STAFF REPORT

TOWN COUNCIL MEETING OF JULY 10, 2012

To: Town Council

From: Town Manager

Date: June 1, 2012

Subject: 2005 Greenhouse Gas Emissions Inventory Presentation by Sierra Business Council

RECOMMENDATION:
Hear presentation. No action is requested.

DISCUSSION:
The attached report was prepared by the Sierra Business Council, in partnership with PG&E and the International Council for Local Environmental Initiatives (ICLEI). The Sierra Business Council staff will be making a presentation on the results of the report (PowerPoint attached).

Town of Loomis

2005 Community-Wide Greenhouse Gas Emissions Inventory

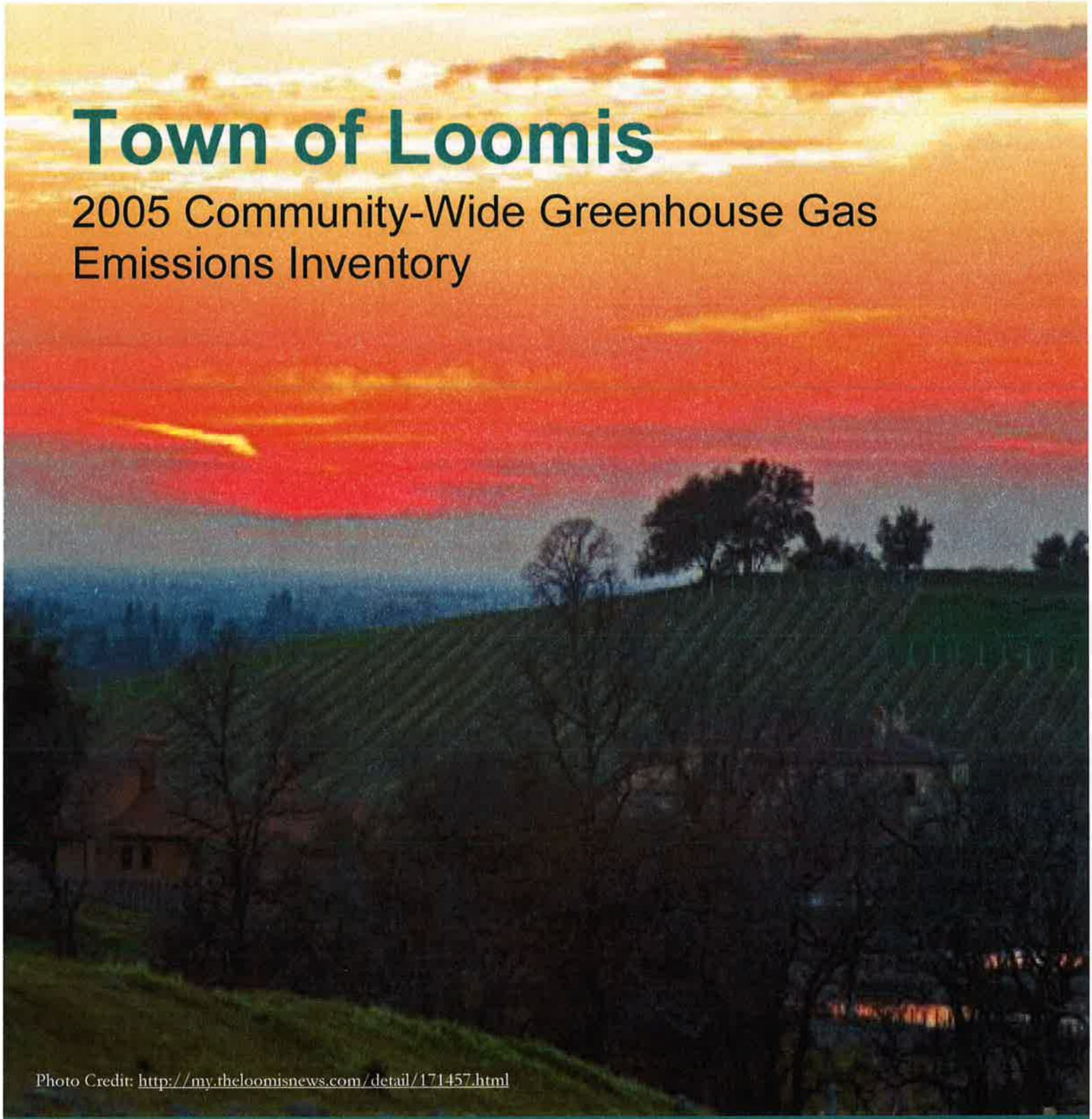

Photo Credit: http://my.theloomisnews.com/detail/171457.html

Narrative Report

Produced by Sierra Business Council
Supported by Pacific Gas and Electric Company
In Collaboration with the Town of Loomis and
ICLEI-Local Governments for Sustainability USA
April 2012

Credits and Acknowledgements

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Pacific Gas and Electric Company provides a range of climate planning assistance to local governments, from providing energy usage data and assistance with greenhouse gas inventories, to training and guidance on the development and implementation of climate action plans.

This program is funded by California utility customers and administered by PG&E under the auspices of the California Public Utilities Commission.

Legal Notice

ICLEI-Local Governments for Sustainability USA

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This report was prepared for the Town of Loomis by the Sierra Business Council, in partnership with PG&E and ICLEI. The authors would like to thank the Town of Loomis' staff for providing much of the insight and local information necessary for the completion of this report. The authors would also like to recognize PG&E for their administrative support of the inventory, made possible through the use of Public Goods Charge funding, as well as thank ICLEI for providing training and technical support.

Letter from Mayor Calvert

This inventory documents the Town's emissions of greenhouse gases (GHG) and also marks the beginning of coordinated Town government and Community response. Loomis recognizes that the two most important things we can do in this arena is to set a good example of reducing greenhouse gas emissions and finding, with community help, ways to support your efforts to the same end.

Town staff, in cooperation with the Town's other elected officials, is committed to facing the challenge of reducing greenhouse gas emissions. The Town's continued interaction with a wide range of community representatives and sustainability groups will help to implement plans that address this challenge. While this is a significant problem that requires commitment and resources, it is also an opportunity that can result in stronger community and a more resilient economy.

Sandra Calvert
Mayor, Town of Loomis

Table of Contents

Tables and Figures

List of Tables

List of Figures

Executive Summary

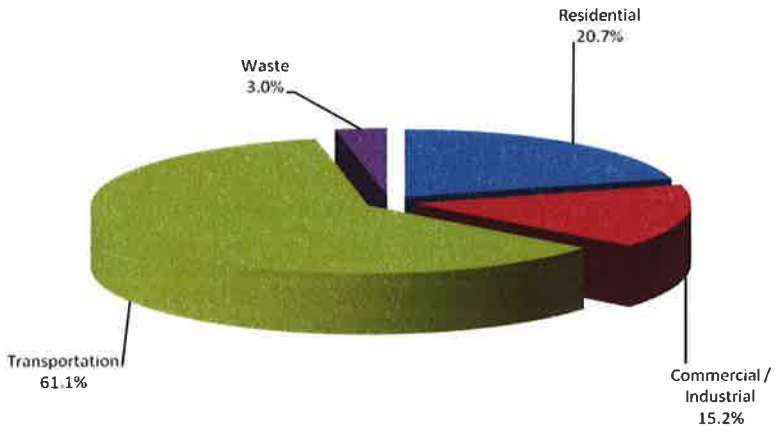
The Town of Loomis recognizes that greenhouse gas (GHG) emissions from human activity are catalyzing profound climate change, the consequences of which pose substantial risks to the future health, well-being, and prosperity of our community. Furthermore, the Town of Loomis has multiple opportunities to benefit by acting quickly to reduce community GHG emissions. Through implementing GHG emissions reduction strategies, the Town of Loomis can help to lower residents' and businesses' energy bills, reduce transportation costs, improve air quality, as well as enhance the efficiency of municipal services such as waste disposal and wastewater treatment, while reducing costs.

The Town of Loomis has begun the climate action planning process, starting with inventorying emissions. The Town of Loomis has already completed an inventory of GHG emissions from government operations. This report provides estimates of greenhouse gas emissions resulting from activities in the Town of Loomis as a whole in 2005. In addition, the Town of Loomis is currently working with Placer Sustain to spread the word about sustainability. They currently condition projects to be efficient in the following ways: energy efficiency, green building design, and waste diversion.

Key Findings

As can be seen in Figure ES-1, the largest contributor to community emissions was the Transportation sector with 61% of total emissions. The next largest contributor was the Residential sector with 21% of total emissions. Actions to reduce emissions in both of these sectors will be a key part of a climate action plan. Waste and Commercial/Industrial sectors were responsible for the remainder of emissions.

Figure ES-1: Community GHG Emissions by Sector



The Inventory Results section of this report provides a detailed profile of emissions sources within the Town of Loomis, information that is key to guiding local reduction efforts. This data will also provide a baseline against which the Town will be able to compare future performance and demonstrate progress in reducing emissions.

Next Steps

With the help of Sierra Business Council and Pacific Gas and Electric Company, Loomis will be able to take the next step in creating a climate action plan (CAP), setting emissions reduction targets as well as prioritizing and setting timelines for implementing projects spelled out in the CAP.

Introduction

Every day, the Town of Loomis plays host to a variety of activities necessary for ensuring a properly functioning and robust community. These activities include burning fuel for transportation, collecting and treating waste, generating power, and providing light and heat for buildings. All of these activities directly or indirectly contribute to the addition of carbon dioxide and other greenhouse gases into the environment. This report presents the findings and methodology of a community-wide greenhouse gas emissions inventory for the Town of Loomis in 2005.

The Town of Loomis, established in 1850 and incorporated in 1984, covers an area of 7.3 square miles and is located off of Interstate 80 in western Placer County, just 25 miles northeast of Sacramento. The Town was home to approximately 6,334 residents in 2005, had an estimated household median income of roughly $80,000, and has an average rainfall of 22 inches per year. Loomis recognizes the opportunity to take meaningful steps towards reducing its community-wide emissions.

Climate Change Background

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation, and other purposes; these activities introduce large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise.

Many communities in the United States have taken responsibility for addressing climate change at the local level. The Town of Loomis' economy and quality of life for its residents could be impacted by risks associated with climate change. Current and expected impacts to Loomis related to climate change are explained below. Beyond the Town of Loomis, climate scientists expect changing temperatures to result in more frequent and damaging storms accompanied by flooding and landslides, summer water shortages as a result of reduced snow pack, and the disruption of ecosystems, habitats, and agricultural activities.

Reducing fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility bills and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs. Additionally, money not spent on energy is more likely to be spent at local businesses, adding to the local economy. Reducing fossil fuel use improves air quality and increases opportunities for alternative forms of transportation (walking and bicycling), improving the overall health of local residents.

Regional and Local Impacts

The Town of Loomis, as all communities in the Sierra Nevada, faces unique challenges associated with climate change. Forests face the threat of increased catastrophic wildfires, introduction of new diseases, altered species composition, and other effects of rapid landscape transformation. Potential impacts on water resources include reduced snow pack, delayed accumulation, earlier melting, and ultimately shortages in runoff and water supply. Increased frequency and altered timing of flooding will increase risks to people, ecosystems, and infrastructure. With rapid change, loss of critical habitat and alteration of fragile ecosystems is likely. Since local economies in the Sierra Nevada rely so heavily on these natural resources for tourism, recreation, forestry, agriculture, and other industries, climate change has the potential to negatively affect economic activity in the Town of Loomis, and ultimately impact quality of life for its residents.

Evidence of Human-Caused Climate Change

There is overwhelming scientific consensus that the global climate is changing and that human actions, primarily the burning of fossil fuels, are the main cause of those changes. The Intergovernmental Panel on Climate Change (IPCC) is the scientific body charged with bringing together the work of thousands of climate scientists. The IPCC's Fourth Assessment Report states that "warming of the climate system is unequivocal."[1] Furthermore, the report finds that "most of the observed increase in global average temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations."

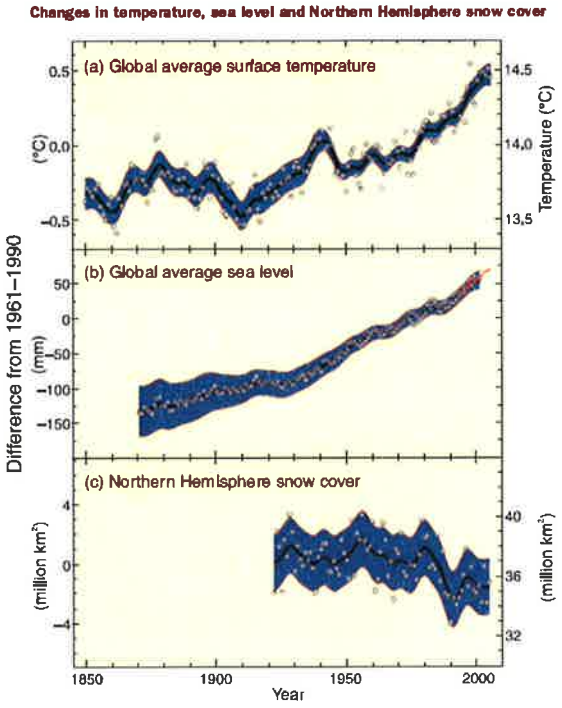


Figure 1: Observed changes in global temperature, sea level and snow cover.

Analysis released in January 2011 by NASA's Goddard Institute for Space Studies shows that global average surface

[1] IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

temperatures in 2010 "tied" 2005 as the warmest on record (the difference is smaller than the uncertainty in comparing the temperatures of recent years).[2] The next hottest years, also with very close average temperatures, are 1998, 2002, 2003, 2006, 2007, and 2009. The period from January 2000 to December 2009 is the warmest decade on record, followed by the 1990's, then the 1980's respectively. The steady uptick in average temperatures is significant and expected to continue if action is not taken to greatly reduce greenhouse gas emissions.

California Policy

California passed the Global Warming Solutions Act (AB 32) in 2006, which charged the California Air Resources Board (CARB) with implementing a comprehensive statewide program to reduce greenhouse gas emissions. AB 32 established the following greenhouse gas emissions reduction targets for the state of California:

- 2000 emissions levels by 2010
- 1990 emissions levels by 2020

Additionally, the passage of SB 375 enhances California's ability to reach its AB 32 goals by promoting good planning with the goal of more sustainable communities. SB 375 requires CARB to develop regional greenhouse gas emission reduction targets for passenger vehicles. CARB is to establish targets for 2020 and 2035 for each region covered by one of the State's 18 metropolitan planning organizations (MPOs). Another policy driver for climate action planning in California is SB 97, which established that GHG emissions and their impacts are appropriate subjects for analysis under the California Environmental Quality Act (CEQA). This law directed the State's Office of Planning and Research (OPR) to develop CEQA guidelines on the mitigation of greenhouse gas emissions for agencies such that they may follow appropriate standards on calculating GHG emissions from projects, determine potential significance, and implement mitigation measures if necessary and feasible. Finally, Executive Order S-3-05, issued by Governor Schwarzenegger, reinforces these goals and sets a schedule for the reporting of both the measured impacts of climate change upon California's natural environment and the emissions reduction efforts undertaken by a myriad of state, regional, and local groups. Executive Order S-3-05 establishes an additional target of 80% below 1990 levels by 2050. The Town of Loomis' GHG emissions inventory is intended to enable the Town to develop effective GHG reduction policies and programs to meet these targets and track emissions reduction progress.

ICLEI Local Governments for Sustainability Climate Mitigation Program

In response to the problem of climate change, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and more, local governments can dramatically reduce

[2] Goddard Institute for Space Studies, "Research Finds 2010 Tied for Warmest Year on Record," 2011, 18 Jan. 2011, <http://www.nasa.gov/topics/earth/features/2010-warmest-year.html>.

emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts.

ICLEI – Local Governments for Sustainability (herewith known as "ICLEI") is an association for local governments to share knowledge and successful strategies toward increasing local sustainability.[3]

ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones (shown in Figure 2):

1. Conduct an inventory and forecast of local greenhouse gas emissions
2. Establish a greenhouse gas emissions reduction target
3. Develop a climate action plan for achieving the emissions reduction target
4. Implement the climate action plan
5. Monitor and report on progress

This report represents the completion of ICLEI's Climate Mitigation Milestone One and provides a foundation for future work to reduce greenhouse gas emissions in the Town of Loomis.

Figure 2: The Five Milestones of identifying and reducing greenhouse gas

Pacific Gas and Electric-Sponsored Inventory Project

This project was made possible by the Pacific Gas and Electric Company (PG&E) Green Communities Program with funding from California utility customers under the auspices of the California Public Utilities Commission. The Green Communities Program assists local governments by providing easy-to-understand information, technical expertise, and financial resources to support local climate action planning. The Green Communities Program is designed to help local governments and communities achieve greenhouse gas reduction goals and to improve air quality, reduce energy costs, and curb greenhouse gas emissions.

Sustainability & Climate Change Mitigation Activities in the Town of Loomis

The Town of Loomis has enacted the following initiatives in an effort to foster a positive environment for sustainability and eventual GHG reductions:

- Leading by example through actions to reduce government operations emissions

[3] ICLEI was formerly known as the International Council for Local Environmental Initiatives, but the name has been changed to ICLEI – Local Governments for Sustainability. http://www.iclei.org & http://www.icleiusa.org

- E.g. installing energy-efficient light bulbs and establishing carpool programs
- Establishing robust community-wide recycling and waste reduction programs
- Collaborating with Placer Sustain[4], a Placer County sustainability non-profit organization.

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline levels and sources of emissions in the community. As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. Standard processes of accounting for emissions have been developed to which our inventory adheres. The authors of this report used the International Local Government GHG Emissions Analysis Protocol (IEAP) to inventory the Town's community emissions. In addition, methods from the Local Government Operations Protocol were used as appropriate for specific sectors.

The Town of Loomis has previously completed an inventory of emissions from government operations. The government operations inventory is a subset of the community inventory; for example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles. The government operations inventory is in this way a subset of the community-scale inventory, as shown in Figure 3.

Figure 3: The Government Operations Emissions Inventory as a subset of the Community Emissions Inventory.

Community Emissions Protocol

The IEAP, developed by ICLEI, provides guidelines for local governments in quantifying greenhouse gas emissions from the community within their geopolitical boundaries. Staff used this protocol to inventory the Town of Loomis' community emissions. ICLEI began development of the IEAP with the inception of its Cities for Climate Protection Campaign in 1993, and through this work has established a common GHG emissions inventory protocol for all local

[4] Placer Sustain, http://www.placersustain.org

governments worldwide.[5] ICLEI USA is currently developing a Community Protocol supplement for the US which is similar in many respects to the Local Government Operations Protocol (LGO Protocol) described below.

Local Government Operations Protocol

In 2008, ICLEI, the California Air Resources Board (CARB), and the California Climate Action Registry (CCAR) released the LGO Protocol to serve as a national appendix to the IEAP.[6] The LGO Protocol serves as the national standard for quantifying and reporting greenhouse gas emissions from local government operations. The purpose of the LGO Protocol is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory. The LGO Protocols also informs some methods used for community inventories.

Quantifying Greenhouse Gas Emissions

Establishing a Base Year

The inventory process requires the selection of a base year with which to compare current emissions. The Town of Loomis' community greenhouse gas emissions inventory utilized 2005 as its base year. The year 2005 is a commonly accepted baseline year in California – it is the reference year in SB 375 and Executive Order S-3-05; additionally it is one of the earliest years for which relatively comprehensive data is available.

Establishing Boundaries

Setting an organizational boundary for greenhouse gas emissions accounting and reporting is an important step in the inventory process. The Town of Loomis' community inventory assessed emissions resulting from activities within its geopolitical boundary. The IEAP defines geopolitical boundary as that "consisting of the physical area or region over which the local government has jurisdictional authority." Activities that occur within this boundary can be, for the most part, controlled or influenced by the Loomis' policies and educational programs. Although the Town may have limited influence over the level of emissions from some activities, it is important that every effort be made to compile a complete analysis of all activities that resulted in greenhouse gas emissions. Note that emissions from facilities that are operated by the Town of Loomis, but are located outside the Town's jurisdictional boundaries were not included in the inventory. Conversely, a government facility operated by another jurisdiction but located within the Town's jurisdictional boundary would be included in the community inventory.

Emission Types

The IEAP and LGOP recommend assessing emissions from the six internationally recognized greenhouse gases regulated under the Kyoto Protocol as listed in Table 1. Emissions of Hydrofluorocarbons, Perfluorocarbons, and

[5] International Local Government Greenhouse Gas Emissions Analysis Protocol (IEAP). ICLEI. http://www.iclei.org/index.php?id=ghgprotocol

[6] Local Government Operations Protocol (LGOP). http://www.icleiusa.org/programs/climate/ghg-protocol/ghg-protocol

Sulfur Hexafluoride were not included in this inventory because of the difficulty in obtaining data on these emissions at a community scale. Greenhouse gas emissions are commonly aggregated and reported in terms of equivalent carbon dioxide units, or CO_2e. This standard is based on the Global Warming Potential (GWP) of each gas, which is a measure of the amount of warming a greenhouse gas may cause, measured against the amount of warming caused by carbon dioxide. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its warming effect, so one metric ton of methane emission is equal to twenty-one metric tons of carbon dioxide equivalents. See Table 1 for the GWPs of the commonly occurring greenhouse gases.

Table 1: Greenhouse Gases

Greenhouse Gas	Chemical Formula	Global Warming Potential
Carbon Dioxide	**CO_2**	**1**
Methane	**CH_4**	**21**
Nitrous Oxide	**N_2O**	**310**
Hydrofluorocarbons	**Various**	**43-11,700**
Perfluorocarbons	**Various**	**6,500-9,000**
Sulfur Hexafluoride	**SF_6**	**23,900**

Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

- **Measurement-based** methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- **Calculation-based** methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used: *Activity Data* $\times$ *Emission Factor* = *Emissions*

All emissions sources in this inventory were quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see appendices for a detailed listing of the activity data used in composing this inventory.

Known emission factors were used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO_2/kWh of electricity). Table 2 demonstrates examples of common emission calculations that use this formula. Please see appendices for details on the emissions factors used in this inventory.

Table 2: Basic Emissions Calculations

Activity Data	Emissions Factor	Emissions
Electricity Consumption (kWh)	CO2 emitted/kWh	CO2 emitted
Natural Gas Consumption (therms)	CO2 emitted/therm	CO2 emitted
Gasoline/Diesel Consumption (gallons)	CO2 emitted /gallon	CO2 emitted
Vehicle Miles Traveled	CH4, N2O emitted/mile	CH4, N20 emitted

CACP 2009 Software

To facilitate community efforts to measure greenhouse gas emissions as a first step towards reducing them, ICLEI developed the Clean Air and Climate Protection 2009 (CACP 2009) software package in partnership with the National Association of Clean Air Agencies (NACAA) and the U.S. Environmental Protection Agency (EPA). CACP 2009 is designed for compatibility with the LGO Protocol and determines emissions by combining activity data (energy consumption, waste generation, etc.) with verified emission factors.

The CACP software has been and continues to be used by over 600 U.S. local governments to measure their greenhouse gas emissions. However, it is worth noting that although the software provides governments with a sophisticated and useful tool, calculating emissions from activity data with precision is difficult. The model depends upon numerous assumptions and is limited by the quantity as well as quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation of reality rather than an exact value.

Evaluating Emissions

There are several important concepts involved in the analysis of emissions arising from many different sources and chemical/mechanical processes throughout the community. Those not already touched on are explored below.

Emissions by Scope

For both community and government operations, emissions sources were categorized relative to the geopolitical boundary of the community or the operational boundaries of the government. Additionally, emissions sources were categorized as either Scope 1, Scope 2, or Scope 3. The Scopes framework is used to prevent double counting of emissions for major categories such as electricity use and waste disposal.

The Scopes framework identifies three emissions scopes for community emissions:

- **Scope 1:** All direct emissions from sources located within the geopolitical boundary of the local government.
- **Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, and cooling. Scope 2 emissions occur as a result of activities that take place within the geopolitical boundary of the local government, but that rely upon emissions-producing processes located outside of the government's jurisdiction.

- **Scope 3:** All other indirect or embodied emissions not covered in Scope 2 that occurred as a result of activity within the geopolitical boundary.

Scope 1 and Scope 2 sources are the most essential components of a community greenhouse gas analysis as these sources are typically the most significant in scale and are most easily affected by local policy making. In addition to the categories in the Scopes framework, emission sources may also fall into a fourth category called Information Items.

Information Items

Information items are emissions sources that were not included as Scope 1, 2, or 3 emissions in the inventory, but were reported here separately in order to provide a more complete picture of community-wide emissions from the Town of Loomis.

A common emission that is categorized as an information item is carbon dioxide emitted in the combustion of biogenic fuels. Local governments or utilities will often burn fuels that are of biogenic origin (wood, landfill gas, organic solid waste, biofuels, etc.) to generate power; in the Town of Loomis many homes burn wood to heat their homes. Other common sources of biogenic emissions are the combustion of landfill gas from landfills or biogas from wastewater treatment plants, as well as the incineration of organic municipal solid waste at incinerators.

Carbon dioxide from the combustion of biogenic fuels was not included in Scope 1 emissions based on established international principles. Methane and nitrous oxide emissions from biogenic fuels are considered Scope 1 stationary combustion emissions and are included in the stationary combustion sections for the appropriate facilities. These principles indicate that biogenic fuels (e.g., wood, biodiesel), if left to decompose in the natural environment, would release CO_2 into the atmosphere, where it would then enter back into the natural carbon cycle. Therefore, when wood or another biogenic fuel is combusted, the resulting CO_2 emissions are akin to natural emissions and should therefore not be considered as human activity-generated emissions. The CH_4 and N_2O emissions, however, would not have occurred naturally and are therefore included as Scope 1 emissions.

Emissions by Sector

In addition to categorizing emissions by scope, this inventory examines emissions by sector. Many local governments find a sector-based analysis more relevant to policy making and project management, as it assists in formulating sector-specific reduction measures and climate action plan components. Table 3 shows the sectors that are included in this inventory.

Table 3: Community Sectors

Community Sectors
Residential
Commercial / Industrial
Transportation
Waste

Community Emissions Inventory Results

Emissions by Scope

The emissions sources by scope and sector included in this inventory are listed in Table 4.

Table 4: Scopes and Sectors Included in the Town of Loomis' Community Inventory

Sector	Scope 1	Scope 2	Scope 3	Information Items
Residential	Natural Gas, Other Fuels	Electricity		Biogenic Emissions from Wood Combustion
Commercial/Industrial	Natural Gas, Propane & Diesel	Electricity		
Transportation	Gasoline & Diesel			
Waste	Wastewater Treatment		Future Emissions from 2005 Solid Waste	

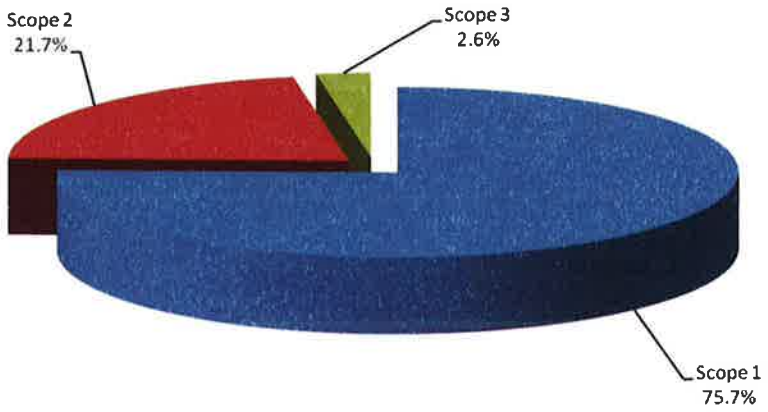
Total roll-up community emissions for the Town of Loomis were approximately 56,041 metric tons[7] of CO_2e in the year 2005. This roll-up does not include emissions categorized as information items. Because the sources that go into a roll-up number vary from community to community, this number should not be used for comparison purposes without a careful analysis of the basis of the number. Table 5 and Figure 4 present the emissions calculations by scope and sector.

Table 5: Community GHG Emissions per Sector per Scope (metric tons CO_2e)

Sector	Scope 1	Scope 2	Scope 3	TOTAL	Information Items
Residential	6,263	5,356	0	11,619	292
Commercial / Industrial	1,684	6,804	0	8,488	0
Transportation	34,238	0	0	34,238	0
Waste	241	0	1,455	1,696	0
TOTAL	42,426	12,159	1,455	56,041	292
% of Total CO2e	75.7%	21.7%	2.6%	100.0%	

[7] All emissions estimated using ICLEI's CACP 2009 Software.

Figure 4: Community GHG Emissions by Scope

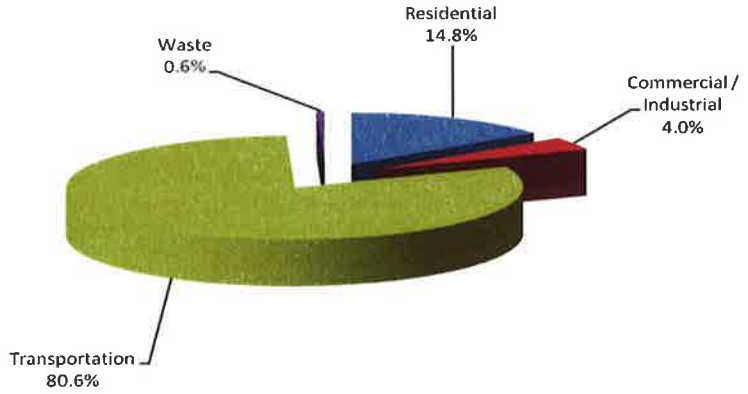


The following sections describe each of the individual scopes in more detail. As shown in Table 6 and Figure 5 below, the largest percentage of Scope 1 emissions came from the Transportation sector (80.6%). The Transportation sector emissions were the result of a mix between local road and interstate highway use, as well as off-road vehicle use within the Town of Loomis' jurisdictional boundaries. The remainder of Scope 1 emissions came from stationary fuel combustion (combustion of natural gas, propane, heating oil, etc.) in the Town of Loomis' homes (Residential sector, 14.8%), stationary fuel combustion in businesses/industry (Commercial/Industrial sector, 4.0%), and fugitive emissions from wastewater treatment (Waste sector, 0.6%).

Table 6: Community Scope 1 GHG Emissions (metric tons CO_2e)

Scope 1 Emissions by Sector	Residential	Commercial / Industrial	Transportation	Waste	TOTAL
CO2e (metric tons)	6,263	1,684	34,238	241	42,426
% of Total CO2e	14.8%	4.0%	80.6%	0.6%	100.0%
MMBtu	117,308	31,672	471,591	0	620,571

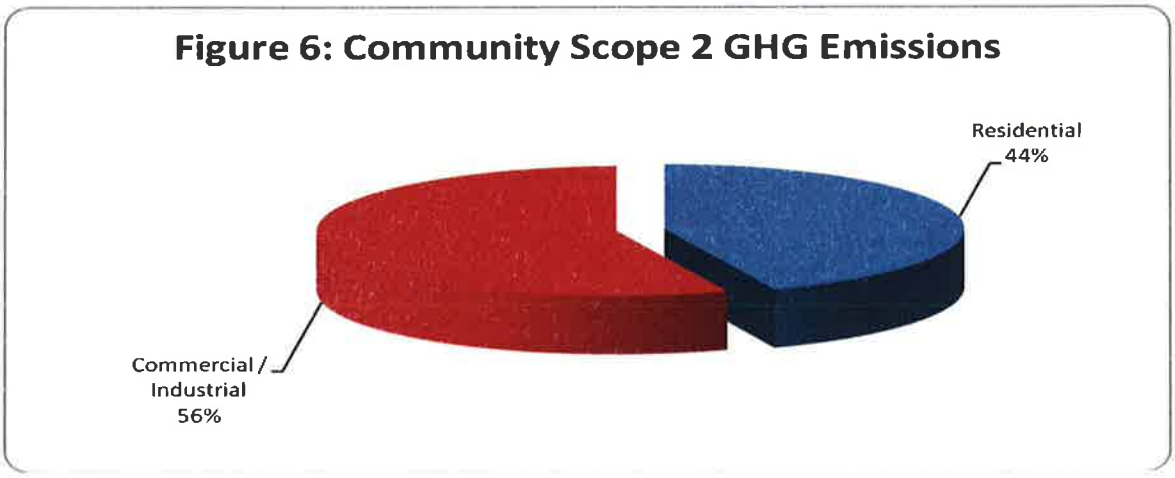
Figure 5: Community Scope 1 GHG Emissions



As shown in Table 7 and Figure 6, 56% of 2005 Scope 2 emissions were generated by the Commercial/Industrial sector. The remainder of the Town of Loomis' Scope 2 emissions (44%) came from electricity consumption by the Residential sector within the Town's boundaries. As noted above in the general description of Scope 2 parameters, the actual emissions from these activities were generated outside of the Town of Loomis' boundaries—in this case, at the source of electricity generation.

Table 7: Community Scope 2 GHG Emissions (metric tons CO_2e)

Scope 2 Emissions By Sector	Residential	Commercial / Industrial	TOTAL
CO2e (metric tons)	5,356	6,804	12,159
% of Total CO2e	44%	56%	100%
MMBtu	81,604	83,178	164,781



The remaining portion of emissions included in the Town of Loomis' 2005 community inventory fell under the category of Scope 3. All emissions in this category were an estimate of future emissions over the lifecycle decomposition of waste and alternative daily cover (ADC) sent from within the Town of Loomis to a landfill in 2005.[8]

In addition to Scope 1, 2, and 3 emissions, there were emissions of 292 metric tons CO_2e categorized as information items, referenced in Table 5. These emissions came from wood burned as a heating fuel in the Town of Loomis' homes. Information items were not included in any inventory roll-up numbers.

Emissions by Sector

In addition to considering emissions via scopes, emissions can be grouped by sector. As visible in Table 8 and Figure 7 below, emissions from the Transportation sector (the same gasoline and diesel sources as that listed under Scope 1 above) were by far the largest source of community emissions (61.1%). Electricity, natural gas, and stationary fuel consumption within the Residential sector accounted for 20.7% of total community emissions. Fifteen and two-tenths percent of total community emissions were caused by electricity, natural gas, and stationary fuel usage within the

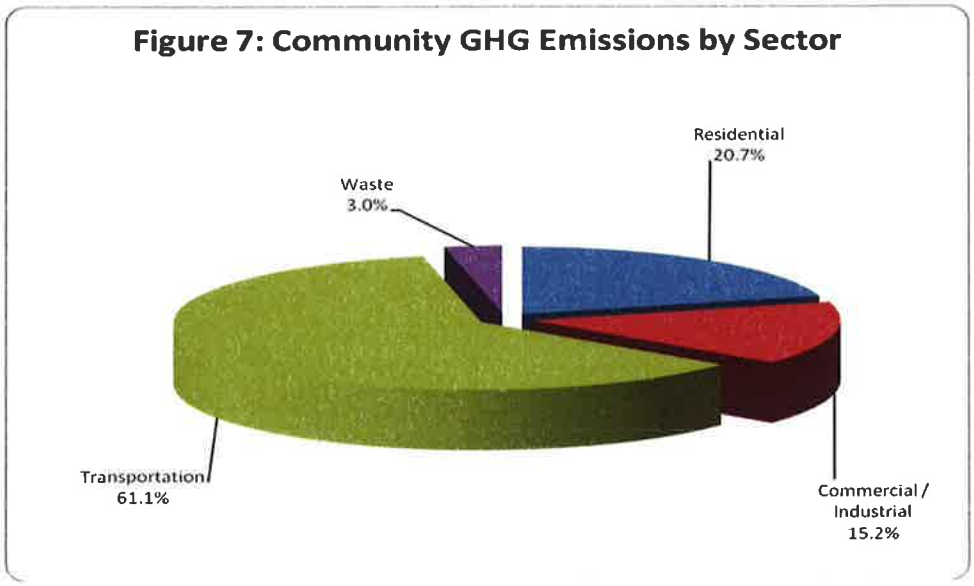
[8] The Solid Waste and Wastewater section of this report provides more detail on emissions from the waste sector.

Commercial sector. The remaining 3.0% of emissions came from the Waste sector. See below for further detail on each sector.

Table 8: Community GHG Emissions by Sector (metric tons CO_2e)

Community Emissions by Sector	Residential	Commercial / Industrial	Transportation	Waste	TOTAL
CO2e (metric tons)	11,619	8,488	34,238	1,696	56,041
% of Total CO2e	20.7%	15.2%	61.1%	3.0%	100.0%
MMBtu	198,911	114,850	471,591	0	785,353

Figure 7: Community GHG Emissions by Sector



Residential

As shown in Table 8, the Town of Loomis' Residential sector generated an estimated 11,619 metric tons of CO_2e in 2005. This estimate was calculated using 2005 electricity and natural gas consumption data provided by PG&E and estimates of home heating fuel use based on census and weather data. It only includes residential building consumption. Data on fuel use from residential emergency generators was not available, and was not included in this inventory. Data on residential equipment usage, such as lawnmowers, were included in the Transportation sector. GHG emissions associated with residential transportation and residential waste generation were included separately in the Transportation and Waste sector emissions totals, respectively. Appendix B provides detailed Residential sector emissions methods.

Table 9 provides information on residential emissions on a per household basis. The Town of Loomis' households generated 11,619 metric tons of GHG emissions in 2005. Per household emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one's emissions with neighboring cities and against regional and national averages. That said, when comparing figures be aware that due to differences in emission inventory methods it can be difficult to get a directly comparable per-household emissions number.

Table 9: The Town of Loomis 2005 Greenhouse Gas Emissions per Household

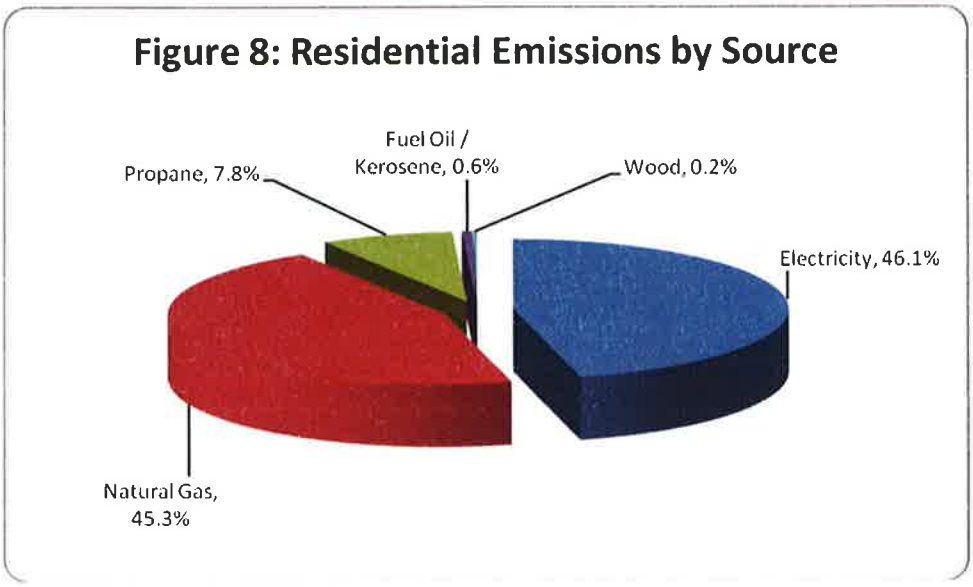
Number of Occupied Housing Units	**2,285**
Total Residential GHG Emissions (metric tons CO2e)	**11,619**
Residential GHG Emissions/Household (metric tons CO2e)	**5.1**

Table 10 and Figure 8 illustrate the breakdown of residential GHG emissions by fuel type. Forty five and three-tenths percent of residential GHG emissions were generated from the use of natural gas. Natural gas is typically used in residences as a fuel for home heating, water heating, and cooking. Forty six and one-tenth percent of residential GHG emissions were generated through electricity provided by PG&E. Propane and fuel oil, also used for home heating and water heating, generated 7.8% and 0.1% of residential GHG emissions respectively. Finally, wood used for home heating accounted for 0.2% of residential emissions (excluding biogenic CO_2 emissions).

Table 10: Residential Emissions by Source (metric tons CO_2e)

Residential Emission Sources 2005	Electricity	Natural Gas	Propane	Fuel Oil / Kerosene	Wood	TOTAL
CO2e (metric tons)	**5,356**	**5,262**	**906**	**70**	**25**	**11,619**
% of Total CO2e	**46.1%**	**45.3%**	**7.8%**	**0.6%**	**0.2%**	**100.0%**
MMBtu	**81,604**	**98,995**	**14,252**	**946**	**3,115**	**198,911**

Figure 8: Residential Emissions by Source



Commercial / Industrial

As mentioned previously, the Town of Loomis' businesses and industries generated 15.2% of community-wide GHG emissions in 2005, or 8,448 metric tons of CO_2e. In addition to emissions from natural gas and electricity consumption, there were additional Commercial/Industrial sector stationary combustion emissions included in this inventory.[9] This data was provided by the Placer Air Pollution Control District and included CO_2, CH_4, and N_2O emissions from several

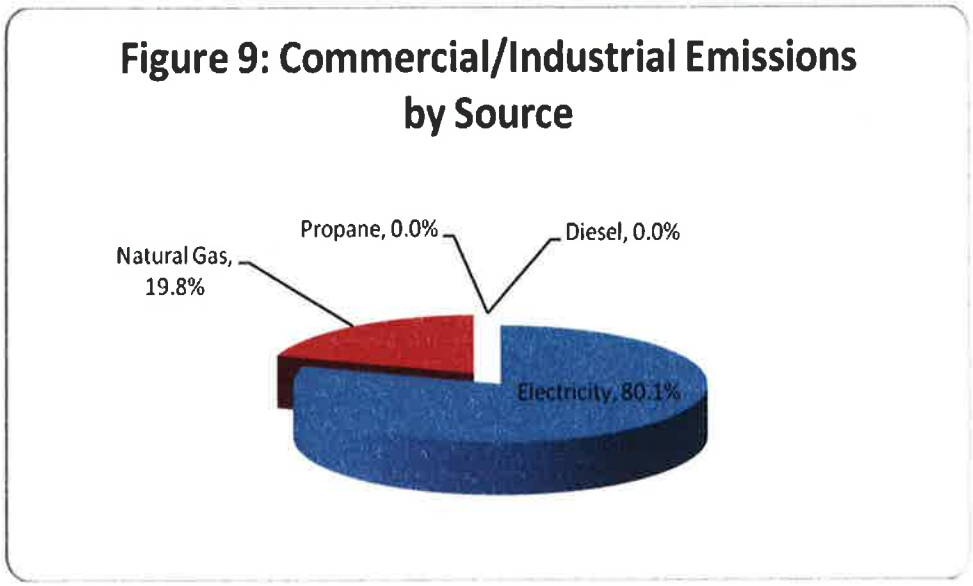
[9] Stationary combustion emissions are those generated from on-site stationary commercial and industrial equipment including power plants and emergency generators.

emergency generators. Stationary combustion emissions associated with Commercial/Industrial natural gas use were intentionally excluded from the Placer Air Pollution Control District data, assuming that the majority of natural gas-associated emissions were accounted for using Utility and CEC data. Appendix C provides details on Commercial/Industrial emissions methods.

As illustrated in Table 11 and Figure 9, electricity consumption accounted for 80.1% of the Commercial/Industrial greenhouse gas emissions. Nineteen and eight-tenths percent of emissions were generated from the combustion of natural gas, used for space heating as well as any on-site generation of electricity and the operation of boilers. Emergency generators using propane and diesel fuel accounted for an extremely small percentage of total emissions, or 1.2 metric tons of CO_2e, within the Commercial/Industrial sector.

Table 11: Commercial / Industrial Emissions by Source (metric tons CO_2e)

Commercial/Industrial Emission Sources 2005	Electricity	Natural Gas	Propane	Diesel	TOTAL
CO2e (metric tons)	6,804	1,683	0.2	1	8,488
% of Total CO2e	80.1%	19.8%	0.0%	0.0%	100.0%
MMBtu	83,178	31,656	4	12	114,850



Transportation

As shown previously in Figure 7 and Table 8, the Town of Loomis' Transportation sector accounted for 34,238 metric tons CO_2e, or 61.1%, of the Town's 2005 GHG emissions. The Transportation sector analysis included emissions from all vehicle use within the Town of Loomis' boundaries (whether on local roads or state highways passing through their jurisdiction), as well as off-road vehicles and machines.[10]

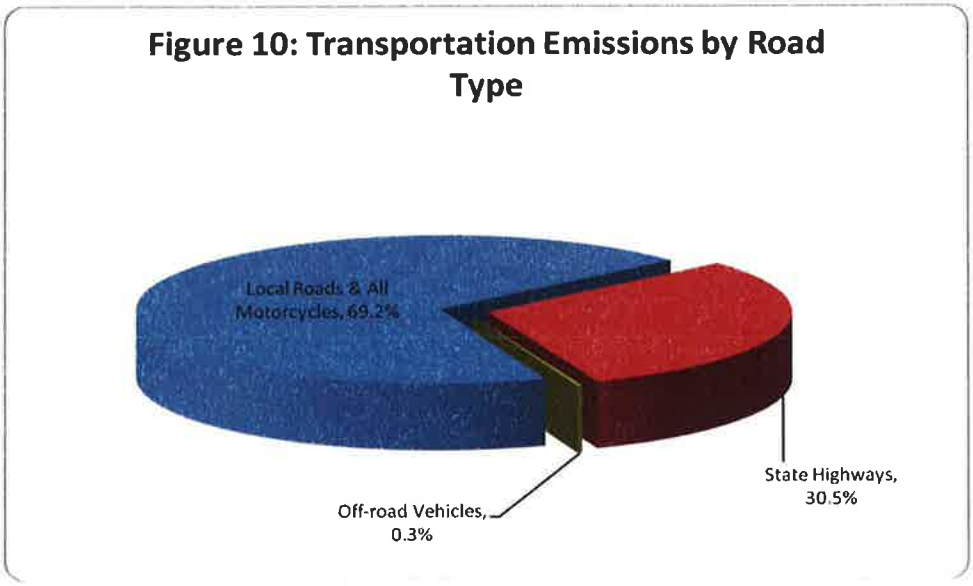
[10] See Appendix D for further information on Transportation sector methods.

Figure 10 and Table 12 show that 69.2% of the Town of Loomis' transportation-related greenhouse gas emissions were generated from vehicle miles traveled (VMT) on local roads and from motorcycles, while 30.5% of emissions were generated from vehicles on state highways located within the Town's boundaries. Off-road vehicles generated the remaining 0.3% of transportation-related greenhouse gas emissions.

Table 12: Transportation Emissions by Road Type (metric tons CO_2e)

Transportation Road Type Emissions Sources 2005	Local Roads & All Motorcycles	State Highways	Off-road Vehicles	TOTAL
CO2e (metric tons)	23,692	10,455	91	34,238
% of Total CO2e	69.2%	30.5%	0.3%	100.0%
MMBtu	326,939	144,652	Data not available	471,591

Figure 10: Transportation Emissions by Road Type



Emissions from the air travel of the Town of Loomis' residents were not included in the Transportation sector analysis. With more time and the availability of additional data the greenhouse gas emissions from air travel could be estimated. Because there were no major airports located within the geographic boundaries of the Town of Loomis it is reasonable to exclude air travel from this inventory. Please see Appendix D for more detail on methods used in calculating emissions from the Transportation sector.

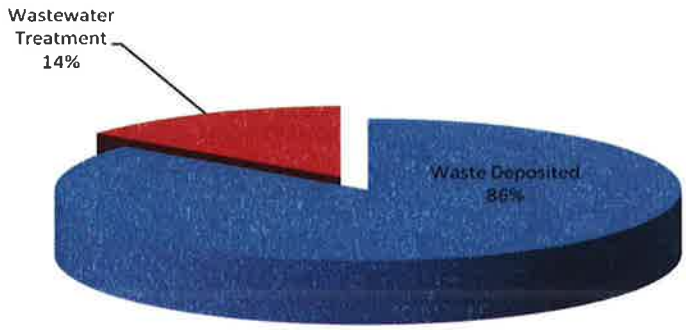
Solid Waste and Wastewater

As noted above in Figure 7 and Table 8, the Waste sector constituted 3% percent of total 2005 emissions for the Town of Loomis. Table 13 and Figure 11 detail the solid waste and wastewater emissions by category.

Table 13: Waste Emissions by Category (metric tons CO_2e)

Waste Emissions Categories 2005	Waste Deposited	Wastewater Treatment	TOTAL
CO2e (metric tons)	1,455	241	1,696
% of Total CO2e	86%	14%	100%

Figure 11: Waste Emissions by Category



Solid Waste emissions are an estimate of methane generation from the anaerobic decomposition of organic wastes (such as paper, food scraps, plant debris, wood, etc.) that are deposited in a landfill. This inventory accounted for the Scope 3 future emissions associated with all solid waste generated in 2005 within the community[11]:

- ***Waste Generation (Scope 3):*** Emissions from waste generated within the Town of Loomis in 2005 and from alternative daily cover (ADC) sent to landfills. These emissions were the estimated future emissions of 2005-generated waste or ADC that was sent to any landfill by Loomis' residents or businesses. These emissions were categorized as Scope 3 because they were not emitted in the base year, but will result from the decomposition of the 2005 waste over the full 100+ year cycle of its decomposition.

The Scope 3 waste emissions method is relevant to policy development addressing waste diversion. Transportation emissions generated from the collection, transfer and disposal of solid waste were included in Transportation sector GHG emissions.

Wastewater emissions can include fugitive N_2O and CH_4 emissions (Scope 1) from wastewater treatment plants (WWTPs), wastewater treatment facilities (WWTFs), and decentralized septic systems. The Town of Loomis' 2005 Wastewater sector emissions resulted solely from decentralized septic systems.

Emissions from decentralized septic treatment were the result of anaerobic digestion through the use of baffled holding tanks, emitting primarily CH_4. Emissions from this process were the result of fugitive emissions from either the tank itself (if there is an exhaust vent) and from the surrounding soil, in which the leechate is finally deposited[12].

[11] See Appendix E for more information on methods and emissions factors used in the Solid Waste sector analysis.
[12] See Appendix F for more information on methods and emissions factors used in the Wastewater sector analysis.

Agriculture

Land use analysis showed that in comparison to the county as a whole, the limited agriculture land within the Town of Loomis' city limits was deemed to be insignificant. As a result, emissions resulting from agricultural activity (livestock enteric fermentation, livestock manure management, and fertilizer application) were assumed to be de minimis in this inventory and all emissions attributed to the county. The emissions associated with energy consumption and transportation in the agricultural sector were reflected in the industrial and transportation emission totals respectively.

Per Capita Emissions

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities as well as against regional or national averages. That said, due to differences in emission inventory methods, it can be difficult to get a directly comparable per capita emissions number; one must be cognizant of this margin of error when comparing figures.

Community GHG Scope 1, 2 and 3 roll-up emission numbers arise from residential and business sectors, transportation, solid waste generation and wastewater treatment. Table 14 divides this roll-up number by population to yield a result of 8.8 metric tons of CO_2e per capita. It is important to understand that this number is not the same as the carbon footprint of the average individual living in the Town of Loomis (which would include emissions from production of goods purchased from outside the community, emissions resulting from air travel, etc.).

Table 14: The Town of Loomis 2005 Greenhouse Gas Emissions per Capita[13]

Estimated 2005 Population	**6,334**
Community GHG Emissions (metric tons CO_2e)	**56,041**
GHG Emissions / Resident (metric tons CO_2e)	**8.8**

[13] Per capita CO_2e emissions were 24.3 tonnes per year for the United States and 13.0 tonnes per year CO_2e emissions for California (World Resource Institute).

Conclusion & Next Steps

This analysis found that the Town of Loomis as a whole was responsible for emitting 56,041 metric tons of CO_2e in the base year 2005, with emissions from the Transportation sector contributing the most to this total. (See summary table in Appendix A for more detail.)

Based on the ICLEI methodology and recommendations, the Town of Loomis should begin to document emissions reduction measures that have been implemented since 2005 and should quantify the emissions benefits of these measures to demonstrate progress made to date.

As the Town of Loomis moves forward with considering emission reduction strategies and works to create a local climate action plan, the Town should identify and quantify the emission reduction benefits of climate and sustainability strategies that could be implemented in the future including: energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, waste reduction, and other strategies. Through these efforts and others the Town of Loomis can achieve additional benefits beyond reducing emissions, including saving money and improving the Town of Loomis's economic vitality and its quality of life. Town staff should continue to update this inventory as additional data become available.

Setting Emissions Reduction Targets

This inventory provides an emissions baseline that can be used to inform Milestone Two of ICLEI's Five-Milestone process—setting emissions reduction targets for the Town of Loomis' community activities. The greenhouse gas emissions reduction target is a goal to reduce emissions to a certain percentage below base year levels by a chosen planning horizon year. An example target might be a 30% reduction in emissions below 2005 levels by 2020. A target provides an objective toward which to strive and against which to measure progress. It allows a local government to quantify its commitment to fighting climate change—demonstrating that the jurisdiction is serious about its commitment and systematic in its approach.

In selecting a target, it is important to strike a balance between scientific necessity, ambition, and what is realistically achievable. The Town of Loomis should give itself enough time to implement chosen emissions reduction measures—noting that the farther out the target year is, the more the Town of Loomis should pledge to reduce. ICLEI recommends that regardless of the chosen long-term emissions reduction target (e.g., 15-year, 40-year), Loomis should establish linear interim targets for every two- to three-year period. Near-term targets facilitate additional support and accountability, and linear goals help to ensure continued momentum around local climate protection efforts. To monitor the effectiveness of its programs, the Town should plan to re-inventory its emissions on a regular basis; many jurisdictions are electing to perform annual inventories. ICLEI recommends conducting an emissions inventory every three to five years.

The Long-Term Goal

ICLEI recommends that near-term climate work should be guided by the long-term goal of reducing its emissions by 80 percent or more from the 2005 baseline level by the year 2050 (California Global Warming Solutions Act of 2006). By referencing a long-term goal that is in accordance with current scientific understanding, the Town of Loomis can demonstrate that it intends to do its part towards addressing greenhouse gas emissions from its community activities.

It is important to keep in mind that it will be next to impossible for local governments to reduce emissions by 80 to 95 percent without the assistance of state and federal policy changes that create new incentives and new sources of funding for emissions reduction projects and programs. However, in the next 15 years, there is much that local governments can do to reduce emissions independently. It is also important that the Town of Loomis works to reduce its emissions sooner, rather than later: the sooner a stable level of greenhouse gases in the atmosphere is achieved, the less likely it is that some of the most dire climate change scenarios will be realized. Additionally, cost saving projects can be undertaken now – why wait to increase the quality of community activities, while reducing taxpayer costs?

State of California Targets and Guidance

An integral component of the State of California's climate protection approach has been the creation of three core emissions reduction targets at the community level. On June 1, 2005 California Governor Schwarzenegger signed Executive Order S-3-05 establishing climate change emission reductions targets for the State of California. The California targets are an example of near-, mid- and long-term targets:

- Reduce emissions to 2000 levels by 2010
- Reduce emissions to 1990 levels by 2020
- Reduce emissions to 80 percent below 1990 levels by 2050

The AB 32 Scoping Plan also provides further guidance on establishing targets for local governments; specifically the Plan suggests creating an emissions reduction goal of 15 percent below "current" levels by 2020. This target has informed many local government's emission reduction targets for community activities—most local governments in California with adopted targets have targets of 15 to 25 percent reductions under 2005 levels by 2020.

Creating an Emissions Reduction Strategy

This inventory identifies the major sources of emissions from the Town of Loomis' community activities and, therefore, where policymakers will need to target emission reduction activities if they are to make significant progress toward adopted targets, and potentially large cost savings. For example, since the Commercial/Industrial sector was one of the major sources of emissions from the Town of Loomis' community activities, it is possible that the Town of Loomis could meet near-term targets by implementing a few major actions to reduce this sector's related emissions. Medium-term targets could be met by additional emission reduction actions for the Transportation and Residential sectors. The long term (2050) target will not be achievable without major reductions in all sectors.

Please note that, whenever possible, reduction strategies should include cost-saving projects that both reduce costs (such as energy bills) while reducing greenhouse gas emissions. These "low hanging fruit" are important because they frequently represent win-win situations in which there is no downside to implementation. Selecting these projects in the order of largest to smallest benefit ensures that solid, predictable returns can be realized locally. These projects lower recurring expenditures, save taxpayer dollars, create local jobs, and benefit the community's environment.

Given the results of the inventory, ICLEI recommends that the Town of Loomis focus on the following tasks in order to significantly reduce emissions from its community activities:

- Implement Travel Demand Management
- Promote Ride Sharing
- Develop Renewable Energy Programs
- Reduce Energy Use
- Implement Carbon-credit programs
- Expand recycling efforts
- Encourage LEED certified construction
- Participate in Phase III of Green Communities: Develop a local Climate Action Plan

Using these strategies as a basis for a more detailed overall emissions reduction strategy, or climate action plan, the Town of Loomis should be able to reduce its impact on global warming. In the process, it may also be able to improve the quality of its services, reduce costs, stimulate local economic development, and inspire local residents and businesses to redouble their own efforts to combat climate change.

Project Resources

ICLEI has created tools for the Town of Loomis to use to assist with future monitoring inventories. These tools are designed to work in conjunction with the IEAP, which is the primary reference document for conducting an emissions inventory. The following tools should be saved as resources and supplemental information to this report:

- The "Master Data Workbook" that contains most or all of the raw data (including emails), data sources, emissions, notes on inclusions and exclusions, and reporting tools
- The "Data Gathering Instructions" on the types of emissions and data collection methodology for each inventory sector

Appendices

Appendix A - Detailed Community Greenhouse Gas Emissions in 2005[1]

Sector	Emissions Source	Equiv CO_2 (metric tons)	Equiv CO_2 (%)	Energy (MMBtu)	Data Source
Residential					
	Electricity	5,356	9.7%	81,604	PG&E
	Natural Gas	5,262	9.5%	98,995	PG&E
	Propane	906	1.6%	14,252	Census Estimates
	Fuel Oil/Kerosene	70	0.13%	946	Census Estimates
	Wood	25	0.04%	3,115	Census Estimates
Subtotal Residential		**11,619**	**21%**	**198,911**	
Commercial/Industrial					
	Electricity	6,804	12.0%	83,178	PG&E
	Natural Gas	1,683	3.0%	31,656	PG&E
	Propane	0.2	0.0005%	4	PG&E
	Diesel	1	0.002%	12	PG&E
Subtotal Commercial		**8,488**	**15%**	**114,850**	
Transportation					
Local Roads AVMT					
23692	Gasoline	19,587	34.9%	272,294	Caltrans/CARB
	Diesel	4,044	7.4%	54,641	Caltrans/CARB
State Highways AVMT					
10455	Gasoline	8,665	15.4%	120,475	Caltrans/CARB
	Diesel	1,790	3.3%	24,175	Caltrans/CARB
Motorcycles					
	Gasoline	61	0.001%	Included with Local and State	CARB
Off-Road Vehicles					
	Gasoline and Diesel	92	0.002%	Data not available	CARB
Subtotal Transportation		**34,238**	**61%**	**471,591**	
Waste					
Total Waste Disposed (w/o ADC)					
	Paper Products	813	1.4%	0	Recology Auburn Placer
	Food Waste	318	0.6%	0	Recology Auburn Placer
	Plant Debris	85	0.2%	0	Recology Auburn Placer
	Wood/Textiles	239	0.4%	0	Recology Auburn Placer
Wastewater					
	Septic	241	0.4%		Census Estimates
Subtotal Waste		**1,696**	**3%**	**0**	
Grand Total		**56,041**	**100%**	**785,352**	

1 Subtotals and grand total may not be the exact sum of individual category emissions due to rounding.

Appendix B - Residential Sector Notes

Table B-1: Data Inputs

Residential	Electricity Consumption PG&E	kWh	23,876,964
	Natural Gas Consumption PG&E	Therms	989,949
	Liquid Propane Gas Consumption	BTUs	14,252,162,968
	Fuel Oil / Kerosene Consumption	BTUs	945,940,020
	Wood for Home Heating Consumption	BTUs	3,114,780,504

Table B-2: Data Sources

Electricity	kWH	Pacific Gas & Electric
Natural Gas	Therms	Pacific Gas & Electric
Liquid Propane Gas	Heating Degree Days	http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html
	Home Heating Estimates	ACS B25040 Report, Home Heating Fuel, ACS 2005-2009 5-Year Estimates
	Space Heating and Water Heating Factors	Greenhouse Gas Inventory Guidance, USEPA, Municipal Clean Energy Program, State and Local Branch http://climateprotection.org/pdf/Appendix-F-USEPA-Draft-Regional-Inventory-Guidance-1-20-09.pdf
Fuel Oil / Kerosene	Heating Degree Days	http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html
	Home Heating Estimates	ACS B25040 Report, Home Heating Fuel, ACS 2005-2009 5-Year Estimates
	Space Heating and Water Heating Factors	Greenhouse Gas Inventory Guidance, USEPA, Municipal Clean Energy Program, State and Local Branch http://climateprotection.org/pdf/Appendix-F-USEPA-Draft-Regional-Inventory-Guidance-1-20-09.pdf
Wood for Home Heating	Heating Degree Days	http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html
	Home Heating Estimates	ACS B25040 Report, Home Heating Fuel, ACS 2005-2009 5-Year Estimates
	Space Heating Factors	Greenhouse Gas Inventory Guidance, US EPA, Municipal Clean Energy Program, State and Local Branch http://climateprotection.org/pdf/Appendix-F-USEPA-Draft-Regional-Inventory-Guidance-1-20-09.pdf

Methods:

Utility Derived Data

Electricity and natural gas consumption data was collected from Pacific Gas & Electric Company (PG&E) for all facilities within the Loomis town limits. The data provided was broken out by residential or commercial use. The residential electricity and natural gas data was entered into the Clean Air and Climate Protection software where the greenhouse gas emissions were calculated using PG&E's reported grid emissions factors for electricity and default combustion emissions factors for natural gas.

Non-Utility Derived Data

Liquid propane gas, fuel oil / kerosene and wood for home heating estimations were determined using three sources of data: heating degree days, home heating fuel type estimates and space heating and water heating factors. First, the heating degree days were determined for Loomis using the reported numbers by NOAA for the Sacramento drainage. Then, the number of homes within Loomis using liquid propane gas, fuel oil / kerosene or wood for home heating was determined by reviewing the 2005 – 2009 American Community Survey 5-Year Estimate for Housing by Home Heating Source. Next, the space heating and water heating factors were determined by reviewing the US EPA Greenhouse Gas Inventory Guidance. Once collected, the annual space heating totals in BTUs for liquid propane gas, fuel oil / kerosene and wood were calculated by multiplying the total 2005 heating degree days by the number households in Loomis using propane, fuel oil and wood for space heating by the respective EPA space heating factor. Please see factors and calculations in Table B-3. It was assumed that a home employing propane or kerosene for space heating uses the same fuel for water heating. Therefore the annual water heating totals in BTUs for liquid propane gas and fuel oil / kerosene were calculated by multiplying the number of households in Loomis using propane or fuel oil by the respective EPA water heating factor. It was also assumed that a household employing wood for space heating employs electricity, rather than wood, for water heating.

Table B-3: Home Heating Calculations

Fuel Type	Propane	Fuel Oil / Kerosene	Wood
Total 2005 Heating Degree Days	4,052.00	4,052.00	4,052.00
# Homes Using Other Fuels for Space Heating	226.00	15.00	66.00
Space Heating Factor (BTU/HDD/Household)	11,647.00	11,647.00	11,647.00
Water Heating Factor (BTU/YR/Household)	15,869,024.00	15,869,024.00	N/A
Annual space heating subtotal	10,665,763,544.00	707,904,660.00	3,114,780,504.00
= (factor x HDD x # of households)			
Annual water heating subtotal	3,586,399,424.00	238,035,360.00	N/A
= (factor X # of households)			
Total BTU	**14,252,162,968.00**	**945,940,020.00**	**3,114,780,504.00**

Appendix C - Commercial/Industrial Sector Notes

Table C-1: Data Inputs

Commercial	Electricity Consumption	kWh	17,881,067
	Natural Gas Consumption	Therms	316,564
Direct Access	Electricity Direct Access Residential	kWh	32,907.12
	Electricity Direct Access Commercial	kWh	6,490,023.88
Power Generation	Diesel Consumption	Gallons	87
	Propane Consumption	Gallons	42

Table C-2: Data Sources

Electricity	kWH	Pacific Gas & Electric
Natural Gas	Therms	Pacific Gas & Electric
Direct Access	kWh	California Energy Commission
Power Generation	Fuel Consumption	Placer Air Pollution Control District

Methods:

Utility Derived Data

Electricity and natural gas consumption data was collected from PG&E for all facilities within the Loomis town limits. The data provided was broken out by residential or commercial use. The commercial electricity and natural gas data was entered into the Clean Air and Climate Protection software where the Greenhouse Gas emissions were calculated using PG&E's reported grid emissions factor for electricity and default combustion emissions factor for natural gas.

Direct Access Data

Direct access is energy supplied by a competitive energy service provider other than the utility, but uses a utility's transmission lines to distribute the energy. All direct access data was provided by the California Energy Commission and used in the direct access calculator, shown in Table C-3. The total direct access electricity consumption for Placer County was used to determine the percent of direct access for residential and commercial / industrial that was used in the calculation of the direct access electricity consumed within the Town of Loomis. The calculated direct access totals for Loomis were entered into the Clean Air and Climate Protection software where the greenhouse gas emissions were calculated using the California Grid Average emissions factor.

Table C-3: Direct Access Electricity Usage From CEC by County

Electricity Consumption (Million kWh)							
County	**Sector**	**Year**	**Utility**		**Direct Access**		**Total**
			Million kWh	**%**	**Million kWh**	**%**	
Placer County	Residential	2005	771.761	61.16%	1.064	0.59%	773
Placer County	Commercial/Industrial	2005	490.036	38.84%	177.861	99.41%	668
Total (MWh)			1,262		179		1,441
Total %			87.58%		12.42%		100.00%

Table C-4: Direct Access Estimate by Local Government

Sector	**PG&E Total kWh**	**% DA Usage**	**DA kWh**	**Calculations to Estimate Proportion**	
Residential	23,876,964	0.14%	32,907.12	0.14%	99.86%
Commercial/Industrial	17,881,067	36.30%	6,490,023.88	26.63%	73.37%

Power Generation Data

Power generation data was collected from the Placer Air Pollution Control District. The fuel usage in gallons was received for all stationary engines under permit in 2005. This was entered into the Clean Air and Climate Protection software to calculate the greenhouse gas emissions. The default combustion emissions for diesel and propane were used.

Appendix D - Transportation Sector Notes

Table D-1:

Transportation	Local Roads (VMT)	Annual VMT ([%] Gasoline [%] Diesel) By Vehicle Type	**33,959,600 Annual VMT** **91.95% Gasoline** 43.27% - Passenger Car 44.62% - Light Truck/SUV/Pickup 4.05% Heavy Truck **7.42% Diesel** 0.21% Passenger Car 0.03% - Light Truck/SUV/Pickup 7.18% - Heavy Truck
	State Highway (VMT)	Annual VMT ([%] Gasoline [%] Diesel) By Vehicle Type	**15,025,207 Annual VMT** **91.95% Gasoline** 43.27% - Passenger Car 44.62% - Light Truck/SUV/Pickup 4.05% Heavy Truck **7.42% Diesel** 0.21% Passenger Car 0.03% - Light Truck/SUV/Pickup 7.18% - Heavy Truck
	Off-road Vehicles	Diesel (gallons) Gasoline (gallons)	5,695 Diesel Gallons 3,202 Gasoline Gallons 2,058 CNG Gallons

Data Sources:

On-Road Emissions

1. Caltrans, 2006. 2005 California Public Road Data. Division of Transportation System Information. Available at: http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2005PRD.pdf.
2. California Air Resources Board, 2011. EMFAC2011. Available at: http://www.arb.ca.gov/msei/modeling.htm

Off-Road Emissions

1. California Air Resources Board, 2007. OFFROAD2007. Available at: http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.
2. Railyard Miles Data Source – US Department of Transportation GIS Data

Sacramento Area Council of Governments – (916) 321-9000

Methods:

On-Road Emissions

Since actual fuel consumption data is not available at a jurisdiction level, on road emissions for local roads and state highways are estimated using vehicle-miles traveled (VMT) estimates coupled with vehicle type and fuel breakdown. The methodology for collecting and conditioning this data is as follows:

Local Roads VMT

Annual VMT on Local Roads are recorded by Caltrans' Highway Performance Monitoring System, which estimates VMT on local roads within various jurisdictions. Local roads annual VMT for the Town of Loomis was taken from Caltrans 2005 California Public Road Data, and is shown in Table D-1.

Clean Air Climate Protection software identifies motorcycle emissions as an off-road emissions source. County-wide motorcycle CO2 emissions are produced in the California ARB's EMFAC2011 model. To produce motorcycle CO_2 emissions specific to the Town of Loomis, EMFAC2011 motorcycle emissions were disaggregated by applying the population ratio of 2.05% (ratio of Loomis population to county-wide population). EMFAC2011 produces daily emissions outputs, which need to be multiplied by 365 in order to produce annual estimates.

State Highway VMT

Table D-2: Jurisdiction share of recorded highway miles

	Jurisdiction	Total Highway Miles	US Hwy	State Hwy	Proportion
Placer Co		156.31	80.37	75.95	100.00%
	Lincoln	5.26	1.85	3.40	3.36%
	Loomis	**1.21**	**1.21**		**0.78%**
	Auburn	5.77	4.45	1.32	3.69%
	Non-Participating Cities	14.30	13.319315	0.98	9.15%
	Unincorporated Co	129.77			83.02%

Table D-3: Loomis share of highway VMT

Placer County Highway VMT	Loomis Share of Hwy Miles	Loomis VMT
1,935,587,700	0.78%	15,025,207

State Highway VMT attributed to Loomis is based on the amount of recorded highway miles within the jurisdiction, taken from Caltrans 2005 California Public Road Data. In order to estimate the State Highway VMT within Loomis, the proportion of 0.78% was multiplied by the total county-wide State Highway VMT recorded by Caltrans (1,935,587,700) to result in State Highway VMT value shown in Table D-1 above.

Fuel/Vehicle Type Breakdown and Emissions Calculations

Since Caltrans does not provide VMT by fuel and vehicle type, fuel and vehicle type breakdown was extracted from California ARB's EMFAC2011 model, which provides this information by air basin. The EMFAC2011 model was run for example year 2005; daily VMT from this model was summed and proportioned by fuel and vehicle classification (Passenger Car, Light-Duty Truck/SUV/Pickup, Heavy-Duty Truck, and Motorcycles). These percentages were applied to the jurisdiction-specific annual VMT figures produced from the Caltrans report, resulting in final VMT figures by fuel and vehicle type. EMFAC2011 data was not used alone because this dataset was aggregated by air basin. Methods

to disaggregate the EMFAC2011 data by city and county jurisdiction could not appropriately be developed so the above method was performed to produce VMT for each jurisdiction. This data was input into ICLEI's Clean Air and Climate Protection software which applies the appropriate emissions factors to produce the final CO_2e emissions quantity.

Off-Road Emissions

Off-road emissions were estimated with standard procedures using California ARB's OFFROAD2007 modeling program. OFFROAD2007 produces emissions for various off-road, fuel-consuming machines at the county level. In order to produce disaggregated emissions data, it is necessary to only consider machines types that are operated within Loomis. For Loomis, selected construction & mining equipment, entertainment equipment, industrial equipment, lawn and gardening equipment, light commercial equipment, other portable equipment, railyard operations, selected recreational equipment, and transport refrigeration units were considered. This information was collected in an initial questionnaire distributed to a government staff person and additional information regarding machine operations was confirmed through phone calls and emails with Loomis' Assistant Planner. After identifying the applicable machine classifications, the data was proportioned by population to represent Loomis' share of the emissions compared to the entire county. Further mapping analysis was conducted using GIS to proportion the amount of railways within each jurisdiction to appropriately disaggregate rail yard emissions. This map is available in the Off-Road Fuels Working Data tab in the Master Data Workbook for this inventory. The data produced by OFFROAD2007 is daily usage – the final data was multiplied by 365 in order to produce annual emissions. The final data that was entered into CACP was annual emissions of CO_2, CH_4, and N_2O, in tons. Table D-4 below shows the proportions applied to each off-road machine category.

Table D-4: Off-Road Proportions by Category

Off Road Machine Type Category	Proportion Applied to OFFROAD 2007 County-Wide Output
Construction & Mining Equipment	2.05% - Cement & mortar mixers, concrete/industrial saws, off-highway trucks, and other construction equipment
Entertainment Equipment	2.05%
Industrial Equipment	2.05%
Lawn & Gardening Equipment	2.05% - Filtered out snow blowers
Light Commercial Equipment	2.05%
Other Portable Equipment	2.05%
Railyard Operations	2.14%
Recreational Equipment	2.05% - Golf carts, mini bikes, and specialty vehicle carts only
Transport Refrigeration Units	2.05%

Appendix E - Solid Waste Sector Notes

Table E-1: Data Inputs

Waste Deposited	2005-Generated Solid Waste	short tons/yr	7,979

Data Sources:

General Manager, Recology Auburn Placer

Methods - Solid Waste:

There are a variety of emissions associated with solid waste management services including collection, processing, and storage of solid waste generated from residents and businesses. Collection emissions are included in the transportation sector of this report. The most prominent source of emissions from solid waste facilities is fugitive methane released by the *anaerobic* decomposition of organic waste over time in dumps and landfills within a jurisdiction. The scale of these emissions depends upon the size and type of the facility and the presence of a landfill gas collection system.

As there are no dumps or landfills within the Town of Loomis, there are no associated Scope 1 emissions to account for in this inventory (other than those accounted for in transportation). The Loomis Sanitary Landfill is located outside the city limits, in unincorporated Placer County.

Solid waste generated within the Town of Loomis in 2005 was transferred to remote landfills for disposal. As shown in Table E-1, 7,979 short tons of solid waste were collected in the Town in 2005. Scope 3 emissions were calculated using standard emission factors and equations adopted by the California Air Resources Board, the California Climate Action Registry, ICLEI - Local Governments for Sustainability and The Climate Registry. The emissions associated with this waste are defined as Scope 3. They occur at the landfill sites over the entire period of decomposition (estimated to be 100 years).

Information on the waste collected from within Loomis was received from Recology waste services. The data was in the form of short tons/yr. Waste characterization values, shown in Table E-2 below, were provided by the California Integrated Waste Management Board (CIWMB) specifically tailored to 2005.

Table E-2: Waste Composition

Paper Products	Food Waste	Plant Debris	Wood/Textile	All Other Waste
21.00%	14.55%	6.89%	21.79%	35.77%

Appendix F - Wastewater Sector Notes

Table F-1: Data Inputs

Wastewater	Centralized	Ave Total Nitrogen Discharged	kg N / day	N/A
		Total Population Served	People	N/A
	Anaerobic Digester	Total Population Served	People	N/A
	Lagoon	Total Population Served	People	N/A
	Septic	Total Population Served	People	1164
Census Bureau		Average Household Size	People	2.76

Data Sources:

Placer County Environmental Health Department

South Placer Municipal Utility District

US Census Bureau, http://www.census.gov/

Methods:

Within any community based greenhouse gas inventory wastewater treatment will only account for a small portion of total emissions. Wastewater can be treated using either: centralized plants (with or without anaerobic digestion), lagoons, or septic systems. The two emissions associated with these processes are methane (CH_4) and nitrous oxide (N_2O); calculating the makeup and amount of emissions depends on the processes involved and the management practices employed. The Town of Loomis' population used two methods to treat their wastewater: treatment at one centralized plant and treatment through decentralized septic systems.

Though some residents in Loomis are attached to a sewer line, the wastewater is sent outside of the Town's jurisdiction to be treated, therefore it was *not* accounted for in this report. Residents not on the city's sewer system are by default on septic. These systems are able to serve either multiple or individual households. Septic treatment involves anaerobic processes to degrade organic matter, emitting primarily CH_4. Using the number of households connected to septic (provided by the city) and an approximation of the average population within a household (provided by the Census Bureau) CH_4 emissions were calculated using standard equations provided by ICLEI, using IPCC methodology.

Town of Loomis
2005 Community
Greenhouse Gas Emissions Inventory

Ryan Casey
Sierra Business Council

Supported by Pacific Gas and Electric Company,
ICLEI-Local Governments for Sustainability USA
April 10th, 2012

SIERRA BUSINESS COUNCIL

...innovative approaches and solutions... in the Sierra Nevada

Pacific Gas and Electric Company's Green Communities Program

The Green Communities Program is designed to provide support to local governments and communities to achieve greenhouse gas (GHG)-reduction goals related to energy usage.

- **Phase 1-**Government Operations Inventory
- **Phase 2-**Community Inventory
- **Phase 3-**Climate Action Plan

Sierra Business Council Collaboration:

ICLEI Local Governments for Sustainability

SIERRA BUSINESS COUNCIL

PG&E Pacific Gas and Electric Company®

Types of Inventories

Government Operations Inventory (2005)

- Emissions from municipal operations only
- Subset of the community inventory, but calculated separately

Community Inventory (2005)

- All emissions released inside the jurisdictional boundary
- Residential, Commercial, Industrial, Transportation, Waste, etc.

Green Communities – Sierra Nevada

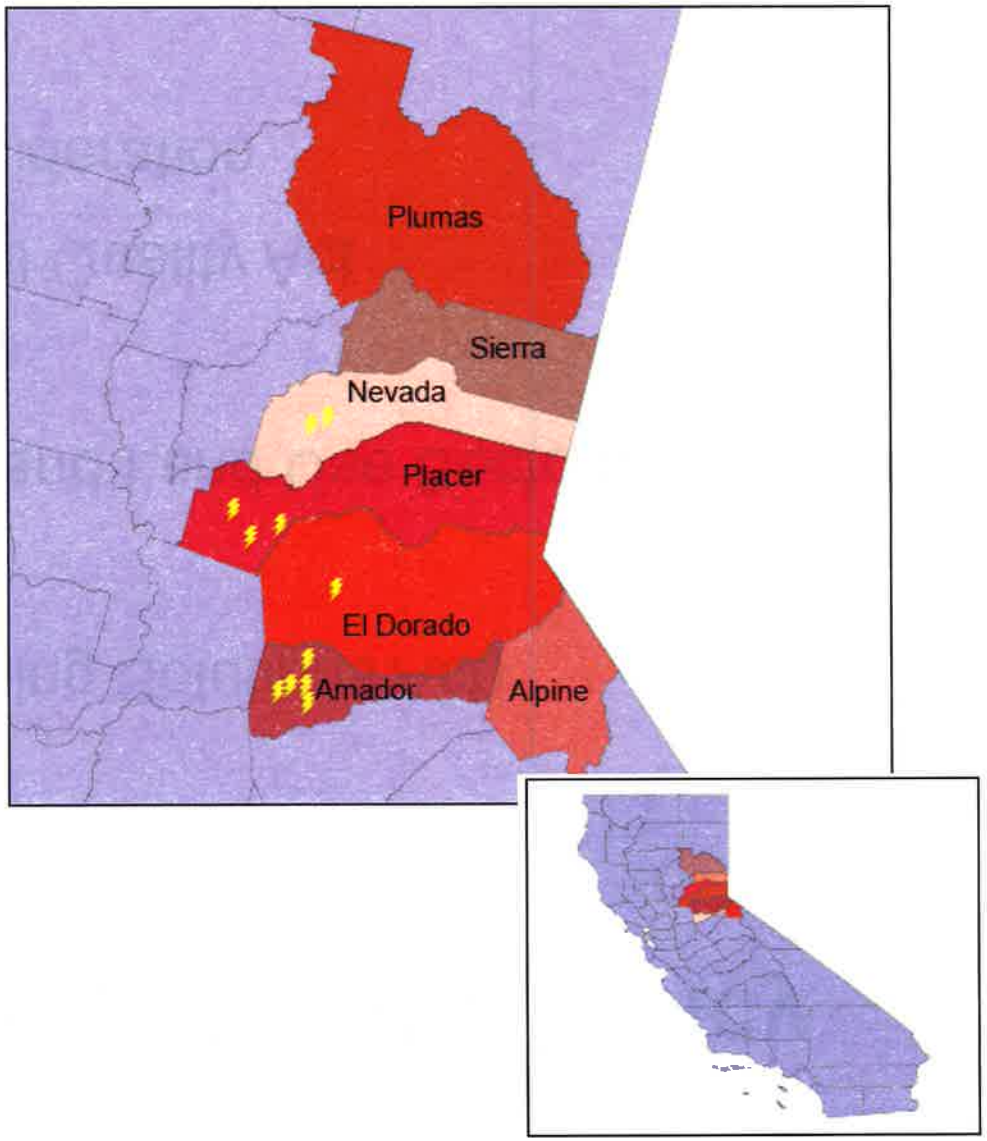
Phase 2: 17 Participants

Counties:

- Plumas
- Sierra
- Nevada
- Placer
- El Dorado
- Amador
- Alpine

Cities/Towns:

- Nevada City
- Auburn
- Lincoln
- Loomis
- Placerville
- Jackson
- Ione
- Amador City
- Sutter Creek
- Plymouth



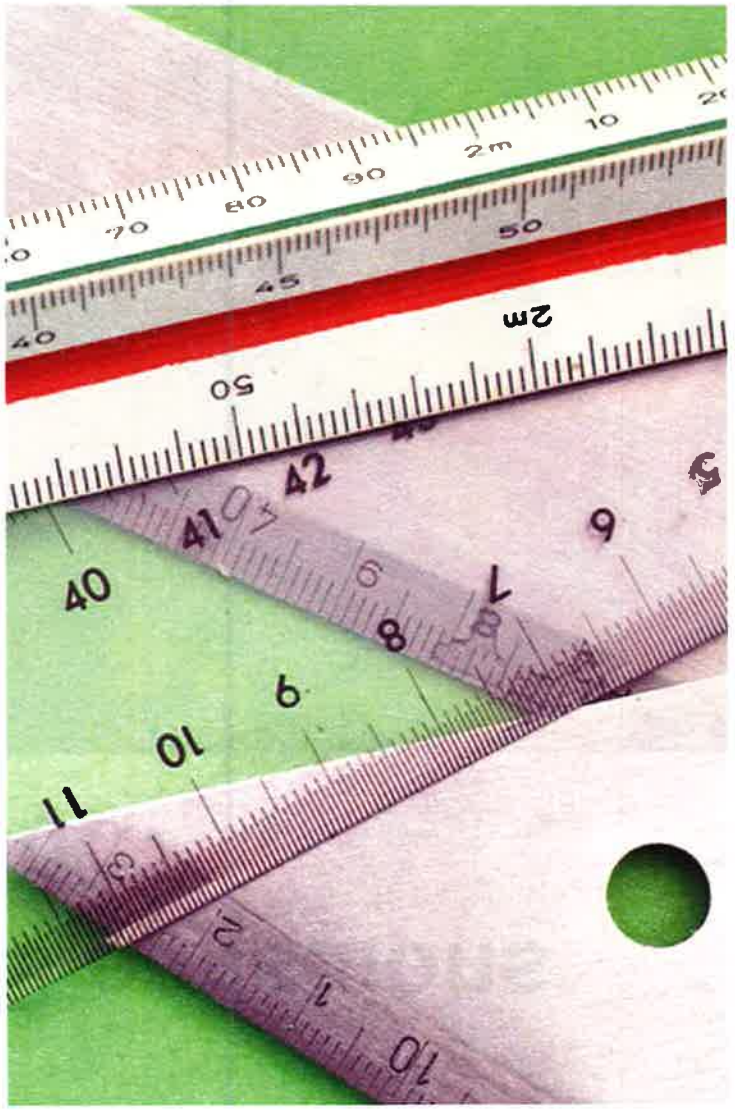
State of California Climate Policy

- **AB 32** (CA Global Warming Solutions Act)
- **SB 375** (Transportation and Land Use Sectors)
- **CEQA** CA Environmental Quality Act
  - GHG emissions consideration

What is a Greenhouse Gas Inventory?

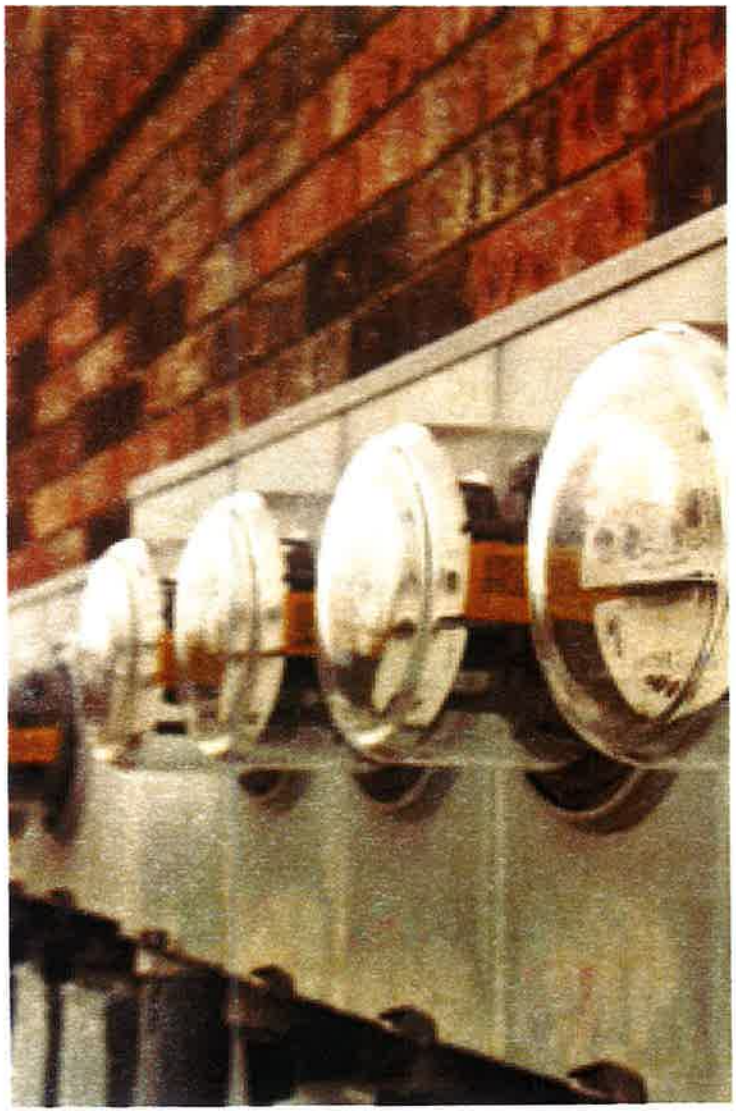
An assessment of GHG emissions from:

- Building Energy Use
- Transportation
- Wastewater
- Solid Waste



Communities with GHG emissions inventories can…

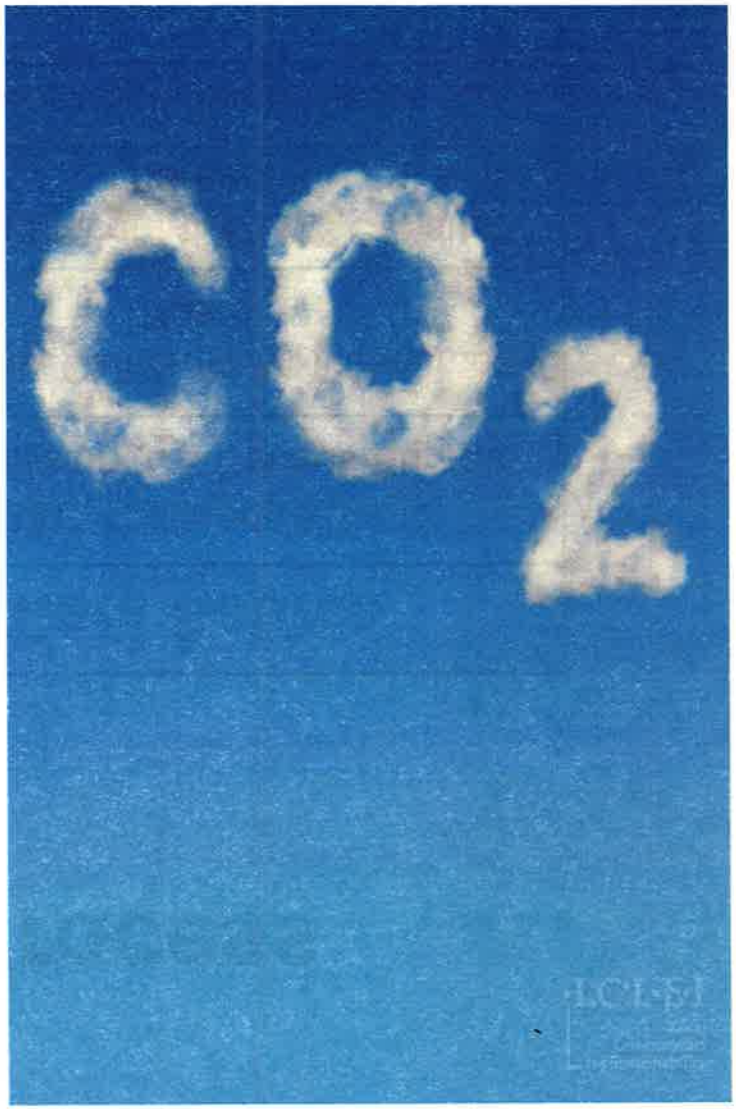
- Develop a 2005 baseline emissions snap-shot
- Create emissions reduction targets
- Identify cost savings opportunities
- Monitor emissions reduction progress



Greenhouse Gases Included in This Inventory

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)

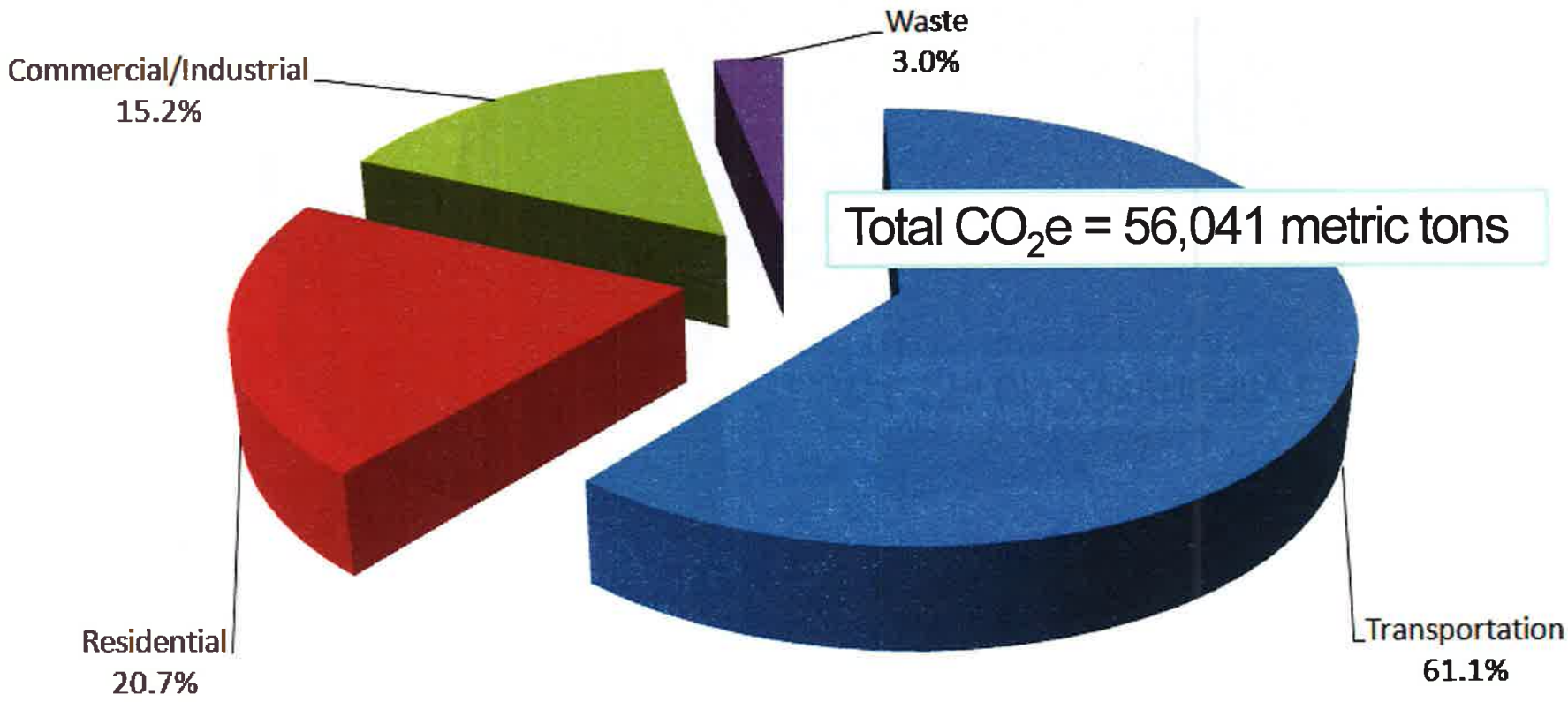
Note: GHG emissions were reported as carbon dioxide equivalents (CO_2e)



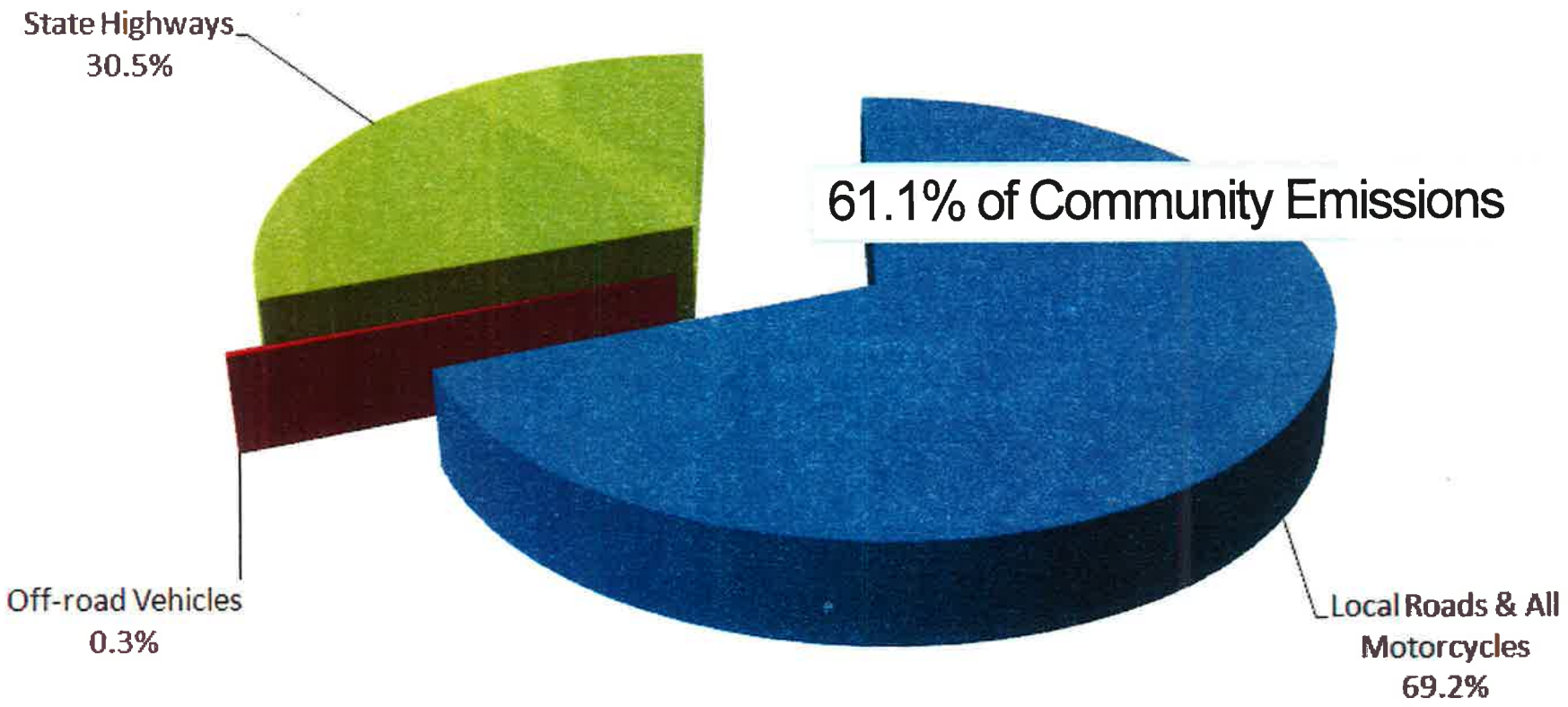
Data Collection Process

Emission Sector	Data Source
Built Environment	PG&E, California Energy Commission, US Census Bureau
Transportation	Caltrans, California Air Resources Board
Wastewater	South Placer MUD, US Census Bureau
Solid Waste	Recology Auburn Placer

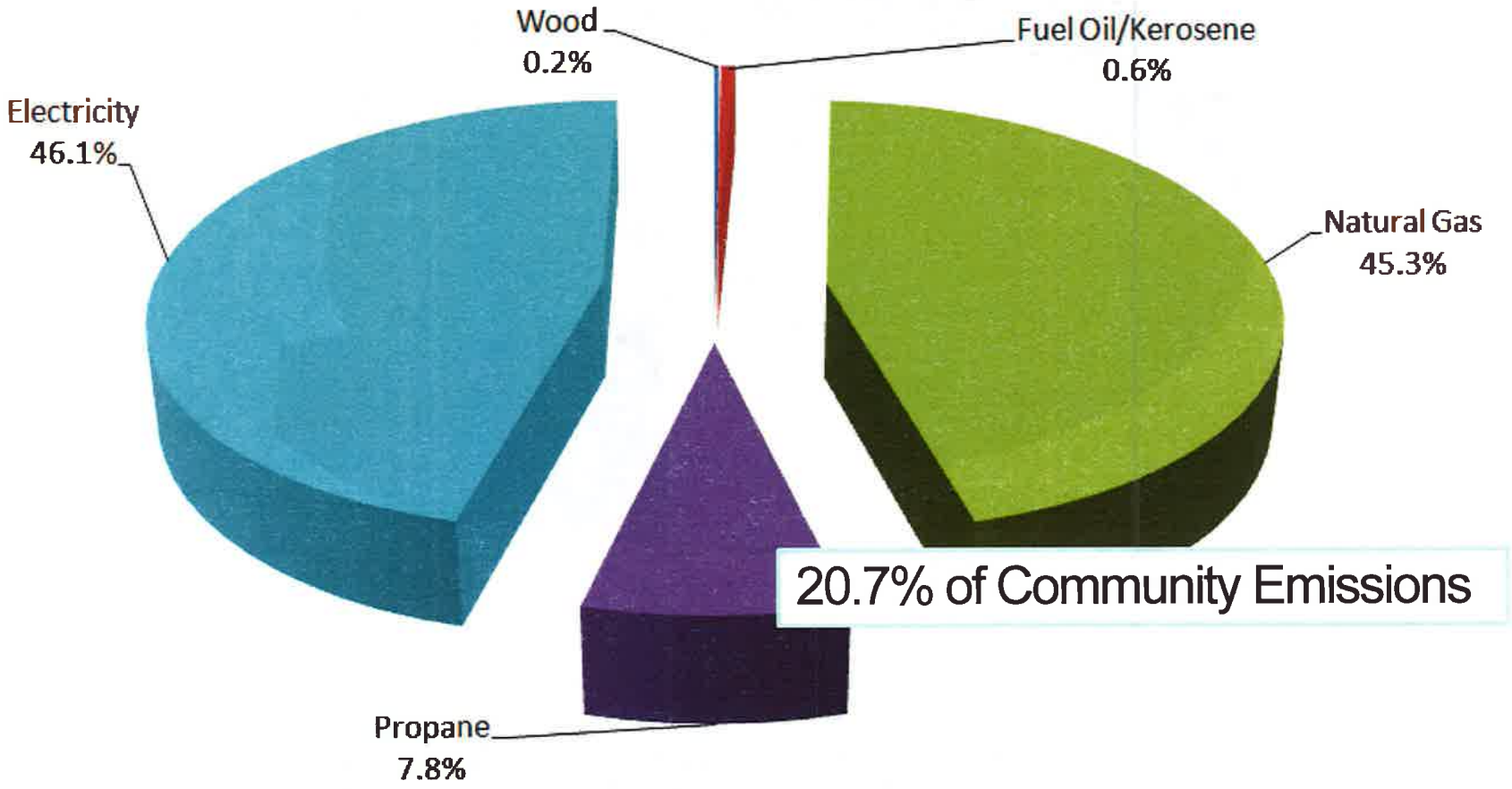
Emissions by Sector



Emissions from Transportation

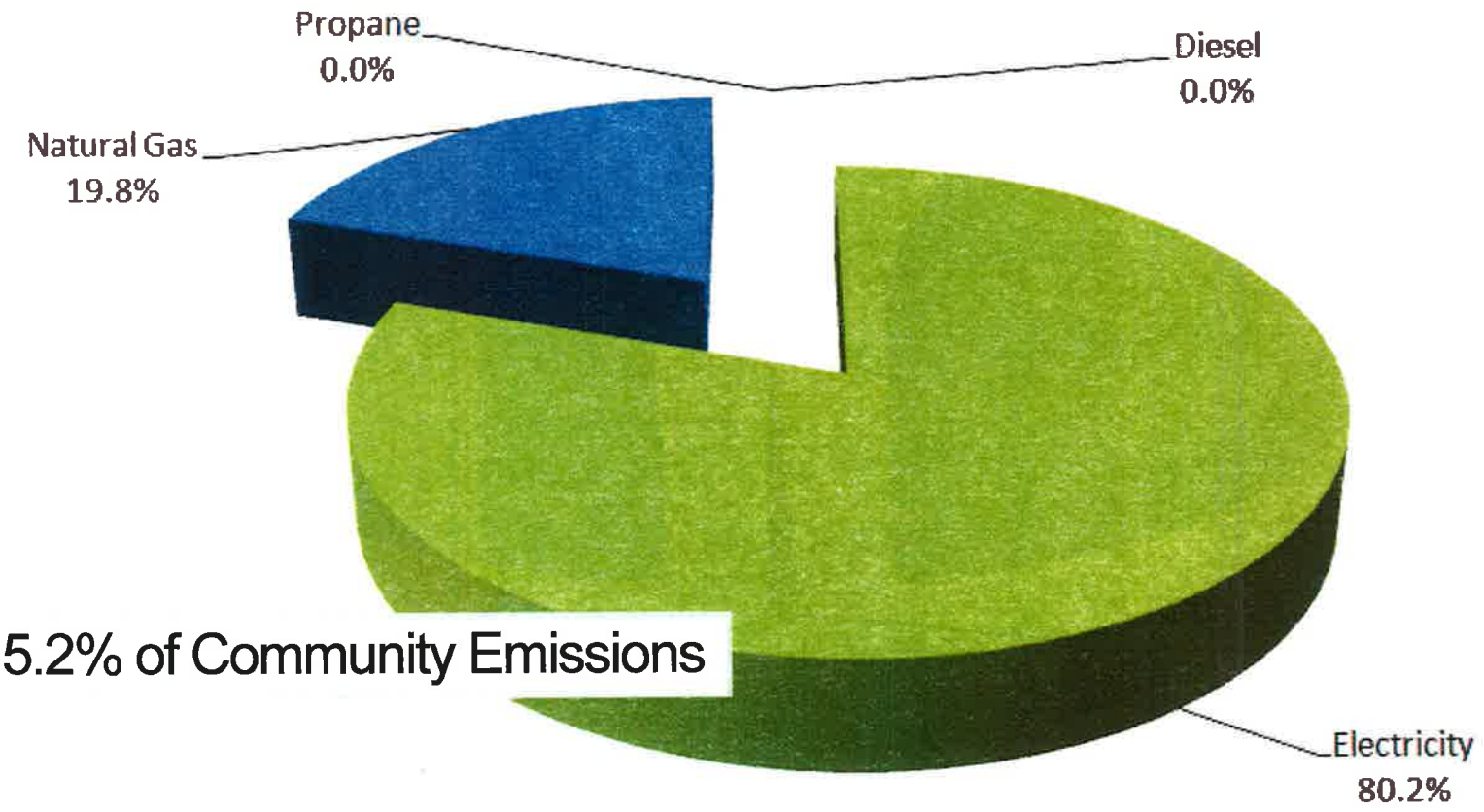


Emissions from Residential Sector



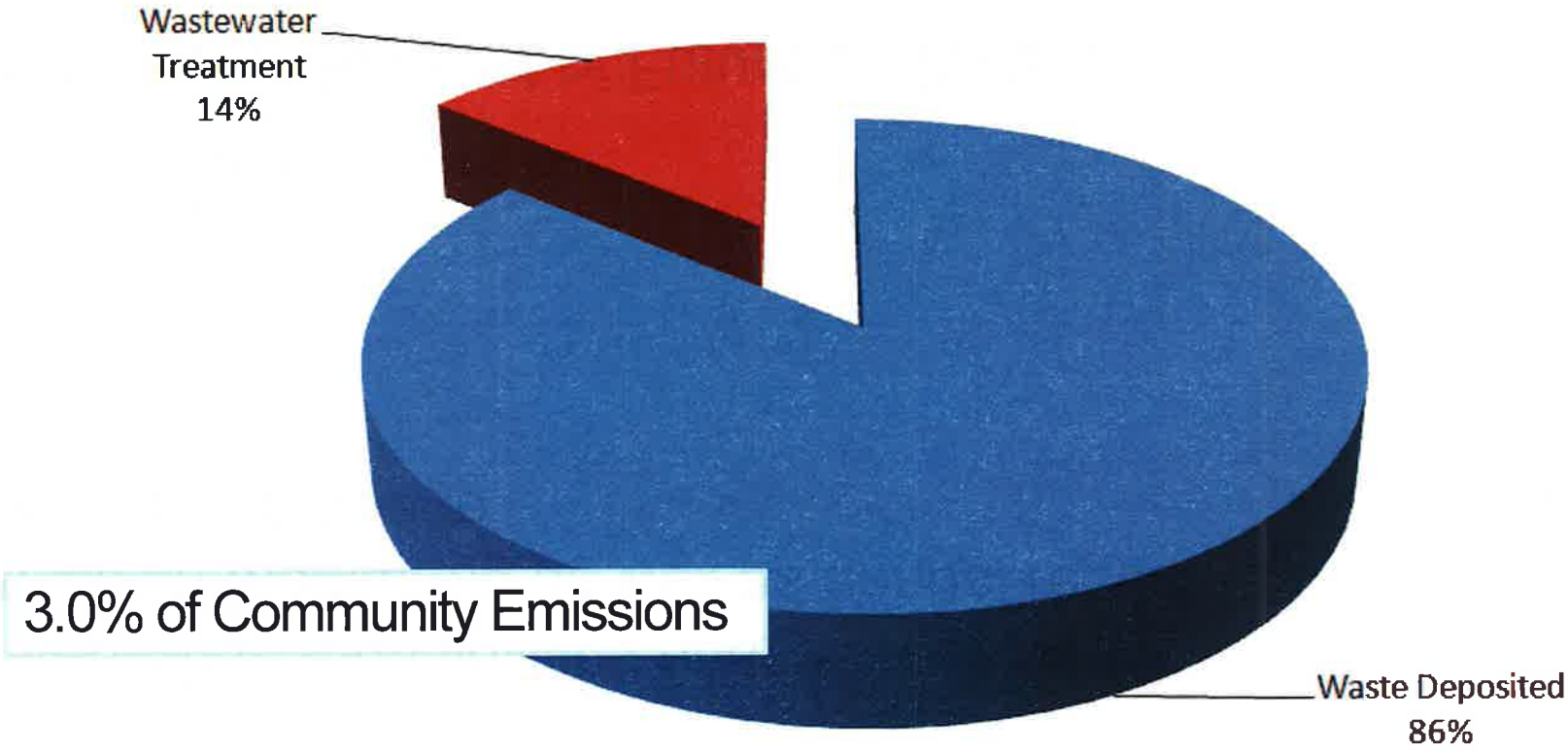
20.7% of Community Emissions

Emissions from Commercial and Industrial Sectors



15.2% of Community Emissions

Emissions from Solid Waste and Wastewater



3.0% of Community Emissions

Where can you go from here?

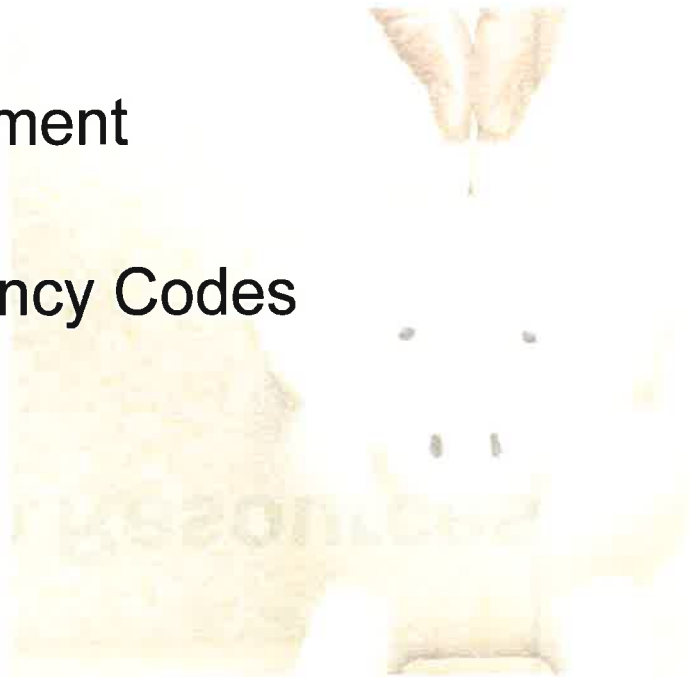
Establish responsibilities and procedures for emission monitoring as well as annual reporting to track energy usage

Next Steps…

- Conduct a Forecast of Future Emissions
- Establish Emission Reduction Targets
- Write a Climate Action Plan
- Monitor Emissions Over Time

Potential Emissions Reduction Strategies

- Electricity and Natural Gas Energy Efficiency
  - Cost-savings programs from PG&E
  - Sierra Nevada Energy Watch
  - Property assessed clean energy
- Travel Demand Management
- Updating Building Efficiency Codes



Available Resources

- Funding Sources
- Technical Assistance
- Examples of Climate Action Plans
- Statewide Energy Efficiency Collaborative (SEEC)

Questions?

What is in a Climate Action Plan?

- Insightful analysis of past progress and current status
- Planned set of strategies
- Supporting detail and justification of each strategy
- Implementation guidance

Emissions Reduction Targets

- Climate science

  IPCC: 20-45% below 1990 by 2020

  80-95% below 1990 by 2050

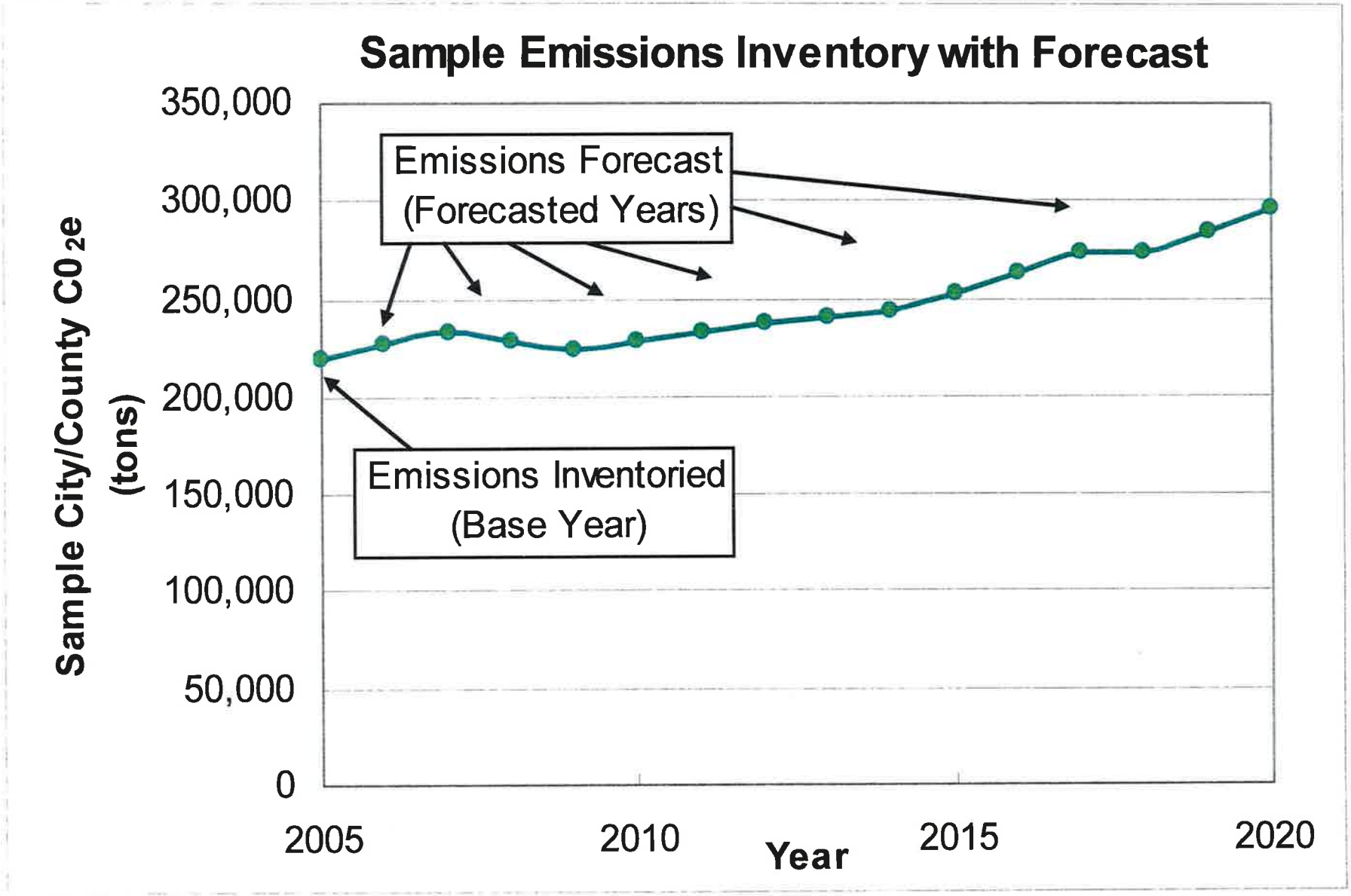
- State of California - AB32

  AB 32: 1990 levels by 2020 (~15% below "current" levels by 2020 for Local Governments)

- State of California – Executive Order S-3-05

  80% below 1990 levels by 2050

Conducting a Business-As-Usual Forecast



Target and Trajectory