

San Mateo County

2010 Government Operations Greenhouse Gas Emissions Inventory



Conducted by Joint Venture Silicon Valley
In collaboration with:
ICLEI-Local Governments for Sustainability USA

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The Joint Venture Public Sector Climate 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.

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.

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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 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 worldwide. ICLEI USA's mission is to build, serve and drive a movement of local governments to advance deep reductions in greenhouse gas emissions and achieve tangible improvements in local sustainability. ICLEI USA provides tools and resources, technical guidance, trainings, and national standards to help local governments meet their goals, as well as global networks to help them share innovations and learn from one another.

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Table of Contents

Executive Summary	6
The Purpose of Conducting an Inventory	6
Inventory Results	7
Regional and Local Context	8
Climate Change Mitigation Activities in California.....	8
Pacific Gas and Electric Company Supported Inventory Project	9
Introduction	11
General Methodology	11
Local Government Operations Protocol.....	11
Greenhouse Gases and Carbon Dioxide Equivalent	11
Calculating Emissions	12
The Scopes Framework	12
Organizational Boundaries	13
Types of Emissions	13
Information Items.....	14
Understanding Totals	14
Inventory Results	16
Emissions Total	16
Buildings and Other Facilities	16
Streetlights, Traffic Signals, and Other Public Lighting	18
Water Delivery Facilities	19
Wastewater Treatment Facilities	20
Airport Facilities	22
Solid Waste Facilities	22
Vehicle Fleet and Mobile Equipment	22
Government-Generated Solid Waste	23
Employee Commute	25
Project Resources	26

List of Tables and Figures

- Figure 1: 2010 Government Operations CO₂e Emissions by Sector 7
- Figure 2: 2010 Government Operations CO₂e Emissions by Source 7
- Table 1: LGO Protocol Report - Overall Emissions by Scope..... 8
- Table 2: Greenhouse Gases 11
- Table 3: Basic Emissions Calculations 12
- Table 4: Inventoried Emissions Sources by Scope..... 13
- Figure 3: Buildings and Other Facilities Emissions by Facility 17
- Figure 4: Buildings and Other Facilities Emissions by Source..... 17
- Table 7: Buildings and Other Facilities Emissions by Source 18
- Table 8: LGO Protocol Report - Buildings Sector Emissions by Scope 18
- Figure 6: Public Lighting Emissions by Subsector 18
- Table 9: Public Lighting Emissions by Subsector 19
- Table 10: LGO Protocol Report – Public Lighting Emissions by Scope..... 19
- Figure 7: Water Delivery Facilities Emissions by Subsector 19
- Table 11: Water Delivery Facilities Emissions by Subsector 20
- Table 12: LGO Protocol Report - Water Delivery Facilities Emissions by Scope 20
- Figure 8: Wastewater Treatment Facilities Emissions by Subsector 21
- Table 13: Wastewater Treatment Facilities Emissions by Subsector 21
- Table 14: LGO Protocol Report - Wastewater Treatment Facilities Emissions by Scope..... 21
- Table 16: LGO Protocol Report – Airport Facilities Emissions by Scope..... 22
- Table 17: LGO Protocol Report – Solid Waste Facilities Emissions by Scope 22
- Figure 10: Vehicle Fleet Emissions by Source..... 23
- Table 20: Vehicle Fleet Emissions by Source..... 23
- Table 21: LGO Protocol Report - Vehicle Fleet Emissions by Scope 23
- Figure 13: Government Waste Emissions by Subsector..... 24
- Table 24: Government Waste Emissions by Subsector..... 24
- Table 25: LGO Protocol Report - Government Waste Emissions by Scope 24
- Figure 14: Employee Commute Emissions by Vehicle Class 25
- Table 26: Employee Commute Emissions by Vehicle Class..... 25
- Table 27: LGO Protocol Report - Employee Commute Emissions by Scope 25

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 findings and methodology of a local government operations (LGO) greenhouse gas emissions inventory for the County of San Mateo. The inventory measures the greenhouse gas emissions (GHGs) resulting specifically from the County of San Mateo's government operations, arranged by sector to facilitate detailed analysis of emissions sources. The inventory addresses the locations and quantities of emissions generated through various local government activities. Through analysis of a local government's emissions profile, the County can tailor strategies to achieve the most effective GHG emission reductions.

Local governments can significantly reduce emissions from their operations with strategies that 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, the County is working to improve government services in a smart and targeted way that will benefit all of the County's residents.

The County of San Mateo recognizes that climate change resulting from the greenhouse gas emissions of human activities is a reality. Average global 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 County of San Mateo is acting now to limit future climate impacts that threaten the lives and property of the County's residents and businesses, make government operations more efficient, and improve the level of service it offers to the residents of the County.

Inventory Results

The following figures summarize the results of the LGO greenhouse gas emissions inventory for the County of San Mateo, by sector and source.

Figure 1: 2010 Government Operations CO₂e Emissions by Sector

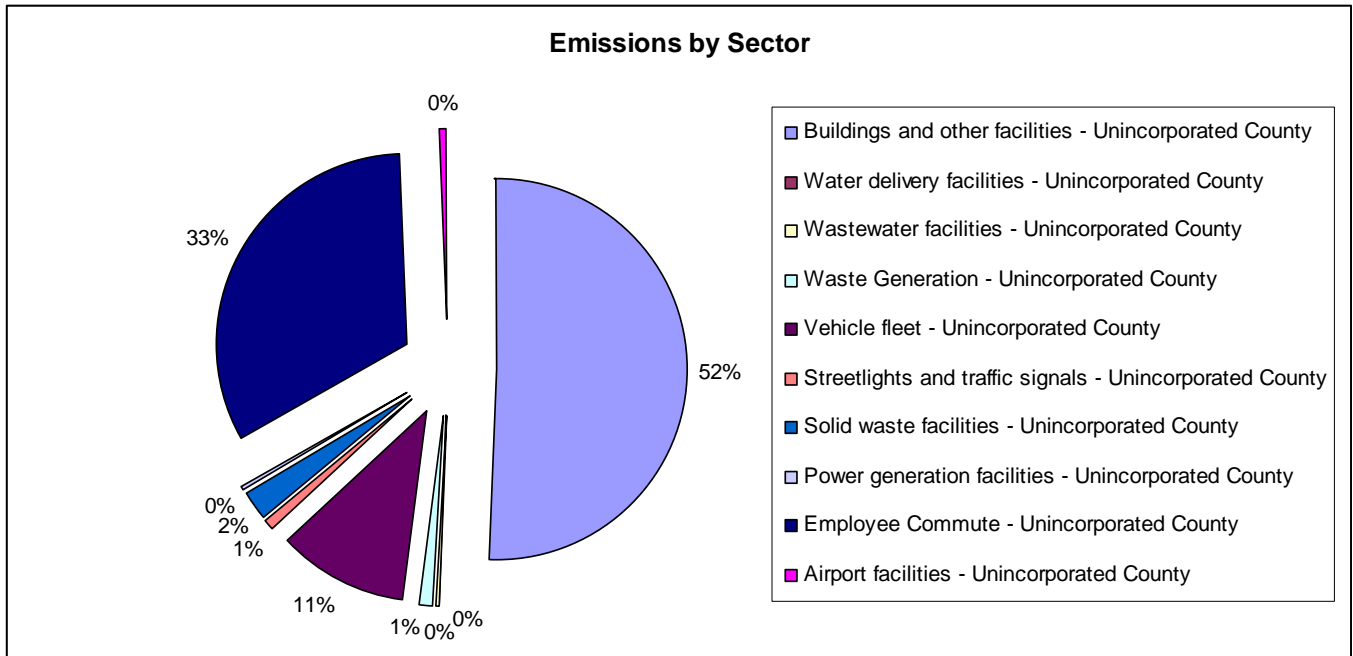


Figure 2: 2010 Government Operations CO₂e Emissions by Source

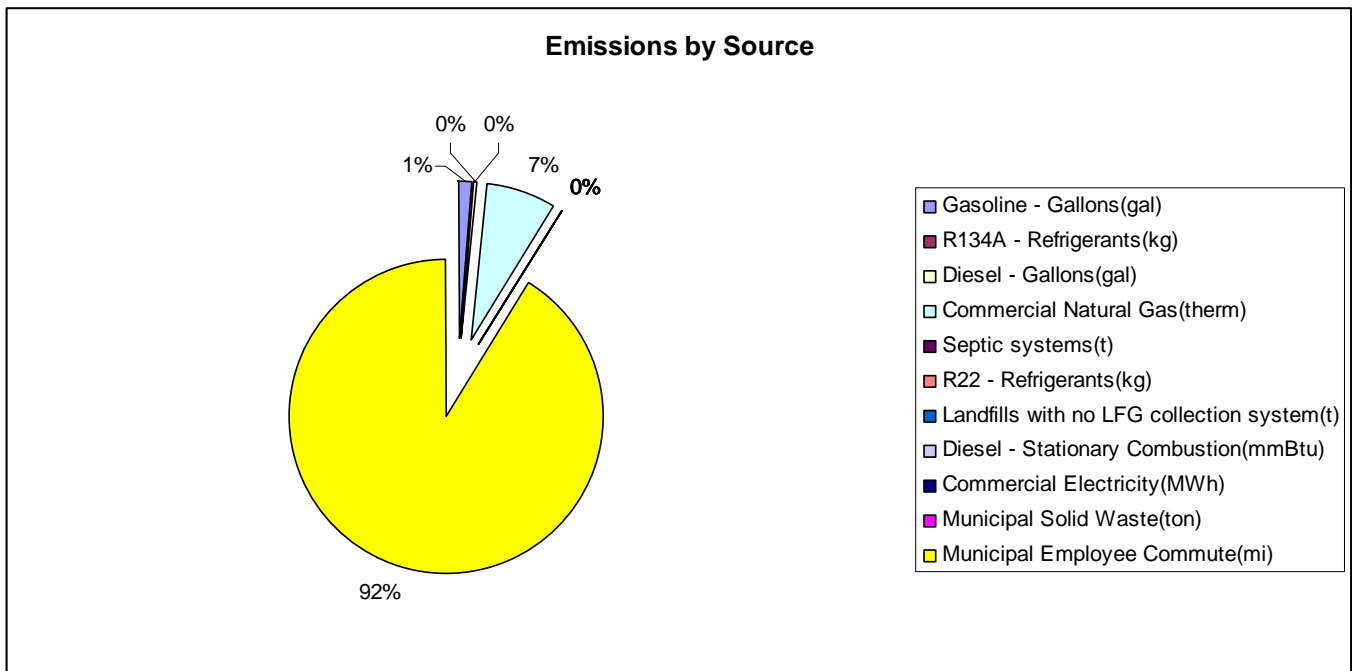


Table 1: LGO Protocol Report - Overall Emissions by Scope

Total Emissions	
	MT CO ₂ e
Scope 1	17,511.2
Scope 2	8646.1
Scope 3	13463.8

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 regarding climate change effects 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.

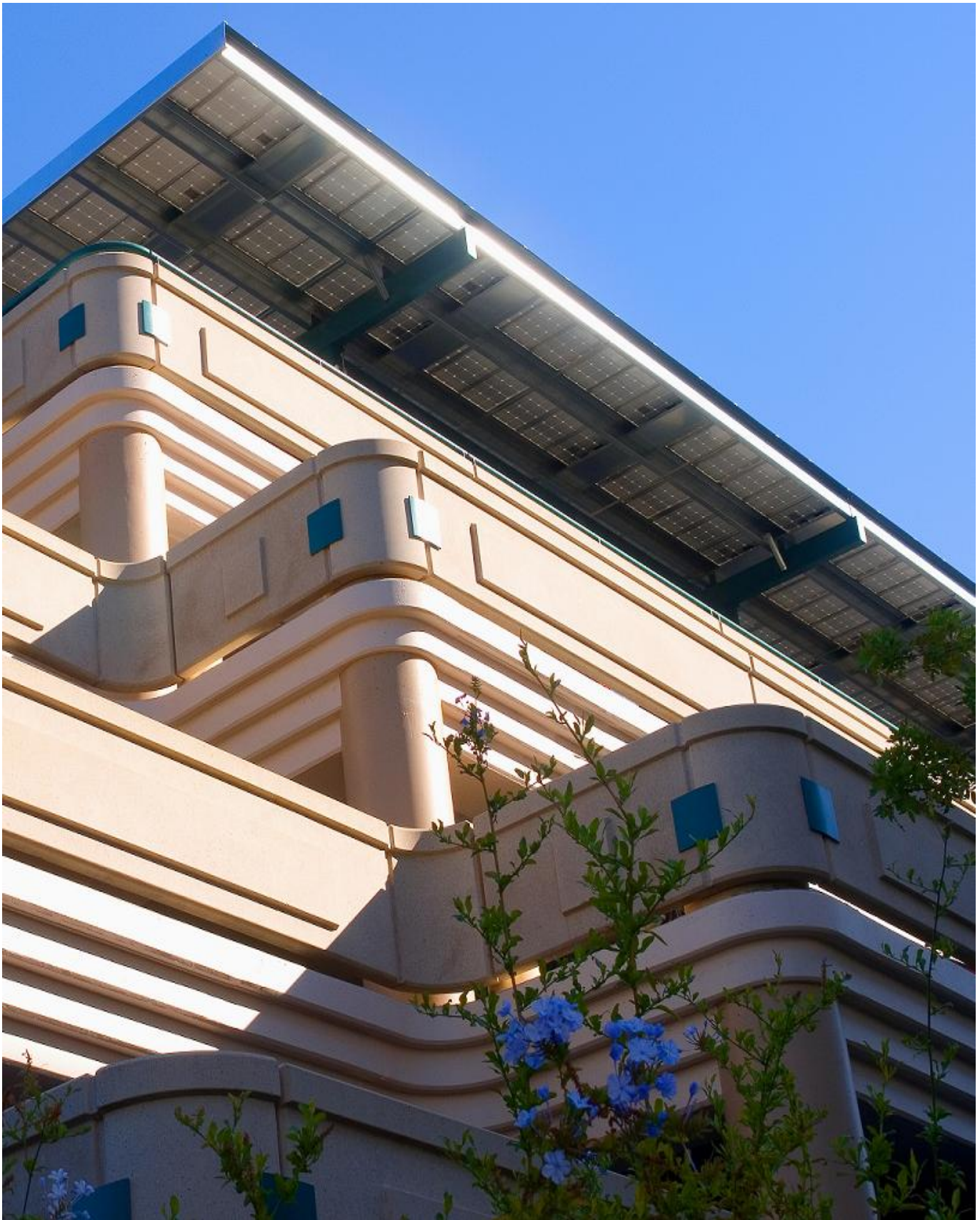
Other state measures include mandating stronger vehicle emissions standards (AB 1493, 2002), establishing a low-carbon fuel standard (EO # S-01-07, 2007), mandating a climate adaptation plan for the state (S-EO # 13-08, 2008), establishing a Green Collar Job Council, and establishing a renewable energy 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 (OPR) to create GHG planning guidelines for the California Environmental Quality Act (CEQA). In addition, the California Air Resources Board (CARB) 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 the County of San Mateo.
- SB 375 (2008) revises the process of regional transportation planning by metropolitan planning organizations (MPOs). The statute requires CARB to establish regional transportation-related GHG 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 respective Sustainable Communities

Strategy and provides CEQA streamlining for local development projects that are also 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 County of San Mateo staff, and other participating jurisdictions conducting GHG inventories.



Introduction

General Methodology

Local Government Operations Protocol

A national standard called the Local Government Operations Protocol (LGO Protocol) has been developed and adopted by CARB, 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.

Greenhouse Gases and Carbon Dioxide Equivalent

In accordance with LGO Protocol recommendations, the Hara Energy and Sustainability System of Record (“Hara ESS”) reports on several internationally recognized greenhouse gases regulated under the Kyoto Protocol (e.g. Carbon Dioxide, Methane, Nitrous Oxide). Emissions summaries found throughout this report also use Hara ESS’ ability to combine emissions from the various greenhouse gases into carbon dioxide equivalent, CO₂e. Since equal quantities of each greenhouse gas have more or less influence on the greenhouse effect, converting all emissions to a standard metric, CO₂e, allows apples-to-apples comparisons amongst quantities of all six emissions types. Greenhouse gas emissions are reported in this inventory as metric tons of CO₂e (MTCO₂e).

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 2: Greenhouse Gases

Gas	Chemical Formula	Activity	Global Warming Potential (CO ₂ e)
Carbon Dioxide	CO ₂	Combustion	1
Methane	CH ₄	Combustion, Anaerobic Decomposition of Organic Waste (Landfills, Wastewater), Fuel Handling	21
Nitrous Oxide	N ₂ O	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 3: 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 CO₂ 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.

ICLEI and the LGO Protocol provide standard methodologies for calculating emissions from the sources shown in Table 4. 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 4: 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. 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 require examination to ascertain 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 the County of San Mateo.

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 the County of San Mateo's government operations.

Information items quantified for this inventory include:

- Ozone depleting chemical used as refrigerants (most notably R-22 and halons)

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 County of San Mateo's 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.



Inventory Results

Emissions Total

In 2010, the County of San Mateo's greenhouse gas emissions from government operations totaled 39,621 metric tons of CO₂e. This number represents 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 and ICLEI identify reporting by scopes, sources, and sectors as the strongly preferred form of reporting a greenhouse gas inventory. A detailed analysis of the County of San Mateo's emissions by scopes, sources, and sectors, is located in the sub-sections below.

Buildings and Other Facilities

Facility operations contribute GHG emissions in two major ways. First, facilities consume electricity and fuels such as natural gas. This consumption is associated with the majority of GHG emissions from facilities. In addition, fire suppression, air conditioning, and refrigeration equipment in buildings can emit hydrofluorocarbons (HFCs) and other GHGs when these systems leak refrigerants or fire suppressants. Refrigerants and fire suppressants are very potent GHGs, and have Global Warming Potential (GWP) of up to many thousand times that of CO₂. For example, HFC-134a, a very common refrigerant, has a GWP of 1300, or 1300 times that of CO₂. Therefore, even small amounts of leaked refrigerants can have a significant effect on GHG emissions.

The County of San Mateo operates more than 260 facilities, included facilities leased from other landowners.

Figure 3: Buildings and Other Facilities Emissions by Facility

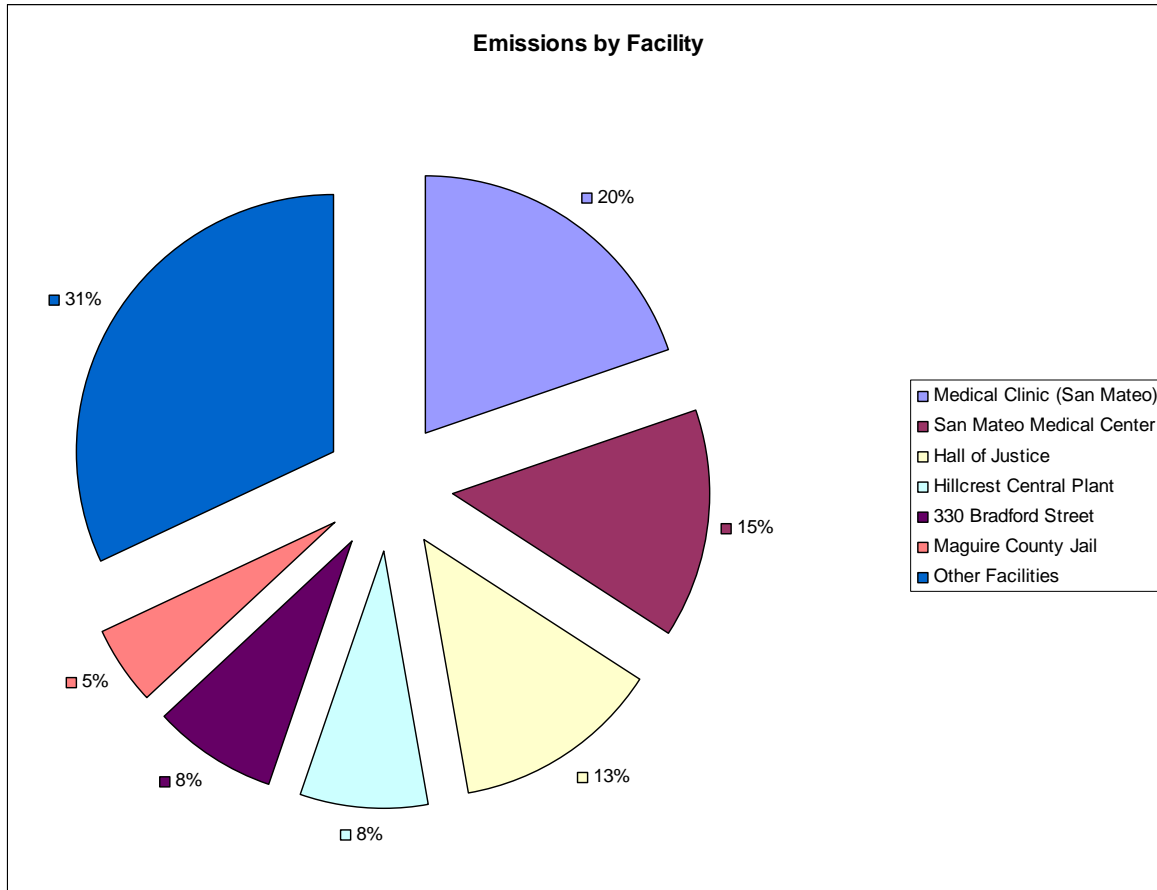


Figure 4: Buildings and Other Facilities Emissions by Source

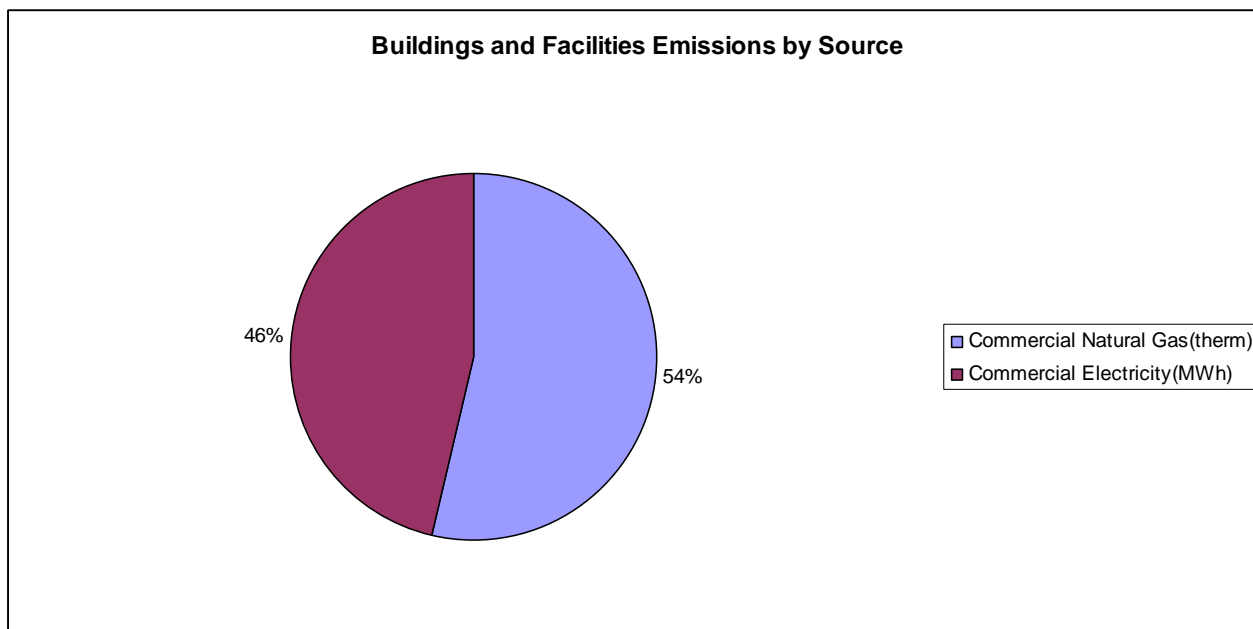


Table 7: Buildings and Other Facilities Emissions by Source

Activity Type	Activity Amount	CO2e (MT)	% of total CO2e
Commercial Natural Gas(therm)	1593819	8476.5	53.69
Commercial Electricity(MWh)	32686	7312.2	46.31

Table 8: LGO Protocol Report - Buildings Sector Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 1	11905.1	59.47
Scope 2	8112.9	40.53

Streetlights, Traffic Signals, and Other Public Lighting

Like most local governments, the County of San Mateo operates a range of public lighting including traffic signals, sidewalk lighting, and park lights. The majority of 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.

Figure 6: Public Lighting Emissions by Subsector

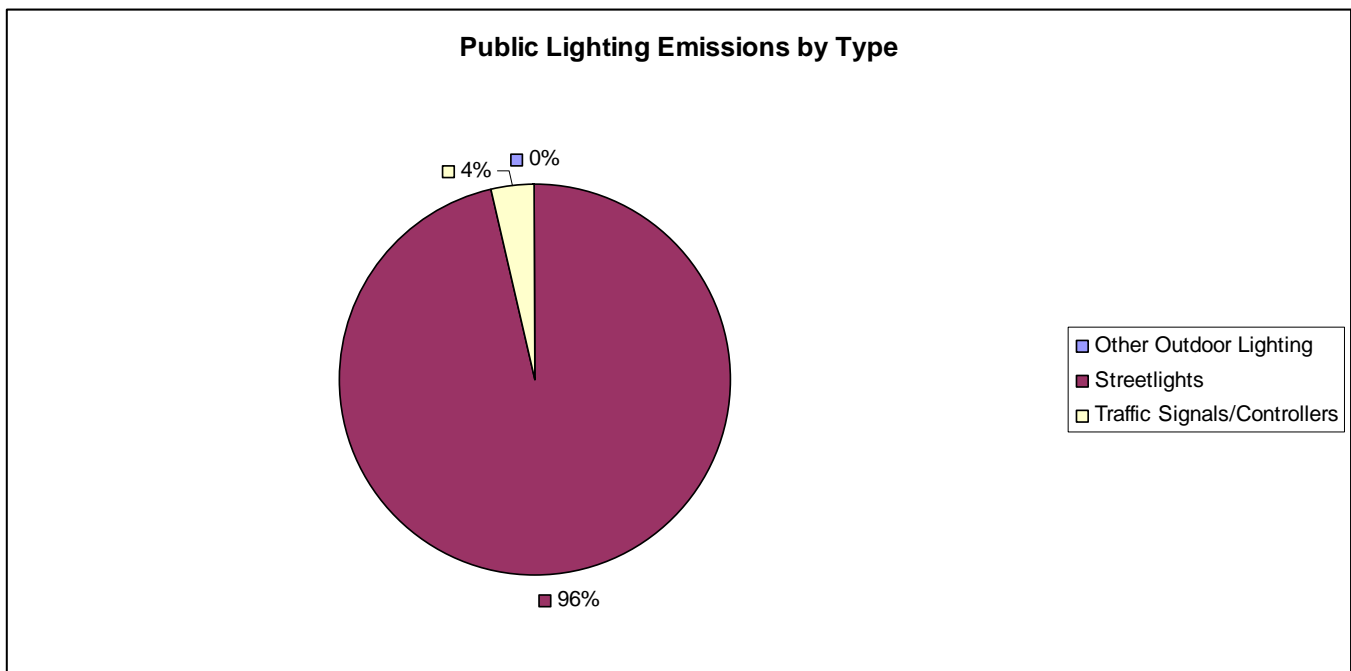


Table 9: Public Lighting Emissions by Subsector

Lighting Type	CO2e (MT)	% of total CO2e
Other Outdoor Lighting	0.1	0.000305157
Streetlights	316.1	0.96460177
Traffic Signals/Controllers	11.5	0.035093073

Table 10: LGO Protocol Report – Public Lighting Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 1	0	0
Scope 2	327.3	100

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 County of San Mateo operates a range of water transport equipment, including water pumps and sprinkler systems. Electricity consumption is the most significant source of greenhouse gas emissions from the operation of the County’s water transport equipment.

Figure 7: Water Delivery Facilities Emissions by Subsector

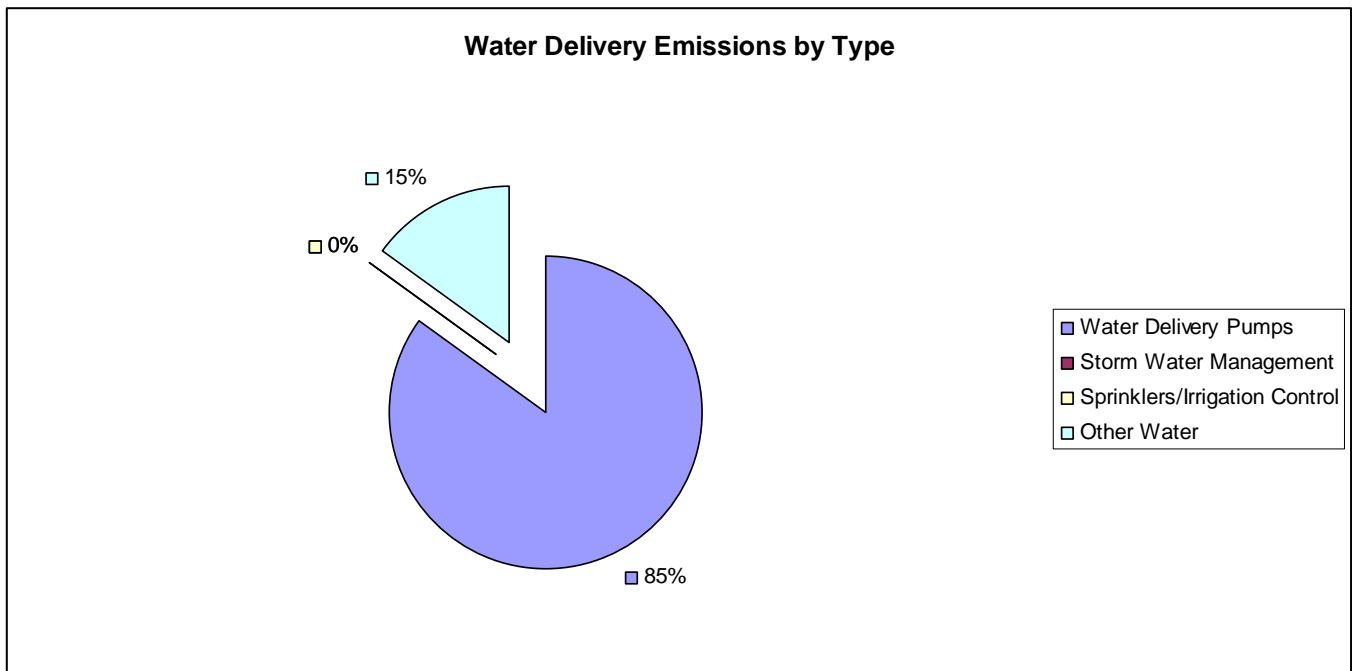


Table 11: Water Delivery Facilities Emissions by Subsector

Type	CO2e (MT)	% of total CO2e
Water Delivery Pumps	36.4	0.85046729
Storm Water Management	0	0
Sprinklers/Irrigation Control	0	0
Other Water	6.4	0.14953271

Table 12: LGO Protocol Report - Water Delivery Facilities Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 1	0.1	0.23
Scope 2	43.1	99.82

Wastewater Treatment Facilities

Wastewater originating from homes and businesses is rich in organic matter and has a high concentration of carbon and nitrogen (along with other organic elements). As wastewater is collected, treated, and discharged, chemical processes in aerobic and anaerobic conditions lead to the creation and emission of two greenhouse gases: methane (CH₄) and nitrous oxide (N₂O). Local governments that operate wastewater treatment facilities, including treatment plants, septic systems, collection lagoons, and other facilities, must therefore account for the emission of these gases.

The County of San Mateo operates several septic systems throughout the region, mostly in unincorporated areas. These facilities serve approximately 700 people.

Figure 8: Wastewater Treatment Facilities Emissions by Subsector

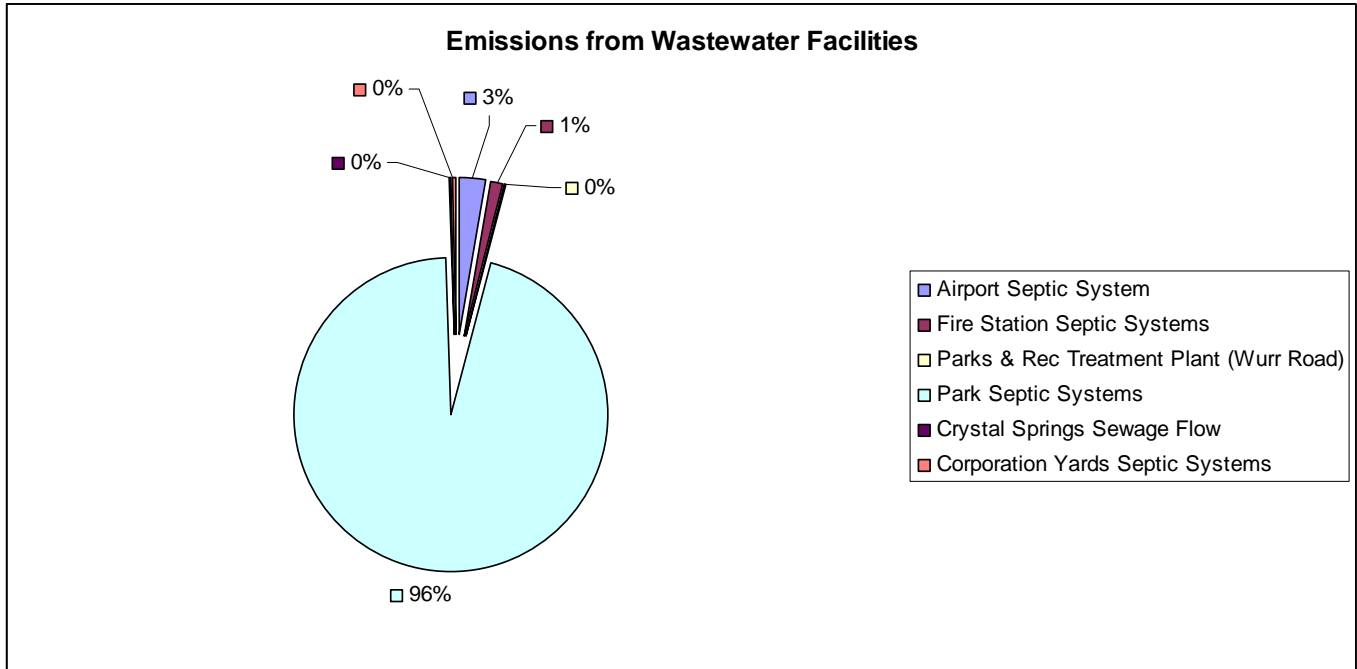


Table 13: Wastewater Treatment Facilities Emissions by Subsector

Organizational Unit	CO2e (MT)	% of total CO2e
Airport Septic System	3.8	2.85
Fire Station Septic Systems	1.6	1.16
Parks & Rec Treatment Plant (Wurr Road)	0.1	0.06
Park Septic Systems	128.3	95.52
Crystal Springs Sewage Flow	0.2	0.14
Corporation Yards Septic Systems	0.4	0.28

Table 14: LGO Protocol Report - Wastewater Treatment Facilities Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 1	134.1	99.83
Scope 2	0.3	0.22

Airport Facilities

The County of San Mateo owns and operates two municipal airports, one in San Carlos and the other in Half Moon Bay. Electricity consumption is the most significant source of greenhouse gas emissions from the operation of the County of San Mateo's Airport Facilities. PG&E supplied data relating to electricity consumption for Airport Facilities.

Table 16: LGO Protocol Report – Airport Facilities Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 1	6.3	3.73
Scope 2	162.6	96.28

Solid Waste Facilities

There are a variety of emissions associated with solid waste management services including the collection, processing, and storage of solid waste generated from residents and businesses. The most prominent source of emissions from solid waste facilities is fugitive methane released by the decomposition of organic waste over time in landfills. The scale of these emissions depends upon the size and type of the landfill and the presence of a landfill gas collection system and purchased electricity used to generate power for all solid waste management facilities. The County of San Mateo formerly operated two landfills, both of which have been closed. The Pescadero Landfill was active from 1975-1987 and the Half Moon Bay Landfill from 1962-1976. The County currently does not operate any of its own landfills.

Table 17: LGO Protocol Report – Solid Waste Facilities Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 1	987	100

Vehicle Fleet and Mobile Equipment

The vehicles and mobile equipment used in the County of San Mateo's daily operations, from maintenance trucks to police cruisers and fire trucks, burn gasoline, diesel, and other fuels, which results in GHG emissions. In addition, vehicles with air conditioning or refrigeration equipment use refrigerants that can leak from the vehicle. In 2010, the County of San Mateo operated a vehicle fleet with roughly 900 vehicles. In order to obtain emissions estimates from the operation of these vehicles, both fuel consumption and refrigerant leakage was calculated and analyzed. The fuel consumption was tracked through an electronic cardlock system which recorded all fueling of County vehicles. Refrigerant leakage was based on a mass balance calculation, taking into account the difference in refrigerant quantity between the beginning of the year and the end of the year.

Figure 10: Vehicle Fleet Emissions by Source

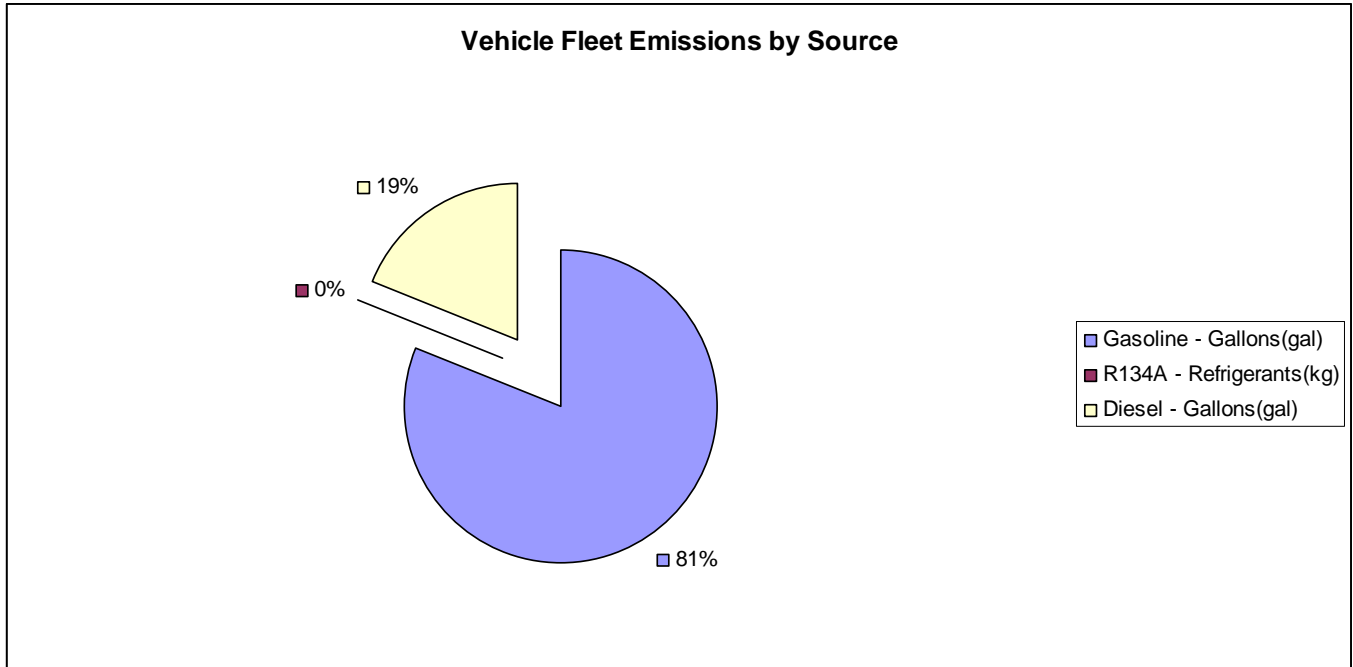


Table 20: Vehicle Fleet Emissions by Source

Activity Type	Activity Amount	CO2e (MT)	% of total CO2e
Gasoline - Gallons(gal)	395332	3482.9	78.38
Diesel - Gallons(gal)	91649	930.2	20.93
R134A - Refrigerants(kg)	18.14	23.6	0.53

Table 21: LGO Protocol Report - Vehicle Fleet Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 1	4443.6	100

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.

Figure 13: Government Waste Emissions by Subsector

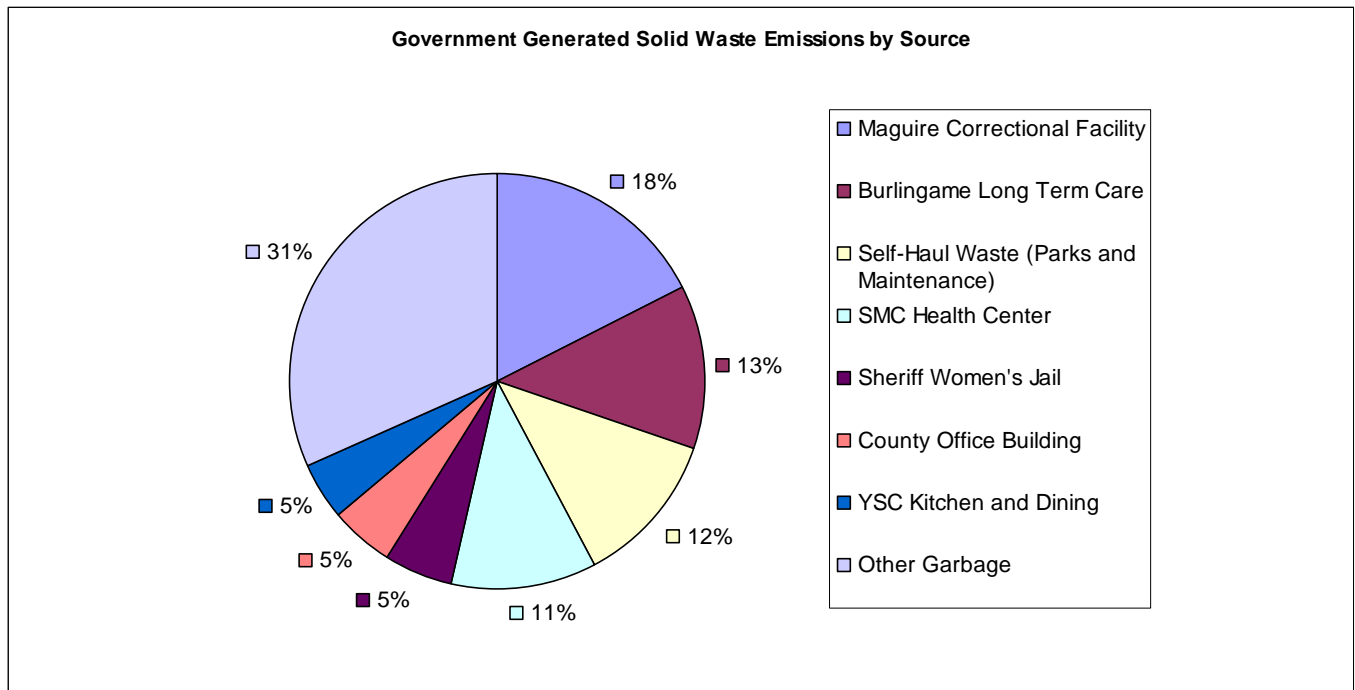


Table 24: Government Waste Emissions by Subsector

Organizational Unit	CO2e (MT)	% of total CO2e
Maguire Correctional Facility	68.6	17.63
Burlingame Long Term Care	49.3	12.66
Self-Haul Waste (Parks and Maintenance)	46.3	11.9
SMC Health Center	44	11.31
Sheriff Women's Jail	21.1	5.43
County Office Building	19.4	4.98
YSC Kitchen and Dining	17.6	4.52
Other Garbage	122.7	31.61

Table 25: LGO Protocol Report - Government Waste Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 3	389.3	100

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 County of San Mateo. Results from a survey designed by ICLEI and administered by the County are shown below. The survey was used to collect the data needed to calculate emissions and also capture other information that will help the County set effective policy addressing this sector.

Figure 14: Employee Commute Emissions by Vehicle Class

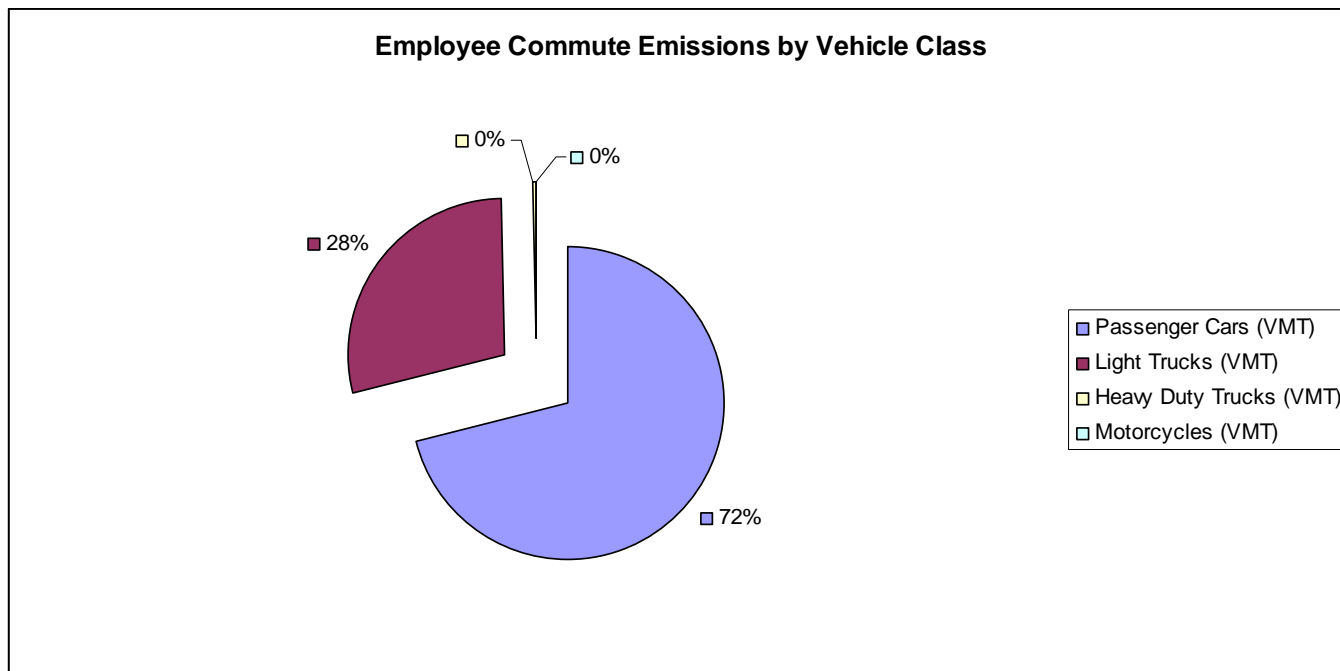


Table 26: Employee Commute Emissions by Vehicle Class

Activity Type	Activity Amount	CO2e (MT)	% of total CO2e
Passenger Cars (VMT)	19471323.7	9295.9695	0.712
Light Trucks (VMT)	7788275.47	3713.158	0.284
Heavy Duty Trucks (VMT)	119335.2546	52.298	0.004
Motorcycles (VMT)	1250.997963	0.653725	0.000

Table 27: LGO Protocol Report - Employee Commute Emissions by Scope

Scope	CO2e (MT)	% of total CO2e
Scope 3	13074.5	100

Project Resources

ICLEI created various tools for the County of San Mateo to use to assist with GHG emissions inventories. These tools are designed to work in conjunction with the LGO Protocol, 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”, 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 “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.
- A presentation with slides completed by the author to summarize findings from the greenhouse gas inventory