APPENDIX E
Greenhouse Gas Inventory

Plumas County

2005 Community-Wide Greenhouse Gas Emissions Inventory

Lake Almanor Photo Credit: http://anglingatlas.com/2009/11/lake-almanor-plumas-county-ca/

Narrative Report

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Credits and Acknowledgements

Plumas County

Randy Wilson, Planning Director

Sierra Business Council

Nicholas Martin, Program Manager
Emma Ingebretsen, Staff Manager
Scott Legg, Lead Author

Pacific Gas and Electric Company (PG&E)

Lisa McNally, Senior Program Manager

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ICLEI-Local Governments for Sustainability USA

Amruta Sudhalkar, Program Officer
Eli Yewdall, Program Officer

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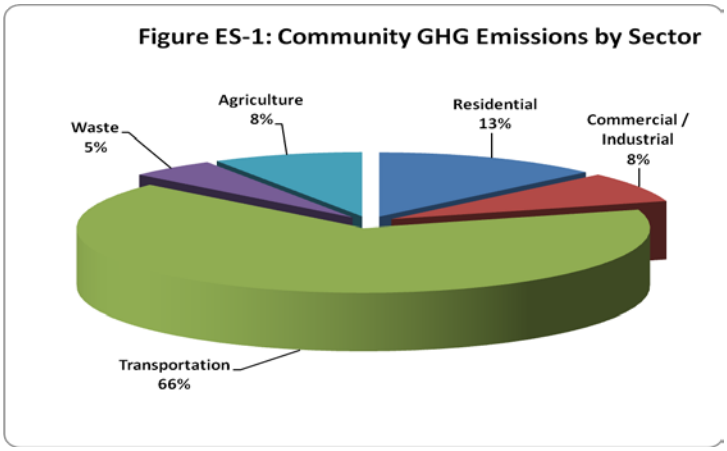
Executive Summary

The County of Plumas 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, wellbeing, and prosperity of our community. Furthermore, Plumas County has multiple opportunities to benefit by acting quickly to reduce community GHG emissions. Through implementing GHG emissions reduction strategies, Plumas County 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.

Plumas County has begun the climate action planning process, starting with inventorying emissions. Plumas County has already completed an inventory of GHG emissions from government operations. This report provides estimates of greenhouse gas emissions resulting from activities in Plumas County as a whole in 2005.

Key Findings

As can be seen in Figure ES-1, the largest contributor to community emissions is the Transportation Sector with 66% of total emissions. The next largest contributor is the Residential Sector with 13% of total emissions. Actions to reduce emissions in both of these sectors will be a key part of a climate action plan. The Commercial/Industrial, Agriculture, and Waste Sectors were responsible for the remainder of emissions.



The Inventory Results section of this report provides a detailed profile of emissions sources within Plumas County; information that is key to guiding local reduction efforts. These data will also provide a baseline against which the County 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, Plumas County will be able to take the next step of creating a formal climate action plan (CAP), after completion of the General Plan update, setting emissions reduction targets and prioritizing and setting timelines for implementing projects delineated in the CAP

Introduction

Every day, Plumas County 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, utilizing agricultural lands, and providing light and heat for buildings. All of these activities either 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 Plumas County in 2005.

The County of Plumas, located in the north eastern section of the Sierra Nevada, covers 2,613 square miles. Portola is the only incorporated city within the County. The County's 2005 population was estimated to be 18,954. Within the jurisdictional boundaries lie Feather River College and a small part of Lassen Volcanic National Park.

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, which introduces 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. Plumas County's economy and quality of life for its residents could be impacted by risks associated with climate change. Current and expected impacts to Plumas County related to climate change are explained below. Beyond Plumas County, 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 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 and add to the local economy. Reducing fossil fuel use improves air quality, and increases opportunities for walking and bicycling, improving the health of local residents.

Regional and Local Impacts

Plumas County, as do all communities in the Sierra Nevada, faces unique challenges associated with climate change in the region. 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 snowpack, delayed snow accumulation, earlier snow 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 Plumas County, 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."

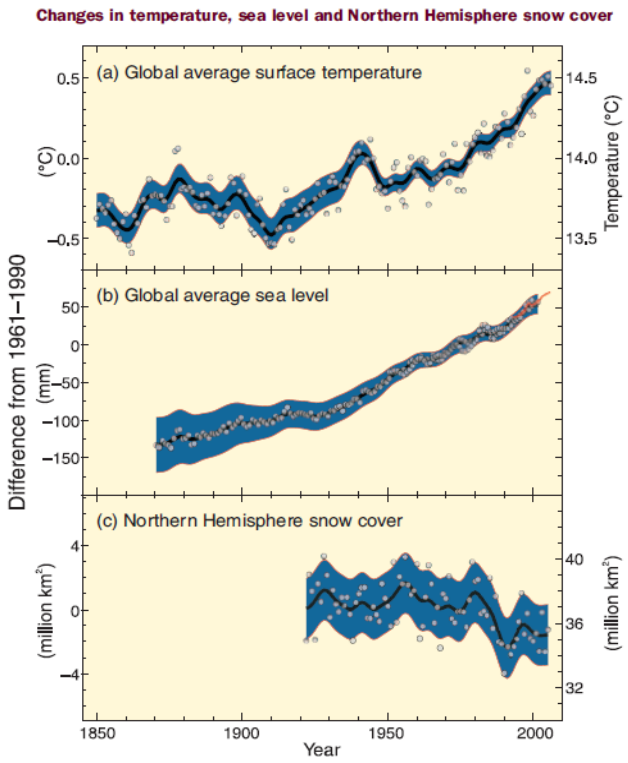


Figure 1: Observed changes in global temperature, sea level and snow cover.

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

[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.
[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>.

California Policy

On June 1, 2005, Governor Schwarzenegger issued Executive Order S-3-05, setting 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 targets of 2000 levels by 2010, 1990 levels by 2020 and 80% below 1990 levels by 2050. 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 formalized the following greenhouse gas emissions reduction target for the state of California:

- 1990 emissions levels by 2020

Additionally, the passage of SB 375, though not directly applying to Plumas County, 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. Plumas County's GHG emissions inventory is intended to enable the County 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 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]

[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

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 of local greenhouse gas emissions
2. Establish a greenhouse gas emissions forecast and a 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

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

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 Plumas County, however the County is not obligated to participate in any other milestones.

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 Plumas County

Plumas County participated in the first phase of the Green Communities Program and was able to produce a GHG emission inventory to be used as a baseline for AB32 goals. Plumas County Department of Facility Services is currently undergoing a lighting retrofit for several County facilities. This retrofit is projected to save 15-25% of the electricity annually used for facility interior and exterior lighting. This last year the Facility Department was awarded recognition from Pacific Gas and Electric Company for "outstanding retro commissioning efforts in 2011." The end result of the effort was 155,892 pounds of CO2e avoided per year. Other initiatives include an aggressive fire safe program spearheaded by the Plumas County Fire Safe Council. This program helps to reduce the risk of wildfire and subsequent GHG emissions.

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. Plumas County staff used the International Local Government GHG Emissions Analysis Protocol (IEAP) to inventory the County's community emissions. In addition, methods from the Local Government Operations Protocol were used as appropriate for specific sectors.

Plumas County 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.

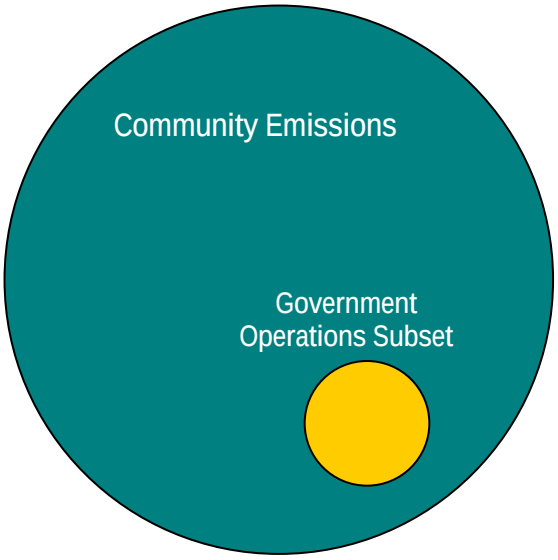


Figure 3: The Government Operations Emissions Inventory as a subset of the Community Emissions Inventory.

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 Plumas County's 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 governments worldwide.[4] 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.[5] The LGO Protocol serves as the national

[4] International Local Government Greenhouse Gas Emissions Analysis Protocol (IEAP). ICLEI. http://www.iclei.org/index.php?id=ghgprotocol
[5] Local Government Operations Protocol (LGOP). http://www.icleiusa.org/programs/climate/ghg-protocol/ghg-protocol

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 Protocol 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. Plumas County's community greenhouse gas emissions inventory utilized 2005 as its base year. 2005 is a commonly accepted baseline year in California – it is the reference year in both SB 375 and Executive Order S-3-05. In Addition, 2005 is one of the earliest years for which relatively comprehensive data is available and is the base year used in Plumas County's government operations inventory.

Establishing Boundaries

Setting an organizational boundary for greenhouse gas emissions accounting and reporting is an important step in the inventory process. Plumas County's 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 Plumas County's policies and educational programs. Although the County 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 Plumas County, but are located outside the County's jurisdictional boundaries were not included in the inventory. Conversely, a government facility operated by another jurisdiction but located within Plumas County's jurisdictional boundary was 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 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, this basic equation is used: *Activity Data x 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)	CO_2 emitted/kWh	CO_2 emitted
Natural Gas Consumption (therms)	CO_2 emitted/therm	CO_2 emitted
Gasoline/Diesel Consumption (gallons)	CO_2 emitted /gallon	CO_2 emitted
Vehicle Miles Traveled	CH_4, N_2O emitted/mile	CH_4, N_20 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 are categorized relative to the geopolitical boundary of the community or the operational boundaries of the government. Emissions sources are 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 occur 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 in a fourth category called Information Items.

Information Items

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

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. Additionally, in Plumas County, 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 emissions from the combustion of biogenic fuels are not included in Scope 1 emissions in accordance with 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
Residential
Commercial/Industrial
Transportation
Solid Waste and Wastewater
Agriculture

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 Plumas County Community Inventory

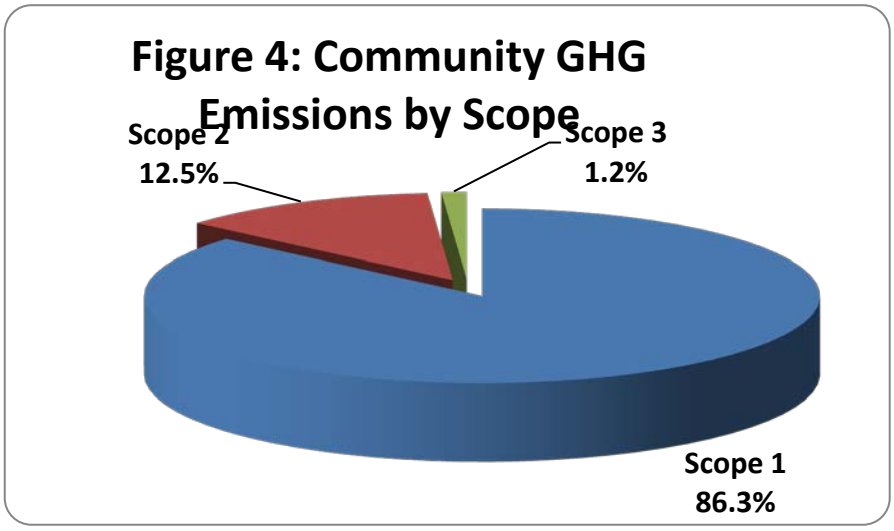
Sector	Scope 1	Scope 2	Scope 3	Information Items
Residential	Propane, Fuel Oil, Kerosene, Wood	Electricity		Biogenic Emissions from Wood Combustion
Commercial/Industrial	Propane, Diesel, Wood Waste	Electricity		Biogenic Emissions from Combustion of Wood Waste
Transportation	Gasoline & Diesel			
Solid Waste and Wastewater	Chester, Gopher Hill, City of Portola Landfills Historic Dumps and Wastewater Treatment		Future Emissions from 2005 Waste	
Agriculture	Enteric Fermentation, Manure Management, Fertilizer			

Total roll-up community emissions for Plumas County were 403,280 metric tons[6] 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	19,372	32,396	0	51,768	14,439
Commercial / Industrial	12,828	17,981	0	30,809	556,812
Transportation	266,717	0	0	266,717	0
Solid Waste and Wastewater	14,943	0	4,854	19,798	0
Agriculture	34,188	0	0	34,188	0
TOTAL	348,048	50,377	4,854	403,280	571,251
% of Total CO_2e	86.3%	12.5%	1.2%	100.0%	

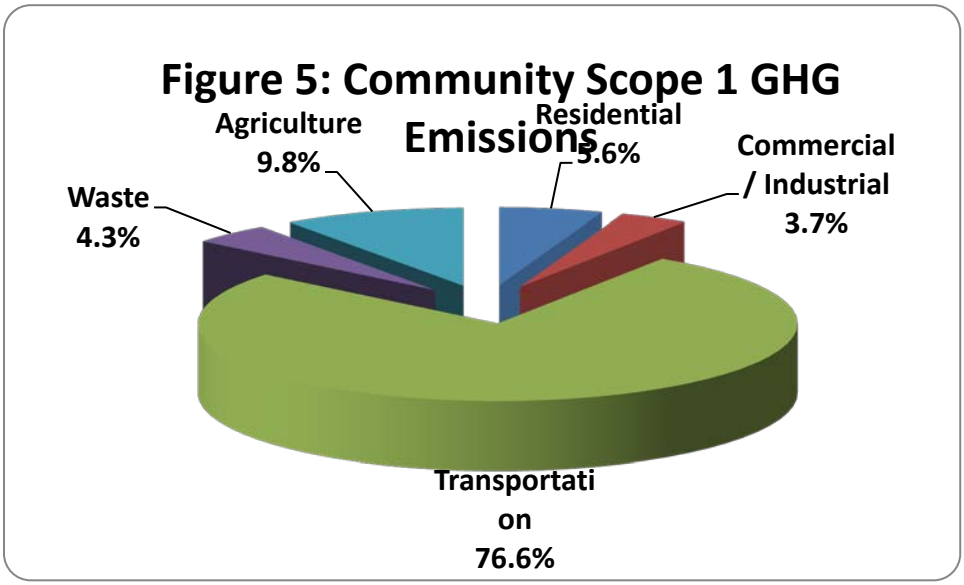
[6] All emissions estimated using ICLEI's CACP 2009 Software.



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 (76.6 percent). The Transportation Sector emissions were the result of diesel and gasoline use within County limits on local roads, on State highways, and by off-road vehicles. The remainder of Scope 1 emissions came from stationary fuel combustion (combustion of propane, fuel oil, kerosene, wood) in Plumas County homes (Residential Sector, 5.6 percent), stationary fuel combustion in businesses/industry (Commercial/Industrial Sector, 3.7 percent), the Agriculture Sector (9.8 percent), and fugitive emissions from wastewater treatment, landfills, and small historic dumps (Solid Waste and Wastewater Sector, 4.3 percent).

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

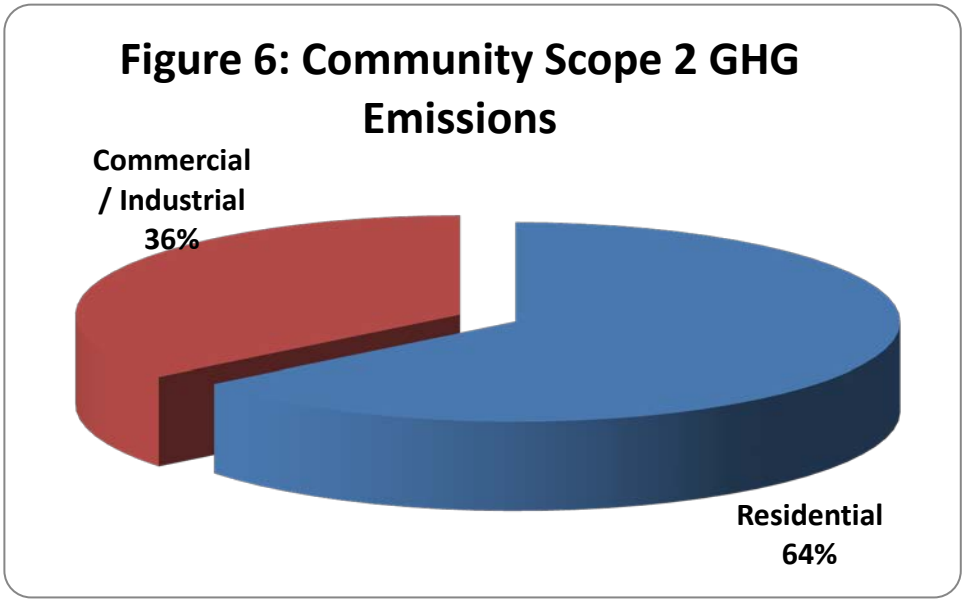
Scope 1 Emissions By Sector	Residential	Commercial / Industrial	Transportation	Solid Waste and Wastewater	Agriculture	TOTAL
CO_2e (metric tons)	19,372	12,828	266,717	14,943	34,188	348,048
% of Total CO_2e	5.6%	3.7%	76.6%	4.3%	9.8%	100%
MMBtu	417,758	5,951,303	3,231,583	0	0	9,600,644



As shown in Table 7 and Figure 6, 36 percent of 2005 Scope 2 emissions were generated by the Commercial/Industrial Sector. Sixty-four percent of Plumas County's Scope 2 emissions came from electricity consumption by the Residential sector within County boundaries. As noted above in the general description of Scope 2 parameters, the actual emissions from these activities were generated outside of Plumas County 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
CO_2e (metric tons)	32,396	17,981	50,377
% of Total CO_2e	64%	36%	100%
MMBtu	329,214	202,443	531,657



The remaining portion of emissions included in the County of Plumas 2005 community inventory fall under the category of Scope 3. All emissions in this category are an estimate of future emissions over the lifecycle decomposition of waste and alternative daily cover (ADC) sent from within Plumas County to a landfill in the base year (2005).[7]

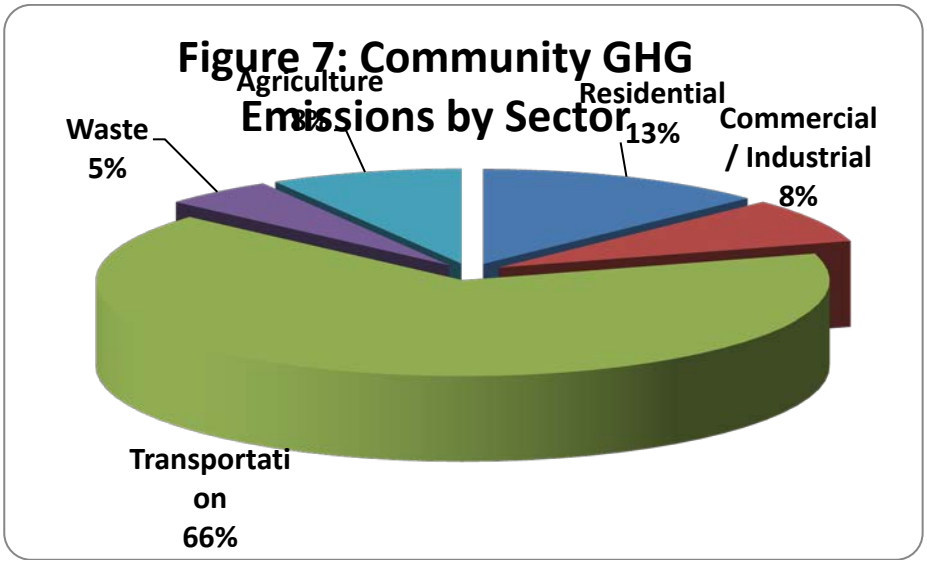
In addition to Scope 1, Scope 2, and Scope 3 emissions, there were emissions of 571,251 metric tons CO_2e designated as information items. These emissions came from wood burned as a heating fuel in Plumas County homes and wood waste used for power generation in the SPI Quincy and Collins Pine plants. Information items are not included in any inventory roll-up numbers.

Emissions by Sector

In addition to considering emissions via scopes, we can also focus specifically on each sector, with emissions aggregated by sector. As visible in Table 8 and Figure 7 below, emissions from the Transportation Sector (Scope 1 gasoline and diesel) accounted for 66 percent of total community emissions, by far the largest source of community emissions. Electricity, propane, wood burning, and fuel oil/kerosene consumption within the Residential Sector were the source of 13 percent of the County's overall emissions. Electricity, propane, stationary diesel, and wood waste fuel usage from the Commercial/Industrial Sector accounted for 8 percent of community emissions. The remaining 13 percent of emissions came from the agriculture and waste sectors. 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	Agriculture	TOTAL
CO_2e (metric tons)	51,768	30,809	266,717	19,798	34,188	403,280
% of Total CO_2e	13%	8%	66%	5%	8%	100%
MMBtu	746,973	6,153,746	3,231,583	0	0	10,132,301



[7] The Solid Waste and Wastewater section of this report presents more detail on emissions from solid waste.

Residential

As shown in Table 8, Plumas County's Residential Sector generated an estimated 51,768 metric tons of CO_2e in 2005. This estimate was calculated using 2005 electricity consumption data provided by PG&E, PSREC, and NV Energy, as well as estimates of propane, fuel oil/kerosene and wood home fuel use based on census and weather data. It only includes residential buildings' energy 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. Plumas County households generated 5.9 metric tons of GHG emissions per household 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.

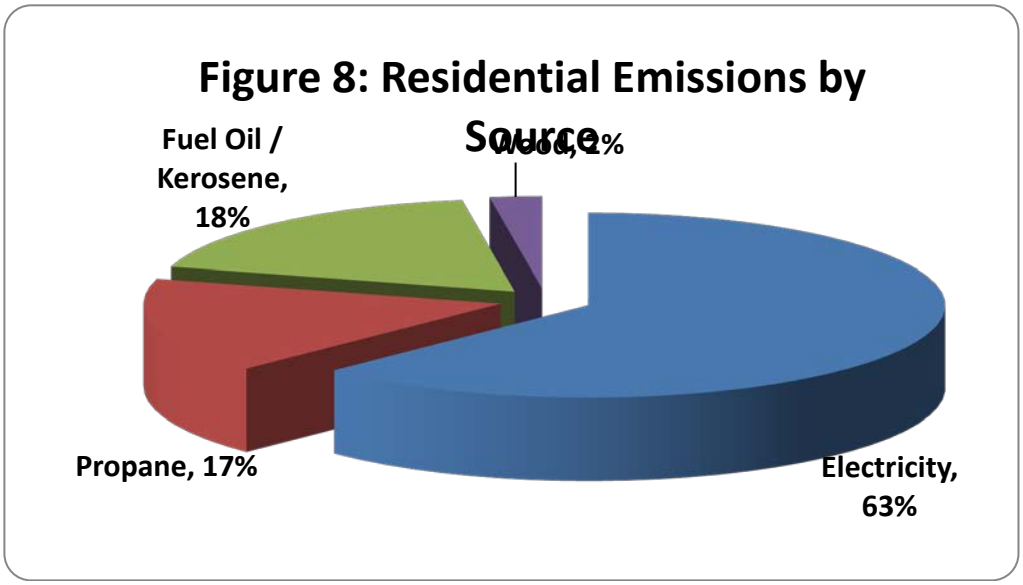
Table 9: Plumas County 2005 Greenhouse Gas Emissions per Household

Number of Occupied Housing Units	**8,843**
Total Residential GHG Emissions (metric tons CO_2e)	**51,768**
Residential GHG Emissions/Household (metric tons CO_2e)	**5.9**

Table 10 and Figure 8 illustrate the breakdown of residential GHG emissions by fuel type. Approximately 63 percent of residential GHG emissions were generated through electricity provided by PG&E, PSREC, and NV Energy. An estimated 17 percent of residential GHG emissions were generated from the use of propane. Propane is typically used in residences as a fuel for home heating, water heating, and cooking. Fuel oil and kerosene, also used for home and water heating, generated 18 percent of residential GHG emissions. Finally, wood used for home heating accounted for 2 percent of residential emissions (excluding biogenic CO_2 emissions).

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

Residential Emission Sources 2005	Electricity	Propane	Fuel Oil / Kerosene	Wood	TOTAL
MTCO2e	**32,396**	**8,665**	**9,484**	**1,222**	**51,768**
% of Total CO2e	**63%**	**17%**	**18%**	**2%**	**100%**
MMBtu	**329,214**	**136,366**	**127,456**	**153,936**	**746,973**



Commercial/Industrial

As mentioned previously, Plumas County's businesses and industries generated nearly 8 percent of community-wide GHG emissions in 2005, or 30,809 metric tons of CO_2e.

In addition to emissions from electricity consumption, there were additional Commercial/Industrial sector stationary combustion emissions included in this inventory.[8] These data were provided by the Northern Sierra Air Quality Management District and include CO_2, CH_4, and N_2O emissions from propane, diesel, and wood waste. Appendix C provides details on Commercial/Industrial emissions methods.

As illustrated in Table 11 and Figure 9, Commercial/Industrial electricity consumption accounted for 58.4 percent of the Commercial/Industrial greenhouse gas emissions. Non-biogenic emissions from wood waste cogeneration at the Sierra Pacific Industries (SPI) Sawmill in Quincy and the Collins Pine Sawmill in Chester accounted for 38.0 percent. These facilities used most of the generated power and heat on-site for their own production processes, and sold the remaining generated power to the grid.[9] In this inventory, all fuel use at these facilities was counted as Scope 1 emissions, since exact data on electricity sold to the grid is not available. Generators and power plants using propane and diesel as fuel accounted for 3.6 percent of the Commercial/Industrial greenhouse gas emissions identified in this study. Propane used for space and water heating is not included; there is a lack of propane data because propane is not regulated.

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

[9] Energy Information Administration 2005 December EIA-923 Monthly Time Series File, available at http://205.254.135.7/cneaf/electricity/page/eia906_920.html. Data on net generation contained in this report does not distinguish between electricity used on site and electricity sold to the grid, but indicates that at least 71% of the fuel consumed at the Collins Pine facility and at least 74% of the fuel consumed at the SPI facility is used for the Sawmills' production processes.

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

Commercial/Industrial Emission Sources 2005	Electricity	Propane	Diesel	Wood waste at SPI and Collins Pine Facilities	TOTAL
CO_2e (metric tons)	17,981	85	1,025	11,718	30,809
% of Total CO_2e	58.4%	0.3%	3.3%	38.0%	100%
MMBtu	202,443	1,343	13,803	5,936,157	6,153,746

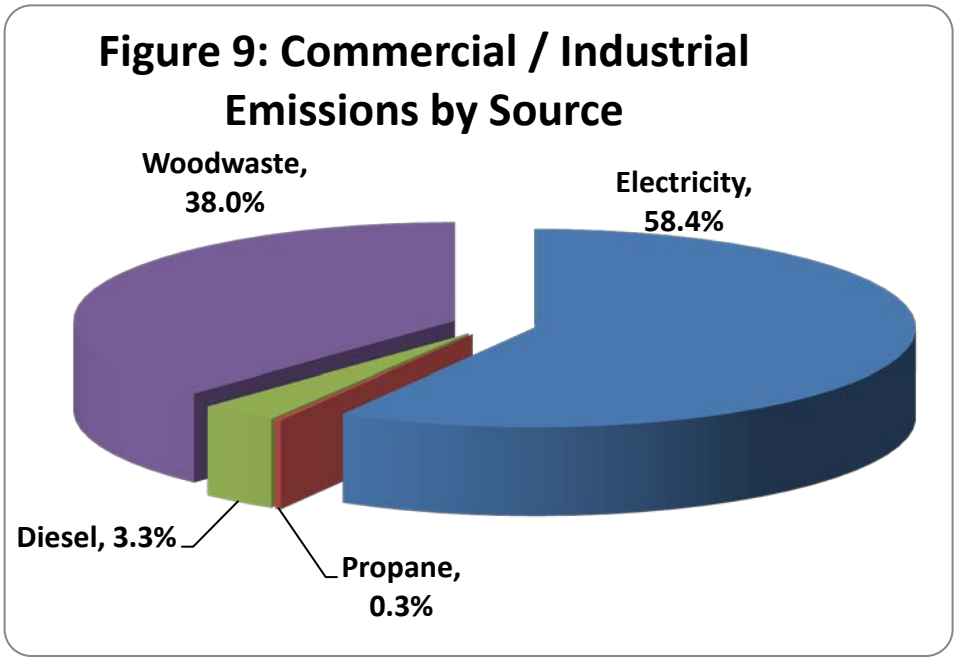


Table 12, below, details the primary 2005 stationary combustion greenhouse gas emissions from on-site power generation as reported by the Northern Sierra Air Quality Management District for specific facilities. The cogeneration facility at SPI Quincy generated over 53 percent of these stationary combustion emissions, and the Collins Pine Cogeneration Facility generated an additional 38 percent.

Table 12: Commercial/Industrial Stationary Combustion Emissions (2005) (metric tons CO_2e)

Facility/Category	Address	GHG Emissions CO_2e (metric tons)
Sierra Pacific Industries Quincy Sawmill and Cogeneration Facility[1,2]	Plumas County, CA	6,824
Collins Pine Sawmill and Cogeneration Facility[1,2]	Plumas County, CA	4,894
Sierra Pacific Industries Quincy Diesel	Plumas County, CA	717
Sierra Aggregates	Plumas County, CA	164
Feather River Rock	Plumas County, CA	75
Plumas County Animal Control	Plumas County, CA	60
Total		12,734

1 Does not include biogenic CO_2 emissions from combustion of woodwaste.

2 Includes emissions from electricity sold to the grid; data on exact quantity of electricity sold to the grid vs. electricity used on site was not available.

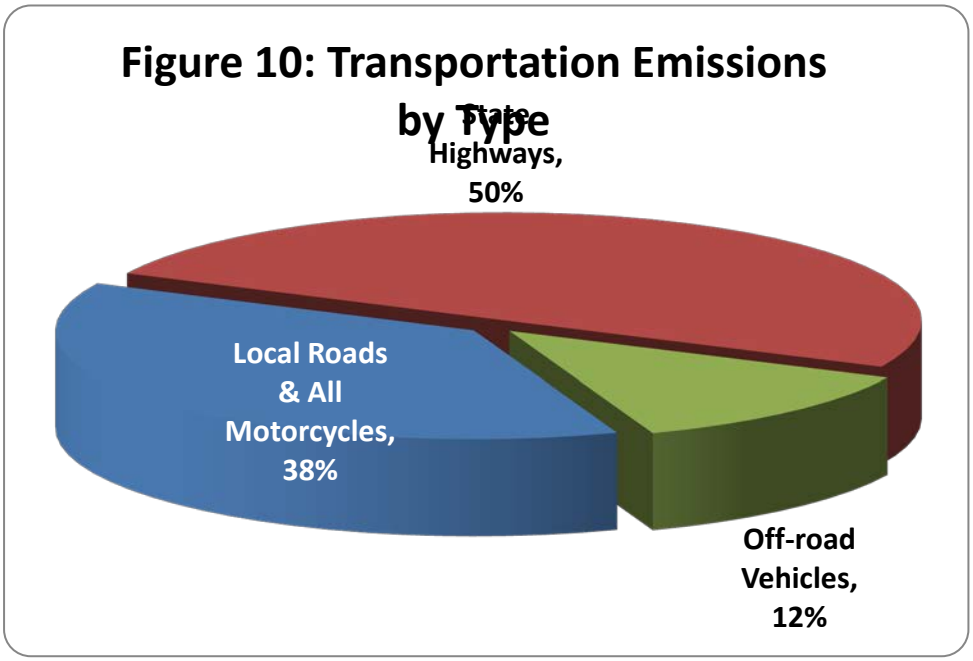
Transportation

As shown previously in Figure 7 and Table 8, Plumas County's Transportation Sector accounted for 266,717 metric tons CO_2e, or 66 percent of the County's 2005 GHG emissions. The Transportation Sector analysis includes emissions from all vehicle use within Plumas County's boundaries (whether on local roads or State highways passing through Plumas County's jurisdiction), including off-road vehicles and machines. [10]

Figure 10 and Table 13, show that nearly 50 percent of Plumas County's 2005 transportation-related greenhouse gas emissions were generated from vehicle miles traveled (VMT) on state highways located within County boundaries, while 38 percent were generated from vehicles on local roads and from motorcycles. Off-road vehicles generated the remaining 12 percent of transportation-related greenhouse gas emissions. The methodology used in this inventory to estimate VMT has the potential to overestimate transportation emissions within Plumas County due to seasonal closure of roads. The methodology, based on standard reporting protocols, used available County level data provided by Caltrans.[11]

Table 13: Transportation Emissions by Type (metric tons CO_2e)

Transportation Road Type Emissions Sources 2005	Local Roads & All Motorcycles	State Highways	Off-road Vehicles	TOTAL
CO_2e (metric tons)	100,617	133,132	32,967	266,717
% of Total CO_2e	38%	50%	12%	100%
MMBtu	1,389,539	1,842,043	data not available	3,231,583



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

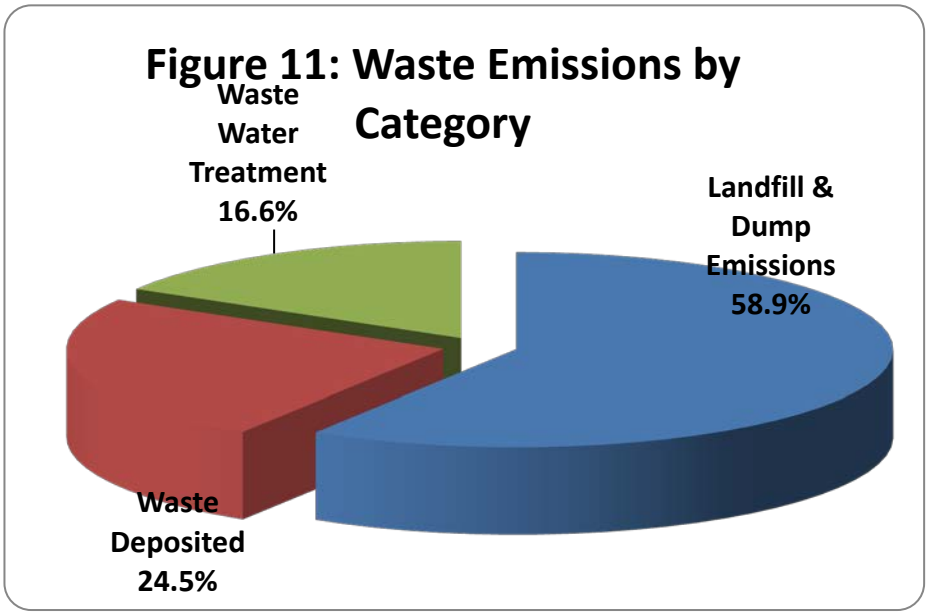
Emissions from the air travel of Plumas County residents and trains passing through Plumas County were not included in the Transportation Sector analysis. With more time and the availability of additional data, the greenhouse gas emissions from air travel and pass through trains could be estimated. Because there were no major airports located within the geographic boundaries of Plumas County 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 Solid Waste and Wastewater Sector constituted 5 percent of total 2005 emissions for the community of Plumas County. Table 14 and Figure 11 detail Solid Waste and Wastewater emissions by category.

Table 14: Solid Waste and Wastewater Emissions by Category (metric tons CO_2e)

Waste Emissions Categories 2005	Landfills & Historic Dump Emissions (Scope 1)	Waste Deposited (Scope 3)	Wastewater Treatment (Scope 1)	TOTAL
CO_2e (metric tons)	11,663	4,854	3,280	19,798
% of Total CO_2e	58.9%	24.5%	16.6%	100%



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 landfills or dumps. This inventory accounted for both 2005 Scope 1 fugitive emissions from Chester, Gopher Hill, and the City of Portola Landfills, and historic dumps within the jurisdiction, as well as Scope 3 future emissions associated with all solid waste generated in 2005 within the community[12]:

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

- *Landfill & Historic Dump Emissions (Scope 1):* Total emissions from the Chester, Gopher Hill and City of Portola Landfills and historic dump sites in 2005. These emissions were the result of decomposing organic waste still in-place in the landfills and dumps located in Plumas County.[13] Specifically, included in the inventory were estimated fugitive emissions (emissions not captured by any methane recovery) coming off the landfills and dumps in 2005.
- **W***aste Generation (Scope 3):* Emissions from waste generated within Plumas County in 2005 and from alternative daily cover (ADC) sent to landfills. These emissions are the estimated future emissions of 2005-generated waste or ADC that was sent to any landfill by Plumas County residents or businesses. These emissions were categorized as Scope 3 because they are 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, while the Scope 1 method is most relevant to landfill gas management practices. Therefore both pieces of information are policy-relevant. Transportation emissions generated from the collection, transfer and disposal of solid waste are included in Transportation Sector GHG emissions.

Wastewater emissions are an estimate of fugitive N_2O and CH_4 emissions (Scope 1) from Quincy Community Service District and Grizzly Ranch Community Service District Wastewater Treatment Plants (WWTP), Indian Valley Community Service District and Chester Public Utilities District Wastewater Treatment Facilities (WWTF), and decentralized septic systems in 2005. Wastewater treatment contributed 16.6 percent of the Waste Sector emissions in the community of Plumas County.

The wastewater emissions from centralized WWTPs were the result of nitrification/denitrification processes and aerobic digestion. Nitrification/denitrification is a process employed to reduce nitrogen levels within influent, but it does not eliminate them. Emissions from centralized WWTFs were the result of anaerobic digestion through facultative lagoons. There was no conventional capture technology so emissions were the direct result of the decomposition of organic matter within the lower depths of the pond where anaerobic/anoxic conditions occur.

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 are 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[14].

Agriculture

As shown in Table 8 and Figure 7, the Agriculture Sector in Plumas County accounted for 34,188 metric tons CO_2e, or approximately eight percent of the County's 2005 GHG emissions. Land use analysis showed that in comparison to the

[13] It can take over 100 years for a given quantity of waste to fully decompose in a landfill, releasing methane and other gases as it breaks down. As such, base year landfill emissions are the result of many years of waste disposal.
[14] See Appendix E for more information on methods and emissions factors used in the Wastewater Sector analysis.

county as a whole, the limited agriculture land within the city limits was deemed to be insignificant. As a result, emissions resulting from agricultural activity were assumed to be de minimis in City inventories and all emissions were attributed to the County. The Agriculture sector analysis includes three general sources of agricultural process emissions, as delineated in Table 15.

Table 15: Agricultural Emissions by Process (metric tons CO_2e)

Agriculture Process Emissions Sources 2005	Livestock Enteric Fermentation	Livestock Manure Management	Fertilizer Application	TOTAL
CO_2e (metric tons)	15,173	579	18,436	34,188
% of Total CO_2e	44%	2%	54%	100%
MMBtu	N/A	N/A	N/A	34,188

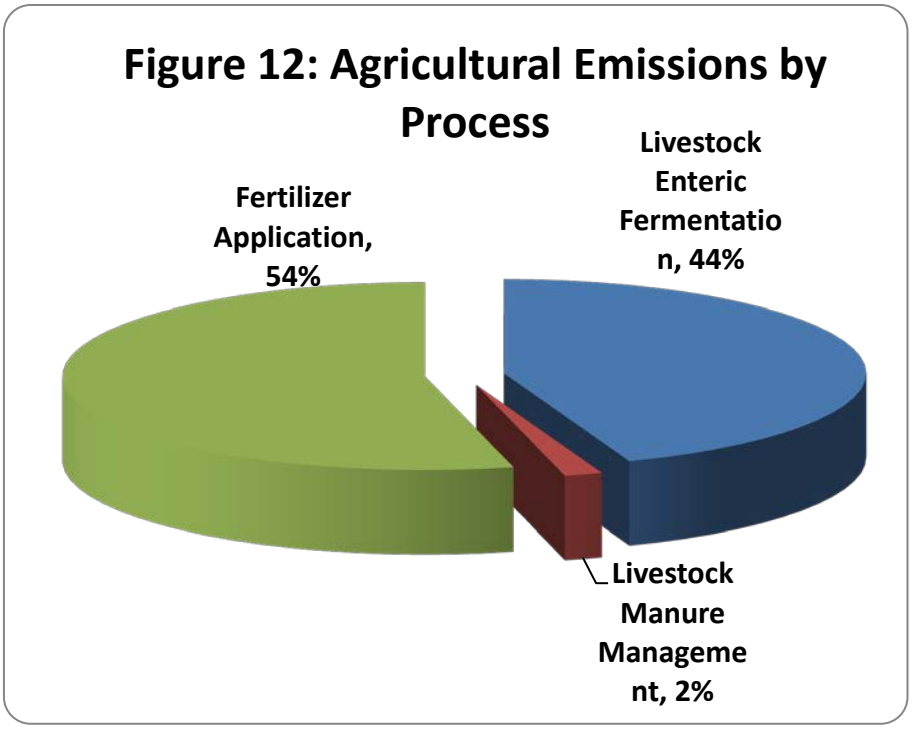


Table 15 and Figure 12 show that fertilizer application contributed 54 percent of Plumas County's total agricultural process emissions. Livestock enteric fermentation contributed 44 percent, and livestock manure management the remaining 2 percent. The emissions associated with energy consumption and transportation in the agricultural sector are reflected in the industrial and transportation emission totals respectively. The methodology and data sources used to quantify emissions from the agricultural sector are described in Appendix G.

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 and against regional and national averages[15]. That said, due to differences

[15] Per capita CO_2e emissions were 24.3 tonnes per year for the United States and 13.0 tonnes per year for California. World Resources Institute: http://www.laedc.org/sclc/documents/Global_AB32Challenge.pdf.

in emission inventory methods, it can be difficult to get a directly comparable per capita emissions number, and one must be cognizant of this margin of error when comparing figures.

Table 16 divides the emissions roll-up number by population to yield 21.3 metric tons of CO_2e per capita. Community GHG Scope 1, 2 and 3 roll-up emission numbers arise from residential and commercial/industrial sectors, including emissions from cogeneration facilities where the majority of power is used on-site, transportation, agriculture, solid waste generation and wastewater treatment. It is important to understand that this number is not the same as the carbon footprint of the average individual living in Plumas County (which would include emissions from production of goods purchased from outside the community, emissions resulting from air travel, etc.).

Table 16: Plumas County 2005 Greenhouse Gas Emissions per Capita

Estimated 2005 Population	**18,954**
Community GHG Emissions (metric tons CO_2e)	**403,280**
GHG Emissions / Resident (metric tons CO_2e)	**21.3**

Conclusion & Next Steps

This analysis found that the Plumas County community as a whole was responsible for emitting 403,280 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, Plumas County 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 Plumas County moves forward with considering emission reduction strategies and works to create a local climate action plan, the County 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. A Climate Action Plan is a document that is developed by County staff to identify the sources of GHG emissions and strategies for reducing those emissions. The plan would pool stakeholders (elected officials, staff, public) to develop reduction targets appropriate to Plumas County and its residents. Through these efforts and others the County of Plumas can achieve additional benefits beyond reducing emissions, including saving money and improving Plumas County's economic vitality and its quality of life. County 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 Plumas County's 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 percent 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. Plumas County should give itself enough time to implement chosen emissions reduction measures—noting that the farther out the target year is, the more Plumas County should pledge to reduce. ICLEI recommends that regardless of the chosen long-term emissions reduction target (e.g., 15-year, 40-year), Plumas County 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, Plumas County 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, Plumas County 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 Plumas County 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 Plumas County's 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 Residential Sector was a major source of emissions from Plumas County's community activities, it is possible that Plumas County could meet near-term targets by implementing a few major actions to reduce residential related emissions. Medium-term targets could be met by additional emission reductions for the Transportation and Commercial/Industrial Sectors, and 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, SBC, PG&E and ICLEI recommend that Plumas County focus on the following tasks in order to significantly reduce emissions from its community activities:

- Reduce vehicle miles traveled by encouraging carpooling and increasing public transportation, and encouraging the use of bicycle lanes on local roads (Travel Demand Management).
- Promote use of low emission vehicles
- Improving electricity and natural gas energy efficiency through cost-savings programs from PG&E such as Sierra Business Council's Sierra Nevada Energy Watch.
- Develop Renewable Energy Programs
- Reduce Energy Use
- Expand Recycling Efforts

- Encourage LEED Certified Construction
- Participate in Phase III of PG&E's Green Communities Program: Develop a local Climate Action Plan

Using these strategies as a basis for a more detailed overall emissions reduction strategy, or climate action plan, Plumas County 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 Plumas County 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	32,396	8.03%	329,214	PG&E, PSREC, NV Energy
	Propane	8,665	2.15%	136,366	US Census Estimates, NOAA
	Fuel Oil / Kerosene	9,484	2.35%	127,456	US Census Estimates, NOAA
	Wood	1,222	0.30%	153,936	US Census Estimates, NOAA
Subtotal Residential		51,768	12.84%	746,973	
Commercial/Industrial	Electricity	17,981	4.46%	202,443	PG&E, PSREC, NV Energy
	Propane	85	0.02%	1,343	NSAQMD
	Diesel	1,025	0.25%	13,803	NSAQMD
	Sierra Pacific Industries Quincy Sawmill and Cogeneration Facility	6824	1.69%	3,457,116	
	Collins Pine Sawmill and Cogeneration Facility	4894	1.21%	2,479,041	
Subtotal Commercial		30,809	7.64%	6,153,746	
Transportation					
Local Roads AVMT	Gasoline	84,149	20.87%	1,169,593	Caltrans/CARB
	Diesel	16,279	4.04%	219,946	Caltrans/CARB
State Highways AVMT	Gasoline	111,552	27.66%	1,550,472	Caltrans/CARB
	Diesel	21,580	5.35%	291,571	Caltrans/CARB
Motorcycles	All	189	0.05%	Data Not Available	CARB
Off-Road	All	32,967	8.17%	Data Not Available	CARB
Subtotal Transportation		266,717	66.14%	3,231,583	
Waste					
No Capture Landfills	Chester , Gopher Hill, City of Portola Landfills	9,771	1.02%	0	County Staff/Cal Recycle/Vestra.
	Historical Dumps	1,892	0.47%	0	Cal Recycle, US Census Bureau
Waste Deposited	Export – All Solid Waste	4,854	1.20%	0	Cal Recycle
Waste Water	Central Treatment	118	0.03%	0	County Staff / US Census Bureau
	Lagoons	1,259	0.31%	0	County Staff / US Census Bureau
	Septic Systems	1,902	0.47%	0	County Staff / US Census Bureau
Subtotal Waste		19,798	4.91%	0	
Agriculture	Livestock Enteric Fermentation	15,173	3.76%	N/A	Department of Agriculture
	Livestock Manure Management	579	0.14%	N/A	Department of Agriculture
	Fertilizer Application	18,436	4.57%	N/A	Department of Agriculture
Subtotal Agriculture		34,188	8.48%		
Grand Total		403,280	100%	10,132,301	

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	54,268,877
	Electricity Consumption NV Energy	kWh	4,696,216
	Electricity Consumption PSREC	kWh	36,693,367
	LPG (Propane) Consumption	BTUs	136,366,476,365
	Fuel Oil / Kerosene Consumption	BTUs	127,456,166,830
	Wood for Home Heating Consumption	BTUs	153,935,757,460

Table B – 2: Data Sources

Electricity	kWh	Pacific Gas & Electric (PG&E)
		NV Energy
		Plumas Sierra Rural Electric Cooperative (PSREC)
Home Heating Estimations (Propane, Fuel Oil / Kerosene and Wood)	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	Green House 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

Methods:

Utility Derived Data

Electricity consumption data was collected from Pacific Gas & Electric Company (PG&E), NV Energy and Plumas Sierra Rural Electric Cooperative (PSREC) for all facilities within unincorporated Plumas County. Utility electricity consumption is shown in Table B-1. The data provided was broken out by residential, commercial or industrial use where possible. The residential electricity 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 provided by PG&E, Sierra Pacific Resources' reported grid emissions factors for electricity provided by NV Energy (Sierra Pacific Resources was purchased by NV Energy after 2005) and the CARB California Grid Average for electricity provided by PSREC because specific 2005 emission factors were not available. Data sources are summarized in Table B-2.

Non-Utility Derived Data

Liquid petroleum gas (propane), fuel oil/kerosene and wood for home heating estimations were determined using three sources of data: heating degree days (HDD), home heating fuel type estimates and space heating and water heating factors. The results are summarized in Table B-1. The heating degree days were determined for Plumas County using a combination of the reported numbers by NOAA for the Sacramento and North East Inter Basins drainages (since Plumas County straddles both drainage basins). The number of heating degree days were proportioned based on the land area within each drainage basin: 95% Sacramento and 5% North East Inter Basins. Then, the number of homes

within unincorporated Plumas County using propane, 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 propane, fuel oil/kerosene and wood were calculated by multiplying the total 2005 HDDs by the number households in unincorporated Plumas County 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 below. 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 unincorporated Plumas County 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	**4,181.20**	**4,181.20**	**4,181.20**
# Homes Using Other Fuels for Space Heating	**2,112.00**	**1,974.00**	**3,161.00**
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	**102,851,097,676.80**	**96,130,713,453.60**	**153,935,757,460.40**
= (factor x HDD x # of households)			
Annual water heating subtotal	**33,515,378,688.00**	**31,325,453,376.00**	**N/A**
= (factor X # of households)			
Total BTU	**136,366,476,364.80**	**127,456,166,829.60**	**153,935,757,460.40**

Appendix C - Commercial/Industrial Sector Notes

Table C – 1: Data Inputs

Commercial	Electricity Consumption PG&E	kWh	37,312,974
	Electricity Consumption NV Energy	kWh	998,447
	Electricity Consumption PSREC	kWh	14,321,722
Industrial	Electricity Direct Access Industrial PG&E	kWh	1,449,711
Direct Access	Electricity Direct Access Residential	kWh	801,296
	Electricity Direct Access Commercial	kWh	5,232,873
Power Generation	Emergency Generators - Diesel Consumption	Gallons	3,011
	Stationary Combustion - Diesel Consumption	Gallons	97,013
	Stationary Combustion - Propane Consumption	Gallons	14,597
	Cogeneration – Wood waste Consumption	Short Tons	385,966 (224,780 SPI Quincy Sawmill, 161,186 Collins Pine Sawmill)

Table C – 2: Data Sources

Electricity	kWh	Pacific Gas & Electric
		NV Energy
		Plumas Sierra Rural Electric Cooperative
Direct Access	kWh	California Energy Commission and PG&E
Power Generation	Fuel Consumption	Northern Sierra Air Quality Management District

Methods:

Utility Derived Data

Electricity consumption data was collected from PG&E, NV Energy and PSREC for all facilities within unincorporated Plumas County, and is shown in Table C-1. The data provided was broken out by residential, commercial or industrial use where possible. The commercial and industrial electricity 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 provided by PG&E, Sierra Pacific Resources' reported grid emissions factors for electricity provided by NV Energy (since Sierra Pacific Resources was purchased by NV Energy after 2005) and the CARB California Grid Average for electricity provided by PSREC because specific 2005 emission factors were not available. Data sources are listed in Table C-2.

Direct Access Data

Direct access energy is energy supplied by a competitive energy service provider other than the utility, but uses a utility's transmission lines for distribution. All direct access data was provided by the California Energy Commission and used in the direct access calculator (see Tables C-3 and C-4 below). The direct access calculator below was used to determine the percent of direct access energy for residential and commercial/industrial sectors that was used within

unincorporated Plumas County. PG&E provided the amount of direct access electricity supplied to industrial facilities under the District category. This total was subtracted from the calculated direct access totals derived from the direct access calculator. The calculated direct access totals for unincorporated Plumas County were entered into the Clean Air and Climate Protection software where the greenhouse gas emissions were calculated using the California Grid Average emissions factors.

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	%	
Plumas County	Residential	2005	53.48	60.55%	0.45	0.07%	2,646
Plumas County	Commercial/Industrial	2005	34.85	39.45%	3.91	0.63%	5,777
Total (MWh)			88.32		622.00		8,423
Total %			1.05%		7.38%		8.43%

Table C – 4: Direct Access Estimate by Local Government

Sector	Utility Total kWh	% DA Usage	DA kWh	Calculations to Estimate Proportion	
Residential	95,658,460	0.84%	801,296	0.83%	99.17%
Commercial/Industrial	46,576,947	11.23%	5,232,873	10.10%	89.90%

Power Generation Data

Power generation data was collected from the Northern Sierra Air Quality Management District, and is summarized in Table C-1. The fuel usage in gallons was received for all stationary engines and emergency generators and in short tons of wood for sawmills/cogeneration facilities under permit in 2005. There were two sawmills in operation in unincorporated Plumas County in 2005: Sierra Pacific Industries Sawmill in Quincy, and the Collins Pine Sawmill in Chester. These facilities used most of the generated power and heat on-site for their own production processes, and sold the remaining generated power to the grid. Exact data on quantity of power sold to the grid was not available, so distinguishing between fuel already accounted for in scope 2 emissions factors was not possible. However the Energy Information Administration's "2005 December EIA-923 Monthly Time Series File" (available at http://205.254.135.7/cneaf/electricity/page/eia906_920.html), indicate that the majority of fuel consumed at these facilities is used for the sawmills' production processes, rather than sold to the grid. All direct emissions from these facilities were therefore counted as Scope 1 emissions in this inventory. Fuel usage data was entered into the Clean Air and Climate Protection software to calculate the green house gas emissions. The default combustion emissions for diesel, propane and wood waste were used.

Appendix D - Transportation Sector Notes

Table D – 1: Data Inputs

Transportation	**Local Roads (VMT)**	**Annual VMT**	**142,678,500 Annual VMT**
		Gasoline By Vehicle Type	**92.15% Gasoline** **32.28% - Passenger Car** **56.44% - Light Truck/SUV/Pickup** **3.44% Heavy Truck**
		Diesel By Vehicle Type	**7.16% Diesel** **0.28% Passenger Car** **0.01% - Light Truck/SUV/Pickup** **6.86% - Heavy Truck**
	State Highway (VMT)	**Annual VMT**	**189,141,805 Annual VMT**
		Gasoline By Vehicle Type	**92.15% Gasoline** **32.28% - Passenger Car** **56.44% - Light Truck/SUV/Pickup** **3.44% Heavy Truck**
		Diesel By Vehicle Type	**7.16% Diesel** **0.28% Passenger Car** **0.01% - Light Truck/SUV/Pickup** **6.86% - Heavy Truck**
	Off-road Vehicles	**Diesel (gallons)**	**1,929,980 Diesel Gallons**
		Gasoline (gallons)	**2,184,095 Gasoline Gallons**
		CNG (gallons)	**36,863 CNG Gallons**

Data Sources:
On-Road Emissions –
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.
California Air Resources Board, 2011. EMFAC2011.
Available at: http://www.arb.ca.gov/msei/modeling.htm
Off-Road Emissions –
California Air Resources Board, 2007. OFFROAD2007.
Available at: http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.
Rail yard Miles Data Source – US Department of Transportation GIS Files

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 unincorporated county was taken from Caltrans 2005 California Public Road Data, and is shown in Table D-1 above. The data provided by Caltrans has

the potential to overestimate VMT for Plumas County because it does not take into account the seasonal closure of roads. In the future, Plumas County may choose to update this baseline using more detailed transportation counts.

Clean Air Climate Protection software identifies motorcycle emissions as an off-road emissions source. County-wide motorcycle CO_2 emissions are produced in the California ARB's EMFAC2011 model. To produce motorcycle CO_2 emissions specific to the unincorporated county communities, EMFAC2011 motorcycle emissions were disaggregated by applying the population ratio of 89.78% (ratio of unincorporated county population to county-wide population). EMFAC2011 produces daily emissions outputs, which need to be multiplied by 365 in order to produce annual estimates.

Table D – 2: State Highway VMT Jurisdiction share of recorded highway miles

	Jurisdiction	Total Highway Miles	US Hwy	State Hwy	Proportion
Plumas Co		**180.98**	**34.09**	**146.89**	**100.00%**
	Portola	**1.31**	**0.78**	**0.52**	**0.72%**
	Unincorporated Co	**179.67**	**33.31**	**146.36**	**99.28%**

Table D – 3: Unincorporated County share of highway VMT

Plumas County Highway VMT	Unincorporated County Share of Hwy Miles	Unincorporated County VMT
190,519,050	**99.28%**	**189,141,805**

As shown in Tables D-2 and D-3, State Highway VMT attributed to the unincorporated county 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 the unincorporated county, the proportion of 99.28% was multiplied by the total county-wide State Highway VMT recorded by Caltrans (190,519,050) to result in State Highway VMT value shown in Table D-1 above.

Fuel/Vehicle Type Breakdown and Emissions Calculations

Caltrans provides VMT by county, but not broken down 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 (rather than county). The EMFAC2011 model was run for the year 2005; total daily (air basin) VMT from this model was 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 shown in Table D-1, resulting in final VMT by fuel and vehicle type for Plumas County. This data was input into ICLEI's Clean Air and Climate Protection software which applies the appropriate emissions factors to calculate CO_2e emissions.

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

the unincorporated county. For Plumas County communities, agricultural equipment, construction and mining equipment, entertainment equipment, industrial equipment, lawn and gardening equipment, light commercial equipment, logging equipment, pleasure craft, rail yard operations, recreational equipment, and transport refrigeration units were considered. Emissions from agricultural, construction and mining equipment, logging equipment, pleasure crafts, and recreational equipment were assigned 100% to the County because they do not play significantly in the incorporated city inventories. This information was collected in a questionnaire distributed to government staff. Additional information regarding machine operations was confirmed through phone calls and emails with Plumas County's Planner. After identifying the applicable machine classifications, the data was proportioned by population to represent the unincorporated county's 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. Due to the seasonal use of some equipment it is possible the off-road emission methodology overestimates off-road transportation emissions. The final data that was entered into CACP was annual emissions of CO_2, CH_4, and N_2O, in tons. The 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
Agricultural Equipment	**100.00%**
Construction & Mining Equipment	**100.00%**
Entertainment Equipment	**89.78%**
Industrial Equipment	**89.78%**
Lawn & Gardening Equipment	**89.78%**
Light Commercial Equipment	**89.78%**
Logging Equipment	**100.00%**
Pleasure Crafts	**100.00%**
Rail yard Operations	**98.45%**
Recreational Equipment	**100.00%**
Transport Refrigeration Units	**89.78%**

Appendix E - Solid Waste Sector Notes

Table E – 1: Data Inputs

			Chester Landfill	Gopher Landfill	City of Portola Landfill	Historic Dumps
Waste – Landfills and Historic Dumps	Year opened / closed		1973-2004	1976-1994	1974-2003	1920-1972
	Total Waste Deposited	Short tons	161,500	196,290	36,962	265,191
	Rainfall	Inches/yr	35	35	35	20-40
	Associated k value		0.038	0.038	0.038	0.038
Waste Deposited	2005-Generated Solid Waste	Short tons/yr	26,614			

Data Sources:
Chester Landfill: Public Works – Solid Waste Division 1834 East Main Street Quincy, CA 95971
Gopher Landfill: Vice President, VESTRA Resources Inc., 5300 Aviation Drive, Redding, CA 96002
City of Portola Landfill: Cal Recycle and www.swrcb.ca.gov/rwqcb5/board_decisions/ tentative_orders/ 0503/ uncontested/ portola_landfill/infosheet.pdf
Historic Dumps: US Census data for population (http://www.census.gov/),
Cal Recycle (http://www.calrecycle.ca.gov/SWFacilities/Directory/Search.aspx)
Waste Deposited 2005: Cal Recycle
http://www.calrecycle.ca.gov/LGCentral/Reports/ReportViewer.aspx?ReportName=eDRSCountyWideOrigin&CountyID=32&ReportYear=2005

Methods - Solid Waste in Landfills and Dumps within Jurisdictional Boundaries:

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. The scale of these emissions depends upon the size and type of the facility and the presence of a landfill gas collection system. Our analyses do not account for the biogenic production of CO_2 during *aerobic* processes.

Plumas County is the location of three landfills of note: Chester, Gopher and City of Portola Landfills. These all opened in the early 1970's. Prior to that, waste was deposited at various dump sites throughout the county. The facilities have no methane-capture, and the Scope 1 methane emissions are calculated using the California Air Resources Board's first-order-decay model. The historic dumps sites similarly produce Scope 1 methane emissions. Assumptions regarding emissions associated with the historic dumps sites were developed with ICLEI staff and IPCC information. They include:

- Solid waste generated is proportional to population (using US Census Bureau population data).
- From 1920-1970's, 25% of waste was burned and 75% went to local dumps sites.
- 20% of historic dump sites were burn dumps (CA Dept of Toxic Substance Control/ Cal Recycle)
- Waste in dumps generates 60% of emissions of landfills. (IPCC/ICLEI)

These assumptions were used to create the input values necessary for the California Air Resources Board's first-order-decay model, which was used to calculate 2005 methane emissions from the dumps across the county between 1920 and 1972, as well as emissions from the landfills. Data inputs are delineated in Table D-1 above.

Methods – 2005-Generated Solid Waste:

Solid waste generated within the county in 2005 was primarily transferred to remote landfills for disposal (less than 1% was deposited in-county). 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). 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. Emissions during the entire period of decomposition are included.

Information on the waste collected from unincorporated Plumas County was found on the Cal Recycle website, in the form of short tons/yr. Waste characterization values were provided by the California Integrated Waste Management Board (CIWMB) specifically tailored to 2005, and are shown in Table E-2 below.

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**	**Total Population Served**	**People**	**5,968**
	Anaerobic Digester	**Total Population Served**	**People**	**N/A**
	Lagoon	**Total Population Served**	**People**	**3,800**
	Septic	**Total Population Served**	**People**	**9,186**
Census Bureau		**Average Household Size**	**People**	**2.125**

Data Sources:
Jerry Sipe, Plumas County Environmental Health, 530-283-6367

Larry, East Quincy CSD, 530-283-0836

Jim Hamblin, Indian Valley CSD, 530-394-8404

Andy Capella, Chester PUD, 530-258-2171

Bill Whitener, Grizzly Ranch CSD, 530-927-8091

Ivan Gosidge, Gold Mountain CSD, 530-832-5945

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 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). The makeup and amount of emissions depends on the processes involved and the management practices employed. Plumas County's population uses all of these methods to treat their wastewater.

Within Plumas County there are two centralized wastewater treatment plants (WWTPs): East Quincy and Grizzly Ranch. Both systems use aerobic processes to degrade the organic content of their influent. Only Grizzly Ranch utilizes nitrification and denitrification processes, in order to reduce N_2O levels. Neither plant has additional industrial or commercial sources which would contribute to the organic loading of their influent. Nor does either plant employ an anaerobic digester, choosing rather to haul their collected sludge away to a landfill. Using data on population served, emissions were calculated with standard equations provided by ICLEI using IPCC methodology.

In addition to the centralized WWTPs there are two lagoon facilities within Plumas County, serving residents of Indian Valley and Chester. The treatment of wastewater at this facility occurs within facultative ponds, degrading the biological material through anaerobic processes and producing CH_4. As in the centralized plants, there are no industrial or commercial sources added to the influent. Using data on population served, emissions were calculated with standard equations provided by ICLEI using IPCC methodology.

Residents not on a centralized or lagoon system are assumed by default to be 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. By subtracting the population served on centralized and lagoon treatment from the total unincorporated population of the county, an approximation of the population served by septic was made and CH_4 emissions were calculated with standard equations provided by ICLEI using IPCC methodology. Data inputs are summarized in Table F-1.

Appendix G - Agriculture Sector Notes

Table G -1: Data Inputs

Agriculture	**Livestock Enteric Fermentation**	**Steers (headcount)**	**8,100**
		Heifers (headcount)	**6,750**
		Slaughter Cows (headcount)	**700**
	Manure Management	**Steers (headcount)**	**8,100**
		Heifers (headcount)	**6,750**
		Slaughter Cows (headcount)	**700**
	Fertilizer Application (Direct and Indirect Emissions)	**Alfalfa Hay Area (acres)**	**6,000**
		Meadow Hay Crop Area (acres)	**3,000**
		Grain Hay Crop Area (acres)	**1,000**
		Irrigated Pasture Crop Area (acres)	**35,000**

Data Sources:

2005 Plumas and Sierra County Annual Crop Report and Livestock Report:
http://www.countyofplumas.com/archives/36/2005_crop_report.pdf

Methods:

Data on livestock headcounts and crop acreage were collected from the 2005 Plumas and Sierra County Annual Crop Report and Livestock Report, and are listed in Table G-1. It was determined that agricultural land within city limits was insignificant, therefore all crop and livestock emissions were attributed to the County.

Livestock Enteric Fermentation and Manure Management Emissions

Livestock enteric fermentation and manure management emissions were calculated by multiplying the number of heads of each livestock group by the specific livestock emission factors, listed in Table G-2. Livestock enteric fermentation and manure management emission factors were taken from the California Air Resources Board greenhouse gas Inventory Methodology. It was assumed that all livestock were raised on pasture, all cattle herds existed in a ratio of 25 Cows: 25 Calves: 1 Bull and there were equal numbers feedlot and stockers for Steers and Heifers.

Table G-2: Livestock Emission Factors

Livestock Emission Factors			
Livestock Name	**Enteric Fermentation Coefficient CH4 (Kg per year per head)**	**Manure Management Coefficient CH4 (Kg per year per head)**	**Manure Management Coefficient N2O (Kg per year per head)**
Cattle and Calves	**72.5**	**1.4**	**0**
Steers	**44.55**	**1.56**	**0**
Heifers	**46.06**	**2.07**	**0**
Swine	**1.5**	**0.6**	**0**
Dairy Cows	**119.24**	**3.37**	**0**
Sheep and Lambs	**8**	**0.78**	**0**
Goats	**5**	**0.375**	**0**

Source: California Air Resources Board: Documentation of California's 2000-2008 GHG Inventory - http://www.arb.ca.gov/cc/inventory/doc/doc_index.php

Fertilizer Application (Direct and Indirect Emissions)

Due to limited availability of data on site-specific fertilizer application in Plumas County it was assumed that an average of 140 lbs per acre per year of fertilizer was applied for all crops and improved pasture. This was determined by reviewing the Sacramento County Greenhouse Gas Inventory Report and Appendices. The same average was used in the Sacramento County Greenhouse Gas Inventory. Direct and indirect fertilizer application emissions were calculated by multiplying the acres of cropland by 140 lbs per acre, converting to tons and then multiplying by the direct and indirect N20 emission factors respectively (see Table G-3). Direct and indirect fertilizer application emissions were taken from the California Air Resources Board Greenhouse Gas Inventory Methodology.

Table G-3: Fertilizer Use Emission Factors

Fertilizer Use Emission Factors			
Fertilizer Use	**Average lbs per acre***	**Direct N20 Emission Coefficient (Kg per ton)****	**Indirect N20 Emission Coefficient (Kg per ton)****
Synthetic	**140**	**14.25**	**4.63**
Organic	**140**	**14.25**	**6.06**

*Average used in Sacramento County GHG Inventory: http://www.dera.saccounty.net/Portals/0/docs/Final_SACCTY_GHG_June09_stacked_small.pdf
**Source: California Air Resources Board: Documentation of California's 2000-2008 GHG Inventory - http://www.arb.ca.gov/cc/inventory/doc/doc_index.php