City of San Carlos

2010 Government Operations

Greenhouse Gas Emissions Inventory

Conducted by Joint Venture Silicon Valley

In collaboration with
ICLEI - Local Governments for Sustainability USA

With support from
Pacific Gas and Electric Company (PG&E)

November, 2012

Credits and Acknowledgements

City of San Carlos

The City of San Carlos is a city of 28,400 that is located in Silicon Valley and is one of 20 cities in San Mateo County. Known as "The City of Good Living", San Carlos has been a leader in the region and the state in its work in Green Programs and Climate Protection. This includes the City's Climate Action Plan that has won three awards for Innovation in Green Planning, installation of one of the first photovoltaic systems in the area at the City Corporation Yard, becoming the first Beacon Award participating agency in San Mateo and Santa Clara counties and certifying more Bay Area Green Businesses in San Mateo County than any other city.

Project Team City of San Carlos
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Joint Venture Silicon Valley

The Joint Venture Climate Protection Task Force is a forum for cities, counties, and other public agencies in Silicon Valley to work together to develop effective, collaborative solutions for the reduction of greenhouse gas emissions from public agency operations.

The City of San Carlos is a charter member of the 42 agency Climate Protection Task Force in Silicon Valley. Assistant City Manager Brian Moura has been a member of the Task Force's Executive Committee since its formation in 2007 and currently serves as the Co-Chair of the Climate Protection Task Force.

Established in 1993, Joint Venture Silicon Valley provides analysis and action on issues affecting our region's economy and quality of life. The organization brings together established and emerging leaders — from business, government, academia, labor and the broader community — to spotlight issues and work toward innovative solutions.

The City of San Carlos is a charter member of Joint Venture Silicon Valley and has been active in a number of the organization's initiatives over the years including Smart Valley, Smart Schools, Net Day, Challenge 2000, Smart Voter, Smart Permit, Silicon Valley Economic Development Alliance (SVEDA), Wireless Silicon Valley and the Climate Protection Task Force.

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Pacific Gas and Electric Company (PG&E)

Pacific Gas and Electric Company provides comprehensive climate planning assistance to local governments, from providing energy usage data and assistance with greenhouse gas inventories, to training and guidance on 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.

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ICLEI - Local Governments for Sustainability USA

ICLEI – Local Governments for Sustainability USA is the leading nonprofit membership association of local governments committed to climate action, clean energy, and sustainability, with more than 500 U.S. members, and 1,100 members worldwide. ICLEI USA assists local governments with their work to achieve reductions in greenhouse gas emissions and achieve tangible improvements in local sustainability. ICLEI USA provides tools and resources, technical guidance, training, and national standards to help local governments meet their goals, as well as global networks to help them share best practices and innovations and learn from one another.

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Report Preparation

This report was prepared by John Sztukowski, Climate Coordinator at Joint Venture Silicon Valley. The author would like to thank ICLEI staff for providing guidance in the inventory process, PG&E for their generosity to provide resources for this project and the City of San Carlos staff that provided data on government operations that is included in this report and for their comments that are included in the final report document.

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Executive Summary

The Purpose of Conducting an Inventory

Each day, local governments operate buildings, vehicle fleets, street lights, traffic signals, water systems, and wastewater plants. Local government employees consume resources commuting to work and generate solid waste which is sent for disposal. All of these activities directly or indirectly cause the release of carbon dioxide and other greenhouse gases into the atmosphere. This report presents the methodology and findings of a local government operations (LGO) greenhouse gas emissions inventory for the City of San Carlos for the year 2010. The inventory measures the greenhouse gas emissions resulting specifically from San Carlos' government operations, arranged by sector to facilitate detailed analysis of emissions sources. The inventory addresses where and what quantity of emissions are generated through various local government activities. Through analysis of a local government's emissions profile, the City of San Carlos can tailor strategies to achieve the most effective greenhouse gas emission reductions in its agency.

Strategies by which local governments can significantly reduce emissions from their operations include increasing energy efficiency in facilities and vehicle fleets, utilizing renewable energy sources, reducing waste, and supporting alternative modes of transportation for employees. The benefits of these actions include lower energy bills, improved air quality, and more efficient government operations, in addition to the mitigation of local and global climate change impacts. By striving to save taxpayer money through efficient government operations, San Carlos is working to improve government services in a smart and targeted way that will benefit all of the City's residents.

The City of San Carlos recognizes that climate change resulting from the greenhouse gas emissions of human activities is a reality. Global average surface temperatures are rising due to intensification of activities that release carbon dioxide and other greenhouse gases into the atmosphere. Potential impacts of climate change include rising sea levels, more severe and frequent storms, increased flooding, greater rates of coastal erosion, loss of critical habitat and ecosystems, more severe heat waves, increased precipitation, extended drought conditions, larger wildfires, shortages in water supply, formation of ground level ozone, and heightened exposure to vector born diseases.

By conducting this inventory, the City of San Carlos is acting now to limit future impacts that threaten the lives and property of San Carlos' residents and businesses, make government operations more efficient, and improve the level of service it offers to the residents of San Carlos.

Inventory Results

The following figures and tables summarize the results of the Local Government Operations (LGO) greenhouse gas emissions inventory for the City of San Carlos, by sector and source.

Figure 1: 2010 Government Operations CO_2e Emissions by Sector

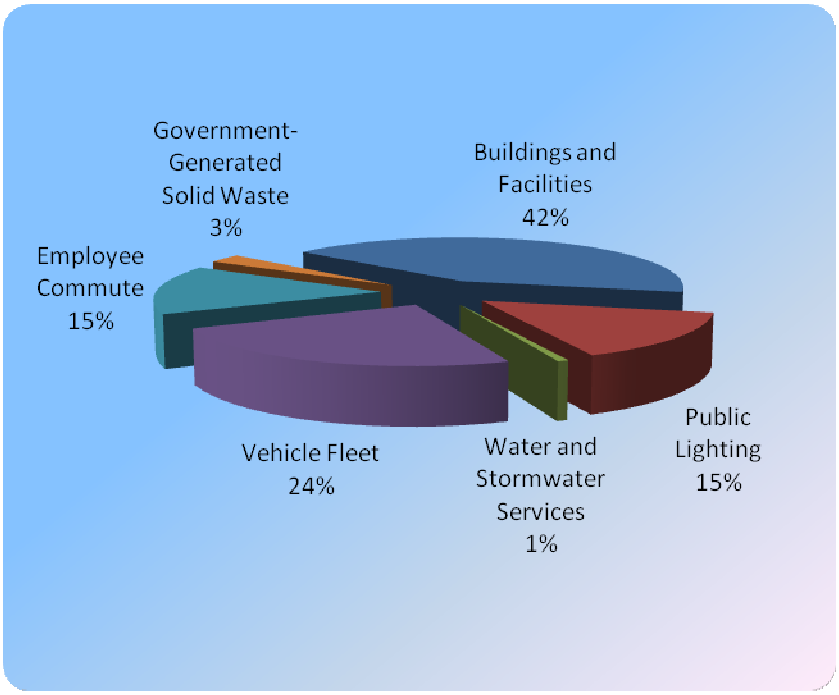

Table 1: 2010 Government Operations CO_2e Emissions by Sector

Sector	2010 Metric Tons CO2e	2005 Metric Tons CO2e	Difference Metric Tons CO2e
Buildings and Facilities	**647**	613	**+36**
Public Lighting	**227**	241	**-14**
Water and Stormwater Services	**11**	18	**-7**
Vehicle Fleet	**368**	425	**-57**
Employee Commute	**233**	353	**-120**
Government-Generated Solid Waste	**41**	93	**-52**
Totals	**1,527**	**1,743**	**-216**

Figure 2: 2010 Government Operations CO_2e Emissions by Source

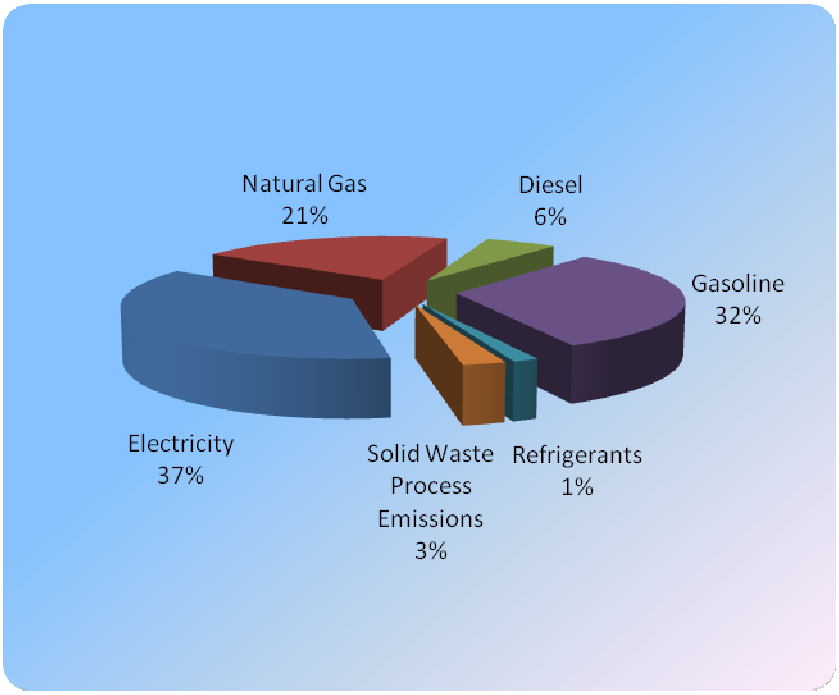

Table 2: 2010 Government Operations CO_2e Emissions by Source

Source	2010 Metric Tons CO2e	2005 Metric Tons CO2e	Difference Metric Tons CO2e
Electricity	**569**	588	**-19**
Natural Gas	**315**	284	**+31**
Diesel	**89**	99	**-10**
Gasoline	**487**	671	**-184**
Refrigerants	**25**	8	**+17**
Solid Waste Process Emissions	**42**	93	**-51**
Totals	**1,527**	**1,743**	**-216**

Table 3: LGO Protocol Report - Overall Emissions by Scope

Total Emissions					
	CO_2e	CO_2	CH_4	N_2O	HFC-134a
SCOPE 1	683.796	656.552	0.037	0.006	0.019
SCOPE 2	568.929	564.200	0.038	0.013	0.000
SCOPE 3	274.449	226.648	1.992	0.019	0.000
INFORMATION ITEMS	0.010	0.000	0.000	0.000	0.000

For more detail on the concepts of scopes, sources, and sectors, and to review more granular data produced through the inventory study, please refer to the full report on the following pages.

Regional and Local Context

Climate Change Mitigation Activities in California

Since 2005, the State of California has responded to growing concerns over the effects of climate change by adopting a comprehensive approach to addressing emissions in the public and private sectors. This approach was officially initiated with the passage of the Global Warming Solutions Act of 2006 (AB 32), which requires the state to reduce its greenhouse gas emissions to 1990 levels by 2020. The AB 32 Scoping Plan was developed to identify strategies for meeting the AB 32 goal, and was adopted by ARB in December 2008. Among many other strategies, the State adopted laws and regulations that require local governments to address climate change in their building codes (Cal Green), account for greenhouse gas emissions when reviewing City projects and development applications (SB 97 and OPR regulations) and state laws and regulations which require these issues to be addressed in General Plan Updates and Climate Action Plans. In addition, it identifies the following strategies that will impact local governance:

- Develop a California cap-and-trade program
- Expand energy efficiency programs
- Establish and seek to achieve reduction targets for transportation-related GHG emissions
- Expand the use of green building practices
- Increase waste diversion, composting, and commercial recycling toward zero-waste
- Continue water efficiency programs and use cleaner energy sources to move and treat water
- Reduce methane emissions at landfills
- Preserve forests that sequester carbon dioxide

Other measures taken by the state include mandating stronger vehicle emissions standards (AB 1493, 2002), establishing a low-carbon fuel standard (EO # S-01-07, 2007), mandating a climate adaptation plan for the state (S-EO # 13-08, 2008), establishing a Green Collar Job Council, and establishing a renewable energy portfolio standard for power generation or purchase in the state. The state also has made a number of legislative and regulatory changes that have significant implications for local governments:

- SB 97 (2007) required the Office of Planning and Research to create greenhouse gas planning guidelines for the California Environmental Quality Act (CEQA). In addition, ARB is tasked with creating energy-use and transportation thresholds in CEQA reviews, which may require local governments to account for greenhouse gas emissions when reviewing project applications.

- AB 811 (2007) authorizes all local governments in California to establish special districts that can be used to finance solar or other renewable energy improvements to homes and businesses in their jurisdiction.
- SB 375 (2008) revises the process of regional transportation planning by metropolitan planning organizations (MPOs), which are governed by elected officials from local jurisdictions. The statute calls on ARB to establish regional transportation-related greenhouse gas targets and requires the large MPOs to develop regional "Sustainable Communities Strategies" of land use, housing and transportation policies that will move the region towards its GHG target. The statute stipulates that transportation investments must be consistent with the Sustainable Communities Strategy and provides CEQA streamlining for local development projects that are consistent with the Strategy.

Pacific Gas and Electric Company Supported Inventory Project

With the administrative support of Pacific Gas and Electric Company (PG&E) and funding from California utility customers under the auspices of the California Public Utilities Commission, ICLEI - Local Governments for Sustainability ("ICLEI") was contracted to work with Joint Venture Silicon Valley to assist in the training and support of interns that worked in San Carlos and 15 other participating jurisdictions (Belmont, Colma, Cupertino, Gilroy, Hillsborough, Millbrae, Morgan Hill, Mountain View, Portola Valley, Redwood City, San Mateo, San Mateo County, Santa Clara, Santa Cruz and Sunnyvale), who conducted the inventories. Joint Venture Silicon Valley coordinated this multi-jurisdictional greenhouse gas inventory update and facilitated the completion of the municipal inventory along with this report. Throughout 2012, ICLEI provided training and technical assistance to participating regional organizations, interns, and local government staff.

Introduction

General Methodology

Local Government Operations Protocol

A national standard called the Local Government Operations Protocol (LGO Protocol) has been developed and adopted by the California Air Resources Board (ARB) in conjunction with ICLEI, the California Climate Action Registry, and The Climate Registry. This standard provides accounting principles, boundaries, quantification methods, and procedures for reporting greenhouse gas emissions from local government operations. The LGO Protocol forms the basis of ICLEI's Clean Air & Climate Protection Software (CACP 2009), which allows local governments to compile data and perform the emissions calculations using standardized methods.

Greenhouse Gases and Carbon Dioxide Equivalent

In accordance with LGO Protocol recommendations, CACP 2009 calculates and reports all six internationally recognized greenhouse gases regulated under the Kyoto Protocol (Carbon Dioxide, Methane, Nitrous Oxide, Hydrofluorocarbons, Perfluorocarbons, and Sulfur Hexafluoride). Emissions summaries found throughout this report also use CACP 2009's ability to combine emissions from the various greenhouse gases into carbon dioxide equivalent, CO_2e. Since equal quantities of each greenhouse gas have more or less influence on the greenhouse effect, converting all emissions to a standard metric, CO_2e, allows apples-to-apples comparisons amongst quantities of all six emissions types. Greenhouse gas emissions are reported in this inventory as metric tons of CO_2e ($MTCO_2e$).

Table 2 exhibits the greenhouse gases and their global warming potential (GWP), a measure of the amount of warming a greenhouse gas may cause compared to the amount of warming caused by carbon dioxide.

Table 4: Greenhouse Gases

Gas	Chemical Formula	Activity	Global Warming Potential (CO_2e)
Carbon Dioxide	CO_2	Combustion	1
Methane	CH_4	Combustion, Anaerobic Decomposition of Organic Waste (Landfills, Wastewater), Fuel Handling	21
Nitrous Oxide	N_2O	Combustion, Wastewater Treatment	310
Hydrofluorocarbons	Various	Leaked Refrigerants, Fire Suppressants	12–11,700
Perfluorocarbons	Various	Aluminum Production, Semiconductor Manufacturing, HVAC Equipment Manufacturing	6,500–9,200
Sulfur Hexafluoride	SF_6	Transmission and Distribution of Power	23,900

Calculating Emissions

In general, emissions can be quantified in two ways.

1. Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions from a monitoring system. Emissions measured this way may include those emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility. This method is the most accurate way of inventorying emissions from a given source, but is generally available for only a few sources of emissions.

2. Calculation-based methodologies refer to an estimate of emissions calculated based upon measurable ***activity data*** and ***emission factors***. Table 3 provides examples of common emissions calculations.

Table 5: Basic Emissions Calculations

Activity Data x	Emissions Factor =	Emissions
Electricity Consumption (kilowatt hours)	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
Waste Generated by Government Operations (tons)	CH_4 emitted/ton of waste	CH_4 emitted

The Scopes Framework

This inventory reports greenhouse gas emissions by sector and additionally by "scope", in line with the LGO Protocol and WRI/WBCSD GHG Protocol Corporate Standard.

Scope 1: Direct emissions from sources within a local government's operations that it owns and/or controls, with the exception of direct CO_2 emissions from biogenic sources. This includes stationary combustion to produce electricity, steam, heat, and power equipment; mobile combustion of fuels; process emissions from physical or chemical processing; fugitive emissions that result from production, processing, transmission, storage and use of fuels; leaked refrigerants; and other sources.

Scope 2: Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, or cooling.

Scope 3: All other emissions sources that hold policy relevance to the local government that can be measured and reported. This includes all indirect emissions not covered in Scope 2 that occur as a result of activities within the operations of the local government. Scope 3 emission sources include (but are not limited to) tailpipe emissions from employee commutes, employee business travel, and emissions resulting from the decomposition of government-generated solid waste.

The LGO Protocol provides standard methodologies for calculating emissions from the sources shown in the following table. Other sources of emissions, such as those associated with the production of consumed products do not yet have standard calculation methodologies and are thus excluded from this inventory.

Table 6: Inventoried Emissions Sources by Scope

Scope 1	Scope 2	Scope 3
Fuel consumed at facilities	Purchased electricity consumed by facilities	Solid waste generated by government operations
Fuel consumed by vehicle fleet and mobile equipment	Purchased electricity consumed by electric vehicles	Fuel consumed by vehicles during employee commuting
Fuel consumed to generate electricity	Purchased steam	
Leaked refrigerants from facilities and vehicles	Purchased cooling (chilled water)	
Leaked / deployed fire suppressants		
Solid waste in government landfills		
Wastewater decomposition and treatment at a municipal wastewater treatment plant		

Organizational Boundaries

The organizational boundary for the inventory determines which aspects of operations are included in the emissions inventory, and which are not. Under the LGO Protocol, two control approaches are used for reporting emissions: operational control or financial control. A local government has operational control over an operation if it has full authority to introduce and implement policies that impact the operation. A local government has financial control if the operation is fully consolidated in financial accounts. If a local government has joint control over an operation, the contractual agreement will have to be examined to see who has authority over operating policies and implementation, and thus the responsibility to report emissions under operational control.

LGO Protocol strongly encourages local governments to utilize operational control as the organization boundary for a government operations emissions inventory. Operational control is believed to most accurately represent the emissions sources that local governments can most directly influence, and this boundary is consistent with other environmental and air quality reporting program requirements. For this reason, this inventory was conducted according to the operational control framework.

Types of Emissions

As described in the LGO Protocol, emissions from each of the greenhouse gases can come in a number of forms:

Stationary or mobile combustion: These are emissions resulting from on-site combustion of fuels (natural gas, diesel, gasoline, etc.) to generate heat, electricity, or to power vehicles and mobile equipment.

Purchased electricity: These are emissions produced by the generation of power from utilities outside of the jurisdiction.

Fugitive emissions: Emissions that result from the unintentional release of greenhouse gases into the atmosphere (e.g., leaked refrigerants, methane from waste decomposition, etc.).

Process emissions: Emissions from physical or chemical processing of a material (e.g., wastewater treatment).

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 San Carlos' government operations.

A common emission that is categorized as an information item is carbon dioxide emitted in the combustion of biogenic fuels. Local governments will often burn fuels that are of biogenic origin (wood, landfill gas, organic solid waste, biofuels, etc.) to generate power. 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 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.

Information items quantified for this inventory include:

- Scope 3 CO_2 emissions from biodiesel consumption to power employee commute vehicles

The emissions categorized as information items in this inventory are presented below in Table 7.

Table 7: Information Items

INFORMATION ITEMS	
	CO_2e
Employee Commute Biodiesel	0.010
Total Information Items	0.010

Understanding Totals

It is important to realize that the totals and sub-totals listed in the tables and discussed in this report are intended to represent all-inclusive, complete totals for the City of San Carlos' operations. However, these totals are only a summation of inventoried emissions using available estimation methods. Each inventoried sector may have additional emissions sources associated with them that were unaccounted for, such as Scope 3 sources that could not be estimated.

Also, local governments provide different services to their citizens, and the scale of the services (and thus the emissions) is highly dependent upon the size and purview of the local government. For these reasons, comparisons between local government totals should not be made without keen analysis of the basis for figures and the services provided.

It is important to understand that in the case where a local government operates a municipal utility that generates electricity for government facilities, the associated emissions should be considered Scope 1 emissions within the Power Generation Facilities sector, and not Scope 2 emissions within each of the other facilities sectors, when calculating a total. This is advised by the LGO Protocol and done to avoid reporting the same emissions twice, also known as double counting.


EXIT

Inventory Results

Emissions Totals

In 2010, San Carlos' greenhouse gas emissions from government operations totaled 1,527 metric tons of CO_2e. This compares to 1,743 metric tons of CO_2e greenhouse gas emissions from government operations in San Carlos for the year 2005 which results in a 12% reduction in such emissions between 2005 and 2010.

These numbers represent a roll-up of emissions. While the roll-up is a valuable figure, information on the breakdown of emissions from local government operations by scopes, sources, and sectors allows the comparative analysis and insight needed for effective decision-making on target setting, developing GHG reduction measures, or monitoring.

The LGO Protocol identifies reporting by scopes, sources, and sectors as the strongly preferred form of reporting a greenhouse gas inventory. For more details on the breakdown of San Carlos' emissions by scopes, sources, and sectors, refer to subsequent sections within Inventory Results in this report.

Buildings and Other Facilities

The buildings and facilities sector represents the largest GHG emitting sector of the entire municipal inventory at 42%. This can be seen by revisiting Figure 1 and Table 1 in the Executive Summary section. Facility operations contribute to greenhouse gas emissions in two major ways. Facilities consume vast amounts of electricity and fuels such as natural gas. Electricity was the leading contributor of GHGs in this sector, accounting for 334 metric tons of CO_2e, as denoted in Table 9 below. Natural Gas was also a major contributor, representing 313 metric tons of CO_2e for buildings and facilities. This energy data was provided by PG&E. Note the PG&E 2010 GHG coefficient for delivered electricity was 445, the lowest since PG&E started public reporting it in 2003. This number reflects a wet year in 2010, in which PG&E was able to take advantage of cleaner electricity in the form of hydropower, as well as an expanded use of cleaner fossil-fueled electricity in the form of two new state-of-the-art natural gas facilities that began service in 2010.

San Carlos operates several facilities. In 2010, San Carlos' buildings and other facilities produced a total of 647 metric tons of CO_2e. For the purposes of this inventory, facilities were divided into seven primary categories (and minor facilities). All of these facilities are depicted in Figure 3, displaying their overall contribution to GHGs for this sector. City Hall was the highest emitter of CO_2e for buildings and facilities in 2010. It represented 39% of all emissions in this sector, compiling 253 metric tons of CO_2e in 2010. In fact the top three energy consuming facilities accounted for 87% of all GHGs in this sector, as summarized in Table 10. Note, diesel fuel used in stationary generators also contributed to CO_2e emissions for buildings and facilities; however this represented less than 1% of total emissions for this sector.

Figure 3: Buildings and Other Facilities Emissions by Department

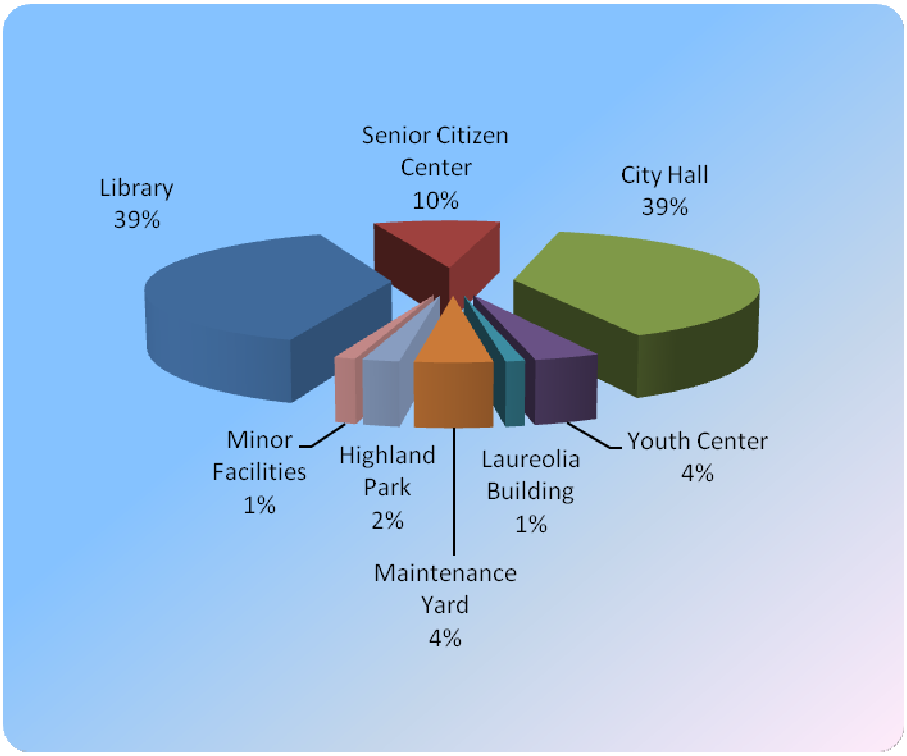

Table 8: Buildings and Other Facilities Emissions by Department

Department	2010 Metric Tons CO2e	2005 Metric Tons CO2e	Difference Metric Tons CO2e
Library	250	130	**+120**
Senior Citizen Center	62	62	**0**
City Hall	253	312	**-59**
Youth Center	24	37	**-13**
Laureola Building	7	4	**+3**
Maintenance Yard	29	21	**+8**
Highland Park	14	25	**-11**
Minor Facilities	8	14	**-6**
Totals	**647**	**605**	**+42**

Figure 4: Buildings and Other Facilities Emissions by Source

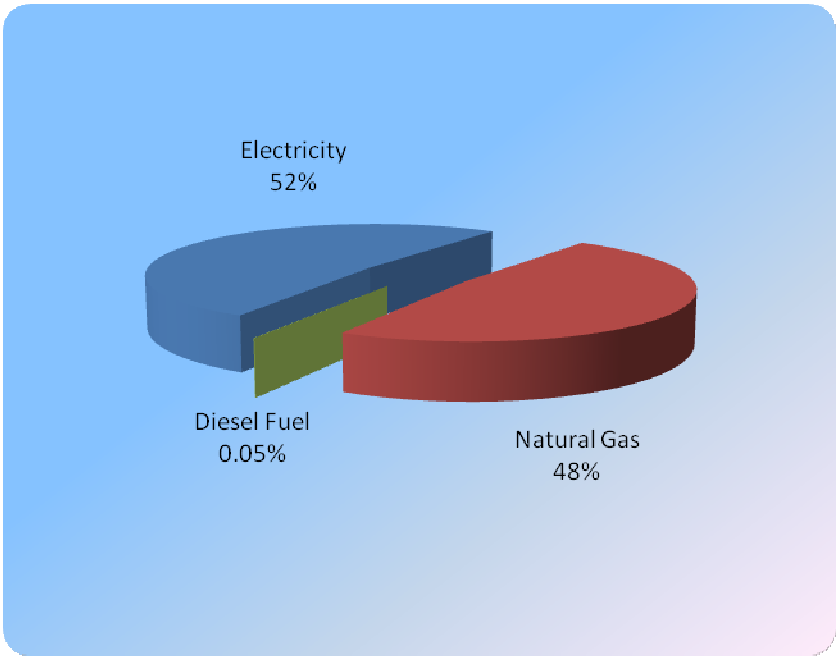

Table 9: Buildings and Other Facilities Emissions by Source

Source	metric tons CO2e
Electricity	333.80
Natural Gas	312.78
Diesel Fuel	0.31
Totals	**646.89**

Table 10: Top 3 Largest Contributors to Emissions from Buildings Sector

Facility	% of Total Buildings/ Facilities Emissions from Electricity	% of Total Buildings/ Facilities Emissions from Natural Gas	% of Total Buildings/ Facilities Emissions from Other Sources	CO2e Emissions from Electricity	CO2e Emissions from Natural Gas	CO2e Emissions from Other Sources	Total CO2e Emissions
City Hall	39%	39%	83%	131.75	120.78	0.26	252.79
Library	36%	42%	0%	118.61	131.87	0.00	250.49
Sr. Citizen Center	10%	9%	0%	32.35	29.16	0.00	61.51
Totals	**85%**	**90%**	**83%**	**282.71**	**281.81**	**0.26**	

Table 11: LGO Protocol Report - Buildings Sector Emissions by Scope and Emission Type

Scope	Emission Type	Greenhouse Gas Emissions (metric tons)			
SCOPE 1		CO_2e	CO_2	CH_4	N_2O
	Stationary Combustion	313.083	312.281	0.029	0.001
	Total Direct Emissions	**313.083**	**312.281**	**0.029**	**0.001**
SCOPE 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	333.803	331.028	0.022	0.007
	Total Indirect Emissions	**333.803**	**331.028**	**0.022**	**0.007**

Streetlights, Traffic Signals, and Other Public Lighting

Like most local governments, the City of San Carlos operates a range of public lighting including traffic signs/controllers, streetlights, park lighting, and other outdoor lighting. All of the emissions associated with the operation of this infrastructure are due to electricity consumption. Data relating to electricity consumption for public lighting was obtained from PG&E.

In 2010, public lighting in San Carlos consumed 1,116,325 kilowatt hours of electricity, producing approximately 227 metric tons of CO_2e. Table 12 illustrates 2010 emissions based on the type of public lighting, electricity consumed, and the costs associated with the activities that generated these emissions. The City of San Carlos spent approximately $147,625 in 2010 on the electricity used to power public lighting. The majority of the emissions, electricity consumption, and cost can be attributed to streetlights, accounting for 88% of all public lighting and producing approximately 200 metric tons of CO_2e.

Figure 5: Public Lighting Emissions by Subsector

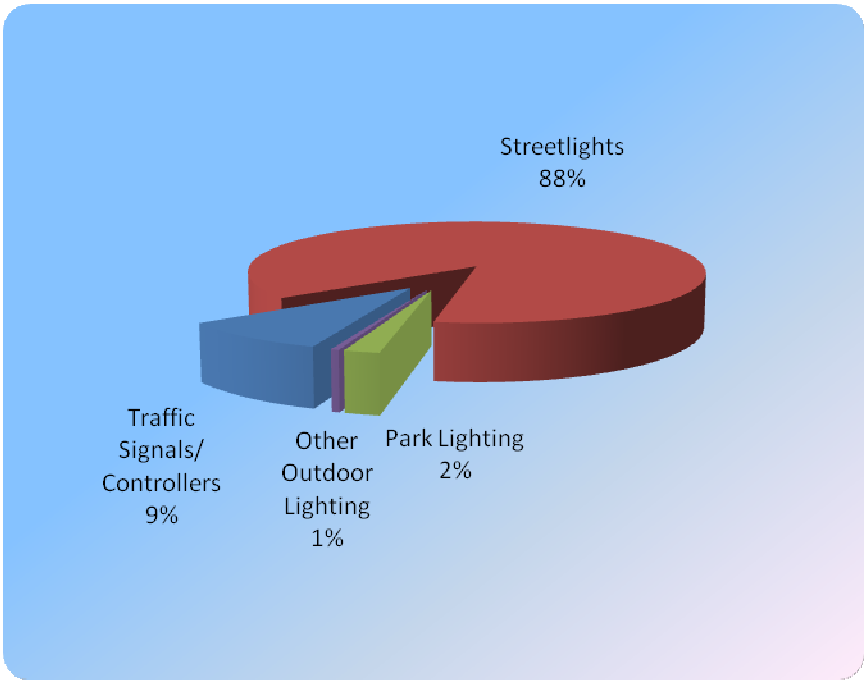

Table 12: Public Lighting Emissions by Subsector

Subsector (Light Type)	metric tons CO2e	% of Sector Emissions	Electricity Use (kWh)	Cost ($)
Traffic Signals/ Controllers	21.32	9%	104,749	$17,114
Streetlights	199.90	88%	982,101	$124,480
Park Lighting	4.89	2%	24,028	$4,717
Other Outdoor Lighting	1.11	0%	5,447	$1,314
Totals	**227.22**	**100%**	**1,116,325**	**$147,625**

Table 13: LGO Protocol Report – Public Lighting Emissions by Scope and Emission Type

Scope	Emission Type	Greenhouse Gas Emissions (metric tons)			
SCOPE 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	227.217	225.329	0.015	0.005
	Total Indirect Emissions	227.217	225.329	0.015	0.005

Water Delivery Facilities

This sector includes emissions from equipment used for the distribution or transport of water, including drinking water, sprinkler systems and irrigation. The City of San Carlos operates a range of water transport equipment, including water delivery pumps, sprinkler/irrigation control, and lift stations. Electricity consumption is the primary source of greenhouse gas emissions from the operation of San Carlos' water transport infrastructure. Electricity and natural gas data for water delivery facilities was provided by PG&E.

In 2010, San Carlos' Water Delivery Services emitted approximately 11 metric tons of CO_2e. This is the lowest GHG emitting sector for San Carlos's 2010 inventory, representing less than 1% of total emissions. Water delivery pumps were by far the leading contributor to GHG emissions in this sector, emitting nearly 10 metric tons of CO_2e, which is 92% of the water delivery services. This is primarily in the form of electricity use; however natural gas was also used in water delivery pumps.

Figure 6: Water Delivery Facilities Emissions by Subsector

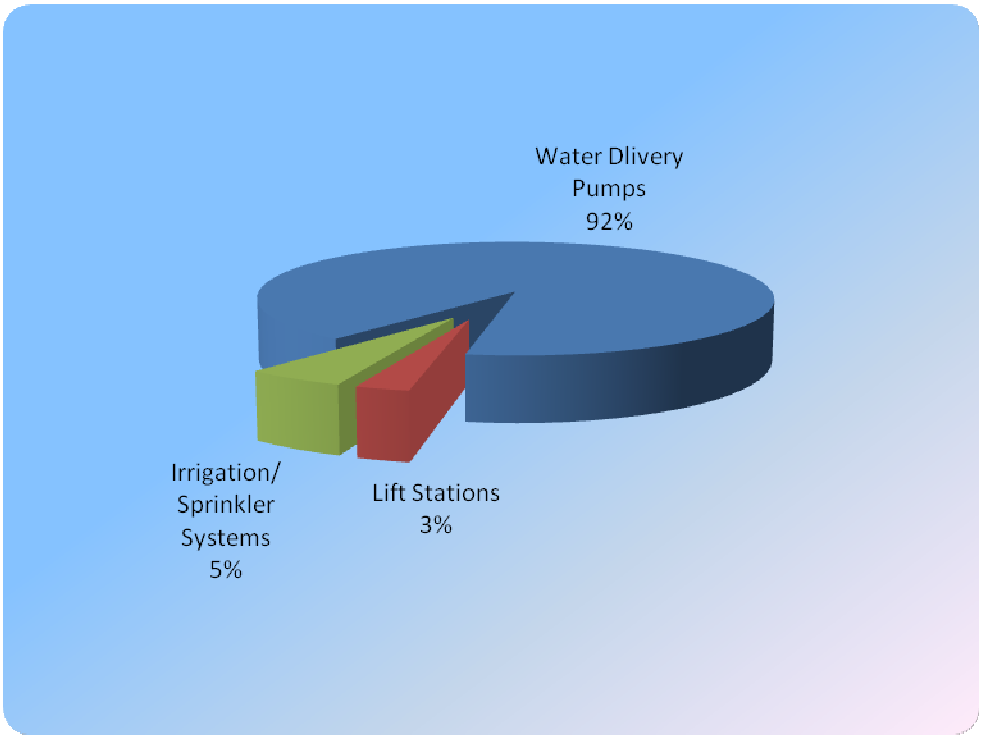

Table 14: Water Delivery Facilities Emissions by Subsector

Subsector (Equipment Type)	metric tons CO2e	% of Sector Emissions	Electricity Use (kWh)	Electricity Cost ($)	Natural Gas Use (Therms)	Natural Gas Cost ($)
Water Delivery Pumps	9.64	92%	34,641	$6,840	487	$343
Lift Stations	0.30	3%	1,480	$519	0	$0
Irrigation/ Sprinkler Systems	0.56	5%	2,735	$693	0	$0
Totals	**10.50**	**100%**	**38,856**	**$8,052**	**487**	**$343**

Table 15: LGO Protocol Report - Water Delivery Facilities Emissions by Scope and Emission Type

Scope	Emission Type	Greenhouse Gas Emissions (metric tons)			
SCOPE 1		CO_2e	CO_2	CH_4	N_2O
	Stationary Combustion	2.582	2.582	0.000	0.000
	Total Direct Emissions	**2.582**	**2.582**	**0.000**	**0.000**
SCOPE 2		CO_2e	CO_2	CH_4	N_2O
	Purchased Electricity	7.909	7.843	0.001	0.000
	Total Indirect Emissions	**7.909**	**7.843**	**0.001**	**0.000**

Vehicle Fleet and Mobile Equipment

The vehicles and mobile equipment used in San Carlos' daily operations, including maintenance trucks used for parks and recreation to police cruisers and fire trucks, burn gasoline, diesel, and other fuels, which results in greenhouse gas emissions. The combustion of these fuels not only emits carbon dioxide directly, but also a small amount of more potent GHGs such as methane and nitrous oxide. See Table 18 for the breakdown of these different GHG emissions.

In addition, vehicles with air conditioning or refrigeration equipment use refrigerants that can leak from the vehicle. Refrigerants are very potent greenhouse gases, and have Global Warming Potential (GWP) of up to many thousand times that of CO_2. For example, HFC-134a, a very common refrigerant in mobile air-conditioning units, has a GWP of 1300, or 1300 times that of CO_2. Therefore, even small amounts of leaked refrigerants can have a significant effect on greenhouse gas emissions. Refrigerants from these mobile sources were taken into account for San Carlos' 2010 municipal inventory. A default method was used to estimate the emissions from leaked refrigerants, and while the amount may be an overestimate, it is in line with the methodology of the LGO Protocol.

In 2010, San Carlos operated a vehicle fleet with 61 vehicles and 98 pieces of mobile equipment. Many different types of vehicles were accounted for, including passenger cars for administrative purposes, light and heavy trucks used for community development, community services, and public works, emergency vehicles from patrol cars and police motorcycles to fire trucks, and a variety of equipment for construction and maintenance. San Carlos' vehicle fleet is second highest the GHG emitting sector of their municipal inventory, representing 24% of total emissions. The Police Department is the primary contributor to GHGs in this sector, accounting for 43% of emissions at 158 metric tons of CO_2e. The vehicle fleet in sum emitted 368 metric tons of CO_2e in 2010, mainly coming from gasoline consumption. For additional information, refer to the figures and tables below.

Figure 7: Vehicle Fleet Emissions by Source

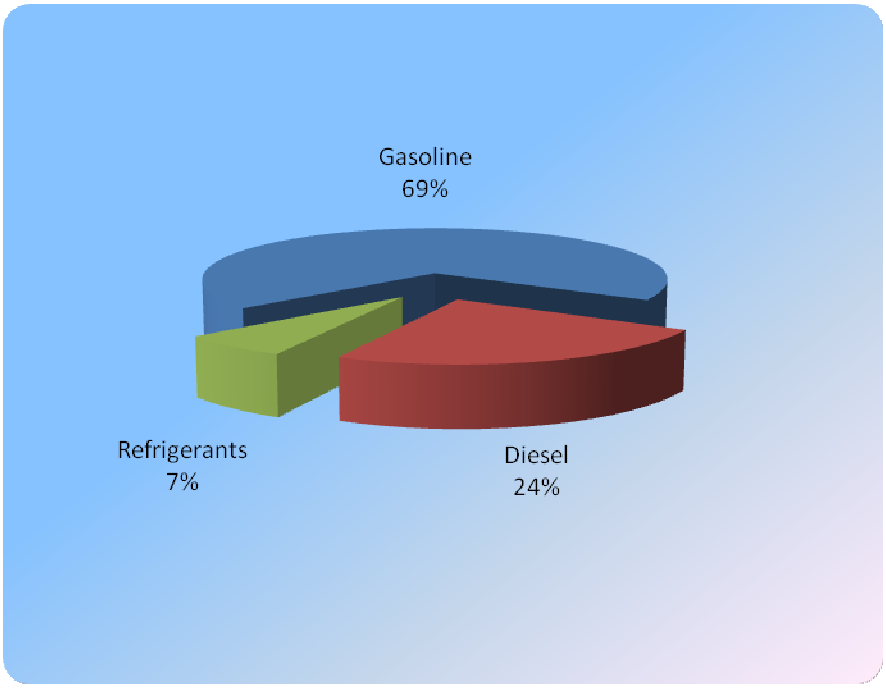

Table 16: Vehicle Fleet Emissions by Source

Source	metric tons CO2e	Consumption Quantity	Consumption Units	Cost ($)
Gasoline	255.81	28,930	US Gallons	73,715
Diesel	87.75	8,588	US Gallons	22,120
Refrigerants	24.57	0.019	Tonnes HFC-134a	-
Totals	**368.12**			**$95,835**

Figure 8: Vehicle Fleet Emissions by Department

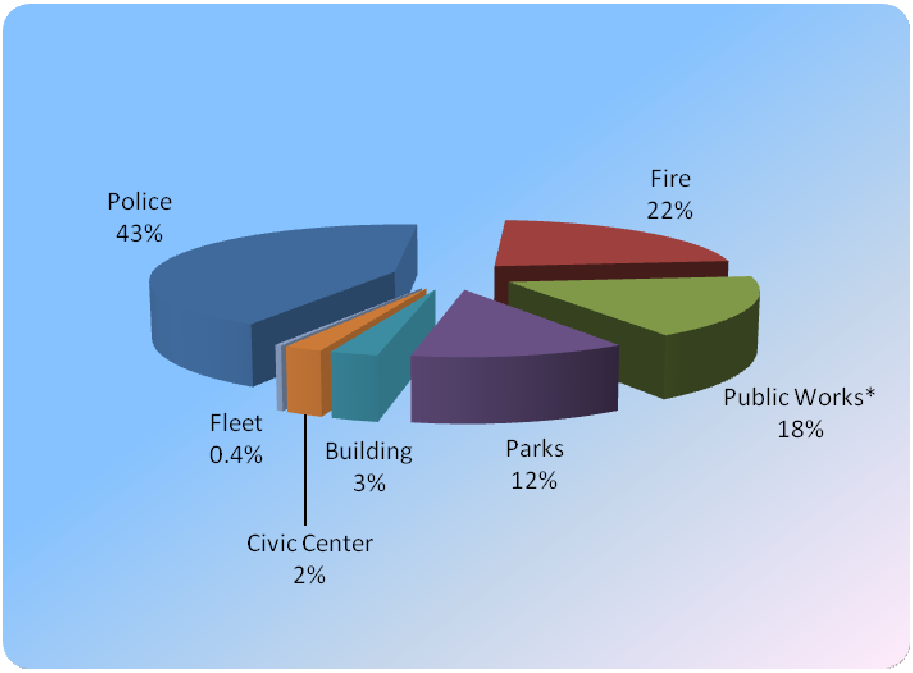

Table 17: Vehicle Fleet Emissions by Department

Department	metric tons CO2e
Police	157.71
Fire	81.70
Public Works*	64.77
Parks	44.50
Building	9.96
Civic Center	8.05
Fleet	1.43
Totals	**368.12**

*Public Works Dept includes Stormwater, Streets, Traffic, and Wastewater divisions

Table 18: LGO Protocol Report - Vehicle Fleet Emissions by Scope and Emission Type

Scope	Emission Type	Greenhouse Gas Emissions (metric tons)				
SCOPE 1		CO_2e	CO_2	CH_4	N_2O	HFC-134a
	Mobile Combustion	343.554	341.689	0.008	0.006	0.000
	Fugitive Emissions	24.570	0.000	0.000	0.000	0.019
	Total Direct Emissions	**368.124**	**341.689**	**0.008**	**0.006**	**0.019**
INDICATORS	Number of Vehicles	61				
	Vehicle Miles Traveled	98,213				
	Number of Pieces of Equipment	98				

Government-Generated Solid Waste

Many local government operations generate solid waste, much of which is eventually sent to a landfill. Typical sources of waste in local government operations include paper and food waste from offices and facilities, construction waste from public works, and plant debris from parks departments. Organic materials in government-generated solid waste (including paper, food scraps, plant debris, textiles, wood waste, etc.) generate methane as they decay in the anaerobic environment of a landfill. Emissions from the waste sector are an estimate of methane generation that will result from the anaerobic decomposition of all organic waste sent to landfill in the base year. It is important to note that although these emissions are attributed to the inventory year in which the waste is generated, the emissions themselves will occur over the 100+ year timeframe that the waste will decompose.

In 2010, 164 tons of government-generated solid waste was estimated to be landfilled, accounting for approximately 42 metric tons of CO_2e, in the form of methane from decomposing matter. Of the four waste pick-up sites, the Corporation Yard contributed the greatest amount of waste in this sector, representing 64% of all emissions associated with municipal waste. This waste data was provided by Recology, the hauler for the City of San Carlos' municipal waste.

Figure 9: Government Waste Emissions by Subsector

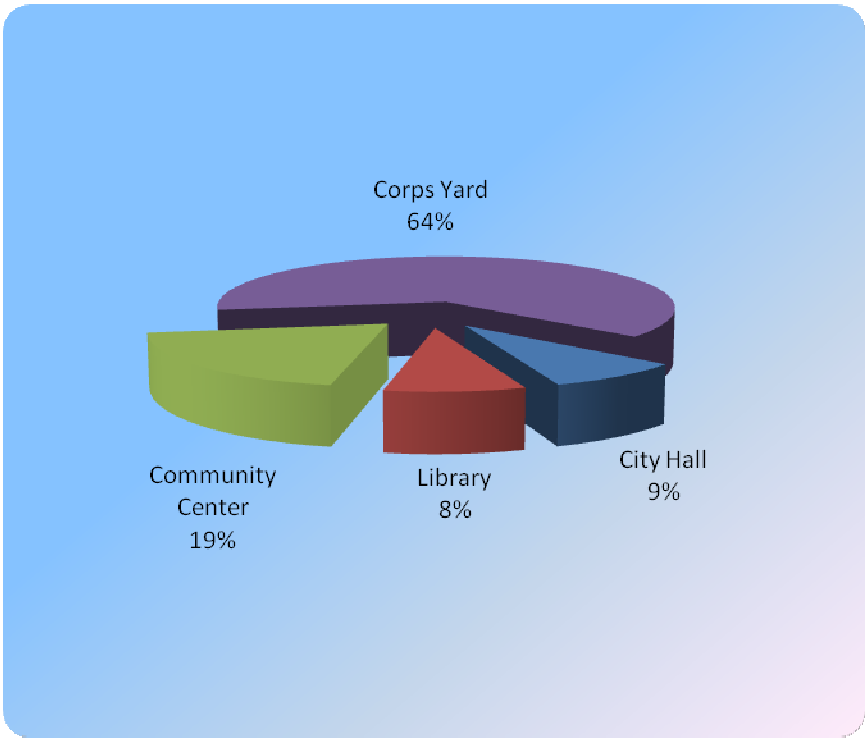

Table 19: Government Waste Emissions by Subsector

Department	metric tons CO2e
City Hall	3.53
Library	3.53
Community Center	8.04
Corps Yard	26.40
Totals	**41.49**

Table 20: LGO Protocol Report - Government Waste Emissions by Scope and Emission Type

Scope	Emission Type	Greenhouse Gas Emissions (metric tons)	
SCOPE 3		CO_2e	CH_4
	Waste All Facilities	41.491	1.976
INDICATORS	Tons of solid waste	164	

Employee Commute

Emissions in the Employee Commute sector are due to combustion of fuels in vehicles used by government employees for commuting to work at the City of San Carlos. Results from a survey designed by ICLEI in coordination with 511.org and administered by San Carlos are shown below. The survey was used to collect the data needed to calculate emissions and also capture other information that will help San Carlos set effective policy addressing this sector. The survey was completed by 58 employees and was extrapolated to account for the 96 employees that worked for the City of San Carlos in 2010. San Carlos employee commutes accounted for approximately 233 metric tons of CO_2e.

In addition to the employee commute data that was used to calculate the GHG emissions, supplementary employee information was quantified to gain a greater insight into the background of this sector. For example, the majority of San Carlos employees drive to work alone, representing 81% of San Carlos' workforce. Also, many San Carlos employees live within 5 miles of work, representing 43% of the workforce, by far the leading category of employee distance to work. This data and more is captured in the figures and tables below.

Figure 10: Employee Commute Emissions by Vehicle Class

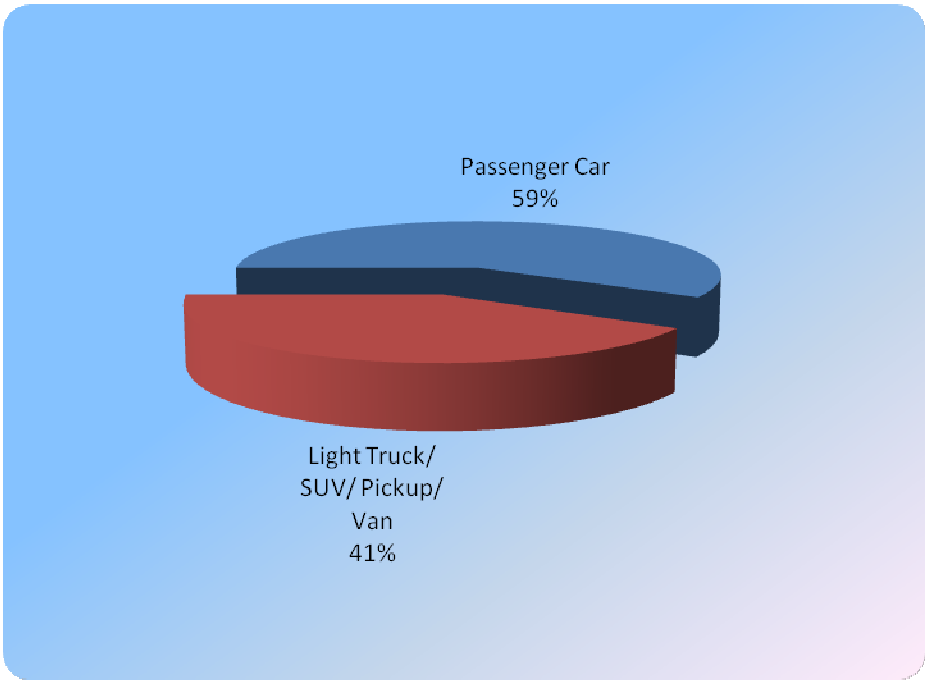

Table 21: Employee Commute Emissions by Vehicle Class

Vehicle Class	metric tons CO2e
Passenger Car	137.15
Light Truck/ SUV/ Pickup/ Van	95.80
Totals	**232.96**

Table 22: LGO Protocol Report - Employee Commute Emissions by Scope and Emission Type

Scope	Emission Type	Greenhouse Gas Emissions (metric tons)			
SCOPE 3		CO_2e	CO_2	CH_4	N_2O
	Mobile Combustion	232.958	226.648	0.016	0.019
INDICATORS	Vehicle Miles Traveled*	559,992			
	Number of Employees	96			

* estimated for all employees

58 employees completed the commute survey for a response rate of 60.4%

Table 23: Employee Commute - Travel Mode Data

Mode	Percentage
Drive Alone	81%
Carpooling/Vanpooling	5%
Public Transportation	2%
Bicycling	2%
Walking	2%
Telecommute/Other	0%
Split Modes	9%

Table 24: Employee Commute - Miles from Work Data

Miles	Percentage
0-5	43%
6-10	14%
11-15	10%
15-20	7%
21-25	10%
26-30	3%
31-35	3%
36-40	3%
41-45	2%
46-50	0%
51-75	2%
76-100	0%
Over 100	2%

Figure 11: Employee Commute – Employee Travel Mode Interest

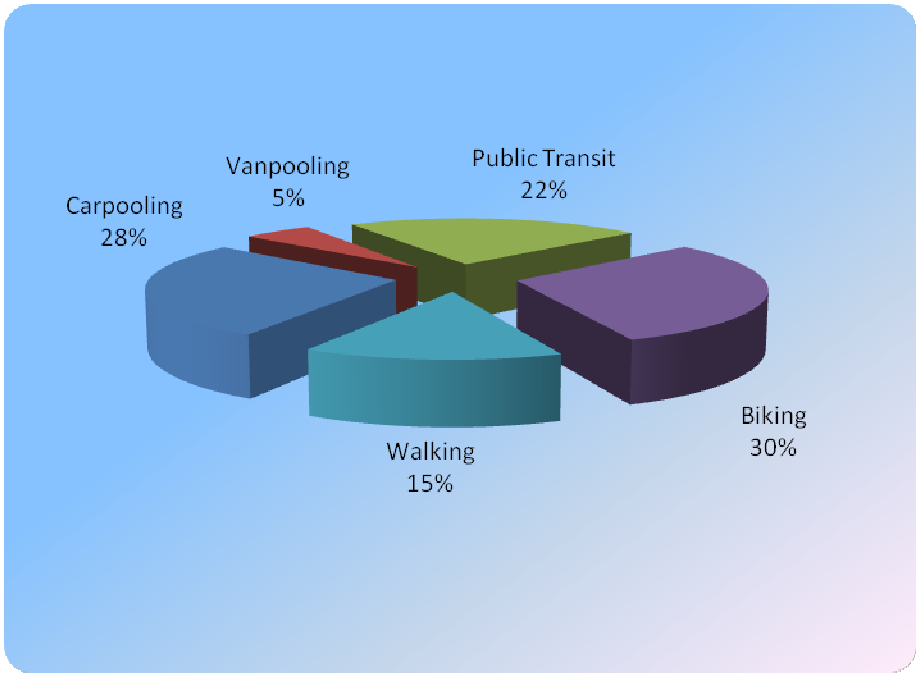

Table 25: Employee Commute – Employee Travel Mode Interest

Mode	Percent of Responding Employees Interested
Carpooling	27.6%
Vanpooling	5.3%
Public Transit	22.4%
Biking	30.3%
Walking	14.5%

Next Steps

Emissions Reduction Targets

Reduction targets provide an objective toward which to strive and against which to measure progress. It allows a local government to quantify its commitment to fighting global warming - 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.

In 2009, the San Carlos City Council set greenhouse gas reduction targets as part of the City's first Climate Action Plan (CAP). The reduction targets in the CAP are a 15% reduction below 2005 levels by the year 2020 and a 35% reduction below 2005 levels by the year 2030.

In 2010, San Carlos' greenhouse gas emissions from government operations totaled 1,527 metric tons of CO_2e. This compares to 1,743 metric tons of CO_2e greenhouse gas emissions from government operations in San Carlos for the year 2005 which results in a 12% reduction in such emissions between 2005 and 2010.

To monitor the effectiveness of its programs, cities should plan to re-inventory its emissions on a regular basis. Some jurisdictions are electing to perform annual or every other year inventories. San Carlos is currently on a five year emissions inventory schedule. This frequency may be increased depending on resources and tools available to the City in the future.

Long Term Goals

By referencing long-term goals (such as those listed above), the City of San Carlos can demonstrate that it intends to do its part towards addressing greenhouse gas emissions from its internal operations.

It is important that the City of San Carlos 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 local government service and operations, while reducing taxpayer costs?

State Reduction Targets

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. While these targets are specific to the community-scale, they can be used to inform emissions targets for government operations as well. 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 municipal operations - most local governments in California with adopted targets have targets of 15 to 25 percent reductions under 2005 levels by 2020. The reduction targets adopted by the City Council in 2009 as part of the San Carlos Climate Action Plan meet these state targets.

Departmental Targets

As a future step, the City may consider department-specific targets for each of the City departments that generate emissions within its operations. This allows San Carlos staff to do a more in-depth analysis of what is achievable in each sector in the near, mid and long-term, and also provides encourages department leaders to consider their department's impact on the climate and institute a climate-conscious culture within their operations.

Future Emissions Reduction Strategies

This inventory identifies the major sources of emissions from the City of San Carlos' operations and, therefore, where policymakers will need to target emissions reductions activities if they are to make significant progress toward adopted targets. For example, since buildings and facilities were a major source of emissions from San Carlos' municipal operations, it is possible that San Carlos could meet near-term targets by implementing a few major actions within the building and facilities sector. Medium-term targets could be met by focusing emissions reduction actions on the vehicle fleet sector, and the long term target (in 2030) will not be achievable without major reductions in all of these sectors.

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 environmentally.

Green Programs in San Carlos

San Carlos has had an active and aggressive series of Green Programs and Climate Protection projects since 2007. This coupled with the City's long standing work in environmental measures has helped to achieve the interim reductions documented in the 2010 report. It is also worth noting that a number of projects and work in recent years occurred after 2010. The results of these efforts will be reflected in future reduction inventories. They include:

- Retrofitting over 100 City Street Lights along Industrial Road and Brittan Avenue with more energy efficient LED Street Lights (100% funded by Federal EECBG Grant)
- Energy Efficiency retrofit work at City Buildings in conjunction with San Mateo County Energy Watch, Right Lights and PG&E (funded by Federal EECBG Grant, PG&E Rebates and City Funds)
- Reduction in the number of Computer Servers at City Hall through Server Virtualization Projects in the Information Technology Division
- Purchasing Hybrid Vehicles in the City vehicle fleet as vehicles come up for replacement
- Initiating Compost Recycling at City Buildings to reduce material being sent to the landfill

Using these strategies to reduce emissions, San Carlos will continue to reduce its impact on global warming through government operations. In the process, it may also be able to improve the quality of its services, reduce costs, and inspire local residents and businesses to redouble their own efforts to combat climate change.

Improving Emissions Estimates

One of the benefits of a local government operations emissions inventory is that local government staff can identify areas in their current data collection systems where data collection can be improved. This affects the accuracy of the emissions estimate and may have other implications for government operations as a whole.

During the inventory process, San Carlos data collectors identified some gaps in data that, if resolved, would allow the City of San Carlos to meet all of the recommended methods outlined in LGO Protocol in future inventories:

1. Direct tracking of refrigerants recharged into HVAC and refrigeration equipment
2. Direct tracking of fire suppressants recharged into fire suppression equipment
3. Fuel consumption by individual vehicles
4. Fuel consumption by mobile equipment
5. Refrigerants recharged into vehicles in the vehicle fleet

City Staff will review these areas to see if the missing data can be captured as part of normal operations. This will enable the City to obtain more complete data for the next emissions inventory, thereby enabling the city to make a more accurate emissions estimate.

Project Resources

ICLEI has created various tools for San Carlos' data collectors to use to assist with greenhouse gas emissions inventories. These tools are designed to work in conjunction with Local Government Operations Protocol, which is the primary reference document for conducting an emissions inventory.

To facilitate a monitoring inventory in future years, the report's author and ICLEI have documented all of the raw data, data sources and calculation methods used in this inventory. Future inventories should seek to replicate or improve upon the data and methods used in this inventory.

The following tools should be saved as resources and supplemental information to this report:

- The "Master Data Workbook", an Excel-based tool 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", an instructions guide on the types of emissions and data collection methodology for each inventory sector.
- The "Quality Control Checklist for Master Data Workbook", a checklist which provides a list of items to review in the Master Data Workbook to ensure information was entered correctly.
- The "CACP 2009 Data Entry Instructions", an instructions guide on how to enter data collected in the Master Data Workbook into the Clean Air and Climate Protection Software (CACP 2009), ICLEI's greenhouse gas emissions calculator.
- The CACP 2009 "Backup" files, a group of files which contain the calculations of emissions based on inputs from the Master Data Workbook into CACP 2009. The CACP 2009 software is required to open the Backup files.
- The "Checklist for Reviewing the Government Analysis Inputs/Outputs, Details Export" a checklist which provides a list of items to review in this CACP 2009 export file to ensure information was entered correctly.
- CACP 2009 "Government Analysis Inputs/Outputs, Summary with Notes Export", an Excel-based export file which contains a summary report of all calculated emissions, with explanatory notes included.
- CACP 2009 "Government Analysis Inputs/Outputs, Details Export", an Excel-based export file which contains a detailed report of all calculated emissions.
- The "Completing the Inventory Report", an instructions guide from ICLEI on how to report greenhouse gas emissions according to the LGO Protocol.
- The "Charts and Tables Data Conditioning Sheet", an Excel-based tool created by ICLEI and completed by the author to aid in creating the charts and tables within the Master Data Workbook.