacts of climate change on the community’s resources – such as energy and water supply, air quality and health, and agricultural production – and resulting impacts on the economy. There are many cases where taking action now is cost-effective and would lessen the impact, or where the issue is evident even without the added challenge of climate change (for example, water resources are already limited and air quality is already impaired due to a growing population).



Actions are presented in this chapter in five main sectors:

- Transportation and Land Use
- Energy
- Water
- Waste Management and Recycling
- Agriculture and Open Space

For each sector, this chapter describes how that sector affects and is affected by climate change, the County’s role, overall goals, and existing, continuing and potential future County actions. In addition, each action is coded to describe whether it affects only County government operations **g** or potentially the community as a whole **c**. A summary is presented at the end of each section for an “at-a-glance” review of all actions pertaining to that sector.

# CLIMATE ACTION PLAN



Watt Avenue Improvement Project improved mobility, safety, and seismic response for what had been one of the area's most congested roadways. The bridge was improved for motorists, cyclists, pedestrians, and residents. (Photo: SACDOT)



## 3.2 TRANSPORTATION AND LAND USE

### Introduction

Transportation accounts for more greenhouse gas (GHG) emissions than any other sector in the county, so reducing GHG emissions from this sector is critical. As explained in Chapter 2, on-road transportation emissions (from autos, buses and trucks) comprised over 40% of GHG emissions in the unincorporated county in 2005; this is very similar to the Countywide total for transportation emissions. Just over 20% of the emissions associated with county government operations were attributable to operation of the county fleet. GHG emissions associated with operation of the Sacramento International Airport (ground operations) accounted for 4% of the unincorporated County GHG emissions total and over 31% of those associated with county government operations.

While county-specific data is not available showing the breakdown in vehicle types for the on-road transportation category, statewide numbers are likely a good estimate. In California, passenger vehicles account for 76% of on-road transportation emission sources; heavy duty vehicles account for the remaining 24%. (CARB, 2008)

Vehicle emissions are determined by three factors:

- **Vehicle fuel efficiency** – Vehicle fuel efficiency can be measured two ways. Traditionally it is measured as vehicle miles traveled per gallon (vmpg), which is determined by emission limits set by state and federal standards, the type of vehicle driven, and to a lesser extent by how the vehicle is driven (for example, idling time affects GHG emissions). However, vehicle fuel efficiency can also be measured by passenger miles traveled per gallon (pmpg). As used here, the term passenger includes the driver. For instance, a car achieving 40 mpg that is only carrying one passenger (40 pmpg) is actually less efficient than a car achieving 20 mpg carrying four passengers (80 pmpg). Improving both vmpg and pmpg is essential to reducing GHG emissions.



- **Carbon content of vehicle fuel used** – Most vehicles on the road today use gasoline or diesel fuel, both of which result in significant carbon dioxide emissions (19.4 pounds/gallon and 22.2 pounds/gallon, respectively.) Transitioning to lower-carbon or zero carbon fuels helps reduce greenhouse gas emissions. In 2007, Governor Schwarzenegger issued an Executive Order requiring a low carbon fuel standard that reduces the carbon intensity of transportation fuels sold in California. The CARB is currently undergoing the regulatory process to put the new standard into effect that will require by 2020, a 10 percent reduction in the carbon content of all passenger vehicle fuels sold in California. While increasing the efficiency of vehicles powered by fossil-fuels can lead to significant GHG reductions, switching to alternative fuel sources (such as electricity, biofuels, fuel cells and other sources) can result in even more substantial reductions and/or potentially the total elimination of GHG emissions.
- **Vehicle miles traveled (VMT)** - Reducing VMT is another way to reduce emissions, and according to the CARB, may be the most difficult to achieve as population growth continues in the region. Local governments have the most direct influence on total VMT, as VMT is largely a function of how communities are planned and developed. Maximizing pmpg by actions such as carpooling, also reduces VMT.

Sacramento County will evaluate and implement feasible and cost-effective actions that address these factors to reduce GHG emissions.

Transportation accounts for nearly half of the GHG emissions for the entire County and similarly, nearly half of the emissions for the unincorporated portion of the county.



### LAND USE AND TRANSPORTATION

The predominant land use and development trends of the post-war period often emphasized segregated land uses and relatively low development densities and intensities. As a result, distances between uses (such as homes, jobs, stores, parks, schools, etc.) increased, leading to a growing reliance on automobiles to meet daily needs. In turn, both total VMT and VMT per capita have increased, leading to rising GHG emissions and reduced air quality, as well as a greater portion of household income devoted to transportation costs and increasing public funds dedicated to construction, operation and maintenance of roadway and parking infrastructure. From 1997 to 2005, Sacramento County's population grew by 22.9%, from 1.12 million to 1.370 million. In the same period, VMT in Sacramento County increased by 27.4%, from 25.23 million miles to 32.15 million miles. (SACOG 2009)

As VMT is directly tied to how communities are planned and developed, reducing VMT will require changes to and coordination of land use and transportation policy and practice. Channeling new development to urban areas and increasing overall land use mix and connectivity can increase walking, bicycling, and transit use and reduce per capita transportation-related emissions. Shifting development patterns to an emphasis on compact development and complemented by smart transportation policies, can significantly reduce carbon emissions. For example, compact development clustered around transit lines can reduce VMT per capita from 20% to 40%. (Ewing, 2008) Mixing compatible uses and developing more compactly yields permanent GHG reduction benefits that compound over time as this development pattern comprises a greater and greater proportion of the community's total land use.



# CLIMATE ACTION PLAN

## The County's Role in Transportation

Sacramento County has no control over the availability of fuel efficient cars and alternative fuels to the community, or the choices County residents and cities in the region make about transportation. However, the County influences emissions from the transportation sector in a number of ways, as described below.

**Land use planning.** Vehicle miles traveled are largely a function of land use patterns, and Sacramento County is responsible for land use planning in the unincorporated county. The County's General Plan provides a blueprint for how the unincorporated county will develop, and includes a map identifying the envisioned future land use (single-family residential, commercial, agriculture, etc.). Therefore, the General Plan will affect future transportation patterns and GHG emissions. Sacramento County has no direct influence over the Sacramento Regional Transit District (RT), railroad companies, or the many commercial transportation businesses operating in the county. However, as a land-use planning agency, the County can facilitate efficient public transit by planning higher density/intensity development near transit stations and stops. In addition, the County can support regional rail by locating appropriate uses (e.g. industrial, warehouses, etc.) near major freight corridors.

**Land development approvals and mitigation.** Individual developments contribute GHG emissions. The County's Community Planning & Development Department is responsible for planning, reviewing, and approving development in the unincorporated county as guided by the General Plan. The County's Department of Environmental Review and Assessment (DERA) ensures compliance with CEQA by determining potential environmental impacts (such as GHG emissions) associated with proposed development and requiring mitigation measures.



**Transportation planning and operations.** As evidenced by the data in Chapter 2, the road and highway network has a significant influence on vehicle miles traveled, and therefore GHG emissions. The extent of pedestrian and bicycle facilities also influences emissions. The County's Department of Transportation (SACDOT) plans and oversees construction and improvement of roads, bridges, and associated pedestrian and bicycle facilities in the county. However, many roads and highways traversing the county are planned, constructed, owned and operated by various agencies over which the County has no control, including the Federal Highways Administration, Caltrans, and the incorporated cities. SACDOT's jurisdiction is limited to maintaining the roads and bridges in the unincorporated area and some designated county roads traversing the cities.

**Traffic Signal Operation.** The street and traffic signal systems operated by SacDOT affect traffic congestion and traffic flow, which also affect fuel efficiency and GHG emissions. The GHG impacts from street signals and street lights are discussed in Chapter 3.3 Energy.

**Operation of the County fleet.** Decisions the County makes about the composition and fuel efficiency of its fleet has a direct impact on GHG emissions. County General Services has adopted a Light Duty Vehicle Acquisition policy and has already converted 10% of the light duty vehicles in its fleet to fuel-efficient and alternative-fuel vehicles. As discussed elsewhere in this plan, the Department of Waste Management and Recycling has re-routed trips and is studying use of global positioning system (GPS) software to cut down on vehicle miles traveled for waste collection and transfer trucks.

**County employee and customer commute choices.** The County helps reduce GHG emissions associated with employee commutes by providing incentives and options for carpooling and transit (e.g., discounted monthly transit passes). It has also reduced or eliminated commute time for some of its customers by locating County services in convenient locations throughout the County and providing on-line computer services.

**Airport operations.**

Sacramento County Airport System (SCAS) operates four airports in the county, including Sacramento International Airport, which services about ten million passengers annually, and Mather, Franklin Field and Executive Airport satellite airfields. SCAS also manages the aviation activities at McClellan Airport on behalf of the County’s Economic Development Department. The decisions SCAS makes about operations within its control impacts GHG emissions. For example, the new Terminal B, currently under construction, will be a LEED-certified energy efficient building when completed. And fueling operations have been modernized to reduce vehicle miles traveled with fuel trucks. These and other actions are described later in this section. SCAS has no control over the actions of the individual airlines (currently there are 12), which are regulated by the Federal Aviation Administration. However, SCAS works with the airlines to encourage actions on the ground to minimize environmental impacts.



The Airport operates several low speed electric trucks and global electric motorcars (< 25 mph) which are ideal for short trips around the facility. (Photo: SCAS)

**Goals**

The County is committed to achieving three goals to mitigate GHG emissions in compliance with state mandates:

- Increase the average fuel efficiency of County-owned vehicles powered by gasoline and diesel and encourage increased fuel efficiency in community vehicles
- Increase use of alternative and lower carbon fuels in the County vehicle fleet and facilitate their use in the community
- Reduce total vehicle miles traveled per capita in the community and the region

**Co-Benefits**

Improving fuel efficiency reduces GHG emissions and air pollution harmful to human health. More fuel-efficient vehicles also save the owner and/or operator money by reducing fuel consumption.

Reducing VMT is essential to achieving necessary GHG emission reductions, but also can result in other concurrent benefits, including:

- Reduced congestion, roadway and parking costs (Litman, 2007)
- Reduced injuries and deaths from collisions
- Reduced generation of toxic air contaminants and improved air quality
- Reduced cardio-respiratory diseases, asthma and premature deaths caused by toxic air contaminants
- Increased walking, bicycling and transit use will yield increased rates of physical activity and reduced rates of chronic diseases related to inactivity and obesity



**HEALTH CO-BENEFITS**

When vehicle trips are replaced by increased walking, bicycling and transit use, the community can benefit from improved air quality, higher rates of physical activity, and reduced rates of chronic diseases related to inactivity and obesity.

# CLIMATE ACTION PLAN

## Actions to Address Climate Change

Existing and potential actions that reduce GHG emissions are described below related to the County's goals for this sector. Each action is coded to indicate whether it applies to Sacramento County government operations **g** or to the entire community **c**.

### Existing or Completed Actions that Increase Fuel Efficiency

The actions described below to increase fuel efficiency include those that improve vehicle miles traveled per gallon of fuel as well as those that improve efficiency by increasing the passenger miles traveled per gallon of fuel (i.e. carpools).

#### County Light-Duty Fleet Conversion Program **g**

The County's Department of General Services (DGS) maintains the largest portion of the overall County fleet (about 3,000 cars, vans, SUVs and small trucks servicing over 50 County departments). DGS has already converted almost 10% of its light-duty fleet to more fuel-efficient vehicles (gas/electric hybrids) and purchases of SUVs now require special approval. The County's policy is to replace cars and light trucks every 12 years or 120,000 miles, whichever occurs first, and to replace them with hybrid vehicles. Non-safety vehicles are replaced with hybrids as budgets allow. In addition, in 2007, the County completed construction of its new fleet maintenance facility at the Bradshaw Branch Complex, designed to maintain and repair all types of energy efficient vehicles, including hybrids and LNG-fueled vehicles, trucks and equipment.



At Sacramento International Airport, the County replaced its fleet of almost 40 diesel buses with buses powered by compressed natural gas (CNG). (Photo: SCAS)

#### County Employee Carpool Incentives **g**

As an incentive to carpool, the County provides employee parking at a reduced monthly rate for carpools. In addition, carpools receive priority on the parking lot waiting list.

### Existing or Completed Actions that Increase Use of Alternative Fuels

#### Alternative Fuel Vehicles for County Heavy-Duty Fleet **g**

County DGS has acquired 20 large trucks that run on alternative fuels. This accounts for 5% of its heavy fleet. In addition, the County's Department of Waste Management and Recycling (DWMR) owns and operates a fleet of approximately 127 waste collection vehicles, of which 103 are dedicated liquefied natural gas (LNG) and 18 are dual-fuel vehicles running on 80% LNG and 20% diesel. This action is estimated to reduce GHG emissions by 3800 metric tons per year.

#### Inherently Low Emission Vehicle Program (ILEAV) **g**

SCAS was one of ten airports in the country that received a grant from the Federal Aviation Administration in September 2001 to expand the use of clean fuel vehicles and associated infrastructure. By 2005, SCAS replaced its fleet of diesel buses with 39 buses powered by compressed natural gas (CNG) and has acquired various electric vehicles for use at Sacramento International Airport. The associated infrastructure allows airport tenants to implement similar initiatives. The ILEAV Program provided valuable data that the FAA is using to assist airports throughout the country in the expanded use of clean fuel technologies.

#### Alternative Fuel Stations **g**

SCAS operates a CNG fuel station at Sacramento International Airport that services the Airport's bus fleet, airport shuttle companies and the local school district. The County also operates a LNG station in North Highlands and a mobile LNG fueling truck at the Bradshaw Branch Center complex. In the County downtown parking structure, there are two conductive chargers and one inductive charger for electric vehicles. At Sacramento International Airport, SCAS performed a power upgrade that included electrical changing stations for electric ground service equipment vehicles.





The County provides several public accessible electric car charging stations in County-owned parking lots, such as this EV charger at the Branch Center complex (Photo: James Collins)

**Existing or Completed Actions that Increase Use of Alternative Fuels (continued)**

**Designated Parking for Alternative Fuel Vehicles c**

The County provides designated parking spaces for electric vehicles in several County-owned parking lots.

**Existing or Completed Actions that Reduce Vehicle Miles Traveled**

**Employee Commute Survey g**

The County conducted a survey of employee commute actions in fall 2010 to provide data for estimating VMT and corresponding GHG emissions for the Sacramento County CAP for Municipal Operations. Additionally, the survey provided data about participation in the various employee incentive programs and employee suggestions for improvements and modifications to the incentive programs.

**County Employee Transportation Program g**

The County implements an employee incentive program to promote carpooling and public transit use. In addition to the carpool incentives described previously, an employee can purchase a Regional Transit (RT) monthly pass at a significantly reduced rate. Also, the County’s travel policy states that transit should be the first option for employees traveling on out-of-town business, instead of rental car use.

**Bike Lockers and Other Secure Bike Storage g**

Many County facilities provide bike lockers, which range from caged areas that are electronically-controlled or box-type lockers. In general, new County building projects include areas for bike lockers.

**Flexible Employee Work Schedules g**

The County allows its employees to participate in the 9/80 program where employees complete 80 hours of work in a 9-day period and have the 10th day off. This reduces VMT for employees who drive to the workplace.

**SCAS Jet Fuel Farm g**

SCAS opened an onsite aircraft fuel facility at Sacramento International Airport, which eliminated the need for approximately 20 daily trips by heavy-duty tanker trucks that delivered jet fuel to the airport. This fuel farm eliminates 8,000 diesel-powered tanker truck trips per year and reduces vehicle miles traveled by 254,775 miles. This voluntary effort was recognized by the Sacramento Environmental Commission with an Environmental Recognition Award and by the SMAQMD with an Emission Reduction Credit certificate. The SCAS subsequently used the certificate to reduce the CEQA-mandated air quality mitigation fees that were assessed for anticipated construction equipment associated with Sacramento International Airport’s Terminal Modernization Program now underway.

**Intelligent Transportation Systems (ITS) Technology c**

The Traffic Operations Center (TOC) enables operators to improve signal timing, identify incidents and congestion, and provide information back out to the traveling public through cooperation with Caltrans, California Highway Patrol, and the media. In addition, partnering with RT allows for traffic data sharing and also provides transit signal priority to RT buses on several key corridors. The TOC function is integral in minimizing congestion and thereby reducing vehicle emissions.

**Convenient County Service Locations c**

The County established convenient customer service centers throughout the county which helps to reduce VMT. Service centers currently operate in the north and east areas of the county. These service centers offer many services that were formally only available in downtown Sacramento, including help with: building permits; business and pet licensing; property tax and utility bill payments; fire inspection; and other planning, transportation and neighborhood services. Decentralizing these services brings them closer to the end user, thereby reducing travel times and distances for residents.



# CLIMATE ACTION PLAN



The Colonia San Martin project in the Florin Area, at over 20 units/ac, is a good example of the type of high density, transit-oriented development the County is promoting in its urban infill corridors. (Photo: Mercy Housing)

## Existing or Completed Actions that Reduce Vehicle Miles Traveled (continued)

### Transit Oriented Development in County Infill Corridors **C**

The County's Draft 2030 General Plan calls for revitalizing 14 key older commercial corridors within the unincorporated county. Currently, these corridors are characterized by numerous vacant and underutilized properties, include predominantly low-intensity commercial and light industrial development, and feature few residential uses. These corridors carry tremendous automobile and transit traffic. Therefore, planning more dense/intense development along these corridors, particularly residential and mixed-use development, will facilitate high quality transit service by providing more potential riders. In addition, by providing more residential units near commercial and employment uses, the future redevelopment will facilitate the opportunity for residents being able to walk, bike or take transit (rather than drive) to meet their daily needs.

The County plans to adopt individual plans for each corridor and three corridor planning processes are currently underway for North Watt Avenue, Florin Road, and Fair Oaks Boulevard in Carmichael.

### Incentives for Increased Density and Mixed Land Use Developments **C**

Through the update to its General Plan, the County is currently exploring ways to increase average density and mix of land uses as a way to shorten distances between destinations and reduce per capita vehicle miles traveled. Actions being explored include: providing more flexibility regarding Level of Service (LOS) standards; implementing new models to evaluate LOS (measuring overall mobility rather than vehicle throughput); and more accurately capturing reductions in VMT from mixed use and transit oriented development

### Pedestrian and Bicycle Master Planning **C**

In November 2007, the Board of Supervisors approved the Sacramento County Pedestrian Master Plan which establishes goals and strategies to increase pedestrian safety and improve walkability in the Sacramento County unincorporated area. Development of projects included in the plan are intended to enhance walking as a viable transportation alternative and help make Sacramento County a better place to live.

The County adopted an update to the Sacramento County Bicycle Master Plan (originally adopted in 1993) in April 2011, to guide and influence bikeway policies, programs, and standards to make bicycling in the unincorporated portion of Sacramento County more safe, comfortable, convenient, and enjoyable for all bicyclists. The ultimate goal of this effort is to increase the number of persons who bicycle to work, school, errands, and recreation in Sacramento County. A Bicycle Advisory Team was created to provide input and perspective in developing and prioritizing the Master plan, and the County consulted with groups such as Sacramento Area Bicycle Advocates regarding bicycling needs and safety.

### Participation "Safe Routes to School" (SR2S) Program Participation **C**

Sacramento County has been very involved in both the Federal (SRTS) and State (SR2S)-sponsored "Safe Routes to School" programs, which encourage walking and reduce car trips. Several SR2S projects have been successfully completed and others are currently underway.

**Potential Actions to Increase Vehicle Fuel Efficiency**

**Consider Employee Training to Reduce Emissions g**

Consider providing employee training to reduce emissions through improved driving practices (such as the amount of idling, braking, coasting, starts and stops). Training would be prioritized for employees operating trucks and equipment most subject to stop-and-start operation.

**Develop County Employee Carpool-at-Work Incentives g**

Encourage employees in all departments to carpool to off-site meetings and field activities.

**Lobby for Improved Fuel Efficiency Standards c**

The County’s Legislative Advocate would work alongside staff from other cities and counties in the region to encourage new or revised state or national legislation to promote manufacture, availability and purchase of more fuel efficient vehicles. Examples of legislation include increased CAFE (corporate average fuel efficiency) standards for cars and light trucks and tiered vehicle registration fees to encourage the purchase of fuel-efficient vehicles.

**Require Designated Parking for Carpool Vehicles in Non-County Parking Lots c**

Amend zoning code to require retail and other commercial uses (including employment centers) in the unincorporated county to provide dedicated parking spaces for carpool vehicles.



In 2005 the County adopted a policy requiring new and replacement vehicles to be hybrid. Since that time, the percentage of hybrids in the light fleet has jumped from 1% to almost 10%. (Photo: Sonia Saini)

**Potential Actions to Increase Use of Alternative Fuels**

**Expand Fleet Conversion Program g**

Consider expanding the existing light-duty fleet conversion policy/program (described previously) with the goal of converting the entire County fleet to vehicles, trucks and equipment powered by alternative low-carbon fuels, electricity, fuel cells and/or other technologies as they become financially feasible.

**Increase Designated Parking for Alternative Fuel Vehicles in County Parking Lots g**

Increase designated parking space in County-owned parking lots for alternative fuel vehicles.

**Require Designated Parking for Alternative Fuel Vehicles in Non-County Parking Lots c**

Identify amendments to the zoning code to require retail and other commercial uses (including employment centers) in the unincorporated county to provide dedicated parking spaces for alternative fuel vehicles.

**Encourage Alternative Fuel Stations in New Development c**

Encourage master plans and developments in new growth areas to address site selection for alternative fueling stations and electrical vehicle charging stations.



# CLIMATE ACTION PLAN

## Potential Actions to Reduce Vehicle Miles Traveled

### Promote County Employee Transportation Program **g**

Work to increase the visibility of the County Employee Transportation Program Coordinator and the number of employees participating. Consider expanding the program to encourage alternative modes of transportation for both home-to-work and at-work travel. Identify improvements to the program based on the feedback from the 2010 employee commute survey. Consider creating a bicycle fleet pool for downtown, McClellan, Airports, and Bradshaw Campus employees.

### Consider an Employee Shuttle System **g**

Consider creating a shuttle system between County offices, other agency offices frequently visited by employees (e.g., Cal EPA building, Caltrans) and services not served by transit. For example, provide shuttle service between the County Administration Center downtown and County's Bradshaw complex, or Bradshaw complex and the nearest RT light rail station.

### Provide Additional Bike Lockers and Other Secure Bike Storage in County Buildings and Parking Lots **g**

Identify, prioritize and install additional bike storage facilities in County buildings and parking lots based on the feedback from the 2010 employee commute survey. Adequacy of facilities could be determined based on employee surveys or a percentage of maximum occupancy.



Bike lockers in the County downtown garage provide secure storage for employees who bike to work. (Photo: Sonia Saini)



### Utilize GPS to Minimize Travel Distances on County-Owned Vehicles **g**

Phase in use of GPS and other route-efficiency software to minimize travel distances on County-owned vehicles.

### Promote More Use of Teleconferencing and Other Virtual Meeting Tools **g**

Consider adopting and implementing a policy to encourage County employees to use more teleconferencing and webcast capabilities, thereby reducing the number of off-site meetings/conferences and associated VMT. The policy could specify that if off-site meetings are necessary, first choice should be to choose location in the unincorporated County and/or near public transit, or for employees to carpool to the meeting.

### Provide Incentives for Increased Density and Mixed Land Use Developments **c**

Evaluate options to increase the average density and mix of land uses in order to reduce distances between destinations and reduce per capita vehicle miles traveled. For example, possible incentives to increase density include: removing zoning and other barriers to mixed-use and higher intensity development; or creating fees.

### Implement Bicycle and Pedestrian Master Plans **c**

Implementing the Pedestrian Master Plan and Bicycle Master Plan would reduce barriers to walking and biking and would also increase mobility for all users of the roadways. Converting automobile trips to bicycling and walking reduces VMT and provides cost-effective opportunities to address congestion, traffic safety and air quality, while providing health benefits and a more livable community.



**Potential Actions to Reduce Vehicle Miles Traveled (continued)**

**Require and Promote Transit Oriented Development C**

As discussed previously, the County is requiring transit oriented development (TOD) for redevelopment in its fourteen infill corridors.

Promote TOD in other areas of the unincorporated county by:

- Adjusting zoning to increase residential densities near existing and planned transit stations to ensure adequate ridership
- Requiring a minimum percentage of residences to be located within ¼ mile of a transit stop
- Requiring a minimum level of connectivity for new street and subdivision designs and include a maximum block length
- Reducing parking requirements along enhanced transit corridors, including bus rapid transit (BRT) and light rail

**Integrate Intelligent Transportation Systems (ITS)**

**Technology C**

SACDOT plans to upgrade and integrate existing traffic signal coordination through an interconnected signal system. This project will replace and upgrade cameras, cabinets, and controllers for approximately 100 signals on six major corridors. These upgrades, which modify traffic signal timing and improve monitoring of real-time traffic conditions, will benefit traffic operation.

**Study/Develop Pricing Policies and Structures to Discourage Car Travel C**

**Discourage Car Travel C**

Study the cost/benefit of implementing new policies to make the cost of driving reflect the full costs to society. Examples might include:

- Parking costs and road pricing systems that provide a disincentive for driving and in turn provide revenue for building infrastructure.
- Assessing a fee for employment uses that provide an excess of parking spaces, or that opt out of the employee transit pass program offered by RT. Use revenue from this fee to fund transit.

Develop and implement programs as warranted based on recommendations of the study.



The County’s final Bicycle Master Plan adopted in April 2011 complements the 2007 Pedestrian Master Plan and is intended to reduce barriers and increase mobility for all roadway users. The report can be accessed on line at: <http://www.msa2.saccounty.net/transportation>.

**Require Secure Bike Storage Facilities for Non-County Buildings and Parking Lots C**

Identify amendments to the zoning code to require retail and other commercial uses (including employment centers) in the unincorporated county to provide adequate, dedicated and secure bike storage facilities. Adequacy could be determined based on a percentage of maximum occupancy.

**Adopt “Complete Streets” Policy to Accommodate All Modes C**

Consider adopting and implementing “complete streets” policy to facilitate all modes of travel (public transit, cars, bicyclists, pedestrians) as safely as possible on existing and new streets under County jurisdictional control. This action will help improve pedestrian infrastructure, such as ensuring that sidewalks are continuous and complete, and improving the Americans with Disabilities Act (ADA) access at intersections.



# CLIMATE ACTION PLAN

**TABLE 3-1**

Transportation and Land Use Sector - Summary of Existing and Potential Actions

ACTION	APPLICATION	CO-BENEFITS							
		Provides economic benefits and/or creates jobs	Reduces energy use	Conserves water	Improves air quality	Protects habitat, open space, Ag lands, &/or rangelands	Improves water quality	Protects public health	Reduces waste to landfill
<b>Existing or Completed Actions that Increase Fuel Efficiency</b>									
County Light-Duty Fleet Conversion Program	County Government	•			•			•	
County Employee Carpool Incentives	County Government				•			•	
<b>Existing or Completed Actions that Increase Use of Alternative Fuels</b>									
Alternative Fuel Vehicles for County Heavy-Duty Fleet	County Government	•			•			•	
Inherently Low Emission Vehicle Program	County Government	•			•			•	
Alternative Fuel Stations	County Government	•			•			•	
Designated Parking for Alternative Fuel Vehicles	Community				•			•	
<b>Existing or Completed Actions that Reduce Vehicle Miles Traveled</b>									
Employee Commute Survey	County Government				•			•	
County Employee Transportation Program	County Government				•			•	
Bike Lockers and Other Secure Bike Storage	County Government	•			•			•	
Flexible Employee Work Schedules	County Government				•			•	
SCAS Jet Fuel Farm	County Government				•			•	
Integrate Intelligent Transportation Systems Technology	Community				•			•	
Convenient County Service Locations	Community				•			•	
Transit Oriented Development in County Infill Corridors	Community	•	•		•	•	•	•	
Incentives for Increased Density and Mixed Land Use Developments	Community	•	•	•	•	•	•	•	•
Pedestrian and Bicycle Master Planning	Community				•		•	•	
"Safe Routes to School" Program Participation	Community				•			•	
<b>Potential Actions to Increase Vehicle Fuel Efficiency</b>									
Consider Employee Training to Reduce Emissions	County Government	•			•			•	
Develop County Employee Carpool-at-Work Incentives	County Government				•			•	
Lobby for Improved Fuel Efficiency Standards	Community	•			•			•	
Require Designated Parking for Carpool Vehicles in Non-County Parking Lots	Community				•			•	

**TABLE 3-1**

**Transportation and Land Use Sector - Summary of Existing and Potential Actions (continued)**

ACTION	APPLICATION	CO-BENEFITS						
		Provides economic benefits and/or creates jobs	Reduces energy use	Conserves water	Improves air quality	Protects habitat, open space, Ag lands, &/or rangelands	Improves water quality	Protects public health
<b>Potential Actions to Increase Use of Alternative Fuels</b>								
Expand Fleet Conversion Program	County Government	•			•			•
Increase Designated Parking for Alternative Fuel Vehicles in County Parking Lots	County Government				•			•
Require Designated Parking for Alternative Fuel Vehicles in Non-County Parking Lots	Community				•			•
Encourage Alternative Fuel Stations in New Development	Community				•			•
<b>Potential Actions to Reduce Vehicle Miles Traveled</b>								
Promote County Employee Transportation Program	County Government				•			•
Consider an Employee Shuttle System	County Government	•			•			•
Provide Additional Bike Lockers and Other Secure Bike Storage in County Buildings and Parking Lots	County Government	•			•			•
Utilize GPS to Minimize Travel Distances on County-Owned Vehicles	County Government	•			•			•
Promote More Use of Teleconferencing and Other Virtual Meeting Tools	County Government	•			•			•
Provide Incentives for Increased Density and Mixed Land Use Developments	Community	•	•	•	•	•	•	•
Implement Pedestrian and Bicycle Master Plans	Community	•			•			•
Require and Promote Transit Oriented Development	Community	•	•	•	•	•	•	•
Integrate Intelligent Transportation Systems Technology	Community				•			•
Study/Develop Pricing Policies and Structures to Discourage Car Travel	Community	•			•			•
Require Secure Bike Storage Facilities for Non-County Buildings and Parking Lots	Community	•			•			•
Adopt "Complete Streets" Policy to Accommodate All Modes	Community				•			•

# CLIMATE ACTION PLAN



Photo: Mike Williams



## 3.3 ENERGY

### Introduction

Energy used in homes and businesses (primarily for heating, cooling and lighting) is the second largest source of GHG emissions in Sacramento County. The emissions produced depend on the amount and type of energy used (e.g., electricity or natural gas) and the primary energy source used to create the power. Most energy generated today is from burning of fossil fuels (coal, oil and natural gas) of those, natural gas burns the cleanest. Electricity produced by renewable energy sources (e.g. wind, hydroelectric or solar) produces negligible GHG emissions.

The United States depends on foreign sources for a large portion of its energy needs. In 2007, for example, 48% of the country's petroleum was imported, making the U.S. the world's largest petroleum consumer. (EIA, 2009) In California, 85% of the energy comes from fossil fuels. (CEC. 2005) For every gallon of oil, cubic foot of natural gas or pound of coal burned to create energy, GHG emissions are emitted into the atmosphere and contribute to climate change. With greater international demand for energy and lower projected supplies of fossil fuels, the nation needs to transition to domestic sustainable sources of energy to secure a reliable energy future, stabilize energy prices and reduce GHG emissions.

Energy used in homes and businesses (for heating, cooling, and lighting) accounts for almost 40% of the GHG emissions for the entire County and similarly, almost 40% of the emissions for the unincorporated portion of the county.

In Sacramento County, almost 40% of the GHG emissions are attributed to residential and commercial/industrial electricity and natural gas use. For Sacramento County municipal government operations, nearly 50% of GHG emissions are attributed to energy used in buildings (see Chapter 2).

## The County's Role in Energy Usage

Sacramento County influences energy use by:

- Collaborating with local utilities (such as SMUD and PG&E) to encourage energy use reduction through rate structures and energy efficiency rebate programs
- Encouraging alternative energy and energy reduction for new developments that go through the County's planning and building permit process
- Requiring energy efficient construction for buildings within its jurisdiction
- Efficiently managing energy consumption of County government operations

Sacramento County does not currently have the ability to influence energy use in existing buildings (non County-owned or rented), which account for a large portion of the building stock in the unincorporated County, and presumably emissions produced.

### Goals

The County is committed to achieving three goals to mitigate GHG emissions in compliance with state climate change regulations:

- Improve energy efficiency of existing and new buildings in the unincorporated County
- Improve energy efficiency of County infrastructure operation (roads, water, waste, buildings, etc)
- Decrease use of fossil fuels by transitioning to renewable energy sources

### Co-Benefits

Sacramento County's efforts toward meeting the above goals result in a number of benefits besides those related to reducing GHG emissions:

- Improved outdoor air quality (and associated public health benefits)
- Future energy reliability
- Stabilized energy prices
- Lowered costs for operating County infrastructure and buildings

In addition, there are a host of benefits for the community associated with green buildings:

- Lower energy costs over the life of the building
- Conservation of building materials
- Water use efficiency (indoors and outdoors)
- Reduction of solid waste
- Improved indoor air quality
- Less incidence of employee respiratory disease, allergies, asthma, headaches, nausea, and fatigue
- Natural day-lighting reduces depression and insomnia through improved regulation of circadian rhythms, the body's natural cycles that control appetite, sleep and mood
- Direct improvements in worker productivity (Kats 2003; EPA 2008)



### HEALTH CO-BENEFITS

The reduced chemical and biological contaminants and improved air quality in green buildings result in less employee illness, and workers in green buildings are generally more productive.



# CLIMATE ACTION PLAN

## Actions to Address Climate Change

Existing and potential actions that reduce GHG emissions are described below related to the County's goals for this sector. Each action is coded to indicate whether it applies to Sacramento County government operations **g** or to the entire community **c**.

### Existing or Completed Actions that Improve Energy Efficiency in New and Existing Buildings

The actions described below to improve energy efficiency include those that reduce energy consumption by modifying building practices and utilizing new sustainable green building practices to conserve energy.

#### Employee Green Building Training and Certifications **g**

Sacramento County encourages employees to obtain accreditation and reimburses costs to the extent feasible. The County's Sustainability Program Manager, Energy Program Manager and several other building and planning employees are Leadership in Energy and Environmental Design (LEED) Accredited Professionals and/or Certified Green Building Professionals.

#### Sacramento Green Building Task Force **c**

The County worked with the City of Sacramento and Valley Vision in 2010 to establish the Sacramento Green Building Task Force. The Task Force was comprised of almost 30 individuals with experience and expertise relevant to the topics under consideration and representative of key stakeholders in the region, including building, design, real estate and finance. The Task Force was guided by a steering committee comprised of County and City staff with Valley Vision serving as the neutral third party facilitator. The final report, published in December 2010, contains recommendations that identify ways to achieve energy and water savings in both new and existing buildings using a variety of approaches. The report captures a body of work that was developed over the course of a year with input from the Task Force experts and members of the public who followed the process and attended the public meetings. The recommendations in the final report are intended for use by the County, cities, and other counties in the region in adopting new green building policies and ordinances, as well as by the private sector and nonprofit partners that can play a role in making the green building suggestions a reality.

#### Sacramento Area Sustainable Business (SASB) Program **c**

The Business Environmental Resource Center (BERC) was established in 1993 as a one-stop, non-regulatory permit assistance center to help Sacramento County businesses understand and comply with Federal, State, and local environmental regulations. Sacramento County is one of the funding partners that help support BERC's efforts. BERC established the Sacramento Sustainable Business Program to certify businesses and public agencies that incorporate sustainability practices into their operations. SASB placards are issued so that businesses and public agencies can display their affiliation and a SSB logo can be used for advertising so that consumers can identify environmentally responsible businesses.



The SASB Program facilitates participation by: 1) Helping businesses develop a positive, proactive relationship with environmental staff members who provide regulatory, pollution prevention, and resource conservation expertise; 2) Coordinating outreach so that businesses receive consistent information and program materials that cover all applicable environmental issues; 3) Recognizing businesses at an annual public awards ceremony; and 4) Promoting the program to encourage the public to choose Certified Sustainable Businesses <http://www.sacberc.org>.

#### Community Outreach and Education **c**

Sacramento County provides information on its Sustainability web page related to steps that residents and businesses can take to conserve energy and purchase renewable energy. This includes links to programs and web sites sponsored by SMUD, PG&E (Flex Your Power) and the SMAQMD.

## Existing or Completed Actions that Improve Energy Efficiency of County Infrastructure Operation

### County Energy Program Manager

In 1992, the County hired its first Energy Program Manager to help reduce the County's consumption of electricity and natural gas.

### County Building Energy Conservation Policy

In 1973, the County created its first Energy Conservation Policy, which was updated in 2001. The Energy Conservation Policy calls for modified building heating, ventilation, and air conditioning (HVAC) settings and lighting levels to reduce energy usage in all County-owned and leased buildings. The County Energy Manager oversees compliance with the policy.



Energy conservation modifications have been made in several County buildings, including the downtown administration building. (Photo: Dan Mendonsa)

### County Green Information Technology (IT) Program

Sacramento County's Green IT Program applies the highest efficiencies to information technology equipment and encourages sustainable practices through each phase of the equipment's life cycle, from production to use to phasing out and recycling. Sacramento County has been boosting its Green IT performance in recent year, virtualizing servers, establishing power management programs for personal computers, strategically replacing inefficient equipment, and developing an internal reuse program for equipment that was once discarded. For example, since 2005, all of the County's personal computer monitors have been switched from cathode ray tube (CRT) to more energy efficient liquid crystal display (LCD).

### County Building Energy Efficiency Upgrades

Starting in 2005 and completed in 2008, ten of the County's buildings (representing 11% of the County's total building square footage) were upgraded to improve their energy efficiency and reduce the County's GHG emissions by over 2,500 metric tons of CO<sub>2</sub>e per year. These improvements included more efficient HVAC equipment, controls, lighting and a 100 kilowatt solar array installed at Building OB3 at the County's Bradshaw Branch Center complex. Buildings with high energy usage relative to similar County buildings were prioritized for upgrades.

### Energy Efficient Streetlights

In 2008, Sacramento County embarked on an induction street light pilot test to determine the cost effectiveness of retrofitting existing high pressure sodium (HPS) lights with induction lights. The results were not promising. Although the induction lights used less energy, provided a truer color, and had longer lamp life than the HPS lights, they also suffered in lighting uniformity and were not cost effective in a retrofit situation. However, in new construction it likely would be more cost-effective to install induction lights instead of older technology HPS lights. The County is currently implementing a federal stimulus-funded project to replace existing County-owned HPS and Mercury Vapor streetlights throughout the unincorporated area with energy-saving Light Emitting Diode (LED) lighting.

### Energy Efficient Street Signals

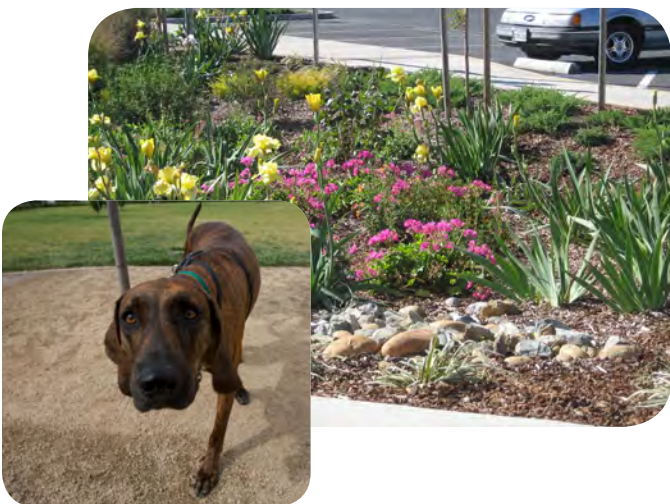
Sacramento County began the conversion of street signals associated with County roads from incandescent light bulbs to light emitting diode (LED) technology in 1997 and is almost completed with replacement of all signals (nearly 600). LEDs are more energy-efficient, consuming approximately 10% of the electrical power required to light an incandescent traffic signal. They also have a longer life expectancy – about five times longer than incandescents. The County has saved approximately \$480,000 each year in energy costs through these efforts.



# CLIMATE ACTION PLAN



The County's Animal Care Shelter opened in 2009 and was the first completed County building to be LEED certified, a nationally recognized standard for sustainable buildings. The money- and resource-saving features are numerous; not only does it use less energy, but it conserves water by featuring a rain garden and River Friendly Landscaping and uses pervious decomposed granite in the "Bark Park" instead of concrete. (Photos: Steve Harriman)



## Existing or Completed Actions that Improve Energy Efficiency of County Infrastructure Operation (continued)

### LEED Certification for New County Buildings <sup>9</sup>

Several County buildings constructed in recent years or currently under construction have or will attain LEED certification (silver rating or better) through the US Green Building Council:

- County Animal Care Facility – Completed 2009
- Sacramento International Landside Terminal B  
In construction, to be completed 2012
- Vineyard Surface Water Treatment Plant –  
In construction, to be completed 2011

## Existing or Completed Actions that Decrease the Use of Fossil Fuels

### Aircraft Preconditioned Air and Electric Power <sup>9</sup>

In 2003, SCAS completed installation of 400 hertz (Hz) power and preconditioned air on all 28 jet bridges at the Sacramento International Airport. The electrified jet bridges provide power and air conditioning to parked aircraft, thereby eliminating the need for aircraft to generate power from onboard auxiliary power units that generate aircraft emissions while in use.

### Landfill Gas-to-Energy <sup>c</sup>

Waste methane has been extracted from the County's Kiefer Landfill since 1997. In 1999, a landfill gas-to-energy facility became operational and was expanded in 2006. The landfill gas-to-energy plant produces 14 megawatts of electricity, enough to power 8,900 homes. This conversion of methane to clean energy has reduced GHG emissions by over 4-million metrics tons of CO<sub>2</sub>e. Refer to Section 3.5 (Waste Reduction and Recycling) for more details.

### Collaboration Related to Renewable Energy Funding <sup>c</sup>

Sacramento County is collaborating with SMUD, PG&E, and other regional partners to actively pursue funding for future renewable energy projects.



The Kiefer Landfill is home to a gas-to-energy plant that collects landfill gases to convert into energy for SMUD to power close to 9,000 homes. (Photo: DWMR)



## Potential Actions to Improve Energy Efficiency in New and Existing Buildings in the Unincorporated County

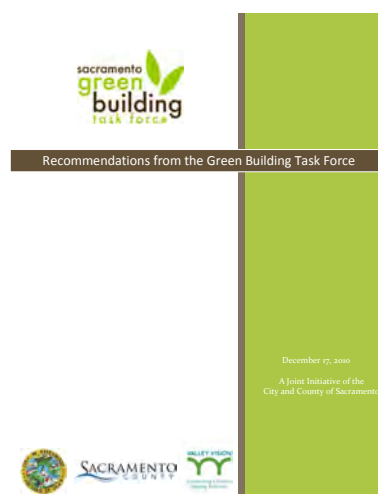
### Support Employee Green Building Training and Certifications **g**

Support employees in the Planning and Community Development and Building Departments (including the Planning Director and Building Official) to become LEED Accredited Professionals and/or Certified Green Builder Professionals. At a minimum, this will apply to all employees responsible for reviewing and approving plans and permits, as well as building inspection supervisors.

### Adopt Green Building Policy and Ordinance for Private Projects **c**

Evaluate the Sacramento Green Building Task Force recommendations (December 2010), in considering adoption and implementation of a Green Building policies, ordinance and/or program to require or incentivize the application of green building techniques for new construction and existing building remodels/redevelopment for commercial and residential projects. It is expected that new policies, incentives and requirements would apply to design, construction and retrofit of existing and new County-owned buildings and facilities as well as private development in the unincorporated County.

In addition to achieving energy efficiency, green buildings are expected to achieve “whole system” environmental benefits, such as conservation of building materials, water use efficiency (indoors and landscaping), reduction of solid waste, and improved indoor air quality.



The December 2010 report by the County/City Green Building Task Force was prepared in collaboration with a diverse group of stakeholders in the region.

### Support programs that promote energy retrofits and renewable energy improvements of residential and commercial buildings **c**

Participate in the development of new energy efficiency retrofits programs developed by the state and local utilities such as SMUD's *Home Performance Program* and the California Energy Commission's *Energy Upgrade California*. Engage in federal and state legislative advocacy efforts that will support and provide funding for programs that will increase energy retrofits of the built environment.



The county has partnered with SMUD to install solar panels on several buildings, including this 100 kW solar array for Sacramento County's Health & Human Services Building which came online in April 2008. In just 3 years, it has produced 450,000 kwh of electricity, reducing greenhouse gases equivalent to taking 61 cars off the road for a year. (Photo: Dan Mendonsa)

### Provide Community Outreach and Education **c**

Sacramento County will continue to provide information on its Sustainability web site related to steps that residents and businesses can take to conserve energy and purchase renewable energy. This will include links to programs and web sites sponsored by SMUD, PG&E (Flex Your Power) and the SMAQMD.

In addition to sharing information with the public through web site postings, the County Sustainability Manager will continue to make presentations to County commissions, advisory councils, and other interested associations and community groups.



# CLIMATE ACTION PLAN

## Potential Actions to Improve Energy Efficiency of County Infrastructure Operation

### Implement Interim Green Building Standards for New County-Owned Buildings 9

Until such time that a new green building policy/ordinance is available, continue to require all new County building designs to achieve LEED silver or appropriate alternative standard.

### Adopt Green Building Policy for New County-Owned Buildings 9

Based on recommendations made in the final report by the Sacramento Green Building Task Force (December 2010), consider adopting and implementing a “New Green Building” Policy for County buildings proposed for future construction. Develop any necessary guidance for engineers and designers and revise standard County design procedures and specifications to ensure compliance.

### Develop Green Building Policy for Leased County Buildings 9

Based on recommendations made in the final report by the Sacramento Green Building Task Force (December 2010), consider adopting and implementing a “Leased Green Building” Policy that sets criteria for County lease agreements, where the County will only enter into new leases when buildings meet specified energy efficiency or other green building standards.

### Conduct Green Building Audits for County-Owned Buildings 9

Following adoption of a new County green building policy/program, develop and begin implementing a plan for conducting audits of County-owned buildings for compliance with the policy. Additionally, ensure compliance with BERCS Sustainable Business Recognition Program, and through the process, recommend enhancements to the BERCS program as warranted.

### Implement County Building Green Building Upgrades 9

Before 2008, various County buildings (representing over 10% of the County’s total building square footage) were upgraded to improve their energy efficiency. Based on the results of the sustainability audits (see above), continue to prioritize and complete upgrades until all County buildings have been recommissioned to improve their energy efficiency and reduce the County’s GHG emissions.



### Adopt County Energy Policy(ies) for County-Owned Infrastructure 9

Consider adopting Infrastructure Energy Policy(ies) specific to the needs of the various departments responsible for constructing, operating and maintaining infrastructure (e.g., SACDOT-roads/bridges, County DWR-water supply/drainage systems). Address water use efficiency (e.g., use of water during field operations) which correlates to energy efficiency. At a minimum, require use of Energy Star programs as applicable for efficient energy management of the infrastructure (e.g., pumps). Energy efficient operation of street signals has previously been addressed by the SACDOT and streetlights are covered in the next action. Construction and operation of wastewater infrastructure will be addressed separately by SRCSD.

### Potential Actions to Improve Energy Efficiency of County Infrastructure Operation (continued)

#### Conduct Audits of County Infrastructure Operations **g**

Following the adoption of County infrastructure energy policy(ies), develop and implement a plan for conducting audits of existing infrastructure for compliance with the policy(ies). Facilities and issues should be benchmarked against similar utilities and agencies to investigate opportunities for improvement. Based on the audit findings, recommend, schedule and implement energy saving measures as appropriate.

#### Enhance County Green Information Technology (IT) Program **g**

Augment the County's existing Green IT Program (described previously) to increase virtualizations of servers and increase the energy efficiency of the County's data centers.

### Potential Actions to Decrease the Use of Fossil Fuels

#### Develop and Adopt County Renewable Energy Policy **g c**

Consider adopting a renewable energy policy and developing an associated green power purchasing program such that by 2020, 33% of the County's electricity purchases could come from renewable sources. This is consistent with CARB's 2008 Scoping Plan for achieving AB 32 compliance.

#### Develop Guidelines for Siting of Large-Scale Renewable Energy Production Facilities **g c**

Consider amending the General Plan, Zoning Code, and other documents as necessary to establish siting criteria and identify areas and/or zones where renewable energy production is a desired land use. Providing guidelines for renewable energy production sites will: 1) protect valuable habitat resources where renewable energy infrastructure may alter the balance of sensitive ecosystems; and 2) streamline renewable energy projects by removing potential barriers to siting of renewable energy facilities and by providing general land use requirements at the front end of the process.



#### Building Fee Incentives for Solar Installations **c**

In past years, before the economic down turn, the County was able to waive or reduce building permit and plan review fees for SMUD-approved residential photovoltaic solar system projects on existing residential buildings. This type of financial incentive encourages the proliferation of solar projects and is consistent with a number of initiatives at the local, State and Federal level. The County will continue to look for such opportunities when economic conditions are more favorable in the future.

# CLIMATE ACTION PLAN

**TABLE 3-2**  
Energy Sector - Summary of Existing and Potential Actions

ACTION	APPLICATION	CO-BENEFITS							
		Provides economic benefits and/or creates jobs	Reduces energy use	Conserves water	Improves air quality	Protects habitat, open space, Ag lands, &/or rangelands	Improves water quality	Protects public health	Reduces waste to landfill
<b>Existing or Completed Actions that Improve Energy Efficiency in New and Existing Buildings</b>									
Employee Green Building Training and Certifications	County Government	•	•	•	•				
Sacramento Green Building Task Force	Community	•	•	•	•		•		•
Sacramento Sustainable Business Program	Community	•	•	•	•		•	•	•
Community Outreach and Education	Community	•	•	•	•	•	•	•	•
<b>Existing or Completed Actions that Improve Energy Efficiency of County Infrastructure Operation</b>									
County Energy Program Manager	County Government	•	•		•				
County Building Energy Conservation Policy	County Government	•	•		•				
County Green Information Technology Program	County Government		•		•				
County Building Energy Efficiency Upgrades	County Government	•	•		•				
Energy Efficient Streetlights	County Government	•	•		•			•	
Energy Efficient Street Signals	County Government	•	•		•				
LEED Certification for New County Buildings	County Government	•	•		•			•	
<b>Existing or Completed Actions that Decrease the Use of Fossil Fuels</b>									
Aircraft Preconditioned Air and Electric Power	County Government	•	•		•			•	
Landfill Gas-to-Energy	Community	•			•			•	
Collaboration Related to Renewable Energy Funding	Community	•	•		•				
<b>Potential Actions to Improve Energy Efficiency in New and Existing Buildings in the Unincorporated County</b>									
Support Employee Green Building Training and Certifications	County Government	•	•						
Adopt Green Building Policy and Ordinance for Private Projects	Community	•	•	•	•		•	•	•
Support programs that promote energy retrofits and renewable energy improvements of residential and commercial buildings	Community	•	•	•	•		•	•	•
Provide Community Outreach and Education	Community	•	•	•	•			•	•

**TABLE 3-2**

**Energy Sector - Summary of Existing and Potential Actions (continued)**

ACTION	APPLICATION	CO-BENEFITS							
		Provides economic benefits and/or creates jobs	Reduces energy use	Conserves water	Improves air quality	Protects habitat, open space, Ag lands, &/or rangelands	Improves water quality	Protects public health	Reduces waste to landfill
<b>Potential Actions to Improve Energy Efficiency of County Infrastructure Operation</b>									
Implement Interim Green Building Standards for New County-Owned Buildings	County Government	•	•	•	•		•	•	•
Adopt Green Building Policy for New County-Owned Buildings	County Government	•	•	•	•		•	•	•
Develop Green Building Policy for Leased County Buildings	County Government	•	•	•	•			•	•
Conduct Green Building Audits for County-Owned Buildings	County Government	•	•	•	•			•	
Implement County Building Green Building Upgrades	County Government	•	•	•	•			•	
Adopt County Energy Policy(ies) for County-Owned Infrastructure	County Government	•	•	•	•	•	•	•	
Conduct Audits of County Infrastructure Operations	County Government	•	•	•	•		•	•	
Enhance County Green Information Technology Program	County Government		•		•				•
<b>Potential Actions to Decrease the Use of Fossil Fuels</b>									
Develop and Adopt County Renewable Energy Policy	Community and County Government		•	•	•		•	•	
Develop Guidelines for Siting of Large-Scale Renewable Energy Production Facilities	Community and County Government		•		•	•			
Building Fee Incentives for Solar Installations	Community	•	•		•				



# CLIMATE ACTION PLAN



## 3.4 WATER

### Introduction

Energy and water are interconnected; energy is used to pump, treat, and deliver water supplies and treat wastewater, and water is used to produce energy (both directly through hydroelectric plants and indirectly for cooling at thermoelectric power plants). Therefore, improving water efficiency will reduce energy demand and improving energy efficiency will reduce water demand. Despite this interrelationship, these two sectors have been managed historically independent of one another. Therefore, it is critical to recognize the balance and tradeoffs involved in meeting both future energy and water demands as these resources become increasingly constrained. Failure to do so, will introduce system vulnerabilities whereby limitations of one resource will result in limitations of the other.

The California Energy Commission (CEC) estimates that approximately 19% of all electricity and 30% of natural gas (e.g., natural gas not used to generate electricity) used in the state is for water management. In general, when a unit of water is saved, so too is the energy required to pump, treat, deliver, heat, use and dispose of that water. (Cal EPA 2008)

The SCWA Vineyard Surface Water Treatment Plant (pictured above) will treat surface water from the Sacramento River that is allocated to the County as part of the Freeport Regional Water Project (FRWP). By increasing the proportion of surface water supplies during “good” water years, the plant enables the County to reduce ground-water pumping to ensure the long-term sustainability of the region’s groundwater basin. (Photo: County DWR)

Water-related GHG emissions (not including wastewater treatment) represent a very small fraction (0.2%) of the GHG emissions for the entire County and similarly, 0.1% of the emissions for the unincorporated portion of the county.

**Note:** This section describes work conducted by the Sacramento County Dept of Water Resources, a municipal government agency, and the Sacramento County Water Agency, a separate legal entity and public utility. However, for consistency with the rest of this plan, activities related to internal operations of both entities are coded simply as “government 9”.

“California has invested in, and now depends upon, a system that relied on historical hydrology as a guide to the future for water supply and flood protection. However, due to climate change, the hydrology of the past is no longer a reliable guide to the future.”

—California Department of Water Resources, *Managing An Uncertain Future*, 2008

Most of the GHG emissions attributed to the water sector are emitted from power plants that generate the electricity needed to convey and treat the water, and from the vehicles and equipment required to construct, operate, and maintain the conveyance, treatment, and production systems. In the County, water-related GHG emissions represent less than one-half percent of all unincorporated area emissions and include emissions from electricity and natural gas consumption for water supply and irrigation infrastructure and wastewater collection and treatment. Data for these calculations was obtained from the County DWR and SMUD and PG&E utility records. *(Note that climate action measures related to wastewater collection and treatment will be identified and implemented by the SRCSD and are not addressed in this Plan.)*



Climate change is expected to strain many of Northern California’s water resources, including surface and groundwater-based systems, increasing competition for water in the region. Various conditions and associated impacts are predicted: (DWR 2007; DWR 2008; EPA 2009)

- A warmer climate is expected to affect the seasonal availability of water by increasing evaporation and reducing the Sierra snowpack
- Variability in reservoir, river and stream flows and temperatures will likely impact water supply, water quality, fisheries, recreation, and hydroelectric power availability
- Higher winter flows could lead to flooding and water quality problems
- Possible decreases in groundwater recharge will reduce water for urban and agricultural uses
- Higher temperatures, reduced summer soil moisture, and variable water supplies will adversely affect agriculture
- Higher temperatures and changing precipitation will likely lead to more droughts and increase the risk of wildfires
- Rising sea levels will increase the probability for salinity intrusion in the Sacramento-San Joaquin Delta that could require greater quantities of upstream freshwater sources, affecting this region’s water supply

As a result of anticipated climate change impacts, Sacramento County exhibits vulnerabilities related to water resources.

75% of the electricity and nearly all of the natural gas use related to water in California is associated with the end use of water, mostly for water heating.

—California Energy Commission



# CLIMATE ACTION PLAN



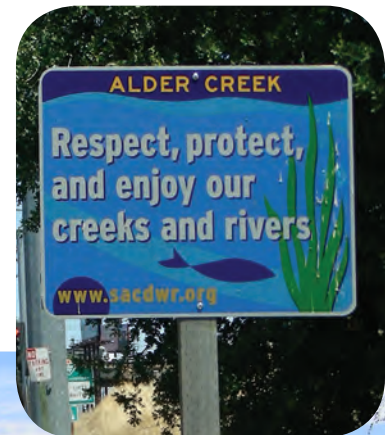
## INCREASED RISK OF FLOODING DUE TO CLIMATE CHANGE

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more of the Sierra Nevada watersheds to contribute to peak storm runoff. High frequency flood events (e.g. 10-year floods) in particular will likely increase with a changing climate. Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding. Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As streamflows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildland fires due to climate change, there is a potential for more floods following fire, which increase sediment loads and water quality impacts.

—California Department of Water Resources,  
*Managing An Uncertain Future*, 2008

There are three key challenges for the water sector in addressing climate change:

- Actions necessary to comply with water quality standards (e.g., treating water and wastewater) could increase GHG emissions. A balance is needed between climate change considerations and water quality/health protection; net zero GHG emissions will not be possible.
- Enhancement of water conservation, recycling and groundwater recharge in a watershed may reduce water supply for downstream urban, agricultural and environmental uses because less water will re-enter the streams and rivers.
- In the event of diminished water supplies, water rights disputes may arise.



Staff in Sacramento County's Stormwater Quality Program work with other agencies and landowners to identify and eliminate sources of pollution to local creeks and rivers. (Photos: Carmel Brown)

## The County's Role in Water Management

Over 20 water purveyors, including the Sacramento County Water Agency (SCWA), provide drinking water for Sacramento County residents. SCWA owns, operates, and maintains the potable water delivery system for approximately 55,000 connections (about 180,000 residents) within its 138 square-mile service area. SCWA uses surface and groundwater resources to provide water to its customers, and a project is underway to increase deliveries from the surface water component of the water portfolio, thereby allowing local groundwater aquifers to recharge.

The County Department of Water Resources (County DWR) plans, owns, and operates the stormwater drainage system in unincorporated Sacramento County. In this area, the County DWR is also responsible for flood protection and compliance with stormwater quality regulations intended to reduce pollution in urban runoff discharged to local creeks and rivers. Additionally, the County DWR is contracted to operate and maintain the stormwater drainage systems and conduct some stormwater quality protection activities within the cities of Citrus Heights and Rancho Cordova.

This section describes only those activities within the control of SCWA and County DWR. The following actions are not addressed:

- Actions to mitigate impacts from wastewater collection, conveyance, and treatment – these activities are conducted by the Sacramento Area Sewer District (SASD) and Sacramento Regional County Sanitation District (SRCSD). Both agencies are independent of the County and their actions will be conducted separately by those entities. GHG emissions from domestic wastewater treatment required for unincorporated Sacramento County in 2005 amounted to 70,662 metric tons of CO<sub>2</sub>e, which represents 1.5% of overall emissions for the unincorporated County (See Chapter 2).
- Water conservation programs (and associated energy efficiencies) and other mitigation actions implemented by over 20 other water purveyors in Sacramento County.
- Water quality and watershed protection initiatives undertaken by cities, community service and parks districts, environmental organizations, federal and state regulatory agencies, and other entities.

- Flood control policies and projects implemented by federal, state, regional and local agencies.

In April 2000, the SCWA along with almost 40 other agencies in the region, signed the Water Forum Agreement, a landmark agreement intended to meet the region's drinking water needs and preserve the fishery, wildlife, recreational and aesthetic values of the lower American River. One of the Water Forum's two coequal objectives is to: "Provide a reliable and safe water supply for the region's economic health and planned development through the year 2030." There are seven major elements of the Water Forum Agreement, three of which (increased surface water diversions, groundwater management and water conservation) relate to goals and actions described in this section. (Water Forum 2000)



One of the objectives of the Sacramento Area Water Forum, in which the county participates, is the preservation of the fishery, wildlife, recreational, and aesthetic values of the lower American River, above.



# CLIMATE ACTION PLAN

## Goals

Sacramento County and SCWA is committed to achieving the following goals to mitigate GHG emissions associated with operation and maintenance of the water supply and drainage systems within its jurisdiction, and to prepare for the potential water-related impacts due to climate change:

- Comply with State requirements as well as commitments in the Water Forum Agreement for water conservation and reduction in potable water demand. Achieve 20% reduction in statewide average per capita water use by 2020, in compliance with the State's water conservation requirements (SBx7-7)<sup>3</sup>. Balance this with the Water Forum Agreement, which requires over 25% reduction in water demands from 1990 levels by 2030.
- Emphasize water use efficiency as a way to reduce energy consumption
- Increase energy efficiency related to water system management
- Strive to reduce uncertainties in water reliability and quality by increasing the flexibility of the water allocation and distribution system to respond to drought conditions and encouraging redundancy in water storage, supply, and treatment systems (consistent with Water Forum Agreement)
- Elevate the importance of floodplain and open space protection as a means of protecting water quality and habitat, sequestering carbon, and providing groundwater recharge opportunities, if suitable soil conditions permit

## Co-Benefits

Sacramento County's and SCWA's efforts toward meeting the above goals result in a number of benefits besides those related to reducing GHG emissions:

- Efforts to conserve water help ensure a reliable drinking water source
- Low impact development practices allow more water to soak into the ground (rather than be carried off as runoff) and typically yield many benefits including reduced flooding risks, increased groundwater recharge and improved water quality
- The River Friendly Landscaping Program (described later) results in many benefits besides efficient water use, including but not limited to, improved air quality and improved runoff quality due to less use of toxic pesticides and fertilizers
- Efforts that preserve floodplains and open space to recharge groundwater typically yield many co-benefits such as wildlife habitat, improved water quality, aesthetics, and provide opportunities for increased physical activity and improved health of community residents
- Conserving water saves money. Customers save on utility bills, and SCWA can save costs associated with developing or expanding water supply sources



## HEALTH CO-BENEFITS

Conserving water (or water conservation) protects drinking water sources and minimizes water pollution and health risks. It also maintains the health of aquatic environments.

3. The 2009 SBx7-7 legislative package requires a statewide 20% reduction in urban per capita water use by 2020. It requires that urban water retail suppliers determine baseline water use and set reduction targets according to specified requirements, and requires agricultural water suppliers to prepare plans and implement efficient water management practices. Agencies must include in their 2010 urban water management plans (UWMPs; due July 2011): baseline water use, reduction targets, and compliance analyses. Agencies should expect to address commercial, industrial and institutional water conservation in their 2015 UWMPs. For more information, see <http://www.acwa.com>.

## Actions to Address Climate Change

Existing and potential actions are described below related to the County's and SCWA's goals for this sector. Each action is coded to indicate whether it applies to Sacramento County government operations **g** or to the entire community **c**.

### Existing or Completed Actions to Reduce per Capita Water Use Levels by 2020

#### Voluntary Water Conservation Targets **c**

In prior years, SCWA has established voluntary water conservation targets for its customers when needed to respond to the region's water supply situation. In 2000, the County signed the Water Forum Agreement which includes a target to reduce water demand by over 25% by 2020. More recently, in January 2011, the County and SCWA adopted a resolution to work towards a 20% reduction in per capita use by 2020. Implementation details are being worked out.

#### Statewide Collaboration on Water Conservation Practices **c**

SCWA is a member of the California Urban Water Conservation Council and has signed the Council's memorandum of understanding, thereby agreeing to implement 14 best management practices (BMPs) intended to conserve water in urban areas. The BMP list is updated periodically and biennial reporting is required to track BMP activities.

#### Water Conservation Rate Structure **c**

As an incentive, SCWA has established a three-tiered water conservation rate structure which allows for a discounted rate for customers who conserve water.

### Existing or Completed Actions to Emphasize and Increase Water Use and Energy Efficiency

#### Energy Efficiency of Water Supply System **g**

SCWA's water well rehabilitation program retrofits its system of over 50 water wells with efficient pumps and motors. Although this project was started to replace mineral oil-lubricated pumps with water-lubricated types (due to bacteria and health problems), it is also expected to reduce energy use. About six wells are retrofitted annually. A computerized Supervisory Control and Data Acquisition (SCADA) system also allows for remote operation and adjustment of pumps and valves to maximize system efficiency.

**Note:** This section describes work conducted by the Sacramento County Dept of Water Resources, a municipal government agency, and the Sacramento County Water Agency, a separate legal entity and public utility. However, for consistency with the rest of this plan, activities related to internal operations of both entities are coded simply as "government **g**".

#### Metered Billing **c**

Metered billing is a water efficiency tool to improve knowledge of personal water use, identify water leaks and establish a more equitable fee structure than flat rate billing. About 80% of SCWA connections (over 140,000 residents) were being charged a metered rate as of March 2011. This includes all new homes constructed since January 1, 2000. In addition, in 2010 SCWA began increasing its efforts to retrofit houses within its service area that were constructed prior to 1992 with water meters and transitioning those customers to metered billing by 2014.



#### Water Wise Audits **c**

SCWA offers free water wise house and business calls to its customers; the current goal is to reach 15 percent of the customers. During an audit, field staff conducts inspections of the customer's irrigation system, inspect for interior and exterior water leaks and offer a custom irrigation schedule and water-saving tips specific to the property.

#### Water Waste Prohibition Program **c**

This SCWA program is designed to increase customer awareness and minimize water waste from overwatering. County staff investigates public complaints and look for cases of water waste; customers wasting water receive a notice offering water efficiency tips.

#### Fixed Base Meter Reading **c**

Over the past several years, SCWA has been installing devices on water meters to allow for remote real time reading, thereby reducing staff time, vehicle miles traveled and associated GHG emissions. That program will also enable SCWA to focus on high water users and identify opportunities to lower water usage and to more accurately track and repair water system leaks.

# CLIMATE ACTION PLAN

## Existing or Completed Actions to Emphasize and Increase Water Use and Energy Efficiency (continued)

### SWCA Water Conservation Coordinator **C**

SCWA employs a full-time water conservation coordinator to educate the public about ways to increase water efficiency. The coordinator oversees SWCA's various water conservation programs described below and manages the water conservation web site.

## Existing or Completed Actions to Reduce Uncertainties in Water Reliability and Quality

### River Friendly Landscaping Program **C**

County DWR launched the River Friendly Landscaping Program in 2007. Through written guidelines and demonstration workshops, the program promotes the use of seven principles. Those have numerous co-benefits, including: reduced water use and site runoff; less green waste delivered to landfills; reduced GHG emissions through water conservation, less use of gas powered equipment, and reduced trips to the landfill; and improved runoff quality due to less use of toxic pesticides and fertilizers. The program targets both landscape

professionals and homeowners. In 2010, the County was one of only 25 municipalities in the nation to be awarded an EPA Climate Showcase Communities Grant to expand the River Friendly Landscaping Program and showcase the GHG reduction potential through application of the principles.

### Watershed Protection and Restoration **C**

County DWR continues to support (with funding and in kind services) the work of local watershed organizations to assess, protect and restore watershed resources, including water quality and habitat. The Laguna Creek Watershed Council is one such group, and the organization is seeking funding for demonstration water use efficiency projects (e.g., demonstration gardens in the watershed).



Photo: Dave Roberts – Roberts Landscape



Photo: Sacramento Splash

### Low Impact Development **C**

Through its development standards and the Stormwater Quality Design Manual for Sacramento and South Placer Regions (May 2007), the County encourages new and redevelopment projects to integrate features of low impact development (LID) to mimic the pre-project hydrologic conditions by routing roof and site runoff to vegetated and pervious areas to promote infiltration and groundwater recharge where possible. Because LID is intended to reduce runoff, its use will typically reduce the stormwater quality treatment requirements (and associated costs) for the property owner. Future updates to the Design Manual in 2011-2012 will make the use of LID mandatory for priority development projects.



**Existing or Completed Actions to Reduce Uncertainties in Water Reliability and Quality (continued)**

**Green Infrastructure c**

The County is promoting the use of green infrastructure techniques which intercept, capture and filter stormwater runoff, and promote infiltration. An example is the Freedom Park Drive Green Complete Street project under construction in 2011 and located in the North Watt Infill Corridor area of North Sacramento County, near McClellan Business Park.

**Conjunctive Use – Freeport Regional Water Project and Vineyard Surface Water Treatment Plant c**

The Freeport Regional Water Project (FRWP) is a cooperative effort of SCWA and the East Bay Municipal Utility District (EBMUD) to supply surface water from the Sacramento River to its customers. SCWA will use up to 85 million gallons of water per day (mgd) from FRWP to serve customers in central Sacramento County. By increasing surface water usage, SCWA can reduce its groundwater use in wet and normal hydrologic years and allow the underlying aquifer to recharge. EBMUD will use up to 100 mgd of water from the FRWP as a supplemental water source in dry hydrologic years only.

SCWA's water will be treated at their new Vineyard Surface Water Treatment Plant which began construction in May 2008, with planned operation beginning in fall 2011. The facility will initially be able to treat up to 50 mgd of water from the FRWP. The facility is part of a concerted effort to balance groundwater pumping with surface water usage to ensure the long-term sustainability of the region's groundwater basin. During dry years, SCWA would rely on "banked" groundwater to offset reduced surface water supplies.



**Water Recycling Program c**

In the late 1980s, the SRCSD, in partnership with the SCWA, began to explore the feasibility of using recycled water to meet the demands of a growing region, reduce impacts from droughts, and minimize the imposition of more stringent discharge requirements. In 2002, SRCSD and SCWA entered into a recycled water Wholesale Agreement; through this agreement, SRCSD is responsible for producing and providing recycled water to SCWA, which in turn is responsible for distributing and retailing recycled water to select customers.

Since April 2003, SRCSD has produced recycled water at the Water Reclamation Facility (WRF), located just north of the City of Elk Grove at the Sacramento Regional Wastewater Treatment Plant site. WRF currently has a capacity of 5 mgd, and produces Title 22 "unrestricted" recycled water that is used in-lieu of potable water to meet non-potable demands, such as landscape irrigation and process water. SCWA currently delivers recycled water to some of its customers in the Laguna West, Lakeside, and Stonelake communities in Elk Grove.

In 2004, the SRCSD Board of Directors approved strategic concepts to evaluate increasing the delivery of recycled water from 5 mgd to 30-40 mgd over the next 20 years. In 2007, SRCSD completed a Water Recycling Opportunities Study which engaged stakeholders and assessed the feasibility of potential water recycling projects. Currently, SRCSD plans on increasing the WRF's current recycled water capacity from 5 to 10 mgd.

**Participation in Delta Vision Process c**

In October 2008, the County Board of Supervisors and SCWA Board of Directors adopted resolutions approving policies regarding Bay-Delta Activities including the Delta Vision and the Bay-Delta Conservation Plan. These policies are intended to promote cooperation between stakeholders and safeguard future water supply and reliability for county residents, as decisions are made about diversions and other activities.

*Left: Rendering of future Freedom Park Drive Green Complete Street Project located in the County's North Wall Infill Area (in construction, 2010-2011). (Source: SACDOT)*



# CLIMATE ACTION PLAN

## Existing or Completed Actions to Reduce Uncertainties in Water Reliability and Quality (continued)

### Participation in the Sacramento Area Water Forum <sup>c</sup>

SWCA participates in the Sacramento Area Water Forum (Water Forum), a consensus-based, stakeholder process involving over forty representatives of water purveyors, businesses, and environmental and public interest groups in the region.

The two co-equal objectives of the Water Forum are:

- To provide a reliable and safe water supply for the region's economic health and planned development through the year 2030; and
- To preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.

SCWA has signed the Water Forum Agreement, which includes detailed understandings among stakeholder organizations on how the region will deal with key issues such as groundwater management, water diversions, dry year water supplies and water conservation. To date, the Water Forum effort has developed integrated projects and programs that meet the water supply, water quality, environmental, recreational, and flood control requirements of the region.

## Existing or Completed Actions to Elevate the Importance of Floodplain and Open Space Protection

### Participation in American River Basin Integrated Regional Water Management Plan (IRWMP) Process <sup>c</sup>

County DWR and SCWA are participating in the process to update the 2006 IRWMP and SCWA is using grant funding in part to implement a project identified in the existing IRWMP: The Freeport Regional Water Project. The project is designed to increase water supply (as previously described).

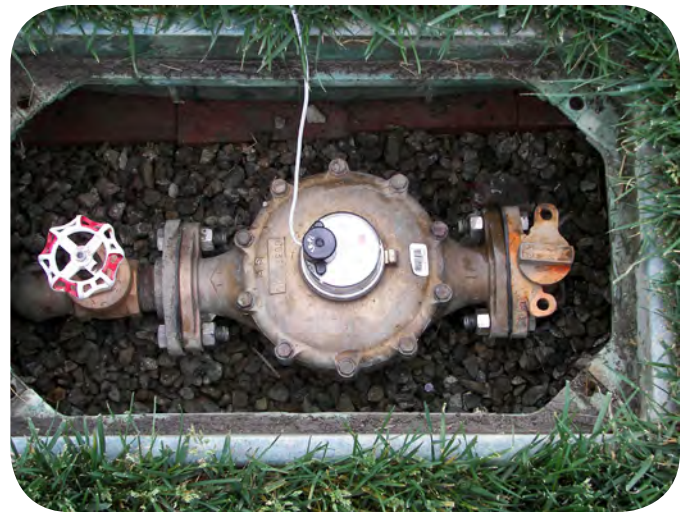
## Potential Actions to Reduce per Capita Water Use by 2020

### Develop Water Use Efficiency Policy for County Facilities and Operations <sup>g</sup>

Sacramento County could adopt a water conservation policy to apply to all County facilities, operations and employees and that include targets consistent with the Governor's water conservation target.

### Study Feasibility of Sub-metering for County-owned Facilities <sup>g</sup>

The County could assess whether installing sub-meters (which provide information about water use) at County facilities would be an effective way to promote water conservation. Any study recommendations that demonstrate cost-efficiency with a short payback period could then be implemented.



Integrated water planning attempts to address the broader association water has within a region. True integrated planning addresses the intertwined cause-and-effect relationship between diverse elements such as flood management, land use planning, economic viability, water supply reliability, water quality and environmental sustainability.

—Sacramento Area Council of Governments, 2009

### Potential Actions to Reduce per Capita Water Use by 2020 (continued)

#### Enhance and Expand Demand Side Management Programs **C**

Existing SCWA programs designed to reduce per capita water consumption for residential and business customers could be expanded. In particular, consider conservation-oriented pricing for metered customers; additional outreach and education; and expansion of the current rebate program to add fixtures and appliances such as waterless urinals, dual flush toilets, faucet retrofits, irrigation controllers, drip irrigation, and water brooms. It may be more economical to reduce water use through such demand side management tools than to pursue new water supply sources.

### Potential Actions to Emphasize and Increase Water Use and Energy Efficiency

#### Conduct Energy and Water Efficiency Audits of Water and Drainage Infrastructure **9**

County DWR and SCWA could audit the efficiency of existing water distribution and stormwater conveyance facilities and then recommend, schedule and implement water and energy saving measures as appropriate. Possible energy saving measures include load management and reduction to increase wire to water efficiency, using more energy-efficient lighting, and replacing HVAC systems, if warranted. SCWA and County DWR facilities and operations could be benchmarked against similar utilities to investigate opportunities for improvement.

#### Study the Water Use Efficiency of County Facilities **9**

SCWA's water conservation staff could advise or train the County's Department of General Services on how to assess indoor and outdoor water use at all County-owned facilities, including buildings, parks and golf courses; and identify ways to reduce water use, where feasible. Ideally water use would be evaluated along with energy efficiency, waste management and indoor air quality in a "whole system" facility assessment. The assessments should address water use in landscapes with respect to the principles outlined in the River Friendly Landscaping program. This action could apply to facilities under the jurisdiction of SCWA or County DWR as well.

The County could also take advantage of any applicable utility/commercial rebates when replacing or upgrading water infrastructure and equipment (e.g., changing water-cooled equipment to air-cooled, replacing standard toilets with dual flush or ultra-low flow toilets, or modifying irrigation systems to use drip irrigation or sprinkler controllers). In most cases the costs of upgrading equipment is soon repaid in reduced utility expenses (and potentially rebates) and also results in long-term environmental benefits.

#### Audit the Water Efficiency of SCWA and County DWR Operations **9**

SCWA could conduct an audit of water use at all SCWA and County DWR field operations within their jurisdiction, including dust control, vegetation management, pavement cleaning, water system testing/flushing, etc. Based on the audit results/findings, a strategy could be developed for other departments to assess their water use efficiency during field operations.



#### Audit the Water Efficiency of all County Field Operations **9**

If SCWA and County DWR conduct water-use audits of their field operations (see prior action), they could provide guidance and support to other departments to assess and improve the water use efficiency of their field operations.

# CLIMATE ACTION PLAN

## Potential Actions to Emphasize and Increase Water Use and Energy Efficiency (continued)

### Develop an Energy Policy for Water and Drainage Infrastructure **g**

Sacramento County could develop an energy policy specific to the needs of both County DWR and SCWA.

### Incorporate Water Use Efficiency in Green Building Efforts **c**

The County could ensure that any green building policies or ordinances address indoor and outdoor water use efficiency in new and existing buildings. As described in Section 3.3 (Energy), the County/City of Sacramento's Green Building Task Force published its recommendations report in December 2010. That report included several recommendations related to water use efficiency.



Some of the new, well-designed showerheads flow at 1.5 gallons per minute - a massive improvement over the federal standard of 2.5 gpm. (Photo: Wikimedia Commons)

### Advertise/Promote Energy Star Rebate Program **c**

Sacramento County could use its website to promote the Energy Star Rebate Program for clothes washers and dishwashers (as well as the County's own incentive programs); providing the message that Energy Star appliances save water, not just energy.



The Fair Oaks Horticulture Center and Water Conservation Demonstration Garden is visited year-round by individuals and groups interested in learning about River Friendly Landscaping and water conservation.

### Create River Friendly Landscaping Demonstration Garden(s) **c**

SCWA could collaborate with watershed organizations, school districts and others to seek funding to construct River Friendly community demonstration gardens throughout the SCWA service area. SCWA already has one water efficient demonstration garden located in its service area (at the Waterman Road Treatment Plant) which will be retrofitted in fall 2011 as part of the River Friendly EPA Showcase Climate Communities Grant, discussed previously.

### Create a Graywater Re-Use Policy and Program **c**

SCWA and the County's Environmental Management Department and Building Inspection groups could work together to create policies and guidelines for graywater reuse in residential and commercial areas. The County and/or SCWA could seek grant funding to implement pilot scale tests to assess feasibility and refine criteria. It could investigate use of rainwater harvesting and/or graywater systems as a source of irrigation water through demonstration projects.



### Potential Actions to Reduce Uncertainties in Water Reliability and Quality

#### Consider Rural-Urban Compacts **C**

The County could consider developing “subsidiary agreements” or similar “rural-urban compacts” to reallocate agriculture and urban water allocations during periods of extreme drought. (Haddad 2005)

#### Encourage Dam Re-Operation Study **C**

SCWA and County DWR could encourage efforts to study and implement dam re-operation projects that provide increased weather and hydrological monitoring. Such monitoring helps dam operators know when to release water to prevent flooding and when to capture it for water supply.

#### Investigate Regional Opportunities for Groundwater Storage **C**

SCWA could work with other regional partners to study existing groundwater storage programs and recommendations on how similar programs could benefit the region. The study could also explore the feasibility of groundwater banking and possible aquifer storage and recovery programs. SCWA has already identified groundwater storage in their master plan and have initiated discussions with other water purveyors.

#### Increase Surface Storage **C**

Working with the State Department of Water Resources and other regulatory/resource agencies, the County and/or SCWA could investigate the need to participate in the construction of surface storage to mitigate peak flood flows and provide additional water supplies.

#### Study Sea Level Rise Impacts to Sacramento County **C**

County DWR and/or SCWA could work with the State Department of Water Resources and other regulatory/resource agencies to investigate the local impact of sea level rise on flood protection and surface and groundwater quality, as well as the impact to North Delta communities.

### Potential Actions to Elevate the Importance of Floodplain and Open Space Protection

#### Promote Open Space Conservation and Conservation Easements **C**

Conserving open space (including through conservation easement) provides groundwater recharge and protects groundwater (as well as wildlife habitat). Retaining and detaining flood flows higher up in the watershed may prove to be an effective way of recharging groundwater along with providing effective stormwater management.

#### Improve Floodplain Protection Policies **C**

The existing floodplain management policy can be strengthened to ensure compliance with legislation mandating protection of the 200-year flood plain.



Sacramento County and other agencies in the region should encourage studies related to dam operations in order to identify and implement improvements to water storage and management. (Source: U.S. Bureau of Reclamation)



# CLIMATE ACTION PLAN

**TABLE 3-3**  
Water Sector - Summary of Existing and Potential Actions

ACTION	APPLICATION	CO-BENEFITS							
		Provides economic benefits and/or creates jobs	Reduces energy use	Conserves water	Improves air quality	Protects habitat, open space, Ag lands, &/or rangelands	Improves water quality	Protects public health	Reduces waste to landfill
<b>Existing or Completed Actions to Reduce per Capita Water Use Levels by 2020</b>									
Voluntary Water Conservation Targets	Community	•	•	•					
Statewide Collaboration on Water Conservation Practices	Community	•	•	•					
Water Conservation Rate Structure	Community	•	•	•					
<b>Existing or Completed Actions to Emphasize and Increase Water Use and Energy Efficiency</b>									
Energy Efficiency of Water Supply System	County Government	•	•	•		•	•	•	
Metered Billing	Community	•	•	•					
Water Wise Audits	Community	•	•	•					
Water Waste Prohibition Program	Community	•	•	•					
Fixed Base Meter Reading	Community	•		•			•	•	
County Water Conservation Coordinator	Community	•	•	•					
<b>Existing or Completed Actions to Reduce Uncertainties in Water Reliability and Quality</b>									
River Friendly Landscaping Program	Community	•	•	•	•	•	•	•	•
Watershed Protection and Restoration	Community	•	•	•	•	•	•	•	•
Low Impact Development	Community	•	•	•	•	•	•	•	
Green Infrastructure	Community	•	•	•	•	•	•	•	
Conjunctive Use – Freeport Regional Water Project and Vineyard Surface Water Treatment Plant	Community	•	•	•	•			•	
Water Recycling Program	Community		•	•	•	•	•		
Participation in Delta Vision Process	Community			•		•	•	•	
Participation in the Sacramento Area Water Forum	Community			•		•	•	•	
<b>Existing Actions to Elevate the Importance of Floodplain and Open Space Protection</b>									
Participation in Integrated Regional Water Management Plan Process	Community			•		•	•		

**TABLE 3-3**

**Water Sector - Summary of Existing and Potential Actions (continued)**

ACTION	APPLICATION	CO-BENEFITS							
		Provides economic benefits and/or creates jobs	Reduces energy use	Conserves water	Improves air quality	Protects habitat, open space, Ag lands, &/or rangelands	Improves water quality	Protects public health	Reduces waste to landfill
<b>Potential Actions to Reduce per Capita Water Use by 2020</b>									
Develop Water Use Efficiency Policy for County Facilities and Operations	County Government	•	•	•	•				
Study Feasibility of Sub Metering for County-Owned Facilities	County Government	•		•					
Enhance and Expand Demand Side Management Programs	Community			•	•				
<b>Potential Actions to Emphasize and Increase Water Use and Energy Efficiency</b>									
Conduct Energy and Water Efficiency Audits of Water and Drainage Infrastructure	County Government	•	•	•	•				
Study the Water Use Efficiency of County Facilities	County Government	•	•	•	•				
Audit the Water Efficiency of SCWA and DWR Operations	County Government	•	•	•					
Audit the Water Efficiency of all County Field Operations	County Government	•	•	•	•				
Develop an Energy Policy for Water and Drainage Infrastructure	County Government	•	•	•	•				
Incorporate Water Use Efficiency in Green Building Efforts	Community	•	•	•	•				
Advertise/Promote Energy Star Rebate Program	Community	•	•	•	•				
Create River Friendly Landscaping Demonstration Garden(s)	Community	•	•	•	•	•	•	•	•
Create a Graywater Re-Use Policy and Program	Community	•	•	•	•	•	•	•	•
<b>Potential Actions to Reduce Uncertainties in Water Reliability and Quality</b>									
Consider Rural-Urban Compacts	Community		•	•	•			•	
Encourage Dam Re-Operation Study	Community			•					
Investigate Regional Opportunities for Groundwater Storage	Community	•	•	•	•			•	
Increase Surface Storage	Community	•	•	•	•			•	
Study Sea Level Rise Impacts to Sacramento County	Community			•		•	•	•	
<b>Potential Actions to Elevate Importance of Floodplain and Open Space Protection</b>									
Promote Open Space Conservation and Conservation Easements	Community	•		•	•	•	•	•	
Improve Floodplain Protection Policies	Community	•		•		•	•	•	

# CLIMATE ACTION PLAN



The landfill gas-to-energy plant at the Kiefer Landfill produces and sells to SMUD enough energy to power 9000 homes. (Photo: County DWMR)



## 3.5 WASTE MANAGEMENT AND RECYCLING

### Introduction

Waste management is responsible for a relatively small portion (6%) of GHG emissions for the entire county and 4% of the emissions for the unincorporated county, as compared to emissions from transportation and building energy use (see Chapter 2). In complying with stringent State air quality regulations since 1990, the County has already made significant progress in lowering GHG emissions. However, the County recognizes the many benefits (including cost savings) that might be achieved by enhancing and expanding efforts described in this section of the Climate Action Plan.

Solid waste management accounts for 6% of the GHG emissions for the entire county and 4% of the emissions for the unincorporated portion of the county.

Right: Most of the County's solid waste fleet has been converted to cleaner burning alternative fuels. (Photo: DWMR)



## The County's Role in Waste Management

Sacramento County provides comprehensive waste management and recycling systems for residents and businesses in the unincorporated area.

The County's Department of Waste Management & Recycling (DWMR) provides waste collection services to 155,000 residential customers in the unincorporated area every week. Residential solid wastes are disposed of in the County's Kiefer Landfill. The County has no influence over residential waste collection operations by other jurisdictions in the region.

Sacramento County is a member of the Sacramento Regional Solid Waste Authority (SWA) formed in December 1992 to assume the responsibilities for commercial solid waste, recycling and disposal for the City of Sacramento and the County. The SWA is a Joint Powers Authority funded by franchisee fees and governed by a Board of Directors consisting of elected officials from the City and the County. The SWA regulates commercial solid waste collection by franchised haulers through franchise agreements and ordinances. SWA ordinances require that franchised haulers achieve a 30 percent recycling rate and offer recycling services to multi-family dwelling units.

In addition to collection services, Sacramento County offers waste transfer and disposal services. The County competes for and accepts residential and commercial waste from all jurisdictions in the region at the following two locations:

- Kiefer Landfill.** Kiefer Landfill is the only active municipal solid waste disposal facility in Sacramento County. Approximately 500,000 to 700,000 tons of waste are accepted each year from the general public, businesses, government operations, and private waste haulers. The entire facility is 1,084 acres, and of that, the current landfill makes up less than half (about 290 acres) of the ultimate 660-acre disposal area, providing space for future disposal needs. In addition, as a result of a comprehensive array of programs aimed at source reduction, recycling, composting, and public education and outreach, the amount of solid waste delivered to the landfill per capita is decreasing. For example, in its service area in 2009, Sacramento County diverted 70% of its solid waste from landfill disposal. Therefore, despite projected population increases, this facility will be able to serve regional waste disposal needs for many years to come.



- North Area Recovery Station (NARS).** The North Area Recovery Station is a transfer and recovery facility that accepts various types of wastes (e.g., solid, green, household hazardous, universal and electronic) from the general public, businesses and private waste haulers, and sorts the waste for shipment off-site. Residential wastes are transferred to Kiefer Landfill. Some organic waste is segregated at NARS for composting and biomass processing. Other materials recovered at the facility include metals, appliances, asphalt, concrete, and soil. Source separated recyclables are transferred off-site for processing and marketing.



# CLIMATE ACTION PLAN

Sacramento County works to reduce GHG emissions from its waste management activities by promoting reduced consumption in homes and businesses and by properly managing all materials to minimize the generation of waste, increase the diversion from landfills, and convert the waste into reusable resources. Reduced waste generation also achieves efficiencies in collection and thus lowered vehicle miles traveled and associated reduction in GHG emissions. Recycling reduces GHG emissions by avoiding the energy used in manufacturing new products and by reducing the amount of methane released into the atmosphere as waste decomposes in landfills.

The two major waste-related sources of GHG emissions for the unincorporated county are solid waste generation and decomposition of waste at Kiefer Landfill. As discussed in Chapter 2, combined emissions from these sources in 2005 represented a relatively small portion (6%) of total emissions for the entire county.

Actions taken by DWMR since 1990 have likely contributed to significant reduction in GHG emissions as discussed below. Additionally, DWMR-owned solid waste collection vehicles contribute to GHG emissions under vehicle fleet categories within the government emissions category (see Chapter 2).

## Emissions from Waste Generation

In 1990, the per capita solid waste generation rate for the unincorporated county was approximately 8 lbs/person/day resulting in about 940,000 tons of solid waste for the unincorporated county area (Table 3-4). As highlighted in Figure 3-1, a large portion of the waste disposed in the Kiefer Landfill in 1990 consisted of organic materials, which contribute carbon dioxide and methane to the atmosphere as they decompose. This is no longer the case. Since 1990, the DWMR has been actively engaged in implementing a multitude of waste diversion activities and has achieved 70% waste diversion as of 2009. Waste diverted from the landfill is reused in other ways.

Assuming that the current diversion programs will continue performing at a similar level and by implementing new programs (both discussed later in this plan), the waste diversion rate for 2020 for the unincorporated area is projected to be 75% or higher (Figure 3-2).

## Emissions from “Waste-in-Place” at Kiefer Landfill

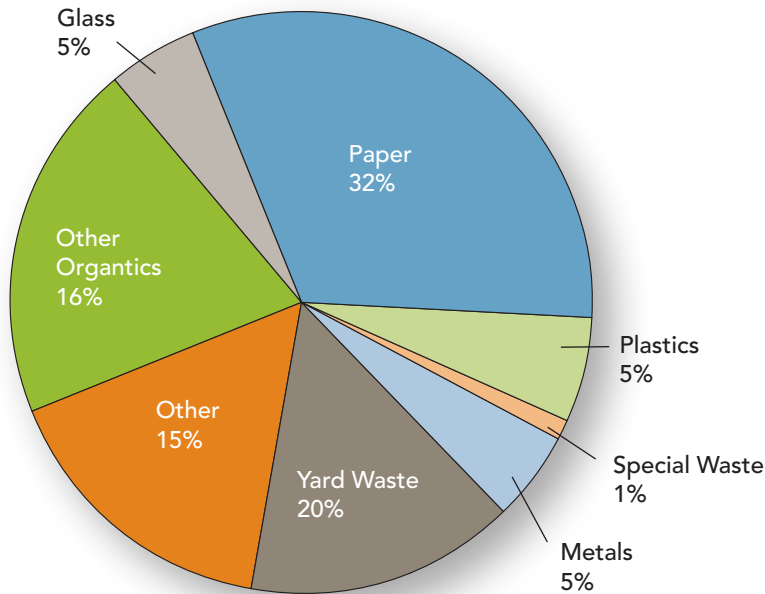
“Waste-in-Place” emissions are based on the accumulated waste in a landfill over the landfill’s lifetime and the efficiency of environmental control systems employed to control landfill gas generated by the decomposing waste. Waste placed in a landfill begins to degrade immediately following placement. The rate of degradation and volume of landfill gas produced are dependent on organic content and environmental variables such as temperature, moisture. Organic materials such as food and yard (green) waste decompose and produce carbon dioxide and methane.

**TABLE 3-4**  
Solid Waste Diversion in Unincorporated Sacramento County (tons):

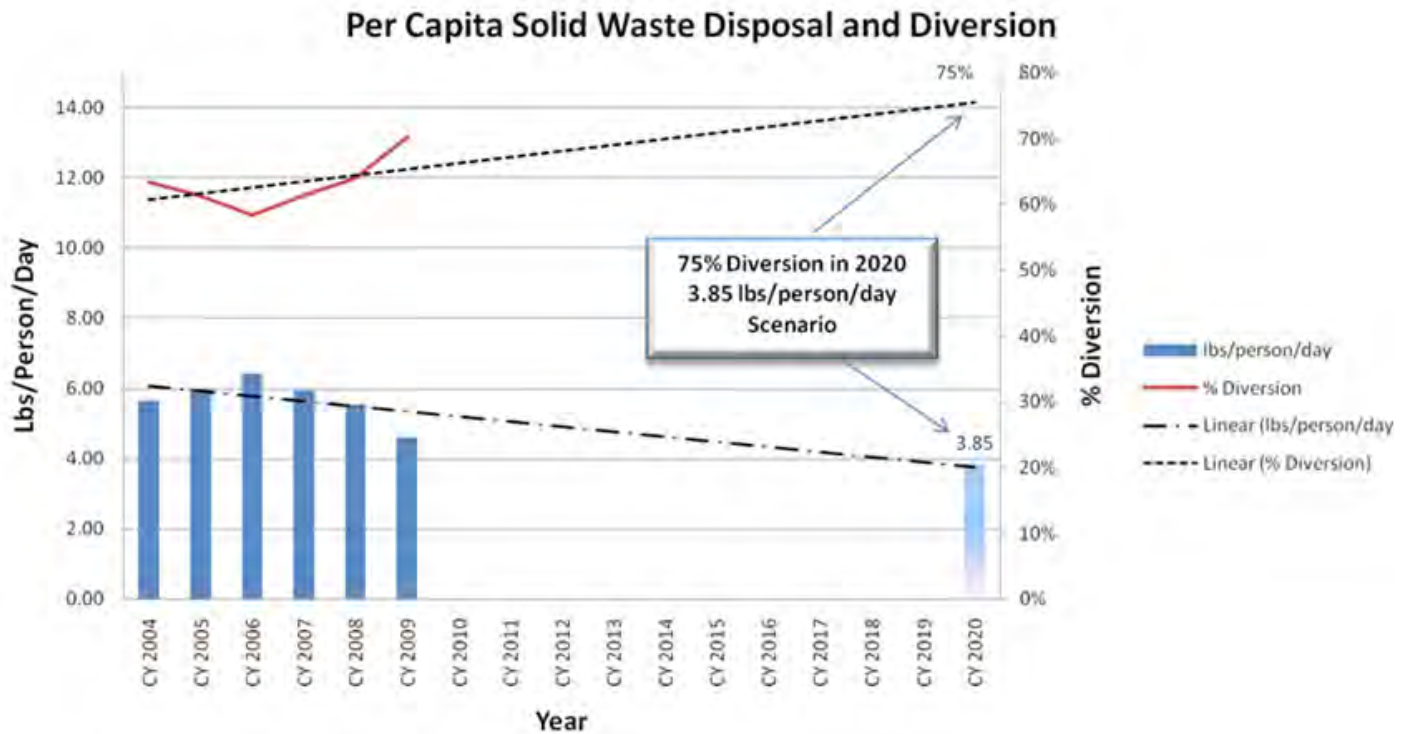
	1990*	2001**	2009***
Solid Waste Generated	941,500	1,552,450	1,575,000
Solid Waste Disposed	769,600	681,020	475,000
Solid Waste Diverted	171,900	871,430	1,100,000
Diversion rate	18%	56%	70%

Source: \*AB 939 SRR Element, 1991, \*\*AB 939 Base Year study, 2002, \*\*\*Communications with R. Lathigara, DWMR, September 2010.

**FIGURE 3-1**  
Composition of Unincorporated County Waste Disposed, 1990



**FIGURE 3-2**  
Solid Waste Diversion History and Projections for Unincorporated Sacramento County



Source: DWMR, September 2010.

# CLIMATE ACTION PLAN

According to the 2005 baseline emissions inventory, total waste-in-place emissions at Kiefer Landfill are estimated to be nearly 50,000 metric tons CO<sub>2</sub>e, based on total waste landfilled through 2005. (Sacramento County, 2009) However, actual emissions may be significantly lower than the 2005 inventory estimate due to the control actions described below. The quantity of landfill gas that is emitted is a function of the efficiency of the collection system, the amount of gas that is oxidized in the landfill cover, and the destruction device efficiency. The County collects, controls, and destroys harmful landfill gas at Kiefer Landfill through the implementation of the following environmental control systems:

- All new landfill cells are constructed with liner systems that mitigate migration of gas from the base of the waste
- Horizontal and vertical wells are installed in the waste to facilitate active extraction of landfill gas from the waste
- The cover system atop the waste actively oxidizes methane and reduces emissions
- Gas is collected from the landfill liner's leachate collection system
- Collected gas is destroyed using either internal combustion engines or a flare
- The landfill surface and perimeter are regularly monitored for fugitive methane emissions or migration



An automated collection vehicle ejects its load of commingled residential recyclables at the North Area Recovery Station. (Photo: DWMR)

## Goals

The County is committed to achieving the following goals to mitigate GHG emissions associated with waste management activities in the unincorporated Sacramento County and County government operations:

- Promote reduction in consumption
- Maximize waste diversion, composting, and recycling through expanding residential and commercial programs
- Reduce methane emissions at Kiefer landfill

This section of the Climate Action Plan describes actions already being conducted and identifies potential options that can lead to realization of these goals.

## Co-Benefits

The County's efforts to maximize waste diversion from the landfill results in several co-benefits in addition to GHG emission reduction:

- Recovering and composting organic materials in gardens and landscapes reduces the need for water, complimenting the County's water conservation program discussed in Section 3.4 and helping the County adapt for projected reduced water supplies in the future
- Reuse of leaves and other green waste as compost also reduces or eliminates the need for fertilizers, which can impair local creeks and rivers when carried from landscapes into storm drains via runoff
- As more community residents practice these techniques, presumably collection trips can be reduced, thereby improving air quality
- Convenient transfer and recycling options mean less solid, hazardous and universal wastes disposed of illegally in storm drains and creeks

In addition, the preserved bufferlands surrounding the Kiefer Landfill (described later in this section) provides a multitude of environmental benefits, including habitat protection, water quality improvement, groundwater replenishment and aesthetic amenities.



UC Master Gardeners are helping Sacramento County to promote River Friendly Landscaping design and maintenance practices to residents, landscape professionals and parks district personnel.

### HEALTH CO-BENEFITS

Promotion and implementation of River Friendly Landscaping principles, which encourage on-site recycling of grass clippings and leaves as garden compost, reduces harmful air pollutants associated with trucking of the green waste to the landfill. Also, the practices reduce the need for pesticides and herbicides which can be carried in urban runoff to local creeks and rivers, threatening aquatic and human health.

### Actions to Address Climate Change

Many of the mitigation measures discussed in this section have been implemented for many years. It is the County's intent to continue enhancing and expanding these programs, for example, by adopting a target to achieve a 75% or higher waste diversion goal by 2020. It is assumed that higher waste diversion combined with continued landfill gas recovery, waste collection routing efficiencies, and alternative fuel fleet will have a positive impact on the overall GHG emissions reduction for the County.

In this section, actions are grouped according to four functional program areas in the County's DWMR organization:

- Solid waste reduction & recycling
- Solid waste collection
- Waste disposal and processing
- Education & outreach

Also, each action is coded to indicate whether it applies to Sacramento County government operations **g** or to the entire community **c**.

### Existing or Completed Actions Related to Solid Waste Reduction and Recycling

#### Recycling Programs at County-Owned Facilities **g**

In 2006, the County established recycling programs at certain high-volume generating County-owned facilities. These programs are managed by the Department of General Services and were established with the assistance of DWMR. The DWMR also assists to implement waste diversion programs at large County events and venues, such as the Sacramento International Airport and the California Capital Airshow held at Mather Field, in accordance with the State requirement under Assembly Bill 2176.



Segregated and labeled disposal containers for recyclables encourage visitors and employees at the County downtown administration building to recycle their waste.



# CLIMATE ACTION PLAN

## Existing or Completed Actions Related to Solid Waste Reduction and Recycling (continued)

### Construction & Demolition (C&D) Waste Recycling Program c

As of January 1, 2011, Sections 5.408 and 5.508 of the California Green Building Code, also known as “CALGreen”, superseded the 2009 Sacramento County Construction and Demolition (C&D) Debris Ordinance. CALGreen and the County C&D ordinance (as well as similar ordinances enforced by other cities in the county) require Contractors to recycle 50% of C&D debris from:

- all new construction projects,
- all full structure demolitions, and
- alterations / tenant improvements with a contracted construction value of \$250,000 or more.

Builders are required to implement jobsite recycling programs and sort and segregate wastes individually on the construction site, or combine the wastes for eventual sorting and recyclable extraction at a Certified C&D sorting facility.

The market conditions in recent years have led to a significant decline in construction in the Sacramento region, therefore reducing the amount of C&D debris generated and making it difficult to project the amount of debris that can be diverted in the county in any given year. The DWMR is now collecting data via required waste logs from construction businesses to make it possible to quantify this information in the future. Without filing the waste log, a builder cannot schedule the final inspection or receive the Certificate of Occupancy.

### SWA Recycling Programs c

SWA ordinances require that franchised haulers achieve a 30% recycling rate and offer recycling services to multi-family housing units. As an incentive, the SWA does not assess franchise fees on revenue derived from commercial recyclable collection. In April 2007, SWA adopted a new Business Recycling Ordinance that requires keeping designated recyclables including cardboard, office paper and beverage containers separate from the garbage. All businesses and all non-residential properties that subscribe to garbage service of four (4) cubic yards or greater per week are required to have a recycling program.



Existing regulations require contractors to recycle 50% of construction and demolition debris (Photo: County DWMR)

### Residential Recycling Programs c

The County DWMR provides residential solid waste and recycling services to approximately 155,000 residential units in unincorporated county service areas each week. The services include separate curbside collection of comingled recyclables (fiber products, used beverage containers, plastics, etc.), yard waste and used oil and filters. An estimated 150,000 tons of trash are collected each year. Along with that, 45,000 tons of recyclables and 75,000 tons of green waste are collected each year and therefore diverted from the landfill for reuse.

### Yard Waste Diversion Programs c

As shown in Figure 3.5-2, a large portion of the waste stream consists of organic waste – one of the most significant sources of methane generated at the landfills. Recognizing the need for diverting organic waste in general and yard waste in particular, the DWMR provides yard waste recycling services to unincorporated county residents. An estimated 75,000 tons of green waste is collected each year. Currently, it is diverted to compost or biomass facilities or used for landfill cover. In addition to this, the SWA is conducting studies related to siting a new regional composting facility to process yard waste locally.

### Existing or Completed Actions Related to Solid Waste Reduction and Recycling (continued)

#### Other Recycling Programs c

In addition to the NARS and Kiefer drop-off locations for collecting and processing household hazardous waste and universal waste described previously, the DWMR offers periodic collection, recycling and disposal services for bulky, household hazardous and universal wastes under its Appointment-Based Neighborhood Clean-Up (ABNCU) program. This program also provides response to illegal dumping incidents in coordination with County Code Enforcement. This convenient centralized collection system reduces GHG emissions associated with vehicle miles traveled.

The County processes on average 100 tons, or 200,000 pounds of e-waste each month through County's e-waste vendor California Electronic Asset Recovery (CEAR). In 2010, The Department turned in almost 1200 tons of e-waste to CEAR, which generated \$490,000 in return.

### Existing or Completed Actions Related to Solid Waste Collection

#### Alternative Fuel Waste Collection Fleet g

As discussed earlier related to the transportation sector (Section 3.2), as of 2009, the DWMR owned and operated a fleet of 127 waste collection vehicles, of which 103 were liquified natural gas (LNG), 18 were dual-fuel vehicles running on 80% LNG and 20% diesel, and the remaining 6 diesel trucks were equipped with CARB conversion kits. The initial LNG fleet was acquired by the County during 2001-2005 and these numbers are changing as the County moves vehicles to surplus and replaces them with LNG. DWMR is working now to convert the entire collection fleet to LNG (the transfer fleet will remain diesel, equipped with conversion kits).

#### Fleet Routing To Reduce Vehicle Miles Traveled g

In addition to converting over 80% of its fleet to alternative fuel, DWMR has implemented periodic re-routing to increase collection efficiencies, reducing VMT and associated GHG emissions. For example, the most recent re-routing (January 2009) successfully reduced nine collection routes.

In 2009, the County adjusted the routes of its waste collection fleet, which resulted in a reduction of 210 metric tons of carbon dioxide per year. This is roughly the annual emissions from electricity use in 26 homes.



The Kiefer Landfill is home to a gas-to-energy plant that collects landfill gases to convert into energy for SMUD to power close to 9,000 homes. (Photo: DWMR)

### Existing or Completed Actions Related to Waste Disposal and Processing

#### Landfill Gas-to-Energy Plant at Kiefer Landfill g c

The County DWMR began operating an extensive landfill gas (LFG) extraction and control system at Kiefer Landfill in 1997, whereby approximately 85 percent of landfill gas generated in the landfill is collected and destroyed. Subsequently, the County began operating a LFG-to-energy facility in 1999 and expanded the facility in 2006. Expansion of the collection system is ongoing with development of the landfill

The energy plant is used as the primary LFG destruction device for the system. The plant consumes up to 5,500 CFM (cubic feet per minute) of LFG. Two flares are used to destroy excess LFG that is collected. If the energy plant is not operational, the flares serve as the primary destruction devices.

The landfill gas-to-energy plant produces 14.0 megawatts of electricity, enough to power almost 9,000 homes. The gas-to-energy plant delivers significant electricity to SMUD's green energy program and displaces electricity generated using fossil fuels.

# CLIMATE ACTION PLAN

## Existing or Completed Actions Related to Waste Disposal and Processing (continued)

### Carbon Sequestration at Kiefer Landfill and Kiefer Bufferlands **C**

Carbon sequestration refers to natural or man-made processes that remove carbon from the atmosphere and store it for long periods or permanently. When more biomass is conserved and allowed to grow than is removed (through harvest or decay), the amount of carbon stored in trees increases, and thus carbon is sequestered. Landfills are another means by which carbon is removed from the atmosphere through carbon sequestration, offsetting methane emissions. Landfill carbon stocks increase over time because much of the disposed organic matter (e.g. wood, paper products) placed in landfills does not decompose for a long time, especially if the landfill is located in an arid area (EPA, 2002). Landfilled paper, yard trimmings, and food wastes accounted for approximately 1 percent of the total US carbon sequestration in 2004.

The DWMR owns approximately 2,000 acres of Kiefer Bufferlands surrounding Kiefer Landfill, including part of the Deer Creek Watershed, oak woodlands, the Sloughouse agricultural area and acres of vernal pool habitat areas, which are home to many threatened or endangered species of flora and fauna such as the Vernal Pool Tadpole Shrimp, the Vernal Pool Fairy Shrimp, the Swainson's Hawk and Orcutt Grass. The area also includes the 243-acres Kiefer Wetland Preserve, established in 2007. Long term planning efforts for the Kiefer Bufferlands are underway through pursuit of a Special Planning Area (SPA). Land use alternatives to be allowed in the SPA include: establishment of additional preserves, renewable energy development (e.g. waste transformation and solar), and advanced recycling industries.



## Existing or Completed Actions Related to Education and Outreach

Education and outreach programs are essential to bring success to any waste diversion activities. Since the enactment of AB 939, the DWMR has implemented various educational programs targeting residential and commercial customers to promote waste reduction and recycling.

### Education for Residential Customers **C**

These programs range from educating residents about the various recycling opportunities to providing hands-on training for backyard composting. Announcements and links are provided on the DWMR web site about Green Gardener and River Friendly Landscaping training and demonstration workshops.

### Education for Commercial Businesses **C**

For the commercial sector, the DWMR and SWA have implemented outreach programs to assist businesses with their recycling needs. Additionally, the DWMR has a strategic alliance with the Business Environmental Resource Center to provide assistance to local businesses in the area of environmental sustainability.

## Potential Actions Related to Waste Disposal and Processing

### Establish New Regional Composting Facility (GreenCycle) **C**

Due to inadequate regional capacity to process organic waste, the SWA has undertaken a project to establish a local composting facility ("GreenCycle") in Sacramento County. The new facility would use green waste and food waste feedstock for energy conversion. The County is working closely with SWA on this important project.

*Left:* The Kiefer Bufferlands is home to hundreds of acres of vernal pools and open space lands that sequester carbon, support wildlife and provide aesthetic value.

**TABLE 3-5**

**Waste Management and Recycling Sector - Summary of Existing and Potential Actions**

ACTION	APPLICATION	CO-BENEFITS							
		Provides economic benefits and/or creates jobs	Reduces energy use	Conserves water	Improves air quality	Protects habitat, open space, Ag lands, &/or rangelands	Improves water quality	Protects public health	Reduces waste to landfill
<b>Existing or Completed Actions Related to Solid Waste Reduction and Recycling</b>									
Recycling Programs at County-Owned Facilities	County Government	•	•		•	•			•
Construction and Demolition Waste Recycling Program	Community	•	•		•	•			•
SWA Recycling Programs	Community	•	•		•	•			•
Residential Recycling Programs	Community	•	•		•	•			•
Yard Waste Diversion Programs	Community		•		•	•			•
Other Recycling Programs	Community		•		•	•	•		•
<b>Existing or Completed Actions Related to Solid Waste Collection</b>									
Alternative Fuel Waste Collection Fleet	County Government	•	•		•	•		•	
Fleet Routing to Reduce Vehicle Miles Traveled	County Government	•	•		•	•		•	
<b>Existing or Completed Actions Related to Waste Disposal and Processing</b>									
Landfill Gas-to-Energy Plant at Kiefer Landfill	County Government and Community	•	•		•			•	
Carbon Sequestration at Kiefer Landfill and Kiefer Bufferlands	Community	•	•		•			•	
<b>Existing or Completed Actions Related to Education and Outreach</b>									
Education for Residential Customers	Community	•	•	•	•	•			•
Education for Commercial Businesses	Community	•	•	•	•	•			•
<b>Potential Actions Related to Waste Disposal and Processing</b>									
Establish New Regional Composting Facility	Community	•	•		•	•			•



# CLIMATE ACTION PLAN



Photo: Rodney Melton



## 3.6 AGRICULTURE AND OPEN SPACE

### Introduction

The relationship between the agricultural industry and climate change is multi-faceted. Agriculture contributes GHG emissions, but can also help reduce greenhouse gases produced by other sectors, as explained below. In addition, agriculture can be used to create fuels with fewer GHG emissions than fossil fuels. Finally, projected climate changes will stress this extremely important industry. Trees and open space, which are also discussed in this section, reduce greenhouse gases in the atmosphere by absorbing carbon dioxide through a process called carbon sequestration.

As explained in Chapter 2, agriculture accounts for 4% of the total GHG emissions for unincorporated Sacramento County. Agricultural GHG emissions originate from various sources including livestock (which produce methane in their digestive systems), manure management, agricultural equipment operation, fertilizer application and soil tillage (which release nitrous oxide), burning of crop residue, refrigeration, processing, and distribution. Distribution-related emissions are reduced when people buy locally grown products. The County's estimate of agricultural GHG emissions only considers emissions produced by livestock digestion, manure management, and fertilizer use.

GHG emissions from agricultural operations (mainly associated with livestock and fertilizer use) account for almost 2% of the GHG emissions for the entire County and 4% of the emissions for the unincorporated portion of the county.

Agriculture contributes greenhouse gases, but also has the potential to reduce emissions from other sectors. The agricultural industry can grow crops used to create biofuels, which generate fewer greenhouse gas emissions than do fossil fuels. In addition, agriculture can take carbon dioxide out of the atmosphere and store it as carbon in plants and soils. Recent studies have found that soils may be either sources or sinks for greenhouse gases. (Paustian et al 2006)

As explained in Chapter 1, it is important to reduce greenhouse gas emissions, but some climate impacts are now seen as inevitable. A changing climate is expected to impact the agricultural industry in a number of ways:

- Increased temperatures will reduce the quantity and quality of agricultural products statewide.
- California farmers will face greater water demand for crops and a less reliable water supply as temperatures rise. By the end of the century, if temperatures rise and precipitation decreases, late spring stream flow could decline by up to 30 percent and California farmers could lose as much as 25 percent of the water supply needed. (Leurs et al 2006).
- Crop growth and development will change, as will the intensity and frequency of pest and disease outbreaks.
- Rising temperatures will likely aggravate ozone pollution, which makes plants more susceptible to disease and pests and interferes with plant growth. (Leurs et al 2006)

These impacts to the California agriculture industry are particularly significant considering that the state is home to a \$38 billion dollar agriculture industry that employs more than one million workers. It is the largest and most diverse agriculture industry in the nation (fifth largest in the world), producing more than 300 commodities including half of the country's fruits and vegetables. (Leurs et al 2006)

In Sacramento County, most of the land outside the urban area is used for agricultural purposes (crop and livestock) and agricultural production in the county is a significant contributor to the local economy. In 2007, the combined total of certain crops (wine grapes, pears, corn, hay, alfalfa and tomatoes), livestock products (milk), livestock (poultry,



Photo: Sonia Saini

cattle, and calves) and wholesale nursery stock accounted for almost 80% of the nearly \$365 million in annual production value. (Sacramento County 2008) There are hundreds of jobs directly tied to that production and thousands more that are impacted indirectly in the production, processing, transportation, and marketing of those commodities.

There is a need to promote sustainable farming and ranching practices which can holistically address all of the challenges associated with a changing climate (see the discussion regarding conventional versus sustainable agriculture).

Like some agricultural practices, open space and trees can be an effective tool for sequestering carbon dioxide. In 1998, a researcher with University of California at Davis estimated that Sacramento County's urban forest of 6 million trees (mainly in residential and suburban areas) removed approximately 304,000 tons of CO<sub>2</sub> each year, with an implied value of \$3.3 million (\$0.55/tree). (McPherson 1998) A study conducted in 2001, which included Sacramento area tree data, found that urban tree planting can account for a 25% reduction in net cooling and heating energy usage in urban landscapes. (Akbari 2001)





# CLIMATE ACTION PLAN



Photos: USDA

## CONVENTIONAL VERSUS SUSTAINABLE AGRICULTURE

Conventional farming systems vary from farm to farm but typically share many characteristics including (but not limited to) being large scale; growing single crops/row crops continuously over many seasons; and extensively using pesticides, fertilizers and external energy inputs. Conventional farms are productive but have resulted in negative effects such as:

- Reduced soil productivity
- Water pollution (Agriculture is the largest single non-point source of water pollutants, and the pollutants include sediments, salts, fertilizers—nitrates and phosphorus, pesticides, and manures [USDA 2007])
- Stresses on pollinators and other beneficial species through pesticide use
- Reduced biodiversity (a key element of food security) due to monocultures and reliance on genetic uniformity in most crops and livestock breeds
- Increased dependence on imported oil

Sustainable agriculture practices follow the principles of nature and result in abundant food without depleting the earth's resources or polluting its environment. Sustainable approaches foster biodiversity, recycle plant nutrients to reduce or eliminate fertilizer use, reduce or eliminate the need for pesticides, protect soil from erosion, conserve water, use energy efficiently, and use minimum tillage. Virtually all of these practices reduce greenhouse gas emissions. Improved management practices can also increase the uptake and storage of carbon in plants and soil. Every ton of carbon added to, and stored in, plants or soils removes 3.6 tons of CO<sub>2</sub> from the atmosphere. (Paustian et al 2006)

Sustainable practices lend themselves to smaller, family-scale farms that tend to find their best niches in local markets, often selling directly to consumers. (Eates 2005)

## The County’s Role in Agriculture and Open Space

The County’s Draft 2030 General Plan sets a strong policy for continued protection of agriculture, open space and other natural resources in Sacramento County. The 2030 General Plan employs smart growth strategies and directs development to take place within the existing urban core to maintain outer agricultural and open space lands. Within its General Plan, the County is implementing the Sacramento Area Council of Governments’ BluePrint which guides projected regional growth, promoting compact, mixed-use development with more transit choices, as alternatives to low density development.

The Land Use Element of the General Plan contains a number of key strategies, including rigorous standards that must be met to convert agricultural or open space uses to urban uses. For instance, Sacramento County has adopted an urban growth boundary (the Urban Services Boundary) that directs urban growth towards the regional core in an effort to reduce conversion of agricultural lands, rangelands, and open space to other uses. The Agricultural, Open Space, Conservation, and Economic Development Elements of the General Plan contain a myriad of policies that not only provide for the protection of natural resources, but also promote sustainable and viable agricultural pursuits. A prime example is a series of policies in the Agricultural and Economic Development Elements that call for an Agricultural Tourism Program to allow farmers flexibility to market their products at the local level (e.g. produce stands, etc) to encourage local consumption of food grown in Sacramento County (which reduces VMT), as well as to give farmers an additional revenue stream. Finally, the Open Space Element includes an “Open Space Vision Diagram” that shows where key natural resources are located throughout the county and will be used to guide future preservation efforts.

In light of its diverse natural resources, Sacramento County is undertaking a multi-jurisdictional habitat conservation plan, which facilitates the establishment of large-scale habitat and species preserves through a comprehensive mitigation plan. The South Sacramento Habitat Conservation Plan (SSHCP) uses the Urban Services Boundary to define the urban growth areas within the unincorporated County. The SSHCP is discussed further under the “Existing Actions That Protect Farmlands and Open Space” section of this chapter.



About 40 percent of Sacramento County’s population lives in the unincorporated county, where agriculture remains an important economic force for many county residents. (Photo: Leighann Moffitt)

The County’s zoning code is a tool used to implement the policies in the General Plan. Land outside the Urban Services Boundary is generally zoned either Agriculture (20-160 acre minimum parcel sizes) or Agricultural-Residential (1-10 acre minimum parcel sizes). These zoning categories preclude urban development and encourage continued agriculture, rangeland, and related uses.

In addition, Sacramento County’s Department of Regional Parks plans and manages a county-wide system of parks, recreation sites, trails, waterways, and open space encompassing 15,000 acres, including the American River Parkway.

Weather, climate and environmental conditions can significantly impact US agricultural productivity, including a wide variety of crops as well as livestock. Today with robust scientific evidence showing that human-induced climate change is occurring, it is critical to understand how this commercial sector might be affected.

—U.S. Climate Change Sciences Program



# CLIMATE ACTION PLAN

## Goals

The County is committed to achieving the following goals to reduce GHG emissions and adapt to the impacts of climate change on local agriculture and open space resources:

- Protect important agricultural lands, range lands and open space from conversion and encroachment and maintain connectivity of protected areas
- Educate the local agricultural community about the impacts of climate change and support efforts to promote sustainable practices
- Promote water conservation to ensure reliable and sufficient water supplies for crop irrigation and livestock needs
- Implement policies and programs which increase demand for locally grown and processed agricultural commodities
- Achieve a net gain in the size, health, and diversity of protected open space and the local urban forest, encouraging native species wherever practical
- Ensure community understanding of and appreciation for open space, parks, and trees both as a vital part of Sacramento's character and as a greenhouse gas-reduction strategy
- Pursue carbon-offset strategies which involve carbon sequestration to complement but not substitute for local emissions reduction strategies



Protection of heritage trees such as this Blue Oak in the future protected open space in the Alder Creek Watershed provide a host of environmental benefits. (Photo: Alder Creek Watershed Group)



County employees volunteer their time in the local "Giving Fresh" program, which encourages shoppers at farmers markets to donate a small portion of their purchased fresh produce to help provide fresh, nutritious food to help feed the needy in the community. (Photo: Judy Robinson)

## HEALTH CO-BENEFITS

Use of sustainable agricultural practices to develop local sources of foods can lead to reduced obesity and other diseases related to preservation and processing of foods shipped over long distances.



Photo: James Wright

### Co-Benefits

Many agricultural practices that reduce greenhouse gas emissions—such as practices that reduce the need for pesticides and fertilizers—provide other environmental benefits such as improved water quality. Many are simply good management practices that can lead to more efficient operations and cost savings for farmers and ranchers.

Agriculture, public health and climate change are connected in numerous ways. The long distance transportation of food creates significant GHG emissions, and food that travels over long distances declines in nutritional value. Industrial food systems that rely on petroleum-based fertilizers, pesticides and herbicides threaten both consumer health and farmworker health while also contributing large amounts of GHG emissions. While beef production creates significant methane emissions, the overconsumption of meat contributes to the development of obesity and cardiovascular disease. Climate change may also result in the spread of agricultural pests and diseases, which can threaten food supplies and food security.

The health benefits of using sustainable agricultural practices to develop local sources of foods include:

- Improved food security
- Reduced obesity and other chronic diseases that are related to consumption of preserved, processed foods shipped over long distances
- Reduced asthma, other respiratory conditions, strokes, heart disease and other conditions triggered by air pollution generated by the long-distance transportation of food

In addition to taking carbon dioxide out of the atmosphere, trees and open space have important benefits for habitat conservation, increased biodiversity, urban temperature control and building energy conservation (due to shade provided by trees), enhanced air and water quality, and stormwater management/runoff reduction (through interception and absorption).



# CLIMATE ACTION PLAN

## Actions to Address Climate Change

Existing and potential actions that reduce GHG emissions are described below related to the County's goals for this sector. The sector's contribution to achieving GHG reduction goals will depend on economics as well as available technology and the biological and physical capacity of local soils to sequester carbon. Policies are needed to provide incentives that make it profitable for farmers to adopt GHG-mitigation practices and to support needed research. Each action described below is coded to indicate whether it applies to Sacramento County government operations **g** or to the entire community **c**.

## Existing or Completed Actions That Protect Farmlands and Open Space

### Open Space and Habitat Conservation Planning **c**

Sacramento County and the cities of Elk Grove, Rancho Cordova, and Galt are working with State and Federal regulatory agencies to develop a South Sacramento Habitat Conservation Plan. South Sacramento County gradually slopes eastward from the rich flat agricultural lands of the untamed Cosumnes River floodplain towards stretching vernal pool landscapes and rolling blue oak woodlands. The interplay between fertile agricultural lands, open rangelands scattered with thousands of vernal pools, and the annual cycle of inundated lands in winter makes the area a key stop for millions of migratory birds and crucial home to an array of threatened and endangered species. The SSHCP area encompasses 341,270 acres with 40 species of plants and animals, including 10 that are state or federally listed as threatened or endangered.

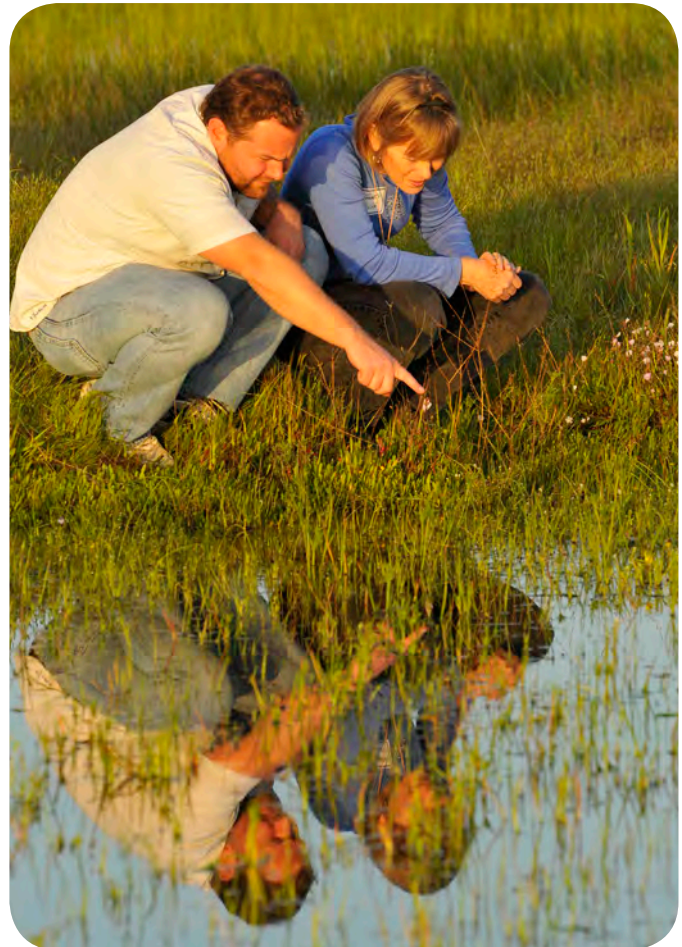
The area's features combined with its proximity to Sacramento, the Bay Area, and Lake Tahoe have also made this area an attractive home for thousands of new residents, and more growth is projected. The SSHCP is intended to accommodate continued growth while maintaining lasting environmental stewardship. The proposed SSHCP seeks to address wetland and endangered species interests in a coordinated manner rather than on a project by project basis as is currently done. (Project by project review can be costly and confusing and result in and scattered and less than desirable habitat preserves.) The plan provides for ecologically viable conservation and minimizes regulatory

hurdles for development by streamlining the permitting process to the benefit of all stakeholders. The SSHCP is currently undergoing the environmental review process.

## Existing or Completed Actions That Promote Collaboration, Sustainable Practices, and Water Conservation

### Collaborative Partnerships **c**

Sacramento County has developed collaborative partnerships with the Farm Bureau, Resource Conservation Districts, and some grass roots efforts like Grow Local Buy Local to support sustainability, agricultural marketing and resource conservation.



Wetlands, like vernal pools, are vital to the health of ecosystems, provide wildlife habitat and serve as a natural source of water purification. (Photo: Sacramento Splash)

**Existing or Completed Actions That Promote Collaboration, Sustainable Practices, and Water Conservation (continued)**

**Integrated Pest Management Program C**

Sacramento County actively promotes the use of Integrated Pest Management (IPM), which is intended to provide effective, sustainable pest control, and to reduce risks to humans and the environment associated with pesticide use. The County’s IPM Program includes outreach programs to educate and encourage residents and businesses to adopt IPM practices. In addition, the County has a policy to follow IPM when its staff or vendors manage pests on County property and facilities.

**Water Conservation C**

Sacramento County has adopted Title 14 of the County Code for “Water Use and Conservation”. The purpose of this ordinance is to ensure skillful planting and irrigation design, appropriate use of plants, and intelligent landscape management to promote landscape development that avoids excessive water demands and is less vulnerable to periods of severe drought. This ordinance is applied to all commercial, industrial and multi-family residential projects, parks, and County road medians and landscape corridors.

Conservation programs for urban areas can benefit rural and agricultural users by preserving or replenishing the groundwater supply. The Sacramento County Water Agency and other water purveyors implement such water conservation programs to target residents and businesses in their respective service areas.



**Existing or Completed Actions That Promote Protection of Open Space, Parks and Trees**

**Tree Preservation C**

Sacramento County was one of the first agencies in the State to recognize the value of tree canopy and specifically the heritage native oak trees unique to the region. To that end, Sacramento County adopted Title 19 of the County Code for “Tree Preservation and Protection”. The purpose of this ordinance is to promote public health, safety, and general welfare, to preserve and protect significant historical heritage values, to enhance the beauty of the County of Sacramento and to complement and strengthen zoning subdivision and land use standards, while at the same time recognizing individuals rights to develop private property, establishing basic standards, regulations and measures for the preservation of trees. It is the policy of Sacramento County to preserve all trees possible through the development review process. This ordinance has served as a model ordinance for the cities of Rancho Cordova, Elk Grove, and Citrus Heights.

**Tree Planting C**

Since 1982, Sacramento County has worked collaboratively with the non-profit Sacramento Tree Foundation to expand urban forests and optimize the benefits of tree canopies. Sacramento County also supports the Sacramento Tree Foundation’s Greenprint initiative, a multi-decade regional framework with the goal of doubling the region’s tree canopy within the next 40 years; this goal supports the County’s sustainability and livability goals. In addition, the County municipal/zoning code requires trees to be planted as part of new landscaping associated with new development projects.

**County Regional Parks System C**

The County’s Department of Regional Parks works to increase protected open space by securing funds to acquire key parcels. Parcels are selected based on the uniqueness of their features, potential connectivity with other existing open spaces, and consistency with the County’s General Plan and open space vision.

*Right: Watershed Groups in the County are working collaboratively with the Sacramento Tree Foundation to plant and maintain trees in creekside areas. (Photo: Laguna Creek Watershed Council)*



# CLIMATE ACTION PLAN

## Potential Actions That Increase Demand for Locally Grown Agricultural Commodities

### Promote Sustainable Agricultural Practices **C**

- Provide support for growers who implement sustainable agricultural practices, with emphasis on the largest production sectors in the county (e.g., vintners, dairies).
- Develop regional partnerships with other agricultural communities (e.g., Yolo and San Joaquin Counties) to share resources, disseminate information, and promote consistency in sustainable practices.
- Showcase sustainable practices each year at the County Fair and through the County's participation in the annual State Fair.
- Work collaboratively to seek and secure funding for demonstration projects in the county/region.

### Promote Sustainable Food Production and Consumption **C**

- Create policies that reduce food miles and create a more sustainable, organic and locally-available food production system for County residents.
- Promote local farmers' markets which make it more convenient for residents to purchase local products.
- Educate and inform the public through the annual County Fair exhibits, web site, and other media.
- Reduce and/or eliminate barriers (such as zoning code restrictions) that inhibit direct sales of agricultural products (e.g. from farmer to consumer).
- Work with local grocers to encourage procurement of locally-grown agricultural products.

## Potential Actions That Promote Protection of Open Space, Parks and Trees

### Adopt Open Space and Urban Forest Policies **C**

The County could adopt policies to achieve a net gain in the size, health, and diversity of protected open space and the local urban forest, encouraging native species wherever practical.



Photo: Sacramento County

### Conduct an Urban Forest Inventory **C**

Support the Sacramento Tree Foundation's regional tree inventory project to determine the current health, quantify its benefits (including CO<sub>2</sub> reduction) and identify needs and priorities for future urban forest management for trees within the unincorporated County.

### Adopt Regional Tree Preservation and Protection Ordinance **C**

The Sacramento Tree Foundation is working with Sacramento County to develop a revised and improved model tree ordinance for possible adoption by the counties and cities in the region. The intent of the revised model tree ordinance is to regionalize the Sacramento Valley tree preservation and protection efforts in order to increase overall effectiveness and promote consistency across jurisdictional boundaries. The goal is to see the forest as a larger mass of infrastructure that crosses agency lines and allows for the sharing of CO<sub>2</sub> sequestration and other environmental benefits such as improved air quality.

### Collaborate with Others to Promote Community Tree Planting **C**

In addition to existing partnerships to promote tree planting, the County could:

- Partner with the Sacramento Tree Foundation to develop new programs to increase tree canopy, including in redeveloping areas
- Forge partnerships with community cooperatives to organize tree-planting and maintenance events

**Potential Actions That Promote Protection of Open Space, Parks and Trees (continued)**

**Enhance Tree Planting and Maintenance in County Rights-of-Way 9**

There are several ways the County could improve tree performance in its right-of-ways: promoting/planting trees that will perform well for a long period of time, designing infrastructure in a manner that will allow trees to grow to their full potential, maintaining trees carefully, and eradicating invasive vegetation.

**Increase Landscaping of County Rights-of-Way 9**

The County could secure increased funding for tree planting and other landscaping in the public right-of-way through partnerships and from businesses, residents, and organizations that would benefit.

**Potential Actions That Pursue Carbon Offset Strategies**

**Explore Carbon Offsets for Government 9**

To help meet its overall greenhouse gas reduction goal, the County could explore investing in carbon offsets and retiring the associated credits.

**Promote Carbon Offsets for the Community C**

The County could encourage residents, businesses, governments, schools, and institutions to invest in greenhouse gas-reducing projects to offset their personal or corporate greenhouse gas emissions. In addition, the County could explore ways to create offset programs which provide local revenues for local climate change projects.



Photo: Rob Thompson

# CLIMATE ACTION PLAN

**TABLE 3-6**  
Agriculture and Open Space - Summary of Existing and Potential Actions

ACTION	APPLICATION	CO-BENEFITS							
		Provides economic benefits and/or creates jobs	Reduces energy use	Conserves water	Improves air quality	Protects habitat, open space, Ag lands, &/or rangelands	Improves water quality	Protects public health	Reduces waste to landfill
<b>Existing or Completed Actions that Protect Farmlands and Open Space</b>									
Open Space and Habitat Conservation Planning	Community			•	•	•	•	•	
<b>Existing or Completed Actions that Promote Collaboration, Sustainable Practices, and Water Conservation</b>									
Collaborative Partnerships	Community		•	•	•	•	•	•	
Integrated Pest Management Program	Community	•	•	•	•	•	•	•	
Water Conservation	Community	•	•		•	•	•	•	
<b>Existing or Completed Actions that Promote Protection of Open Space, Parks, and Trees</b>									
Tree Preservation	Community	•	•		•	•	•	•	
Tree Planting	Community	•	•		•	•	•	•	
County Regional Parks System	Community	•			•	•	•	•	
<b>Existing or Completed Actions that Increase Demand for Locally Grown Agricultural Commodities</b>									
Promote Sustainable Agricultural Practices	Community	•	•	•	•	•	•	•	•
Promote Sustainable Food Production and Consumption	Community	•	•	•	•	•	•	•	•
<b>Potential Actions that Promote Protection of Open Space, Parks, and Trees</b>									
Adopt Open Space and Urban Forest Policies	Community	•	•	•	•	•	•	•	
Conduct an Urban Forest Inventory	Community	•			•	•		•	
Adopt Regional Tree Preservation and Protection Ordinance	Community	•	•	•	•	•	•	•	
Collaborate with Others to Promote Community Tree Planting	Community	•	•		•	•	•	•	
Enhance Tree Planting and maintenance in County Rights-of-Way	County Government	•			•	•	•	•	
Increase Landscaping of County Rights-of-Way	County Government				•	•	•	•	
<b>Potential Actions that Pursue Carbon-Offset Strategies</b>									
Explore Carbon Offsets for Government	County Government		•		•	•		•	
Promote Carbon Offsets for the Community	Community		•		•	•		•	

## GLOSSARY

ADA	Americans with Disabilities Act	RT	Sacramento Regional Transit District
BERC	Business Environmental Resource Center	SACDOT	Sacramento County Department of Transportation
BMP	Best Management Practice	SACOG	Sacramento Area Council of Governments
BRT	Bus Rapid Transit	SAGP	Sacramento Area Green Partnership
CACP	Clean Air and Climate Protection	SASD	Sacramento Area Sewer District
Cal EPA	California Environmental Protection Agency	SCADA	Supervisory Control and Data Acquisition
CalTrans	California Department of Transportation	SCAS	Sacramento County Airport System
CAP	Climate Action Plan	SCWA	Sacramento County Water Agency
CARB	California Air Resources Board	SEC	Sacramento Environmental Commission
CCAR	California Climate Action Registry	SMAQMD	Sacramento Metropolitan Air Quality Management District
CEC	California Energy Commission	SMUD	Sacramento Municipal Utilities District
CEQA	California Environmental Quality Act	SPA	Special Planning Area
CNG	Compressed Natural Gas	SR2S	Safe Routes to School (State)
DERA	Sacramento County Department of Environmental Review and Assessment	SRCSD	Sacramento Regional County Sanitation District
DWMR	Sacramento County Department of Waste Management and Recycling	SRTS	Safe Routes To School (Federal)
DWR	Sacramento County Department of Water Resources or State of California Dept. of Water Resources (will be used with prefix "County" or "State")	SRWTP	Sacramento Regional Wastewater Treatment Plant
EIR	Environmental Impact Report	SSB	Sacramento Sustainable Business
FAA	Federal Aviation Administration	SSHCP	South Sacramento Habitat Conservation Plan
FRWP	Freeport Regional Water Project	SWA	Solid Waste Authority
GHG	Greenhouse Gas	TOD	Transit Oriented Development
GPS	Global Positioning System	US	United States
Green IT	Green Information Technology	US EPA	United States Environmental Protection Agency
GWP	Global Warming Potential	USDA	United States Department of Agriculture
HPS	High Pressure Sodium	VMPG	Vehicle Miles traveled Per Gallon
Hz	hertz (unit of frequency)	VMT	Vehicle Miles Traveled
ICLEI	Local Governments for Sustainability		
ILEAV	Inherently Low Emission Airport Vehicle		
IPCC	Intergovernmental Panel on Climate Change		
IPM	Integrated Pest Management		
IRWMP	Integrated Regional Water Management Plan		
ITS	Intelligent Transportation Systems		
LED	Light Emitting Diode		
LFG	Landfill Gas		
LID	Low Impact Development		
LNG	Liquefied Natural Gas		
LOS	Level of Service		
M	Million		
MGD	Million Gallons per Day		
MPG	Miles Per Gallon		
NARS	North Area Recovery Station		

This glossary contains definitions for terms and abbreviations used in the *Sacramento County Climate Action Plan - Strategy and Framework Document*. These definitions were adapted from a number of sources, including the U.S. Environmental Protection Agency, StopWaste.Org, the California Environmental Protection Agency, the California Climate Change Portal, the Bio-integral Resource Center, the State of Oregon Department of Environmental Quality, the Municipal Research and Services Center of Washington, the Canadian Department of Industry, Merriam-Webster Online, Wikipedia, and Wiktionary.



## GLOSSARY (continued)

**9/80 Schedule:** A compressed work week schedule in which employees work 80 hours over nine days with one day off. This frequently consists of eight nine-hour days, one eight-hour day, and the last Friday of the pay period off.

**AB32:** See Assembly Bill 32, the *Global Warming Solutions Act of 2006*.

**Actions:** The primary component of the Climate Action Plan. The measures are specific short and long-term policies, programs, and actions that the County can carry out to reduce its greenhouse gas emissions.

**Adaptation:** The ability of a system to adjust to, or minimize, the potential impacts of climate change or other environmental disturbances.

**Alternative Fuels:** Substitutes for traditional fossil-fuel-derived liquid motor vehicle fuels like gasoline and diesel. Includes biodiesel, hydrogen, electricity, compressed natural gas, methanol, ethanol, and mixtures of alcohol-based fuels with gasoline.

**Alternative Fuel Vehicle:** A vehicle powered by an alternative fuel as opposed to traditional gasoline or diesel.

**Assembly Bill 32 (AB32):** *The Global Warming Solutions Act of 2006* is the law that set the State of California's 2020 greenhouse gas emissions reduction target of reducing greenhouse gas emissions to 1990 levels. It also directed the California Air Resources Board to develop a Scoping Plan to outline how best to reach the 2020 target.

**Assembly Bill 811 (AB811):** Law passed in Sep 2008 to assist municipalities with retrofitting residential and commercial properties by providing low interest loans for energy efficient installations that are paid for using tax assessments.

**Atmosphere:** The blanket of air surrounding the earth that supports life. The atmosphere absorbs energy from the sun and retains heat. It also recycles water and other chemicals and protects the Earth from high-energy radiation and the frigid vacuum of space. The Earth's atmosphere consists of approximately 79% nitrogen (by volume), 20% oxygen, 0.036% carbon dioxide, and trace amounts of other gases.

**Baseline Emissions/Level/Inventory:** The amount of greenhouse gas emissions released in a designated year against which future changes in emissions levels are measured. For Sacramento County, the baseline year is 2005. Baseline estimates are needed to determine the effectiveness of emissions reduction programs by providing a basis for comparison.

**Biodiesel:** a form of diesel fuel manufactured from vegetable oils (used or new) or animal fats. Biodiesel can be used in its pure form (B100) or blended with petroleum diesel in varying proportions (e.g., B20 is 20% biodiesel, 80% petroleum diesel).

**C&D:** Construction and Demolition, usually used in reference to the waste produced in building projects.

**CAFE:** See Corporate Average Fuel Economy

**Capital Improvement Plan:** A Sacramento County planning document which identifies capital projects, major equipment purchases, and financing options. The plan is the link between comprehensive and strategic plans and the annual budget. It is developed to assist the Board of Supervisors with identifying long-range funding needs to support County programs, improvements, and infrastructure. This plan is updated annually.

**Carbon Dioxide (CO<sub>2</sub>):** The greenhouse gas whose concentration is being most affected by human activities. CO<sub>2</sub> also serves as the reference to compare all other greenhouse gases (see Carbon Dioxide Equivalencies). The major source of CO<sub>2</sub> emissions is fossil fuel combustion. CO<sub>2</sub> emissions are also a product of forest clearing, biomass burning, and non-energy production processes such as cement production. Atmospheric concentrations of CO<sub>2</sub> have been increasing at a rate of about 0.5% per year and are now about 30% above preindustrial levels.

**Carbon Dioxide Equivalent (CO<sub>2</sub>e):** Emissions from different types of greenhouse gases (carbon dioxide [CO<sub>2</sub>], methane [CH<sub>4</sub>], and nitrogen dioxide [N<sub>2</sub>O]) are reported in terms of equivalent carbon dioxide units based on their ability to trap heat in the atmosphere. For example one ton of methane traps 21 times the heat of a ton of carbon dioxide, therefore, 1 ton CH<sub>4</sub> = 21 tons CO<sub>2</sub>e. Similarly, 1 tons N<sub>2</sub>O = 310 tons CO<sub>2</sub>e.

**Carbon Footprint:** The total set of greenhouse gas emissions caused directly and indirectly by an individual, organization, event, or product.

**Carbon Sequestration:** See Sequestration

**CEC:** California Energy Commission, the primary energy policy and planning agency for the State.

**Climate:** The average weather (usually taken over a 30-year time period) for a particular region and time period. Climate is not the same as weather. It is the average pattern of weather for a particular region. Climatic elements include average annual temperature, humidity, sunshine, wind speed, precipitation, and other measures of atmospheric conditions.

**Climate Change:** A significant change in climatic conditions (such as temperature, precipitation, or wind) that lasts for an extended period (decades or longer). Climate change should not be confused with weather, which is the short-term fluctuation in these conditions. A change in the climate effectively means that there is a new set of expected atmospheric conditions.

**CO<sub>2</sub>:** See Carbon Dioxide

**CO<sub>2</sub>e:** See Carbon Dioxide Equivalent

**Co-Benefits:** Additional benefits that occur as a result of greenhouse gas reduction measures. These include financial savings, improved air quality, increased health or safety, better communications, improved employee morale, and natural resource concentration.

**Composting:** The controlled breakdown of organic material (e.g., plant trimmings, kitchen scraps, paper) through natural decomposition processes into a nutrient rich soil.

**Compressed Work Week:** An alternative work schedule that combines longer workdays with a day off. For example, a standard 40-hour work week is completed in 4 days rather than 5 days, or 80 hours of work are completed in 9 days rather than 10 days.

**Corporate Average Fuel Economy (CAFE):** Regulations in the United States that specify the overall fuel efficiency of cars and light trucks (pick-up trucks, vans, and sport utility vehicles) sold in the United States. These regulations require that the overall average fuel efficiency of all vehicles a manufacturer sells exceeds a minimum level, measured in terms of miles per gallon.

## GLOSSARY (continued)

**Decomposition:** The process by which organic material (plants, animals, and items derived from them such as paper and wood products) breaks down into simpler forms of matter. Also commonly known as rotting.

**Ecosystem:** An ecological community of interdependent plant and animal species and their physical environment.

**Electric vehicle:** A vehicle that operates on an electric motor, powered by batteries, that is recharged by connecting it (plugging in) to an external electricity source.

**Emissions Forecast:** The emissions that would occur in a future year if no action were taken to change those levels. This is also called a business-as-usual scenario.

**Energy Conservation:** Reducing energy consumption. Energy conservation can be achieved through energy efficiency (getting the most productivity from each unit of energy) or by reduced use of energy such as turning off appliances when not in use.

**Energy Efficiency:** Using less energy to provide the same level of service or complete the same task. For example, a more efficient light will use less electricity to provide the same amount of illumination.

**Energy Star:** An international program, developed by the U.S. Environmental Protection Agency and the U.S. Department of Energy, which identifies energy-efficient consumer products. Energy Star rates a diverse range of items, including computers and peripherals, kitchen appliances, and even buildings. These items generally use 20% to 30% less energy than required by federal standards.

**Environmentally Preferable Purchasing:** See Sustainable Purchasing

**EPA:** See U.S. Environmental Protection Agency

**Forecast:** See Emissions Forecast

**Fossil Fuel:** A general term for combustible geologic deposits of carbon, including coal, oil, natural gas, oil shale, and tar sands. These fuels emit carbon dioxide into the atmosphere when burned, thus significantly contributing to the enhanced greenhouse effect.

**Fuel Cell:** A device that converts a source of fuel into electricity through a chemical reaction that does not involve burning the fuel. These chemical processes are similar to those occurring in a battery, but with a continual input of fuel and output of electricity. Most commercial fuel cells use natural gas-derived hydrogen as the fuel source.

**Fuel Efficiency:** The distance a vehicle can travel on an amount of fuel. This is most often measured in miles traveled per gallon of fuel. A higher-efficiency vehicle travels farther on a gallon of fuel than similar vehicles.

**General Plan:** A long-range policy document to guide land use decisions about physical, economic, and environmental growth. California State law requires counties and cities to have a General Plan which contains seven elements: Land Use; Transportation; Housing; Open Space; Conservation; Safety; and Noise. County general plans cover unincorporated areas.

**GHG:** See Greenhouse Gas

**Global Positioning System (GPS):** In the context of the Climate Action Plan, a system that provides information on a vehicle's location, speed, and condition.

**Global Warming:** An increase in the near surface temperature of the Earth. Global warming has occurred in the distant past as the result of natural influences, but the term is most often used to refer to the warming predicted to occur as a result of increased emissions of greenhouse gases due to human activity.

**GPS:** see Global Positioning System

**Green(ing):** An environmentally preferable version of something (transforming something into a more environmentally friendly version of itself).

**Green Building:** A structure constructed using materials and building practices that reduce its impact on the environment throughout its entire life (siting, design, construction, operations, and deconstruction). Green buildings are resource efficient, using less energy, water, and other materials.

**Green Infrastructure:** The network of trees, plants, and natural ecosystems in a community. These provide services to a community, such as decreasing rainwater runoff, providing healthy soils, removing air pollutants and greenhouse gases from atmosphere, and providing shade and beautification.

**Greenhouse Effect:** Carbon dioxide and other atmospheric gases warm the surface of the planet by trapping heat close to the surface of the Earth. In a natural state, the greenhouse effect warms the planet, making it habitable by humans. However, human activities have dramatically increased the amount of carbon dioxide and other greenhouse gases in the atmosphere. Higher levels of greenhouse gases trap more heat, causing temperatures to rise.

**Greenhouse Gas:** A gas, including water vapor, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), which traps heat close to the surface of the Earth, contributing to global warming and climate change.

**Greenhouse Gas Reduction Measures:** see Measures or Actions

**HVAC:** Heating, Ventilation, and Air Conditioning systems.

**Hybrid Vehicle:** See Hybrid-Electric Vehicle

**Hybrid-Electric Vehicle:** A vehicle that uses both a conventional gasoline-powered internal combustion engine and an electric motor to achieve better fuel efficiency than a traditional vehicle. The vehicles have a battery pack that is recharged when the gasoline engine is producing more power than the vehicle needs to operate, therefore the vehicle does not need to be charged by an external electricity source (unlike a plug-in hybrid-electric vehicle or electric vehicle).

**Infrastructure:** The basic shared physical structures needed for an urban area to function in an efficient, safe manner. The term typically refers to items such as roads, drinking water systems, sewers, energy systems, and telecommunication systems in a community.

**IT:** Information Technology, systems and areas of expertise related to computer-based information systems, such as software applications and computer hardware.

## GLOSSARY (continued)

**Jurisdiction:** In general, a legal authority. The County is the governing body that oversees the unincorporated areas within its boundaries, therefore it has jurisdiction over those areas. The areas within the County's geographic boundaries can also be referred to as its jurisdiction. Similarly, other cities and counties are often referred to as other jurisdictions.

**Kilowatt (KW):** One thousand watts.

**Kilowatt-hour (KWh):** an amount of electricity equivalent to the use of one kilowatt for one hour. A hundred watt light bulb that is on for 10 hours uses one kilowatt-hour of electricity (100 watts x 10 hours = 1,000 watt-hours = 1 kilowatt-hour). Electricity production or consumption is often expressed as kilowatt- or megawatt-hours produced or consumed during a period of time. Residential energy bills usually charge users by cents per kilowatt-hour. A U.S. household might consume 10,000 kilowatt-hours per year.

**Leadership in Energy and Environmental Design (LEED®):** A set of green building standards developed for the U.S. Green Building Council. They provide a set of criteria against which the environmental sustainability of a building's design and construction or operations can be measured. Buildings can be LEED Certified, Silver, Gold, or Platinum depending on the number of criteria they fulfill.

**LEED®:** See Leadership in Energy and Environmental Design

**Lifecycle assessment/lifecycle analysis:** The evaluation of a product or service's impacts (environmental, financial, etc.) from production through use to disposal. A greenhouse gas lifecycle analysis of a product would include the emissions associated with the extraction and processing of raw material, manufacture, transportation to the County, use, and disposal (e.g., in a landfill, transfer to a reuse facility) at the end of its life. A lifecycle financial analysis would consider the costs to purchase, operate, and dispose of a product. This is often compared to an end user greenhouse gas analysis, which only considers the emissions associated with using a product, or a traditional financial analysis which focuses on the cost to purchase a product. Also known as a cradle-to-grave analysis.

**Megawatt (MW):** One million watts.

**Methane (CH<sub>4</sub>):** A greenhouse gas that traps 21 times the amount of heat as carbon dioxide. (Recent research indicates this might be as high as 25 times; however, the U.S. EPA uses a factor of 21 when calculating methane's impact on global warming). Methane is produced through the decomposition of waste in landfills, animal digestion, decomposition of animal wastes, incomplete fossil fuel combustion, and the production and distribution of natural gas, oil, and coal.

**Metric Ton:** Common international measurement for the quantity of greenhouse gas emissions. A metric ton is equal to 2,205 lbs or 1.1 short tons (the common form of ton used in the United States).

**Mitigation:** A human intervention to either reduce the amount of greenhouse gases being emitted into the atmosphere or remove previously emitted gases from the atmosphere.

**N<sub>2</sub>O:** See Nitrous Oxide

**Nitrous Oxide (N<sub>2</sub>O):** A powerful greenhouse gas with the ability to trap 320 times the amount of heat as a molecule of CO<sub>2</sub>. Major sources of nitrous oxide include soil cultivation

practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

**Non-Motorized Transport:** Any form of transportation that relies on human power as opposed to an external power source (e.g., walking, biking, skateboarding).

**Ozone (O<sub>3</sub>):** An important greenhouse gas that is responsible for global warming, contributes to the formation of smog, and has harmful effects on human health and the environment.

**Pacific Gas & Electric Company (PG&E):** The utility company that is the primary provider of natural gas in Sacramento County.

**Parts Per Million (ppm):** A unit commonly used to express concentration. In the same way that 1% refers to 1 part out of 100, 1 ppm means that one part of a given substance is present in every million total parts examined.

**PG&E:** See Pacific Gas & Electric Company

**Photosynthesis:** The process by which green plants use light to synthesize organic compounds from carbon dioxide and water. In this process, carbon dioxide is absorbed from the air and oxygen and water are released. Through this process, plants become a very important reservoir for storing carbon dioxide in the form of carbon.

**Plug-in Hybrid-Electric Vehicle:** A hybrid vehicle with batteries that can be recharged from an external electric power source. Unlike a hybrid vehicle, it has a larger battery pack and a plug that connects to the electric grid in order to recharge. This external power source provides the vehicle with a much longer range per gallon of gasoline.

**Pollutant:** An air pollutant is a substance in the atmosphere that causes adverse effects to human health, property, or the environment.

**Recycled-Content Products:** Products made totally or partially from materials contained in items that would otherwise have been discarded, such as aluminum cans or paper. Recycled content products also include rebuilt or re-manufactured items, such as toner cartridges.

**Recycling:** A process that minimizes waste generation by recovering and reprocessing products that might otherwise be sent to a landfill. For example, recycling aluminum cans, paper, and bottles entails reprocessing them into new products that are made with fewer raw materials.

**Renewable Energy/Power:** Energy generated from sources that are naturally replenished or not used up in the course of providing power (e.g., wind, solar, biomass, and geothermal). This is in contrast to the burning of fossil fuels, which destroys the fuel source and thereby depletes the overall amount of fuel available. Renewables Portfolio Standard (RPS): A regulation, typically found at the state level in the U.S., that requires an increased amount of energy to be generated from renewable energy sources. For example, a 33% RPS requires that 33% of the electricity a utility company delivers to customers be produced from wind, solar, biomass, or another renewable source.

**Retro-Commissioning:** A process in which specialists inspect major building systems (e.g., HVAC, lighting) and interview maintenance staff and building occupants to assess a building's performance and identify opportunities to improve the efficiency of its operations and to restore them to optimal performance.

## GLOSSARY (continued)

**Retrofit:** The addition of new technology or features to older systems. For example, adding new energy-efficient lamps to existing lighting fixtures.

**River Friendly Landscaping (RFL):** A program run by Sacramento County and the RFL Coalition that provides tools and information on creating landscaping adapted to the natural conditions of the Sacramento Region. Techniques include using mulch, permeable pavement, smart irrigation controllers, and planting with native vegetation. These practices foster soil health and conserve water and other natural resources, while reducing waste, preventing pollution, and providing natural habitats.

**RPS:** see Renewables Portfolio Standard

**Sacramento Air Quality Management District (SAQMD):** The public agency that regulates sources of air pollution in the five-county Sacramento region.

**Sacramento Municipal Utility District (SMUD):** The utility company that is the primary provider of electricity in Sacramento County.

**Scoping Plan:** The document, adopted by the California Air Resources Board, that outlines the actions the State of California will take to reduce greenhouse gas emissions in the state. Sequestration: The uptake and storage of carbon from the atmosphere. Most commonly refers to trees and plants absorbing carbon dioxide through photosynthesis (see Photosynthesis).

**Senate Bill 375 (SB375):** This law established the process for developing regional GHG emission targets aimed at reducing VMT. It also requires government organizations to align regional transportation, housing and land use to conform with the regional GHG targets.

**Smart Grid:** An electricity system that utilizes two-way communication between power suppliers and consumers. This allows for adjustments to a facility's operations to save energy, reduce cost, and increase the reliability of the power supply. A smart grid includes a monitoring system at facilities that can turn off or adjust systems to reduce demand at peak times when power is more expensive. For example, a smart grid could temporarily turn off selected appliances, such as washing machines, or adjust a building temperature by a few degrees to save power.

**Smart Meter:** An electrical meter that tracks power consumption in real-time, communicates with the local utility company for monitoring and billing purposes, and (if connected to a smart grid) can adjust a building's energy use automatically to reduce demand on the power grid at peak use times.

**SMAQMD:** See Sacramento Air Quality Management District

**Smog:** A type of air pollution that forms in the atmosphere when vehicular and industrial emissions react with one another and sunlight.

**Snowpack:** The naturally formed, packed snow that accumulates during the cold season and melts during warmer months. Many areas of California depend on Sierra Nevada winter snowpack melt for their drinking water.

**Source:** Any process or activity that releases a greenhouse gas into the atmosphere.

**Sustainable Purchasing:** The procurement of goods and services that have a less harmful effect on human health and environment than competing goods or services that serve

the same purpose. Sustainable purchasing decisions take into consideration criteria such as raw materials acquisition, production, manufacturing, packaging, distribution, operation, maintenance, reuse, disposal, energy efficiency, performance, durability, and safety, as well as needs of the purchaser and cost.

**Sustainability:** In a broad sense, the capacity to endure. In ecology, the word describes how biological systems remain diverse and productive over time. For human society, it is the potential for long-term maintenance of well-being, which in turn depends on the well-being of the natural world and the responsible use of natural resources. Sustainability has multiple facets: environmental, economic, and social. The UN defines sustainability as the ability of the present generation to meet their needs without compromising the ability of future generations to meet theirs.

**Telecommute:** A system that allows employees to work from home or locations other than their assigned office. Telecommuting usually involves having remote access to the business computer network and the office phone system.

**Therm(s):** A unit of measurement of natural gas. It is approximately the energy equivalent of burning 100 cubic feet of natural gas. It is equivalent to 100,000 British thermal units (BTU) or about 29.3 kilowatt-hours of electrical energy.

**Unincorporated Area:** A region that is not part of a municipality (city). To incorporate means to form a municipal corporation – a city or town with its own government. Thus, an unincorporated community does not have its own municipal government and is administered by another authority, such as the county government. In Sacramento County, these communities include (but are not limited to) Arden, Carmichael, Orangevale, parts of Natomas and Willton. In the unincorporated County, Rancho Murieta is governed by the County, but infrastructure and utilities are provided by the Rancho Murieta Community Services District.

**U.S. Environmental Protection Agency (EPA):** The federal environmental science, research, education, assessment, and regulatory agency. The mission of the Environmental Protection Agency is to protect human health and the environment.

**Waste Diversion:** A waste reduction strategy focused on the recycling or composting of materials, diverting what would otherwise have been sent to a landfill for use in new products.

**Waste Reduction:** Techniques such as source reduction, recycling, or composting that reduce waste generation or prevent waste from being created at all.

**Waste Stream:** The total flow of solid waste from homes, businesses, institutions and manufacturing plants that is recycled, composted, burned, or disposed of in landfills.

**Watt:** The standard measure of an amount of energy, usually electricity. For example, a 60 watt light bulb requires 60 watts of electricity to turn on. Energy use is measured in terms of the number of watts used over a period of time (see Kilowatt-hour).

**Weather:** The specific condition of the atmosphere at a particular place and time. It is measured in terms of such factors as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather changes from hour to hour, day to day, and season to season. Climate is the average of weather over time and space. A simple way of remembering the difference is that climate is what you expect (e.g., cold winters) and weather is what happens (e.g., a blizzard).



# REFERENCES

## Chapter 1

### General References

California Air Resources Board, Climate Change web site.

Accessed January-April 2009 and March 2011. <http://www.arb.ca.gov/cc/cc.htm>

California Department of Water Resources, Climate Change web site. Accessed March 2011. <http://www.water.ca.gov/climatechange/>

Cal EPA California Climate Change Portal. Accessed January-April 2009 and March 2011. <http://www.climatechange.ca.gov/publications>.

Intergovernmental Panel on Climate Change (IPCC) web site. Accessed January 2009 and March 2011. <http://www.ipcc.ch/>

State of California Department of Justice, Office of the Attorney General. Global Warming web site. Accessed January-April 2009. <http://www.ag.ca.gov/globalwarming/>

State of California, Office of the Governor. *Fact Sheet: Senate Bill 375: Redesigning Communities to Reduce Greenhouse Gases*. October 1, 2008. <http://gov.ca.gov/fact-sheet/10707/>

United Nations Department of Economic and Social Affairs, Division for Sustainable Development. Climate Change web site. Accessed January 2009. [http://www.un.org/esa/dsd/dsd\\_aofw\\_cc/cc\\_index.shtml](http://www.un.org/esa/dsd/dsd_aofw_cc/cc_index.shtml)

## Chapter 2

### References Cited

Sacramento County. 2009. *Greenhouse Gas Emissions Inventory for Sacramento County*. Prepared by ICF Jones & Stokes for Sacramento County Department of Environmental Review and Assessment. June 2009. <http://www.sustainability.sacounty.net/ReportsPublications/default.htm>

SMUD. 2011. *Final Revised Sacramento County 2005 Greenhouse Gas Inventory and 2020, 2030 and 2050 Business as Usual Projections*. Prepared by ICF International, Inc. for Sacramento Municipal Utility District. February 24, 2011. **Need to post this on county web site**

Mercer et al. 2011. Mercer, Thomas and Christensen, Jon, *Measuring Performance of Water Systems in California* (Water in the West Working Paper 2). April 2011. Woods Institute for the Environment, The Bill Lane Center for the American West, Stanford University.

## Chapter 3, Section 3.2 Transportation and Land Use

### References Cited

CARB. 2008. California Air Resources Board, *Climate Change Proposed Scoping Plan: A Framework for Change*. Published October 2008 and finally adopted May 2009. <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>

EPA. 2005. United States Environmental Protection Agency, *Emission Facts: Average Carbon Dioxide Emissions Resulting*

*from Gasoline and Diesel Fuel*, February 2005. <http://www.epa.gov/oms/climate/420f05001.htm>

Ewing et al. 2008. Ewing, Reid and Nelson, Arthur, *CO2 Reductions Attributable to Smart Growth in California*. University of Maryland and University of Utah, 2008. <http://www.solutionsforglobalwarming.org/docs/California-Ewing-Nelson-Analysis.pdf>

Goldberg et. al. 2007. *New Data for a New Era: A Summary of the SMARTRAQ Findings Linking Land Use, Transportation, Air Quality and Health in the Atlanta Region*. 2007. Goldberg, David; Chapman, Jim; Frank, Lawrence; Kavage, Sarah; and McCann, Barbara. [http://www.livablecommunitiescoalition.org/uploads/100012\\_bodycontentfiles/100573.pdf](http://www.livablecommunitiescoalition.org/uploads/100012_bodycontentfiles/100573.pdf)

Litman 2008. Litman, Todd, *Win-Win Emission Reduction Strategies*. Victoria Transport Policy Institute. July 10, 2008. <http://www.vtpi.org/wwclimate.pdf>

SACOG. 2009. Clint Holtzen, Assistant Planner, Sacramento Area Council of Governments, Personal Correspondence. March 16, 2009.

Sacramento County. 2009. *Greenhouse Gas Emissions Inventory for Sacramento County*. Prepared by ICF Jones & Stokes for Sacramento County Department of Environmental Review and Assessment. June 2009. <http://www.sustainability.sacounty.net/ReportsPublications/default.htm>

SMUD. 2011. *Final Revised Sacramento County 2005 Greenhouse Gas Inventory and 2020, 2030 and 2050 Business as Usual Projections*. Prepared by ICF International, Inc. for Sacramento Municipal Utility District. February 24, 2011. **Need to post this on county web site**

## Chapter 3, Section 3.3 Energy and Green Buildings

### References Cited

CARB. 2008. California Air Resources Board, *Climate Change Proposed Scoping Plan: A Framework for Change*. Published October 2008 and finally adopted May 2009. <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>

CEC. 2005. *Development of Energy Balances for the State of California*. Prepared by Scott Murtishaw, Lynn Price, Stephane de la Rue du Can, Eric Masanet, Ernst Worrell and Jayant Sathaye of Lawrence Berkeley National Laboratory for California Energy Commission - Public Interest Energy Research Program, June 2005. <http://industrial-energy.lbl.gov/node/78>

EIA. 2009. Energy Information Administration, Official Energy Statistics from the U.S. Government. Accessed April 23, 2009. [http://tonto.eia.doe.gov/energy\\_in\\_brief/foreign\\_oil\\_dependence.cfm](http://tonto.eia.doe.gov/energy_in_brief/foreign_oil_dependence.cfm)

Kats. 2003. *The Costs and Financial Benefits of Green Buildings*. Prepared by Greg Kats for the California Sustainable Building Task Force, 2003. <http://www.cap-e.com/ewebeditpro/items/O59F3259.pdf>

EPA. 2008. *Indoor Air Facts No. 4 (Revised) Sick Building Syndrome*, U.S. Environmental Protection Agency, February 20, 2008. [http://www.epa.gov/iaq/pdfs/sick\\_building\\_factsheet.pdf](http://www.epa.gov/iaq/pdfs/sick_building_factsheet.pdf)

## REFERENCES (continued)

### General References

Build It Green, Green Point Rater and Certified Professional in Green Building. Accessed January – April 2009. <http://www.builditgreen.org/>

U.S. Green Building Council, Leadership in Energy and Environmental Design (LEED) – information on building certification program and training/accreditation program. Accessed January – April 2009. <http://www.usgbc.org/DisplayPage.aspx?CategoryId=19>

### Chapter 3, Section 3.4 Water

#### References Cited

Cal EPA. 2008. California EPA Climate Action Team, *Water-Energy Sector Summary -AB32 Scoping Plan -GHG Emission Reduction Strategies*, April 28, 2008. [http://www.climatechange.ca.gov/climate\\_action\\_team/reports/](http://www.climatechange.ca.gov/climate_action_team/reports/)

DWR. 2007. *Climate Change in California, June 2007* (fact sheet). State of California Department of Water Resources (DWR). <http://www.water.ca.gov/climatechange/docs/062807factsheet.pdf>

DWR. 2008. *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water*. State of California DWR, October 2008. <http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf>

EPA. 2009. *Climate Change – Health and Environmental Effects, Possible Water Resource Impacts in North America*. US EPA. Accessed February 2009. <http://www.epa.gov/climatechange/effects/water/northamerica.html>

Haddad. 2005. *California Water Policy: Planning for Climate Change, Growth, and Natural Heritage Preservation*. Haddad, Brent M. University of Santa Cruz. October 2005. <http://www.lib.berkeley.edu/WRCA/WRC/pdfs/Haddad.pdf>

Water Forum. 2007. *Water Forum Agreement*. January 2000. <http://www.waterforum.org/>

### General References

East Bay Municipal Utility District (EBMUD) Drought Management Program, May 2008. [http://www.ebmud.com/conserving\\_recycling/water\\_smart\\_tips/default.htm](http://www.ebmud.com/conserving_recycling/water_smart_tips/default.htm)

ICLEI. 2007. *Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments*. ICLEI-Local Governments for Sustainability and King County, Washington. 2007. <http://www.icleiusa.org/action-center/planning/adaptation-guidebook/view?searchterm=>

Oasis Design, Santa Barbara, CA. *Graywater* (greywater) resource. Accessed March 2009. <http://www.oasisdesign.net/greywater/index.htm> (linked from EBMUD site)

Sacramento County Water Agency, Water Conservation Programs. Accessed March 2009. <http://www.msa2.sacounty.net/dwr/scwa/Pages/default.aspx>

Sacramento County Water Agency, Resolutions Related to Delta Vision and the Bay-Delta Conservation Plan. October 2008.

[http://www.msa2.sacounty.net/dwr/scwa/Documents/Water%20News/BDC\\_DV\\_BoardPackage.pdf](http://www.msa2.sacounty.net/dwr/scwa/Documents/Water%20News/BDC_DV_BoardPackage.pdf)

Saving Water Saves our Nation's Water Supplies. Accessed March 2009. [http://www.energystar.gov/index.cfm?c=products\\_pr\\_protect\\_water\\_supplies](http://www.energystar.gov/index.cfm?c=products_pr_protect_water_supplies)

State Water Resources Control Board 20x2020 Agency Team on Water Conservation. Accessed January - April 2009. [http://www.swrcb.ca.gov/water\\_issues/hot\\_topics/20x2020/index.shtml](http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/index.shtml)

U.S. Environmental Protection Agency and U.S. Department of Energy, Energy Star Program. Accessed March 2009. <http://www.energystar.gov/>

### Chapter 3, Section 3.5 Waste Management and Recycling

#### References Cited

EPA. 2002. *U.S. EPA, Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks*, 2nd Edition, EPA530-R-02-006. May 2002. <http://epa.gov/climatechange/wycd/waste/SWMGHGreport.html>

### Chapter 3, Section 3.6 Agriculture and Open Space

#### References Cited

Akbari 2001. *Shade trees reduce building energy use and CO2 emissions from power plants*. Akbari, H., Lawrence Berkeley National Laboratory. Published by Elsevier Science Ltd. December 17, 2001. <http://www.sciencedirect.com/science?ob=ArticleURL&udi=B6VB5-44PCGFP15&user=10&rdoc=1&fmt=&orig=search&sort=d&view=c&acct=C000050221&version=1&urlVersion=0&userid=10&md5=9e8520fad63ed27317d1053cedc08882>

Eates 2005. *Sustainable Agriculture: An Introduction*. Eates, Richard as revised by Williams, Paul. ATTRA, the National Sustainable Agriculture Information Service. Arkansas. 2005. [http://attra.ncat.org/new\\_pubs/attra-pub/sustagintro.html?id=California#what](http://attra.ncat.org/new_pubs/attra-pub/sustagintro.html?id=California#what)

Leurs et. al. 2006. *Our Changing Climate: Assessing the Risks to California. A Summary Report of the California Climate Change Center*. Prepared by Amy Lynd Luers (Union of Concerned Scientists), Daniel R. Cayan (Scripps Institution of Oceanography), Guido Franco (California Energy Commission), Michael Hanemann (University of California, Berkeley), and Bart Croes (California Air Resources Board). July 2006. [http://meteora.ucsd.edu/cap/pdffiles/CA\\_climate\\_Scenarios.pdf](http://meteora.ucsd.edu/cap/pdffiles/CA_climate_Scenarios.pdf)

McPherson 1998. *Atmospheric Carbon Dioxide Reduction by Sacramento's Urban Forest*. *Journal of Arboriculture* 24(4): July 1998. McPherson, Gregory, USDA Forest Service c/o UC Davis Department of Environmental Horticulture. <http://www.fs.fed.us/ccrc/topics/urban-forests/docs/1998%20Atmospheric%20carbon%20dioxide%20reduction%20.pdf>

Paustian et al 2006. *Agriculture's Role in Greenhouse Gas Mitigation*. Prepared for the Pew Center on Global Climate Change by Keith Paustian, John Antie, John Sheehan and Eldor A. Paul. September 2006. <http://www.pewclimate.org/docUploads/Agriculture's%20Role%20in%20GHG%20Mitigation.pdf>

## REFERENCES (continued)

USDA 2007. Special Reference Briefs Series no. SRB 99-02: *Sustainable Agriculture: Definitions and Terms*. U.S. Department of Agriculture (USDA), National Agricultural Library. Sept. 1999, slightly updated 2007. <http://www.nal.usda.gov/afsic/pubs/terms/srb9902.shtml>[http://attra.ncat.org/new\\_pubs/attra-pub/sustagintro.html?id=California#what](http://attra.ncat.org/new_pubs/attra-pub/sustagintro.html?id=California#what)

### General References

Cal EPA. 2008. California EPA Climate Action Team, *Agriculture Sector Write-Up for Public Distribution - AB 32 Scoping Plan*. December 2008. [http://www.climatechange.ca.gov/climate\\_action\\_team/reports/](http://www.climatechange.ca.gov/climate_action_team/reports/)

Council for Agricultural Science and Technology (CAST). May 2004. *Interpretative Summary, Climate Change and Greenhouse Gas Mitigation, Challenges and Opportunities for Agriculture* (Task Force report 141). [http://www.cast-science.org/cast/src/cast\\_top.htm](http://www.cast-science.org/cast/src/cast_top.htm)

D'Souza, Shereen. *Comments on City of Berkeley Draft Climate Action Plan*. California Food and Justice Coalition. October 2008. <http://www.foodsecurity.org/california/CFJC-SubmissionToBerkeleyClimateActionPlan.pdf>

Grubinger, Vern, 2006. *Climate Change and Agriculture: Challenges and Opportunities for Outreach*. University of Vermont Extension. VT. <http://www.climateandfarming.org/pdfs/FactSheets/Outreach.pdf>

Sacramento County 2008. *Sacramento County 2007 Crop and Livestock Report*. Sacramento County Agricultural Commissioner, August 22, 2008. [http://www.agcomm.saccounty.net/coswcm/groups/public/@wcm/@pub/@agcomm/@inter/documents/webcontent/sac\\_016425.pdf](http://www.agcomm.saccounty.net/coswcm/groups/public/@wcm/@pub/@agcomm/@inter/documents/webcontent/sac_016425.pdf)

Smith, Pete (Lead Author); Marco Bertaglia (Topic Editor). 2007. *Greenhouse Gas Mitigation in Agriculture*. In: *Encyclopedia of Earth*. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [Published in the *Encyclopedia of Earth* June 26, 2007; Retrieved February 26, 2009]. [http://www.eoearth.org/article/Greenhouse\\_gas\\_mitigation\\_in\\_agriculture](http://www.eoearth.org/article/Greenhouse_gas_mitigation_in_agriculture)

U.S. Department of Agriculture (USDA), Economic Research Service web site. Accessed February 2009. <http://www.ers.usda.gov/>

U.S. Department of Economic Analysis. *U.S. Agricultural Trade Update – July 2008*. <http://www.kfb.org/commodities/commoditiesimages/July2008TradeUpdate.pdf>

