

# City of Del Mar 2005 Greenhouse Gas Emissions Inventory



March 2011

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ICLEI-Local Governments for Sustainability USA (ICLEI) is a membership association of more than 1,000 local governments worldwide—more than 500 in the United States—committed to advancing climate protection and sustainability. Through technical expertise, direct network engagement, and the innovation and evolution of tools, ICLEI strives to empower local governments to set and achieve their emissions reduction and sustainability goals. For more information, visit [www.icleiusa.org](http://www.icleiusa.org).

# Table of Contents

## Executive Summary

Government Operations Inventory Results.....	x
Community Inventory Results .....	xi

## Introduction

1.1 Climate Change Background and Potential Impacts.....	2
1.2 Purpose of Inventory .....	4
1.3 Climate Change Mitigation Activities in California.....	5
1.4 Climate Change Mitigation Activities in Del Mar.....	6
1.5 The San Diego Regional Climate Protection Initiative.....	8

## Methodology

2.1 Greenhouse Gases .....	11
2.2 Calculating Emissions.....	11
2.3 Reporting Emissions .....	12
2.3.1 <i>The Scopes Framework</i> .....	12
2.3.2 <i>Double Counting and Rolling Up Scopes</i> .....	14
2.3.3 <i>Emissions Sectors</i> .....	15

## Government Operations Inventory Results

3.1 Summary by Sector.....	17
3.2 Summary by Source.....	18
3.3 Summary by Scope .....	19
3.4 Detailed Sector Analyses .....	20
3.4.1 <i>Buildings and Other Facilities</i> .....	20
3.4.2 <i>Streetlights, Traffic Signals, and Other Public Lighting</i> .....	21
3.4.3 <i>Water Transport</i> .....	21
3.4.4 <i>Vehicle Fleet and Mobile Equipment</i> .....	22
3.4.5 <i>Government-Generated Solid Waste</i> .....	24
3.4.6 <i>Employee Commute</i> .....	24

## Community Inventory Results

4.1 Community Inventory Summary.....	26
4.1.1 <i>Summary by Scope</i> .....	27
4.1.2 <i>Summary by Sector</i> .....	27
4.1.3 <i>Summary by Source</i> .....	28
4.1.4 <i>Per Capita Emissions</i> .....	30
4.2 Community Inventory Detail by Sector.....	30

4.2.1 Residential Sector .....	30
4.2.2 Commercial / Industrial Sector .....	31
4.2.3 Transportation Sector .....	32
4.2.4 Solid Waste Sector .....	33
4.2.5 Wastewater Sector .....	33
4.3 Community Emissions Forecast .....	34
4.3.1 Residential Sector .....	34
4.3.2 Commercial / Industrial Sector .....	34
4.3.3 Transportation Sector .....	35
4.3.4 Solid Waste and Wastewater Sectors .....	35

## Conclusion

5.1 Toward Setting Emissions Reduction Targets .....	37
5.1.1 The Long-Term Goal .....	38
5.1.2 State of California Targets and Guidance .....	38
5.1.3 Department Targets .....	38
5.2 Creating an Emissions Reduction Strategy .....	39

## Appendix A: The Local Government Operations Protocol

A.1 Local Government Operations Protocol .....	II
A.1.1 Background .....	II
A.1.2 Organizational Boundaries .....	III
A.1.3 Types of Emissions .....	III
A.1.4 Quantifying Emissions .....	IV
A.1.5 Reporting Emissions .....	V
A.2 Baseline Years .....	V

## Appendix B: Government-Generated Solid Waste Methodology

B.1 Estimating Waste Tonnages from the City of Del Mar's Operations .....	VII
B.2 Emissions Calculation Methods .....	VI
B.2.1 Methane Commitment Method .....	VIII

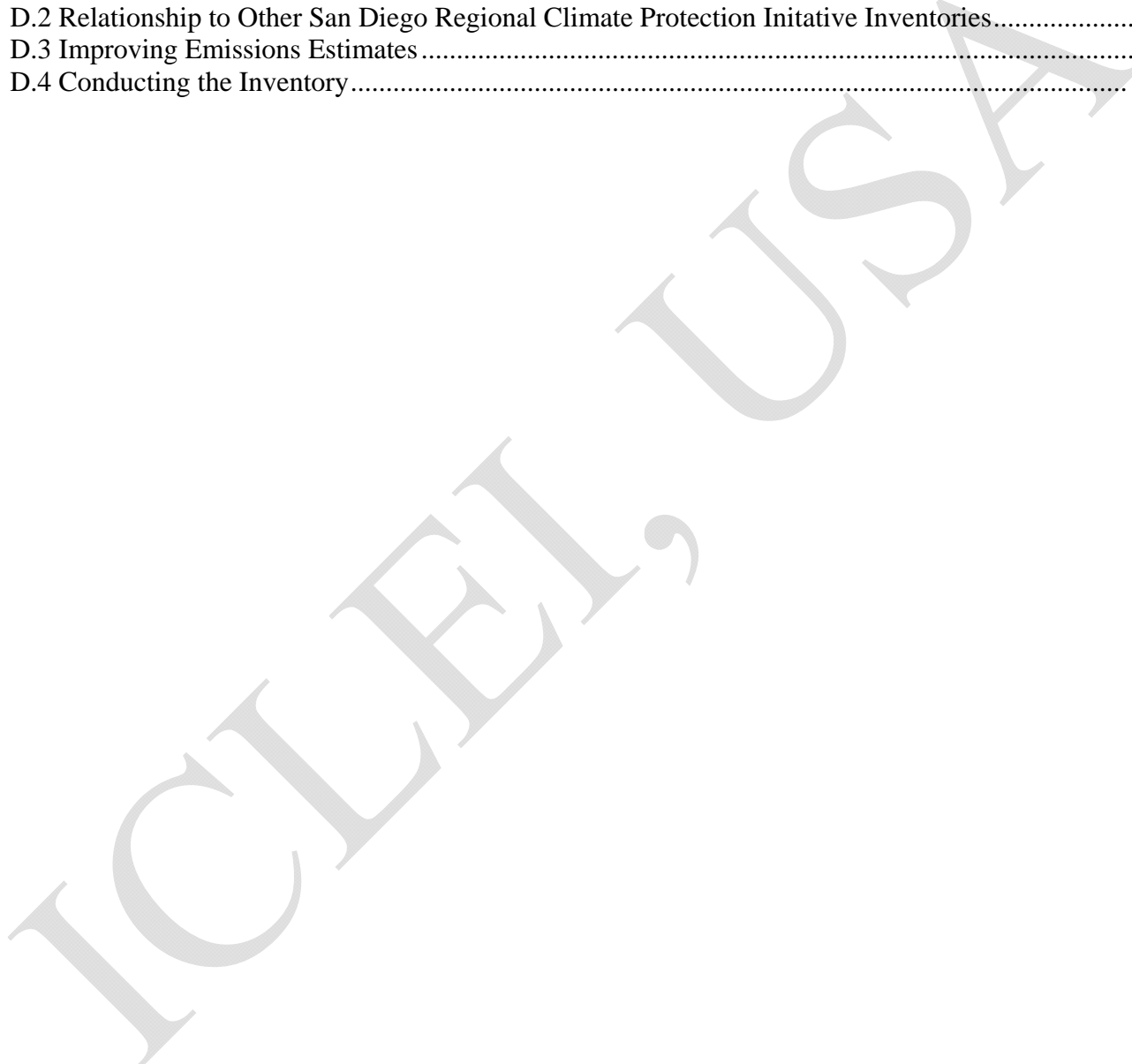
## Appendix C: Community Inventory Methodology

C.1 Overview of Inventory Contents and Approach .....	IX
C.1.1 Emissions Sources Included and Excluded .....	IX
C.2 Emissions Forecast .....	XI
C.3 The Built Environment: Residential, Commercial, and Industrial Sectors .....	XI
C.4 On-road Transportation and Off-road Mobile Sources .....	XII
C.4.1 On-road Transportation .....	X
C.4.2 Off-road Mobile Sources .....	XII
C.5 Solid Waste .....	XIII

<i>C.5.1 Landfill Waste-in-Place</i> .....	<i>XIII</i>
<i>C.5.2 Community-Generated Solid Waste</i> .....	<i>XIII</i>
C.6 Wastewater .....	XIII

## **Appendix D: Conducting a Monitoring Inventory**

D.1 ICLEI Tools for Local Governments .....	XIV
D.2 Relationship to Other San Diego Regional Climate Protection Initiative Inventories.....	XV
D.3 Improving Emissions Estimates .....	XV
D.4 Conducting the Inventory.....	XVI



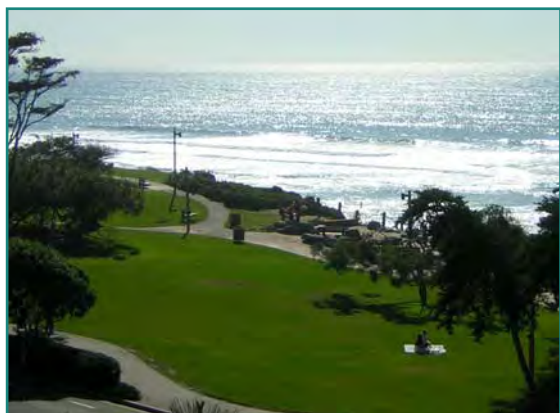
# List of Tables and Figures

## List of Tables

ES.1	Government Operations Emissions by Sector	xi
ES.2	Community Emissions by Sector	xii
1.1	Del Mar Profile	7
2.1	Greenhouse Gases	11
2.2	Basic Emissions Calculations	12
3.1	Government Operations Emissions by Sector	18
3.2	Government Operations Emissions by Source	19
3.3	Energy Use and Emissions from Major Facilities	21
3.4	Energy Use and Emissions from Public Lighting	21
3.5	Energy Use and Emissions from Water Transport Equipment	22
3.6	Emissions from Vehicle Fleet and Mobile Equipment	23
4.1	Community Emissions Summary by Scope	26
4.2	Community Emissions Summary by Sector	28
4.3	Community Emissions Summary by Source	29
4.4	Per Capita Emissions	30
4.5	Transportation Emissions by Type	32
4.6	Waste Emissions Sources	33
4.7	Community Emissions Growth Forecast by Sector	35

## List of Figures

ES.1	Del Mar Government Operations Emissions by Sector	xi
ES.2	Del Mar Community Emissions by Sector	xii
1.1	The Five-Milestone Process	5
2.1	Emissions Scopes	13
3.1	Government Operations Emissions by Sector	18
3.2	Government Operations Emissions by Source	19
3.3	Emissions from Major Facilities by Department	20
3.4	Emissions from Mobile Sources	23
4.1	Community Scope 1 Emissions	27
4.2	Community Emissions Summary by Sector	28
4.3	Community Emissions Summary by Source	29
4.4	Residential Emissions by Source	31
4.5	Commercial / Industrial Emissions by Source	32
4.6	Community Emissions Forecast for 2020	34
5.1	California Greenhouse Gas Reduction Targets	38



# Executive Summary

The City of Del Mar has recognized that human-caused climate change is a reality, with potentially disruptive effects to the City's residents and businesses. The City also recognizes that local governments play a leading role in both reducing greenhouse gas (GHG) emissions and adapting to the potential impacts of climate change. Local governments can dramatically reduce emissions from their government operations through such measures as increasing energy efficiency in facilities and vehicle fleets, utilizing renewable energy sources, enacting sustainable purchasing policies, reducing waste, and supporting alternative modes of transportation for employees. The co-benefits of these measures may include lower energy bills, improved air quality, and more efficient government operations. In addition, the City of Del Mar can influence emissions in the community by exercising its regulatory authority and leading by example.

The City of Del Mar has begun its efforts to address the causes of climate change with the assistance of the partners in the San Diego Regional Climate Protection Initiative. These partners include Kaiser Permanente, The San Diego Foundation, 17 local jurisdictions in the San Diego region, and ICLEI-Local Governments for Sustainability.

This greenhouse gas emissions inventory is an important first step in the City's climate protection efforts. As advised by ICLEI, it is essential to first quantify emissions to establish:

- A baseline emissions inventory, against which to measure future progress.
- An understanding of the scale of emissions from various sources.

Presented here are estimates of greenhouse gas emissions in 2005 resulting from the City of Del Mar's government operations and from the community-at-large. With one exception,<sup>1</sup> all government operations emissions estimates in this report refer to emissions generated from sources over which the City has direct operational control, exclusive of

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<sup>1</sup> The exception is emissions from employee-owned vehicles that are used by employees during commuting.

physical location.<sup>2</sup> This includes all government-operated facilities, streetlights, and other stationary sources; the on-road vehicle fleet and off-road equipment; and waste generated by government operations. The inventory also estimates emissions from the community-at-large. Community-scale emissions are reported by five primary sectors: residential, commercial/industrial, transportation, solid waste and wastewater.

Like all emissions inventories, this document must rely on the best available data and calculation methodologies. Emissions estimates are subject to change as better data and calculation methodologies become available in the future. Nevertheless, the findings of this analysis provide a solid basis upon which the City of Del Mar can begin planning and taking action to reduce its greenhouse gas emissions.

This inventory uses the protocol developed by the California Air Resources Board (CARB) in conjunction with ICLEI, the California Climate Action Registry and The Climate Registry. This standard, called the Local Government Operations Protocol (LGO Protocol), provides standard accounting principles, boundaries, quantification methods, and procedures for reporting greenhouse gas emissions from local government operations.

## Government Inventory Results

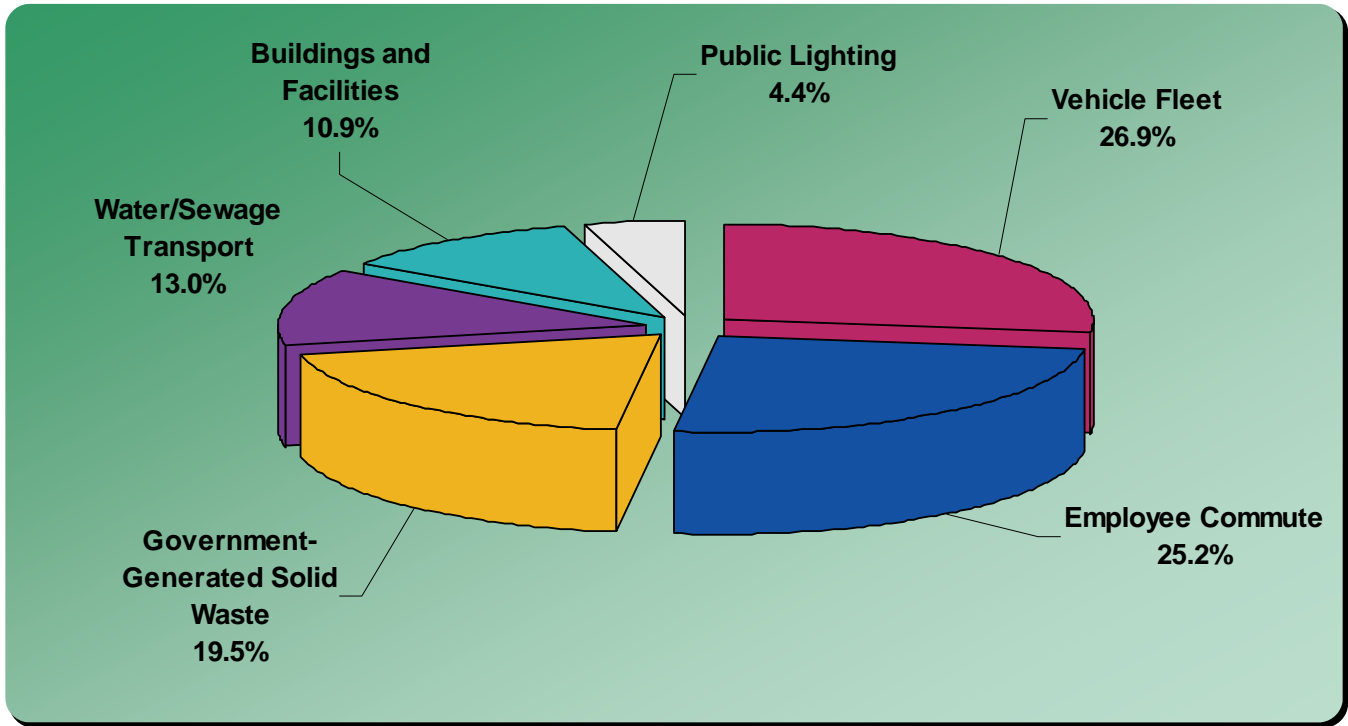
In 2005, the City of Del Mar's operational greenhouse gas emissions totaled 579 metric tons of CO<sub>2</sub>e.<sup>3</sup> Of the total emissions accounted for in this inventory, transportation-related emissions were the largest with the City's Vehicle Fleet accounting for 26.9 %, closely followed by Employee Commute emissions accounting for 25.2 % of total emissions (as shown in Figure ES.1 and Table ES.1).

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<sup>2</sup> Facilities, vehicles, or other operations wholly or partially owned by, but not operated by the City of Del Mar are not included in this inventory. See Appendix A for more details on the boundaries of the inventory.

<sup>3</sup> This number represents a "roll-up" of emissions and is not intended to represent a complete picture of emissions from the City's operations. This roll-up number should not be used for comparison with other local government roll-up numbers without a detailed analysis of the basis for this total.

**Figure ES.1 Government Operations Emissions by Sector**



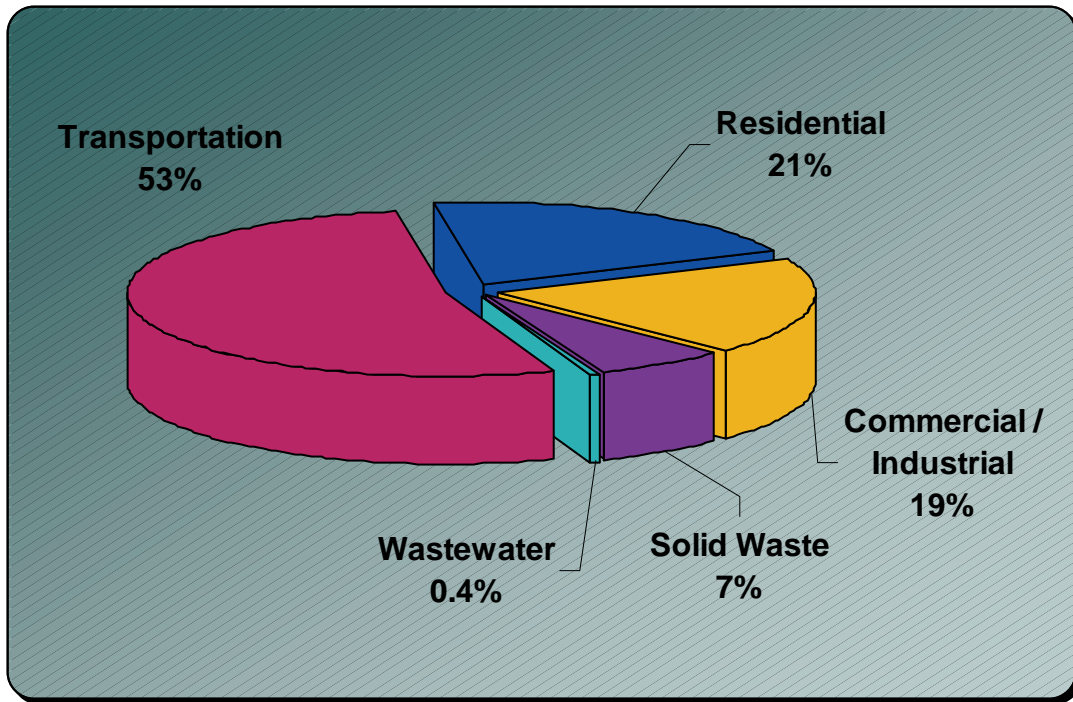
**Table ES.1: 2005 Government Operations Emissions by Sector**

Sector	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)
Vehicle Fleet	156
Employee Commute	146
Government-Generated Waste	113
Water/Sewage Transport	76
Buildings and Facilities	63
Public Lighting	26
<b>Total</b>	<b>579</b>

## Community Inventory Results

In 2005, the Del Mar community emitted approximately 48,776 metric tons of CO<sub>2</sub>e. As shown in Figure ES.2 and Table ES.2 below, the transportation sector was by far the largest source of emissions, generating approximately 25,825 metric tons of CO<sub>2</sub>e, or 53% of total 2005 emissions. Transportation sector emissions are the result of diesel and gasoline combustion in vehicles traveling on both local roads and state highways that pass through the boundaries of Del Mar.

**Figure ES.2 Community Emissions by Sector**



Electricity and natural gas consumption within the residential sector, the second greatest source of 2005 emissions, generated 10,279 metric tons CO<sub>2</sub>e, or 21% of the total. Similarly, electricity and natural gas use in Del Mar's commercial and industrial sector produced 9,184 metric tons CO<sub>2</sub>e, or 19% of total community emissions. The remaining 7% of emissions are from solid waste and wastewater.

**Table ES.2: Community Emissions Summary by Sector**

Sector	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)
Transportation	25,825
Residential	10,279
Commercial / Industrial	9,184
Solid Waste	3,279
Wastewater	210

# Section One: Introduction





# Introduction

Local governments play a fundamental role in addressing the causes and effects of human-induced climate change through their actions at both the community and government operations levels. While local governments cannot solve the problems of climate change by themselves, their policies can dramatically reduce greenhouse gas emissions from a range of sources and prepare their communities for the potential impacts of climate change.

Within the context of government operations, local governments have direct control over their emissions-generating activities. They can reduce energy consumption in buildings and facilities, reduce fuel consumption by fleet vehicles and equipment, reduce the amount of government-generated solid waste that is sent to a landfill, and increase the amount of energy that is obtained through alternative energy sources. By quantifying the emissions coming from government operations, this report will assist policymakers and stakeholders in addressing the City of Del Mar's contribution to climate change.

Local jurisdictions in California also have broad influence over activities in the community that generate greenhouse gas emissions, such as new construction, the operation of buildings and transportation, and solid waste disposal. That influence may be exercised directly through the jurisdiction's authority over local land use planning and building standards, and indirectly through programs that encourage sustainable behavior among local residents and businesses. The community inventory provides a starting point for addressing how the City can impact emissions within its jurisdictional boundaries.

## 1.1 Climate Change Background and Potential Impacts

In the phenomenon known as the greenhouse effect, naturally-occurring atmospheric gases help regulate the global climate by trapping solar radiation within the Earth's atmosphere. Overwhelming evidence indicates that modern human activity is artificially intensifying the greenhouse effect, causing global average surface temperatures to rise. This intensification is caused by activities that release carbon dioxide and other greenhouse gases into the atmosphere—most notably the burning of fossil fuels for transportation, electricity and heating.

Rising temperatures affect local and global climate patterns. These changes are forecast to manifest themselves in a number of ways that may impact the San Diego region. In 2008, an impact assessment entitled the *San Diego Regional Focus 2050 Study* (the Focus 2050 Study) was prepared by the Scripps Institution of Oceanography (SIO), SAIC, the Environmental and Sustainability Initiative at University of California, San Diego, and many other contributors, and was published by The San Diego Foundation. The Focus 2050 Study explored what the San Diego Region may look like in 2050 if current climate trends continue. Potential impacts were forecast by scientists at SIO using three Intergovernmental Panel on Climate Change (IPCC) climate models and two emissions scenarios.

The models predicted warming in San Diego County of between 1.5°F and 4.5°F by 2050. Rising temperatures, along with a growing population, will likely create a variety of challenges for the San Diego Region. For example, the Focus 2050 Study determined that heat waves are likely to increase in frequency, magnitude, and duration, thereby increasing energy demand and bringing about public health threats in the process. Extended drought conditions were forecast to lead to longer fire seasons and an increased likelihood of large wildfires. The study indicated that warmer temperatures also increase the formation of ground level ozone and may heighten exposure levels to vector-borne diseases, such as West Nile Virus.

The Focus 2050 Study also examined how climate change will impact water supply and water quality. The study found that shortfalls in water supply likely will occur as warmer temperatures cause significant declines in Colorado River flow and Sierra Nevada snowpack, the region's two main sources of imported water. Additionally, sea level rise along with an increased incidence of extreme high sea level events will lead to coastal erosion and will damage critical habitat, real estate and infrastructure. These projected impacts will also put additional stress on the region's threatened and vulnerable ecosystems.

In response to the climate change threat, many communities in the United States are taking responsibility for addressing climate change at the local level. Since many of the major sources of greenhouse gas (GHG) 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 sustainable land use patterns, transportation demand management, energy efficiency, green building and waste diversion, 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. As the effects of climate change become more common and severe, local government adaptation policies will be fundamental in preserving the welfare of residents and businesses.

Recent public opinion research shows that San Diegans support community efforts to develop plans and policies to address climate change. The San Diego Foundation released a survey in September 2010 which assessed the views, values and perspectives of San Diego County voters on the local impacts of climate change and the public's appetite for policies needed to address it. The survey results show that voters are indeed concerned about the impacts of

climate change, especially changes that increase risks from water shortages and wildfires. Seven out of ten voters agree that the San Diego region should take a statewide leadership position in setting goals to reduce greenhouse gas emissions, and that this will not harm our economy. In fact, three times as many voters believe that addressing global warming will create more rather than fewer jobs, and nearly eight in ten agree that we can have a clean environment and a strong economy in our region without having to choose one over the other.

## 1.2 Purpose of Inventory

The objective of this greenhouse gas emissions inventory is to identify the sources and quantities of greenhouse gas emissions resulting from government operations and the Del Mar community-at-large. This inventory, a necessary first step in addressing greenhouse gas emissions, serves two purposes:

- It creates an emissions baseline against which the City can set emissions reductions targets and measure future progress.
- It allows the City to understand the scale of emissions from various sources.

While Del Mar has already begun to reduce greenhouse gas emissions through its actions (See Section 1.4 for more detail), this inventory represents the first step in a systems approach to reducing the City's emissions. This system, developed by ICLEI, is called the Five Milestones for Climate Mitigation. This Five-Milestone process involves the following steps:

- |                         |                                                           |
|-------------------------|-----------------------------------------------------------|
| <b>Milestone One:</b>   | Conduct a baseline emissions inventory and forecast       |
| <b>Milestone Two:</b>   | Adopt an emissions reduction target for the forecast year |
| <b>Milestone Three:</b> | Develop a local climate action plan                       |
| <b>Milestone Four:</b>  | Implement the climate action plan                         |
| <b>Milestone Five:</b>  | Monitor progress and report results                       |

**Figure 1.1 The Five-Milestone Process**



### **1.3 Climate Change Mitigation Activities in California**

Since 2006, 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. It also requires the California Air Resources Board (CARB) to develop a policy plan for reaching AB 32 emissions reduction goals and to adopt and enforce regulations to implement the plan.

The resulting AB 32 Scoping Plan was adopted by CARB in December 2008. Among many other strategies, it encourages local governments to reduce emissions in their jurisdictions by a degree commensurate with state goals, approximately 15% below current levels. 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).
- 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 CARB to establish regional transportation-related greenhouse gas targets and requires the MPO to develop a regional “Sustainable Communities Strategy” of land use, housing and transportation policies that will move the region towards its GHG target; the San Diego Association of Governments (SANDAG) is preparing the state’s first Sustainable Communities Strategy in 2011. 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.

## **1.4 Climate Change Mitigation Activities in the City of Del Mar**

The City of Del Mar is a vibrant beach community 20 miles north of downtown San Diego. Incorporated in 1959, the City is home to more than 4,500 citizens who live within the two square mile coastal area. Del Mar’s residents and visitors enjoy a range of community amenities, including pristine beaches, the San Dieguito River Lagoon, gourmet dining and art galleries. Torrey Pine trees, the rarest native pines in the United States, line Del Mar’s streets and Torrey Pines State Park, a 1750-acre reserve dedicated to preserving these trees, is adjacent to the City. See Table 1.1 for more on city statistics.

**Table 1.1 Del Mar Profile**

Size	Population	Annual Budget	Employees	Climate Zone	Heating and Cooling Degree Days <sup>4</sup>
2 sq mi	4,660	34,432,276	54	3/7	1,842/664

In 2006, the City Council established the Sustainability Advisory Board (formerly the Energy Issues Advisory Committee) to assist with efforts to promote clean and reliable energy and to take a leadership position in educating its residents and businesses about energy savings programs. The Board works with other regional and municipal groups to seek means of improving energy efficiency and to identify renewable energy sources. It makes recommendations on bills pending in the California Legislature that affect the City of Del Mar and the San Diego region. The Board also reviews sections of the City of Del Mar Municipal Code (DMMC) that are relevant to energy consumption and reduction, and works with the Planning Commission and Planning staff to propose revised DMMC language as required.

In 2010, the U.S. Department of Energy awarded a \$25,000 Energy Efficiency and Conservation Block Grant to the City to invest in energy savings at its facilities. The City of Del Mar is now using these funds to purchase a storage array network that will consolidate storage of the city's data into a single physical device, resulting in reduced energy use. The City of Del Mar was one of the first municipalities in the region to sign the U.S. Mayor's Climate Protection Agreement, voluntarily committing to reduce the City's greenhouse gas emissions below 1990 levels. In 2010, the City reaffirmed its commitment to address climate change by becoming a member of ICLEI-Local Governments for Sustainability.

Del Mar's government leaders have embraced the concepts of smart growth and use them to guide their visions for the future. To gain a greater understanding of how to grow in a more sustainable way, the City will undertake the Sustainability Community self-evaluation, being developed by the San Diego Regional Association of Governments (SANDAG) in Fiscal Year 2012. The City is in the process of preparing policies and regulatory amendments to be environmental stewards of the region, including preparation and implementation of a Habitat Conservation Management Plan and requirements for drought-tolerant landscape planning for new commercial and residential sites.

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<sup>4</sup> Heating and cooling degree days are measurements designed to reflect the demand for energy needed to heat or cool a home or business. It is derived from measurements of outside air temperature.

## 1.5 The San Diego Regional Climate Protection Initiative

The San Diego Regional Climate Protection Initiative is a joint effort between Kaiser Permanente, The San Diego Foundation, ICLEI and 17 local governments in San Diego County. The Initiative, established in 2009, provides a regional platform for local governments to follow ICLEI's Five-Milestone process (described in Section 1.2).

Through generous support from Kaiser Permanente and The San Diego Foundation, ICLEI is working directly with local governments in the San Diego region to quantify greenhouse gas emissions and drive regional activity to reduce emissions and enhance resiliency to a changing climate. Through their participation, cities are able to realize significant cost savings as the emissions inventories, relevant planning tools, and technical assistance, are provided free of charge. In addition to performing greenhouse gas inventories for each local jurisdiction, ICLEI is facilitating a sea level rise adaptation planning process for San Diego Bay on behalf of the five Bay cities, the San Diego Unified Port District and the San Diego County Regional Airport Authority.

# Section Two: Methodology





# Methodology

The inventories in this report follow two standards, one for government operations emissions and one for community emissions. As local governments around the world continue to join the climate protection movement, the need for common conventions and a standardized approach to quantifying greenhouse gas emissions is more pressing than ever.

The government operations component of the greenhouse gas emissions inventory follows the standard methodology outlined in the Local Government Operations Protocol (LGOP), which was adopted in 2008 by CARB and serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. By participating in the San Diego Regional Climate Protection Initiative, the County of San Diego has become one of the first in the nation to follow LGOP when inventorying emissions from government operations.

The community emissions inventory follows the standard outlined in the draft International Local Government GHG Emissions Analysis Protocol (IEAP). ICLEI has been developing this guidance since the inception of its Cities for Climate Protection Campaign in 1993, and has recently formalized version 1 of the IEAP as a means to set a common framework for all local government worldwide. The community inventory also draws on the methodology developed in the *San Diego County Greenhouse Gas Inventory* developed by the Energy Policy Initiatives Center (EPIC) at the University of San Diego in September 2008.

This chapter outlines the basic methodology utilized in the development of this inventory to provide clarity on how the inventory results were reported. Specifically, this section reviews:

- What greenhouse gases were measured in this inventory
- What general methods were used to estimate emissions
- How emissions estimates can be reported (the scopes framework, roll-up numbers)
- How emissions estimates were reported in this inventory

A more detailed account of the protocols and methodology used in this inventory can be found in Appendices A-D.

## 2.1 Greenhouse Gases

According to both the LGOP and the IEAP, local governments should assess emissions of all six internationally recognized greenhouse gases regulated under the Kyoto Protocol. These gases are outlined in Table 2.1, which includes the sources of these gases and their global warming potential (GWP).<sup>5</sup> This report focuses on the four GHGs most relevant to local government policymaking: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, and hydrofluorocarbons. These gases comprise a large majority of greenhouse gas emissions at the community level, and are the only gases emitted in San Diego County's government operations. The omitted gases, SF<sub>6</sub> and perfluorocarbons, are emitted primarily in private sector manufacturing and electricity transmission, and are the subject of regulation at the state level.

**Table 2.1 Greenhouse Gases**

Gas	Chemical Formula	Emissions-generating Activity	Global Warming Potential (CO <sub>2</sub> e)
Carbon Dioxide	CO <sub>2</sub>	Combustion	1
Methane	CH <sub>4</sub>	Combustion, Anaerobic Decomposition of Organic Waste (Landfills, Wastewater), Fuel Handling	21
Nitrous Oxide	N <sub>2</sub> 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 <sub>6</sub>	Transmission and Distribution of Power	23,900

## 2.2 Calculating Emissions

The majority of the emissions recorded in this inventory have been calculated using **calculation-based methodologies** to derive emissions using activity data and emission factors. To estimate emissions accordingly, the basic equation below is used:

$$\text{Activity Data} \times \text{Emission Factor} = \text{Emissions}$$

### Activity Data

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 the appendices for detailed listing of the activity data used in composing this inventory.

<sup>5</sup> Global warming potential (GWP) is a measure of the amount of warming a greenhouse gas may cause, measured against the amount of warming caused by carbon dioxide.

## Emission Factors

Emission factors are used to convert energy usage or other activity data into associated emissions quantities. They are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO<sub>2</sub>/kWh). Please see Appendix B for a listing of emissions factors used in this report. Table 2.2 demonstrates an example of common emission calculations that use this formula.

**Table 2.2 Basic Emissions Calculations**

Activity Data	Emissions Factor	Emissions
Electricity Consumption (kilowatt hours)	CO <sub>2</sub> emitted/kWh	CO <sub>2</sub> emitted
Natural Gas Consumption (therms)	CO <sub>2</sub> emitted/therm	CO <sub>2</sub> emitted
Gasoline/Diesel Consumption (gallons)	CO <sub>2</sub> emitted/gallon	CO <sub>2</sub> emitted
Waste Generated by Government Operations (tons)	CH <sub>4</sub> emitted/ton of waste	CH <sub>4</sub> emitted

## 2.3 Reporting Emissions

LGOP provides two reporting frameworks: reporting by scope and reporting by sector. This section defines the two reporting frameworks and discusses how they are used in this inventory. It also discusses the concept of “rolling up” emissions into a single number. The section provides guidance on communicating the results of the inventory and using the inventory to formulate emissions reductions policies.

### 2.3.1 The Scopes Framework

For government operations and community inventories, emissions sources can be categorized by “scope” according to the entity’s degree of control over the emissions source and the location of the source. Emissions sources are categorized as direct (Scope 1) or indirect (Scope 2 or Scope 3), in accordance with the World Resources Institute and the World Business Council for Sustainable Development’s *Greenhouse Gas Protocol Corporate Standard*. The standard is to report emissions by scope as a primary reporting framework.<sup>6</sup>

#### Government Operations Scope Definitions

Similar to the community framework, the government operations scopes are divided into three main categories:

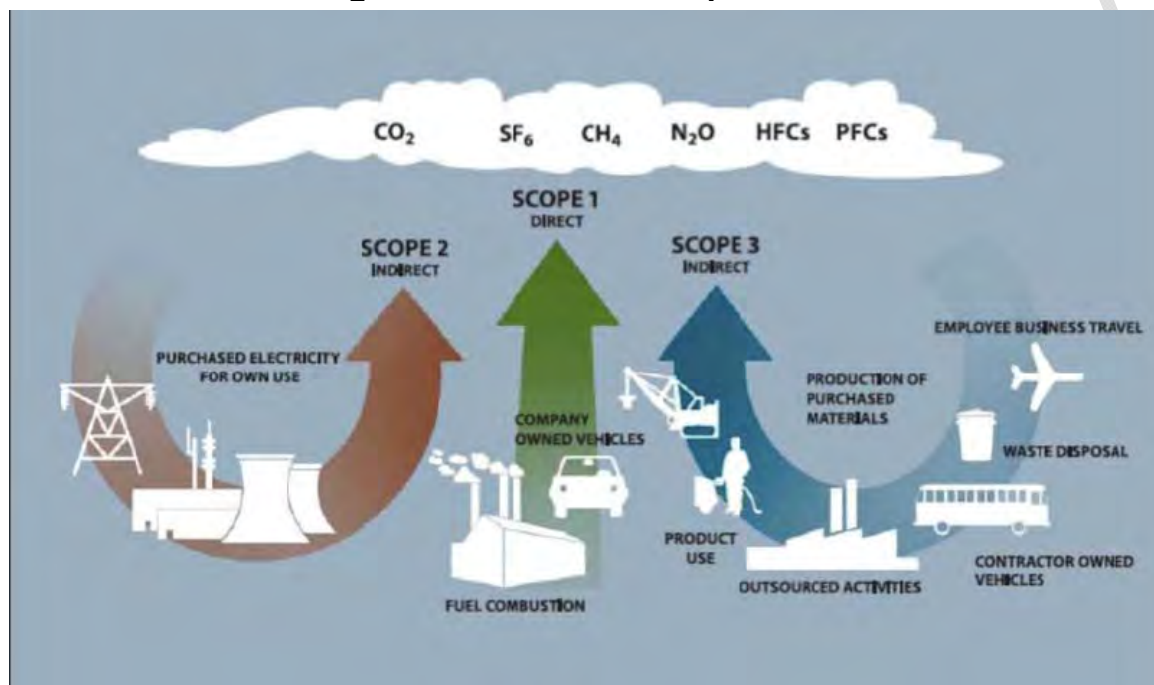
**Scope 1:** Direct emissions from sources within a local government’s operations that it owns and/or controls. This includes stationary combustion to produce electricity, steam, heat, and power equipment; mobile combustion of fuels; process emissions from physical or chemical processing; fugitive emissions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

<sup>6</sup>Another common reporting framework is emissions by sector: See Section 2.3.3-Emissions Sectors for details.

**Scope 2:** Indirect emissions associated with the consumption of electricity, steam, heating, or cooling, that are purchased from an outside utility.

**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.

**Figure 2.1 Emissions Scopes**



Source: WRI/WBCSD GHG Protocol Corporate Accounting and Reporting Standard (Revised Edition), Chapter 4.

## Community Scope Definitions

The scopes framework includes three emissions scopes for community emissions:

**Scope 1:** All direct emissions from sources located within the jurisdictional boundaries of the local government, including fuel combusted in the community and direct emissions from landfills in the community.

**Scope 2:** Indirect emissions associated with the consumption of energy that is generated outside the jurisdictional boundaries of the local government.

**Scope 3:** All other indirect or embodied emissions not covered in Scope 2, that occur as a result of activity within the jurisdictional boundaries.

Scope 1 and Scope 2 sources are the most essential components of a community greenhouse gas analysis. This is because these sources are typically the most significant in scale, and are most easily impacted by local policy making. The IEAP also includes, in its *Global Reporting Standard*, the reporting of Scope 3 emissions associated with the future decomposition of solid waste generated in the community in the base year.

### 2.3.2 Double Counting and Rolling Up Scopes

Many local governments find it useful for public awareness and policymaking to use a single number (a “roll-up” number) to represent emissions in its reports, target setting, and action plans. A roll-up number allows local governments to determine the relative proportions of emissions from various sectors (e.g., 30% of rolled up emissions came from the vehicle fleet), which can help policymakers and staff identify priority actions for reducing emissions from their operations.

For these reasons, this report includes roll-up numbers as the basis of the both the government operations and community emissions analyses in this inventory. This roll-up number is composed of direct emissions (Scope 1), all emissions from purchased electricity (Scope 2), and other indirect emissions (Scope 3).

While this report uses a standard roll-up number, these numbers should be used with caution, as they can be problematic for three reasons:

**First**, a roll-up number *does not* represent all emissions from the City’s operations, only a summation of inventoried emissions using available estimation methods. Reporting a roll-up number can be misleading and encourage citizens, staff, and policymakers to think of this number as the local government’s “total” emissions. Therefore, when communicating a roll-up number it is important to represent it only as a sum of *inventoried* emissions, not as a comprehensive total.

**Second**, rolling up emissions may not simply involve adding emissions from all sectors, as emissions from different scopes can be double-counted when they are reported as one number. For example, if a local government operates a municipal utility that provides electricity to government facilities, these are emissions from both the power generation and facilities sectors. If these sectors are rolled up into a single number, these emissions are double counted, or reported twice. For these reasons, it is important to be cautious when creating a roll-up number to avoid double counting; the roll-up number used in this report was created specifically to avoid any possible double counting.

**Third**, it is very difficult to use a roll-up number as a common measure between local governments, which is how the results are sometimes applied. Currently, there is no national or international standard for reporting emissions as a single roll-up number. In addition, local governments provide different services to their citizens, and the scale of the services (and thus the emissions) is highly dependent upon the size of the jurisdiction. For these reasons, comparisons between local government roll-up numbers should not be made without significant analysis of the basis of the roll-up number and the services provided by the local governments being compared.

### 2.3.3 Emissions Sectors

In addition to categorizing emissions by scope, ICLEI recommends that local governments examine their emissions in the context of the sector that is responsible for those emissions. Many local governments will find a sector-based analysis more directly relevant to policy making and project management, as it assists in formulating sector-specific reduction measures and climate action plan components. The government operations inventory uses LGOP sectors as a primary reporting framework, including the following sectors:

- Buildings and facilities
- Streetlights, traffic signals, and other public lighting
- Water delivery facilities
- Wastewater facilities
- Solid waste facilities
- Vehicle fleet and mobile equipment
- Government-generated solid waste

The community inventory reports emissions by the following sectors:

- **Residential** - including Scope 1 natural gas combustion and Scope 2 electricity consumption.
- **Commercial/Industrial** - including Scope 1 fuel combustion and Scope 2 electricity consumption.
- **Transportation** - including exclusively Scope 1 transportation fuel combustion.
- **Solid Waste** – including Scope 1 emissions from landfills located in the jurisdiction and Scope 3 emissions from future decomposition of solid waste generated in the community in the base year.
- **Wastewater** - including emissions from wastewater generated in the community in the base year.

# Section Three: Government Operations Inventory Results





# Government Operations Inventory Results

This chapter provides a detailed description of the City of Del Mar's greenhouse gas emissions from government operations in 2005, rolling up and comparing emissions across sectors and sources as appropriate. This chapter also provides details on emissions from each sector, including a breakdown of emissions types and, where possible, an analysis of emissions by department. This information identifies more specific sources of emissions (such as a particular building) that can help staff and policymakers in the City to best target emissions reduction activities in the future.

In 2005, greenhouse gas emissions from Del Mar's government operations totaled 579 metric tons of CO<sub>2</sub>e.<sup>7</sup> In this report, this number is the basis for comparing emissions across sectors and sources (fuel types), and it is the aggregate of all emissions estimates used in this inventory.

## 3.1 Summary by Sector

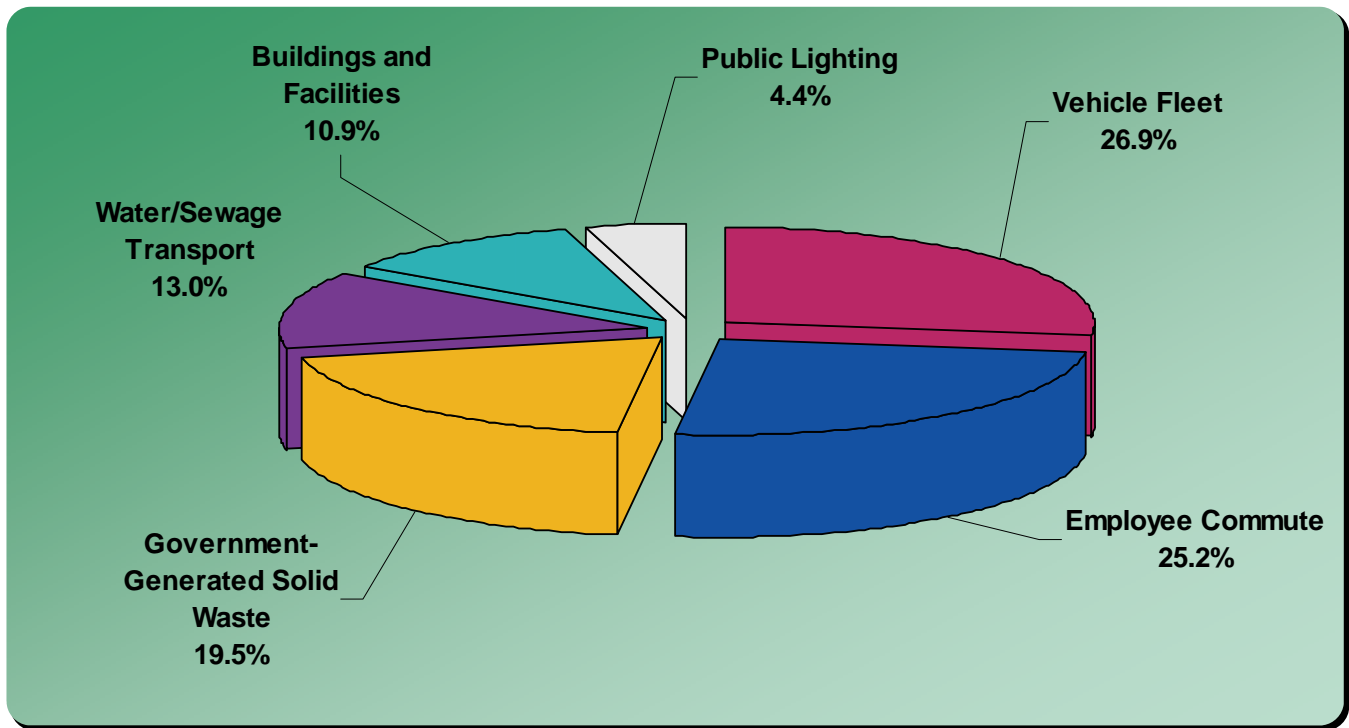
Reporting emissions by sector provides a useful way to understand the sources of Del Mar's emissions. By better understanding the relative scale of emissions from each sector, the City can more effectively focus emissions reductions strategies to achieve the greatest emissions reductions.<sup>8</sup>

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<sup>7</sup> This number represents a roll-up of emissions, and is not intended to represent a complete picture of emissions from the City's operations. This roll-up number should not be used for comparison with other local government roll-up numbers without a detailed analysis of the basis for this total. See Section 2.3.2 for more detail.

<sup>8</sup> The sectors with the largest scale of emissions do not necessarily represent the best opportunity for emissions reductions. Cost, administration, and other concerns may affect the City's ability to reduce emissions from any one sector.

**Figure 3.1 2005 City of Del Mar Government Operations Emissions by Sector**



**Table 3.1: 2005 Government Operations Emissions by Sector**

Sector	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)
Vehicle Fleet	156
Employee Commute	146
Government-Generated Waste	113
Water/Sewage Transport	76
Buildings and Facilities	63
Public Lighting	26
<b>Total</b>	<b>579</b>

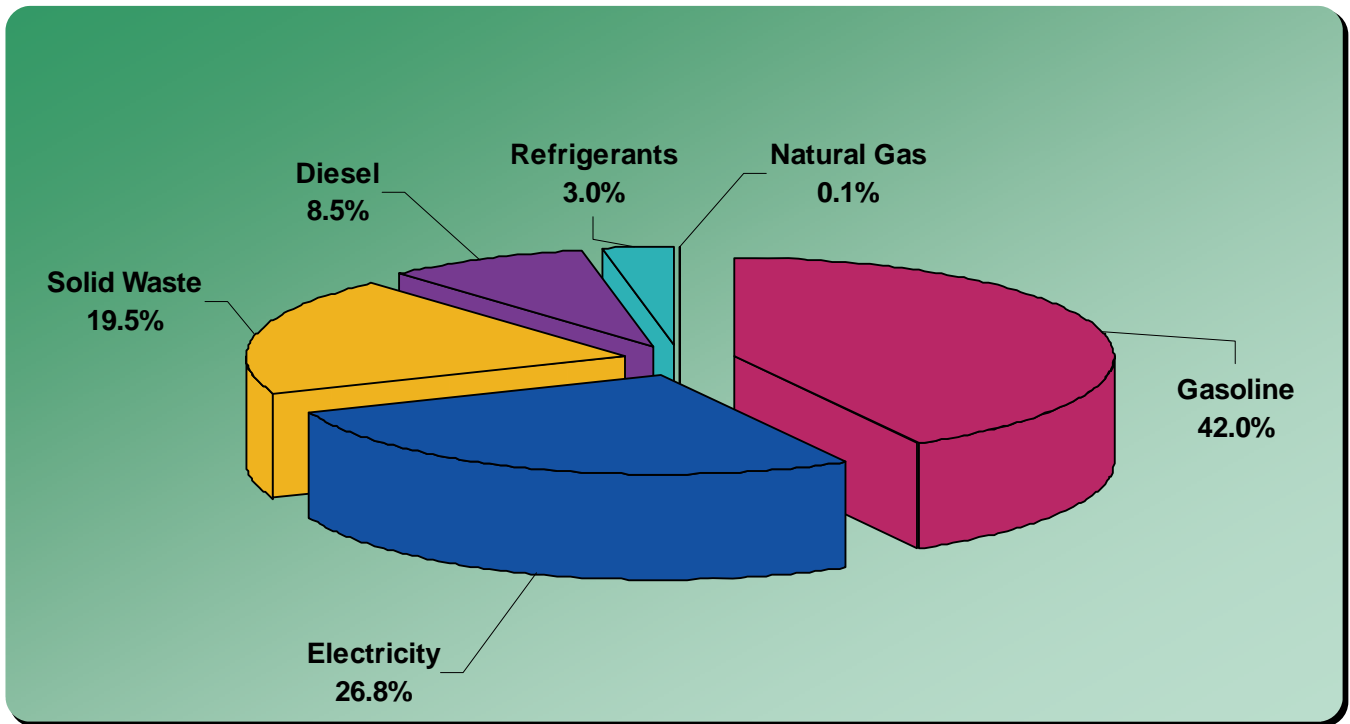
As shown in Figure 3.1, the Vehicle Fleet was the largest emitter (156 metric tons CO<sub>2</sub>e) in 2005. Emissions from Employee Commute produced the second highest quantity, resulting in 146 metric tons of CO<sub>2</sub>e. Del Mar's Government-generated Solid Waste produced 113 metric tons of CO<sub>2</sub>e of total emissions with the remainder coming from Water/Sewage Transport, Buildings & Facilities and Public Lighting.

### 3.2 Summary by Source

When considering how to reduce emissions, it is helpful to look not only at which sectors are generating emissions, but also at the specific raw resources and materials (gasoline, diesel, electricity, natural gas, solid waste, etc.) whose use and generation directly result in the release of greenhouse gases. This analysis can help target resource

management in a way that will successfully reduce greenhouse gas emissions. Figure 3.2 and Table 3.2 provide a summary of Del Mar’s 2005 government operations’ greenhouse gas emissions by fuel type or material.

**Figure 3.2 2005 Del Mar’s Government Operations Emissions by Source**



**Table 3.2: 2005 Del Mar Government Operations Emissions by Source**

Source	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)
Gasoline	243
Electricity	155
Solid Waste	113
Diesel	49
Refrigerants	17
Natural Gas	1
<b>Total</b>	<b>579</b>

### 3.3 Summary by Scope

As described in Section 2, reporting by scope is an important practice to minimize the risk of double-counting emissions. Scope 1 direct emissions in the City of Del Mar totaled 165 tons of carbon dioxide equivalent (CO<sub>2</sub>e). Scope 2 emissions from electricity consumption were 155 metric tons CO<sub>2</sub>e. Finally, 259 metric tons CO<sub>2</sub>e were estimated from optional Scope 3 sources.

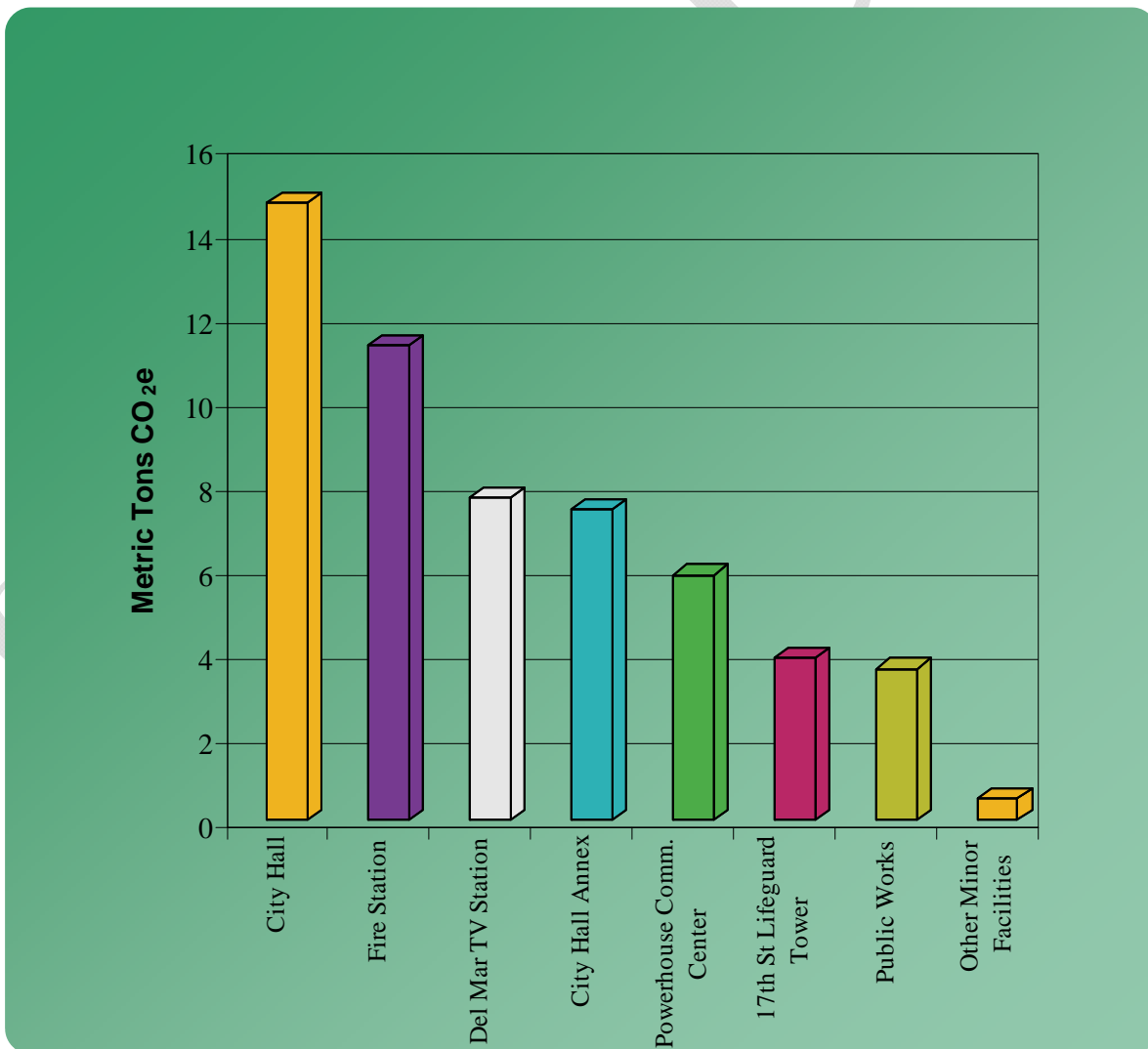
### 3.4 Detailed Sector Analyses

#### 3.4.1 Buildings and Other Facilities

Through their use of energy for heating, cooling, lighting, and other purposes, buildings and other facilities operated by local governments constitute a significant amount of their greenhouse gas emissions. The City of Del Mar operates several major facilities, including City Hall, the Fire Station and the Del Mar TV Station. Facility operations contribute to greenhouse gas emissions in two major ways. First, facilities consume electricity and fuels such as natural gas, which contribute the majority of greenhouse gas emissions from facilities. Second, fire suppression, air conditioning and refrigeration equipment in buildings can emit hydrofluorocarbons (HFCs) and other greenhouse gases when these systems leak refrigerants or fire suppressants.

In 2005, the operation of the City’s facilities produced approximately 56 metric tons of CO<sub>2</sub>e from the above sources. Figure 3.3 and Table 3.3 depict 2005 emissions from major facilities by department.

**Figure 3.3: Emissions from Major Facilities By Department**



**Table 3.3: Energy Use and CO<sub>2</sub>e Emissions from Major Facilities**

Department	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)	Percent Emissions of All Facilities	Electricity Use (kWh)	Natural Gas Use (therms)
City Hall	15	26.8	57,859	38
Fire Station	11	20.6	45,141	0
Del Mar TV Station	8	14.0	30,680	0
City Hall Annex	7	13.5	29,497	0
Powerhouse Comm. Center	6	10.6	21,339	91
17 <sup>th</sup> St. Lifeguard Tower	4	7.0	15,364	0
Public Works	4	6.5	14,340	0
Other Minor Facilities	.5	.9	2,031	0
<b>TOTAL<sup>9</sup></b>	<b>55.5</b>	<b>100</b>	<b>216,251</b>	<b>129</b>

### 3.4.2 Streetlights, Traffic Signals, and Other Public Lighting

Like most local governments, the City of Del Mar operates a range of public lighting, such as traffic signals and street lights. In 2005, public lighting in the City consumed a total of 102,810 kilowatt hours of electricity, producing almost 26 metric tons of CO<sub>2</sub>e. Table 3.4 depicts 2005 emissions per lighting type and estimated electricity consumption associated with the activities that generated these emissions.

**Table 3.4: Energy Use and CO<sub>2</sub>e Emissions from Public Lighting**

Source	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)	Percent Emissions of All Lighting	Electricity Use (kWh)
Traffic Signals/ Controllers	14	55.5	57,081
Streetlights	11	41.8	42,962
Park and Other Outdoor Lighting	.70	2.7	2,767
<b>TOTAL</b>	<b>25.7</b>	<b>100</b>	<b>102,810</b>

### 3.4.3 Water Transport

This section addresses equipment used for the distribution of water. Typical systems included in this section are pumps/lifts, sprinklers, and other irrigation controls.<sup>10</sup> The City of Del Mar operates a range of water transport equipment, including water pumps and four small reservoirs.

<sup>9</sup> Emissions from leaked refrigerants are not included in this chart. These emissions totaled 7.5 metric tons of CO<sub>2</sub>e.

<sup>10</sup> While equipment that transports water and stormwater may be managed separately in a jurisdiction's operations, the types of equipment are similar, and therefore the ways to reduce emissions from this equipment, are similar. For this reason, this section groups equipment used for transporting water and wastewater. Del Mar's irrigation requirements are supplied by an outside/external contractor, thus those emissions are not considered part of its government operations and are not included in this section of the report.

In 2005, the operation of the City’s water transport equipment produced approximately 76 metric tons of CO<sub>2</sub>e from the above sources. Table 3.5 depicts 2005 emissions per equipment type and shows estimated activities associated with the operation of this equipment.

**Table 3.5: Energy Use and CO<sub>2</sub>e Emissions from Water Transport Equipment**

Source	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)	Percent Emissions of Water Transport Equipment	Electricity Use (kWh)
Water Pumps	73	96.2	291,006
Other Water Transport	3	3.6	10,942
Storm Water Management	0.13	0.2	514
<b>TOTAL</b>	<b>75.52</b>	<b>100%</b>	<b>302,462</b>

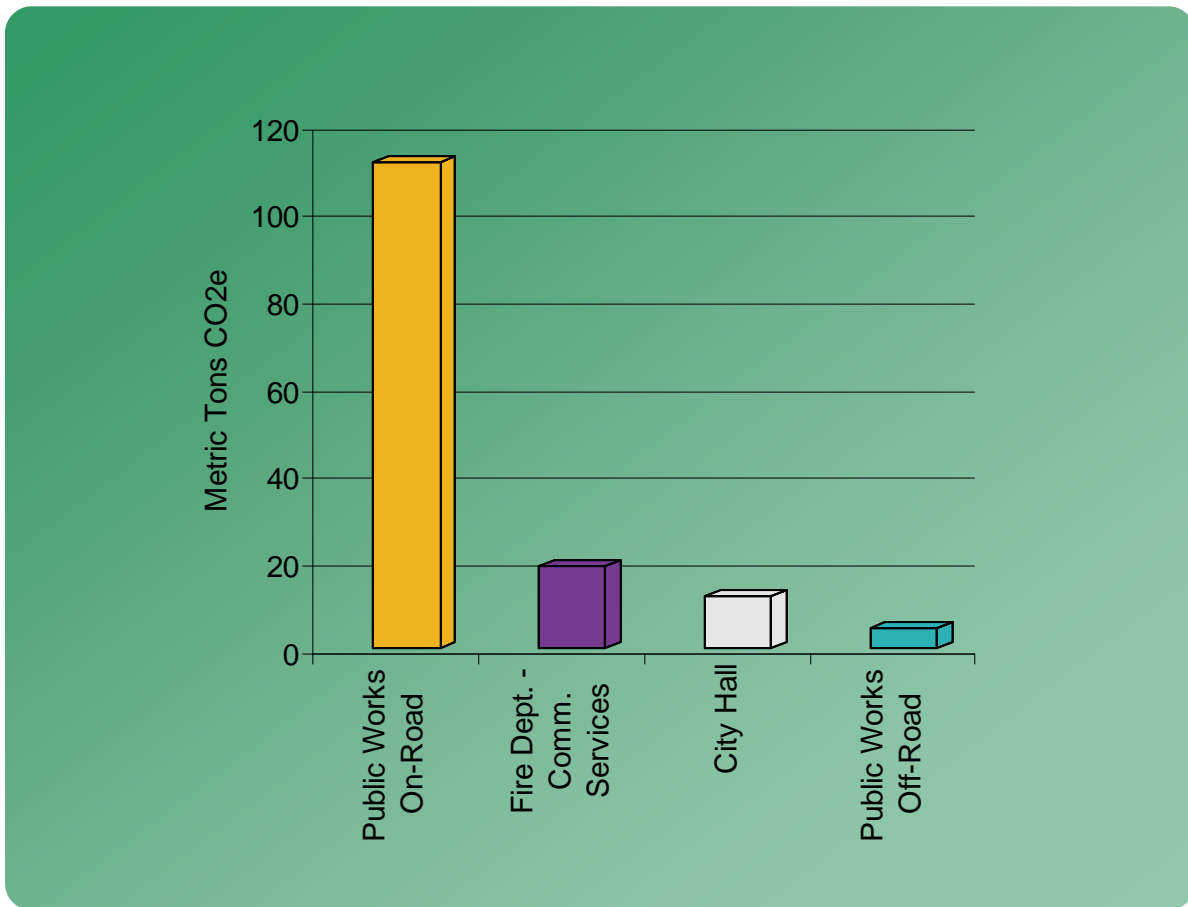
### 3.4.4 Vehicle Fleet and Mobile Equipment

The majority of local governments use vehicles and other mobile equipment as an integral part of their daily operations—from maintenance trucks for parks and recreation to fire trucks. These vehicles and equipment burn gasoline, diesel, and other fuels, which results in greenhouse gas emissions. In addition, vehicles with air conditioning or refrigeration equipment use refrigerants that can leak from the vehicle. Emissions from vehicles and mobile equipment comprise a significant portion of emissions within most local governments.

In 2005, the City of Del Mar operated a vehicle fleet with 35 vehicles, ranging from small passenger cars to street sweepers and major construction vehicles. The City’s vehicle fleet performed a number of essential services, including public safety and emergency response. The City emitted approximately 147 metric tons of CO<sub>2</sub>e as a result of the combustion of fuels to power the City’s vehicle fleet. Figure 3.4 and Table 3.6 depict 2005 vehicle emissions by department. Vehicles used by the Public Works department were the largest emitters of greenhouse gases, representing approximately 76% of total vehicle fleet emissions.<sup>11</sup>

<sup>11</sup> The LGOP Alternative Method (Mobile Fugitive Emissions) was used to estimate emissions from leaked mobile refrigerants. This amount is likely a significant overestimate but in line with LGOP methods.

**Figure 3.4: Emissions from Mobile Sources**



**Table 3.6: Energy Use and CO<sub>2</sub>e Emissions from Vehicle Fleet and Mobile Emissions**

Department	GHG Emissions (metric tons CO <sub>2</sub> e)	Percent of All Mobile Emissions	Gasoline Consumption (gal)	Diesel Consumption (gal)
Public Works On-Road	111	75.8%	7,368	4,421
Fire Department. - Comm. Services	19	13.0%	2,169 <sup>12</sup>	
City Hall	12	8.1%	1,357	0
Public Works Off-Road	4.57	3.1%	0	446
<b>TOTAL<sup>13</sup></b>	<b>147</b>	<b>100.0%</b>		

<sup>12</sup> Although some vehicles in this department used diesel, city records do not identify the fuel used thus both gas and diesel are included in this number.

<sup>13</sup> Emissions from leaked refrigerants within the vehicle fleet are not included in this chart. These emissions totaled approximately 9 metric tons of CO<sub>2</sub>e.

### **3.4.5 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. An estimated 75% of this methane is routinely captured via landfill gas collection systems; however, a portion escapes into the atmosphere, contributing to the greenhouse effect. As such, estimating emissions from waste generated by government operations is an important component of a comprehensive emissions inventory. It is estimated that the waste disposed of by Del Mar government facilities in 2005 cumulatively produced 5.4 metric tons of methane gas, or 113 metric tons of CO<sub>2</sub>e.

### **3.4.6 Employee Commute**

Fuel combustion from employees commuting to work is another important emissions source from Del Mar's operations. Similar to the City's vehicle fleet, personal employee vehicles use gasoline and other fuels which, when burned, generate greenhouse gas emissions. Emissions from employee commutes are considered optional to inventory by the LGO Protocol because the vehicles are owned and operated privately by the employees. However, the protocol encourages reporting these emissions because local governments can influence how their employees commute to work through incentives and commuting programs. For this reason, employee commute emissions were included in this report as an area where the City could achieve significant reductions in greenhouse gases.

To calculate emissions, the City administered a survey to its employees regarding their commute patterns and preferences. ICLEI then extrapolated the results of the survey of 2010 employees to represent emissions from the 52 city employees in 2005. Based on these results, employees commuting in vehicles to and from their jobs at the City in 2005 emitted an estimated 146 metric tons of CO<sub>2</sub>e.

# Section Four: Community Inventory Results





# Community Inventory Results

## 4.1 Community Inventory Summary

In 2005, activities and operations taking place within the jurisdictional boundaries of Del Mar resulted in approximately 48,776 metric tons of CO<sub>2</sub>e. This number includes all Scope 1 emissions from the on-site combustion of fuels in the residential and commercial/ industrial sectors, from the combustion of gasoline and diesel in vehicles traveling on local roads and state highways, and any methane released from any landfills within Del Mar. This number also includes all Scope 2 emissions associated with community electricity consumption, and Scope 3 emissions from waste and wastewater generated by the unincorporated community.<sup>14</sup>

**Table 4.1: Community Emissions Summary by Scope**

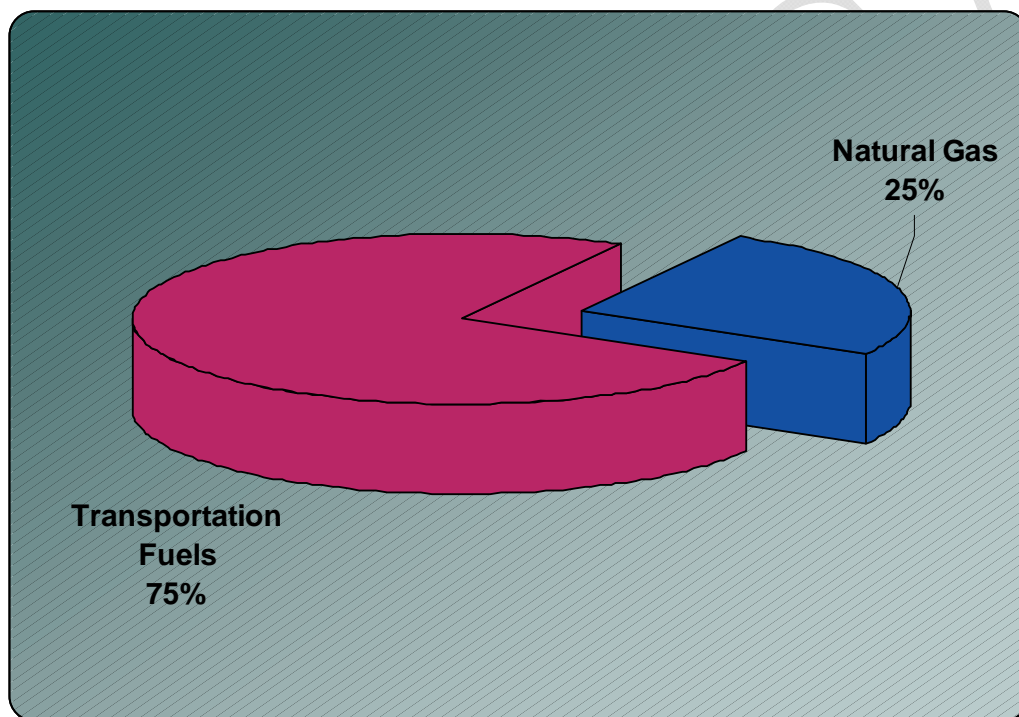
Activity	CO <sub>2</sub> e emitted	Scope Total
<b>Scope 1</b>		<b>34,589</b>
Transportation Fuels	25,825	
Natural Gas	8,764	
Landfill Waste-in-Place	0	
<b>Scope 2</b>		<b>10,699</b>
Purchased Electricity	10,699	
<b>Scope 3</b>		<b>3,488</b>
Community-Generated Solid Waste	3,279	
Wastewater	210	

<sup>14</sup> For a detailed description of scopes, please see Section 2: Methodology.

### 4.1.1 Summary by Scope

As shown in Table 4.1, Scope 1 sources produced the largest amount of community greenhouse gas emissions in 2005, totaling 34,589 metric tons of CO<sub>2</sub>e. As seen in Figure 4.1, the largest share (75%) of Scope 1 emissions resulted from mobile combustion of fuels. The second largest source of Scope 1 emissions was stationary combustion of natural gas, constituting 25% of Scope 1 emissions. Scope 2 emissions constituted the second largest amount (10,699 metric tons of CO<sub>2</sub>e), and Scope 3 emissions totaled 3,488 metric tons of CO<sub>2</sub>e.<sup>15</sup>

**Figure 4.1 Community Scope 1 Emissions**



### 4.1.2 Summary by Sector

By better understanding the relative scale of emissions from each primary sector, the City of Del Mar can more effectively focus emissions reductions strategies to achieve the greatest emission reductions. For this reason, an analysis of emissions by sector is included in this report. The five sectors included in this inventory are residential, commercial / industrial, transportation, solid waste, and wastewater.

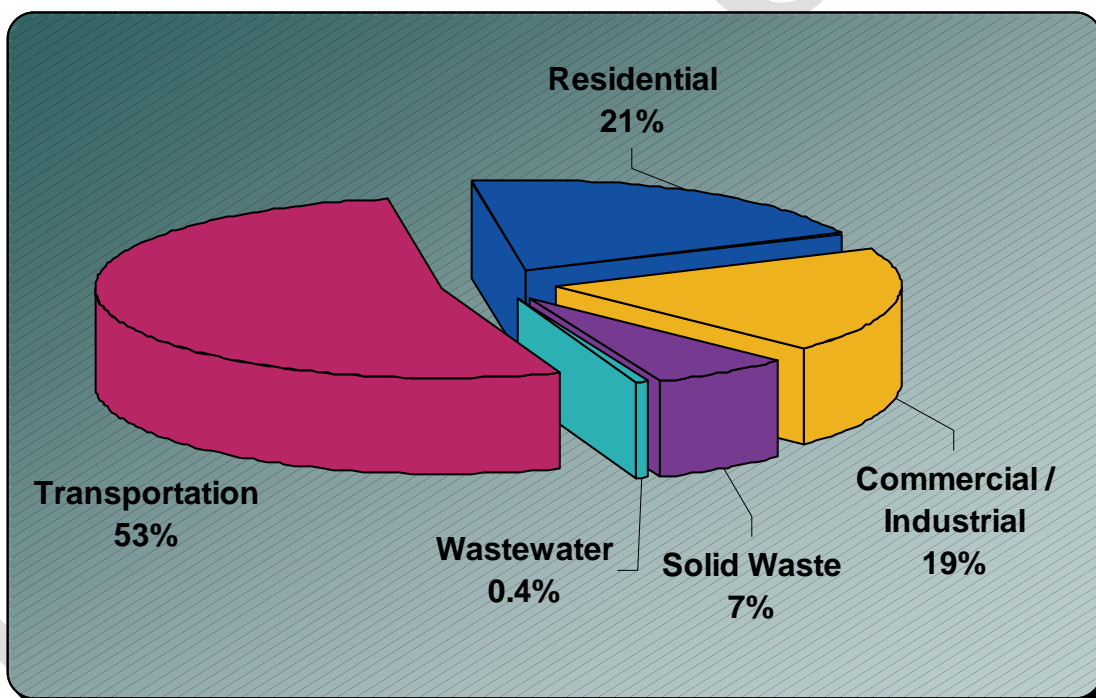
<sup>15</sup> These emissions have not been totaled as this may result in double counting and a percentage is not significantly relevant to forming emissions reduction policy. The summaries by sector and source have percentage breakdowns, as do individual sources of emissions.

As shown in Figure 4.2, the transportation sector was the largest emitter (53%) in 2005. Emissions from the residential sector produced the second highest quantity, resulting in 21% of total emissions. The remainder of emissions came from the commercial / industrial sector (19%) solid waste (7%), and wastewater (0.4%).

**Table 4.2: Community Emissions Summary by Sector**

Sector	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)
Transportation	25,825
Residential	10,279
Commercial / Industrial	9,184
Solid Waste	3,279
Wastewater	210

**Figure 4.2 Community Emissions Summary by Sector**

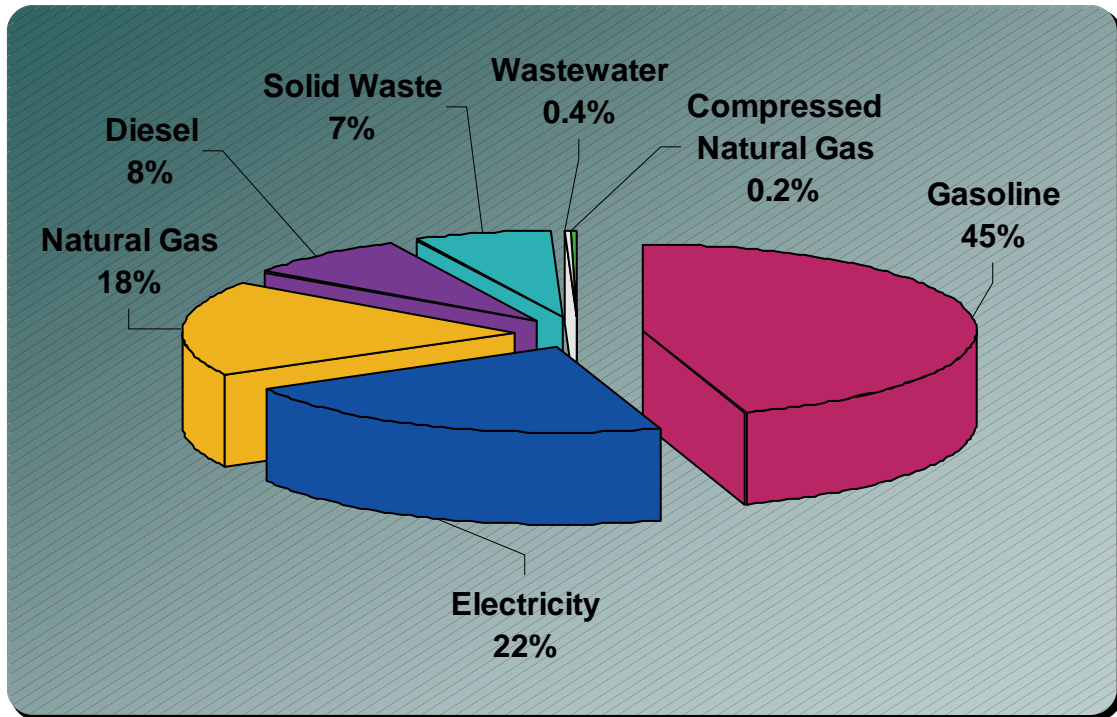


#### 4.1.3 Summary by Source

When considering how to reduce emissions, it is also helpful to look not only at which sectors are generating emissions, but also at the specific raw resources and materials (gasoline, diesel, electricity, natural gas, solid waste, etc.) whose use and generation directly result in the release of greenhouse gases. Such analysis can help target

resource management in a way that will successfully reduce greenhouse gas emissions. Below (Figure 4.3 and Table 4.3) is a summary of Del Mar’s 2005 greenhouse gas emissions by fuel type or material.

**Figure 4.3 Community Emissions Summary by Source**



**Table 4.3: Community Emissions by Source**

Source	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)
Gasoline	21,925
Electricity	10,699
Natural Gas	8,764
Diesel	3,826
Solid Waste	3,279
Wastewater	210
Compressed Natural Gas	74
<b>TOTAL</b>	<b>48,776</b>

#### 4.1.4 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. That said, due to differences in emission inventory methods, it can be problematic to produce directly comparable per capita emissions numbers, and one must be cognizant of a margin of error when comparing figures between jurisdictions.

As detailed in Table 4.4, dividing the total community-wide GHG emissions by population yields a result of *10.8 metric tons of CO<sub>2</sub>e per capita*. It is important to note that this number is not the same as the carbon footprint of the average individual living in Del Mar (which would include lifecycle emissions, emissions resulting from air travel, and other indirect sources).

**Table 4.4: Per Capita Emissions**

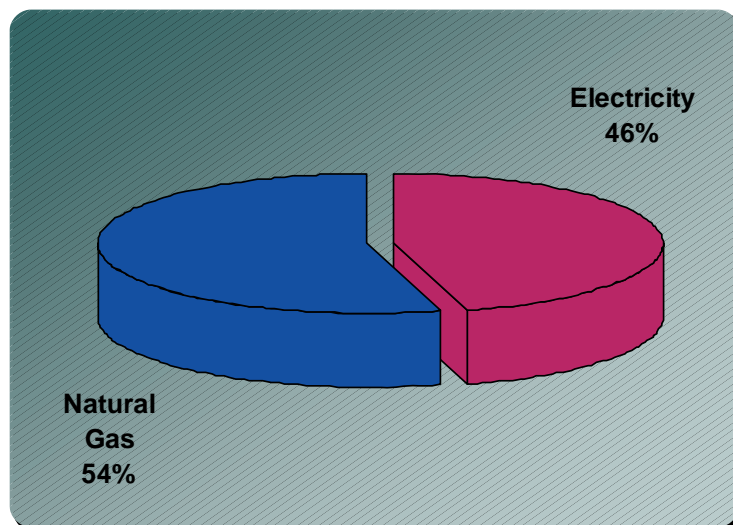
Estimated 2005 Population	4,533
Community GHG Emissions (MT CO <sub>2</sub> e)	48,776
Per Capita GHG Emissions (MT CO <sub>2</sub> e)	10.8

## 4.2 Community Inventory Detail by Sector

### 4.2.1 Residential Sector

Energy consumption associated with Del Mar homes produced 10,279 metric tons of greenhouse gas emissions in 2005 (21% of total community emissions). All residential sector emissions are the result of electricity consumption and the on-site combustion of natural gas. Emissions from lawn equipment, wood-fired stoves, transportation and waste generation are **not** included in these totals. In 2005, the residential sector consumed 18,686,857 kWh of electricity and 1,046,837 therms of natural gas. As shown in Figure 4.4, 54% of total residential emissions were the result of natural gas use, and 46% were the result of electricity consumption. Natural gas is typically used in residences as a fuel for home heating, water heating and cooking, and electricity is generally used for lighting, heating, and to power appliances.

**Figure 4.4 Residential Emissions by Source**



#### **4.2.2 Commercial / Industrial Sector**

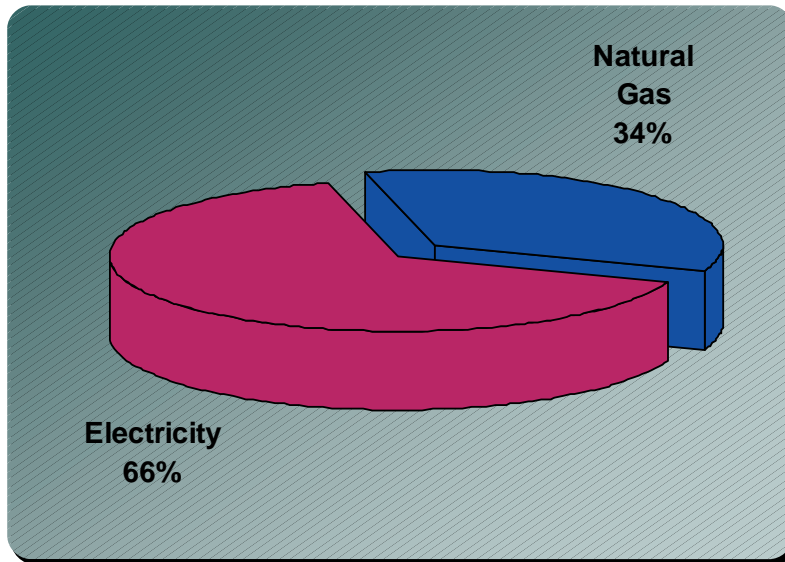
The commercial / industrial sector includes emissions from the operations of businesses as well as public agencies. For example, the majority of buildings and facilities included in the government operations inventory are also included as a subset of the commercial / industrial sector. In 2005, buildings and facilities within the commercial / industrial sector produced 9,184 metric tons of greenhouse gas emissions (19% of total community emissions). All commercial / industrial sector emissions included in this inventory are the result of electricity consumption and the on-site combustion of natural gas. It is important to note that emissions from off-road equipment, transportation, waste generation, stationary combustion other than natural gas, and other industrial processes are **not** included in these totals.

Del Mar businesses generated 2.3 metric tons of GHG emissions per job in 2005.<sup>16</sup> This metric provides an indication of the carbon intensity of local economic activity.

As shown in Figure 4.5, 34% of total commercial / industrial emissions were the result of natural gas use, and 66 % were the result of electricity consumption. Natural gas is typically used in the commercial / industrial sector to heat buildings, fire boilers, and generate electricity; and electricity is generally used for lighting, heating, and to power appliances and equipment.

<sup>16</sup> Jobs data was provided by SANDAG Technical Services Department, *Current Estimates*, August 2009.

**Figure 4.5 Commercial / Industrial Emissions by Source**



### 4.2.3 Transportation Sector

As with many other local governments, transportation within the jurisdictional boundaries of the City of Del Mar constitutes the greatest percentage (53%) of community wide greenhouse gas emissions – 25,825 metric tons CO<sub>2</sub>e.

**Table 4.5: Transportation Emissions by Type**

Source	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)	Share of Total Transportation Emissions
<b>On-Road Transportation</b>		
Local Roads	24,443	95%
State Highways	0	0%
<b><i>On-Road Subtotal</i></b>	<b>24,443</b>	<b>95%</b>
<b>Off-Road Transportation</b>	<b>1,383</b>	<b>5%</b>
<b>TOTAL</b>	<b>25,825</b>	<b>100%</b>

Ninety-five percent of transportation sector emissions came from on-road travel, with the remaining 5% originating from off-road mobile sources. As shown above in Table 4.5, travel on local city roads constituted 100% of on-road emissions, and no percentage was due to travel on state highways within Del Mar. An estimated 85% of transportation emissions were due to gasoline consumption with the remaining approximately 15% from diesel use and 0.3% from compressed natural gas.

Please see Appendix C for more detail on methods and emissions factors used in calculating emissions from the Transportation Sector.

#### 4.2.4 Solid Waste Sector

The solid waste sector constituted 7% of total emissions for the Del Mar community in 2005. Emissions from the solid waste sector are an estimate of future methane generation from the decomposition of municipal solid waste (MSW) and alternative daily cover (ADC) sent to landfill in the base year. These emissions are considered Scope 3 because they are not generated in the base year, but will result from the decomposition of 2005 waste over the full 100+ year cycle of its decomposition.

The solid waste sector also includes Scope 1 base year emissions from landfills in the jurisdiction, known as “landfill waste-in-place.” As stated in the Government Inventory section, about 75% of landfill methane emissions are captured through landfill gas collection systems,<sup>17</sup> but the remaining 25% escape into the atmosphere as a significant contributor to global warming. Please see Table 4.6 below for a summary of emissions by major waste type.<sup>18</sup>

**Table 4.6: Waste Emissions Sources**

Source	Greenhouse Gas Emissions (metric tons CO <sub>2</sub> e)	Share of Total Waste Emissions
Paper Products	1,686	51%
Food Waste	663	20%
Wood / Textiles	495	15%
Plant Debris	434	13%
<b>TOTAL</b>	<b>3,279</b>	<b>100%</b>

#### 4.2.5 Wastewater Sector

The wastewater sector contributed 210 metric tons of greenhouse gas emissions, constituting 0.4% of total emissions for the Del Mar community in 2005. Emissions from the wastewater sector are an estimate of methane and nitrous oxide generated in the process of wastewater treatment. These emissions are considered Scope 3 because they occur at treatment facilities outside the jurisdictional boundaries and “downstream” from the Del Mar community where the wastewater is generated. In the San Diego region, about 71% of wastewater treatment methane emissions are captured through biogas collection systems.<sup>19</sup> The remainder escapes into the atmosphere and contributes to Del Mar’s impact on climate change.

<sup>17</sup> US EPA AP 42.

<sup>18</sup> Waste characterization figures were provided by the 2004 *California Waste Characterization Study*, <http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097>

<sup>19</sup> San Diego County Greenhouse Gas Inventory, USD Energy Policy Initiatives Center.

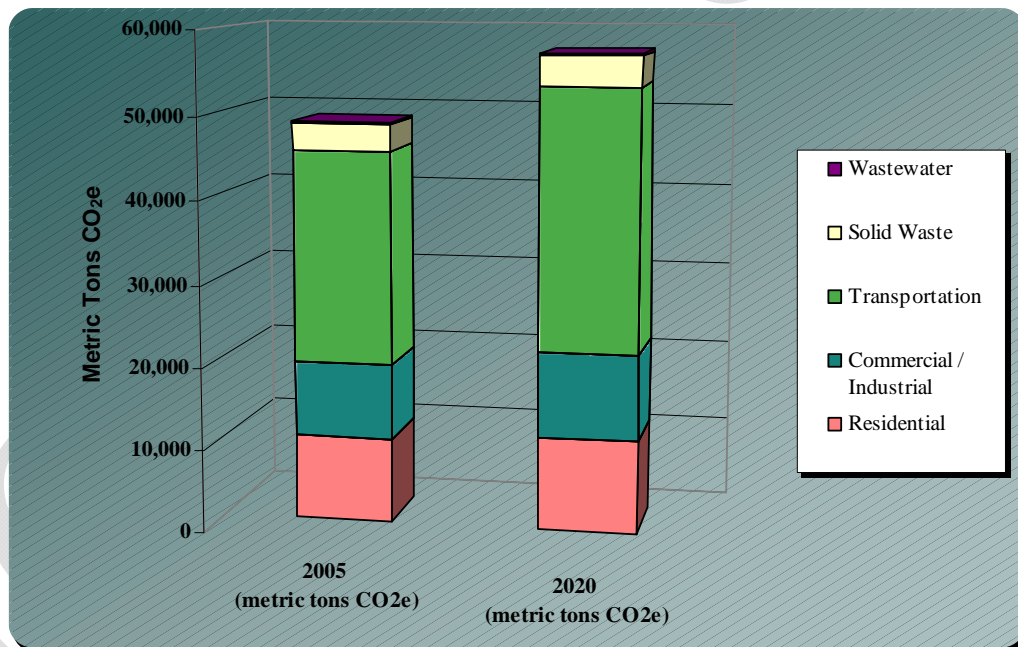
### 4.3 Community Emissions Forecast

To illustrate the potential emissions growth based on projected trends in energy use, driving habits, job growth, and population growth from the baseline year going forward, this report includes an emissions forecast for the year 2020. Under a business-as-usual scenario, Del Mar’s emissions are projected to grow by approximately 17% by the year 2020, from 48,776 to 57,285 metric tons CO<sub>2</sub>e. Figure 4.6 and Table 4.7 show the results of the forecast. A variety of different reports and projections were used to create the emissions forecast, as profiled below.

#### 4.3.1 Residential Forecast

For the residential sector, a households projection conducted by the San Diego Association of Government (SANDAG) was used to estimate average annual compound growth in local residential energy demand (0.68 percent). SANDAG estimates that the number of households in Del Mar was 2,137 in 2006, and will be 2,367 in 2020.<sup>20</sup>

Figure 4.6 Community Emissions Forecast for 2020



#### 4.3.2 Commercial / Industrial Forecast

The California Energy Commission’s *California Energy Demand 2008-2018* shows that commercial floor space and the number of jobs have closely tracked the growth in energy use in the commercial sector. Using job growth

<sup>20</sup> SANDAG 2030 Regional Growth Forecast Update (2006).

projections also provided by SANDAG, it was calculated that the average annual growth in energy use in the commercial / industrial sector between 2006 and 2020 will be 0.83 percent.<sup>21</sup>

### 4.3.3 Transportation Forecast

Growth in transportation emissions over the forecast period is closely related to planned transportation infrastructure investments and the associated vehicle activity, as measured in vehicle miles traveled (VMT). Long-term transportation infrastructure is planned through the 2030 San Diego Regional Transportation Plan, published by SANDAG in 2007, and travel activity projections performed by SANDAG are based on this plan. These projections forecast a 22% increase in regional VMT between 2005 and 2020; this trend was applied to unincorporated County 2005 VMT to estimate 2020 travel activity. While this increase is attributed to regional travel as a whole and not specifically local travel in unincorporated areas, local VMT is likely to follow a similar trend, and this forecasting approach is more reliable than applying state-wide travel forecasts to the local level.<sup>22</sup>

### 4.3.4 Solid Waste and Wastewater Forecasts

Population is the primary determinate for growth in emissions pertaining to waste and wastewater generation. Therefore, the average annual population growth rate from 2006 to 2020 (0.84%, as calculated from above-referenced SANDAG population projections) was used to estimate future emissions from solid waste disposal and wastewater treatment.

**Table 4.7: Community Emissions Growth Forecast by Sector**

Sector	2005 (metric tons CO <sub>2</sub> e)	2020 (metric tons CO <sub>2</sub> e)	Annual Growth Rate	Percent Change from 2005 to 2020
<b>Residential</b>	10,279	11,385	0.68%	11%
<b>Commercial / Industrial</b>	9,184	10,402	0.83%	13%
<b>Transportation</b>	25,825	31,544	1.34%	22%
<b>Solid Waste</b>	3,279	3,716	0.84%	13%
<b>Wastewater</b>	210	238	0.84%	13%
<b>TOTAL</b>	<b>48,776</b>	<b>57,285</b>	<b>--</b>	<b>17%</b>

<sup>21</sup> Ibid.

<sup>22</sup> New fuel efficiency standards under the federal Corporate Average Fuel Economy (CAFE) program and State of California “Clean Car” standards under AB 1493 (Pavley) could significantly reduce the demand for transportation fuel in Del Mar. An analysis of potential fuel savings from these measures at a scale that would be useful for the purpose of this report has not been conducted, nor would such an analysis produce a true business-as-usual estimation.

# Section Five: Conclusion





# Conclusion

By participating in the San Diego Regional Climate Protection Initiative and other sustainability initiatives, the City of Del Mar has taken an important first step toward reducing its impacts on the environment. With increasing guidance and support from the state, the City should be increasingly empowered to make the necessary changes to promote its vision for a more sustainable future.

This conclusion discusses the inventory as a baseline for emissions targets and suggests steps for the City to move forward to reduce emissions both from its internal operations and from the community.

## 5.1 Toward Setting Emissions Reduction Targets

This inventory provides an emissions baseline that the City of Del Mar can use to inform Milestone Two of ICLEI's Five-Milestone process—setting emissions reduction targets for its municipal operations. The greenhouse gas emissions reduction target is a goal to reduce emissions in its government operations to a certain percentage below base year levels, by a chosen planning horizon year. An example target might be a 30% reduction in emissions below 2005 levels by 2020. A target provides an objective toward which to strive and against which to measure progress. It allows a local government to quantify its commitment to fighting 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. The City will want to give itself enough time to implement chosen emissions reduction measures—but note that the farther out the target year is, the more that the City should pledge to reduce. ICLEI recommends that regardless of the City of Del Mar's chosen long-term emissions reduction target (e.g., 15-year, 40-year), it should establish interim targets for every two- to three-year period. Near-term targets facilitate additional support and accountability and help to ensure continued momentum around the City's local climate protection efforts. To monitor the effectiveness of its programs, the City should plan to re-inventory its emissions on a regular

basis; many jurisdictions are electing to perform annual inventories. See Appendix D for more information on how to re-inventory the City's emissions.

### 5.1.1 The Long-Term Goal

ICLEI recommends that the City's near-term climate work should be guided by the long-term goal of reducing its emissions by 80-95% from the 2005 baseline level by the year 2050. By referencing a long-term goal that is in accordance with current scientific understanding, Del Mar can demonstrate that it intends to do its part to address greenhouse gas emissions from its internal operations.

It is important to keep in mind that it will be next to impossible for local governments to reduce emissions by 80 to 95% 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 10 years, there is much that local governments can do to reduce emissions independently. It is also important that the City work 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.

### 5.1.2 State of California Targets and Guidance

An integral component of the State of California's climate approach has been establishing 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. Figure 5.1 highlights adopted emissions targets for the State. 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% below "current" levels by 2020. This target has informed many local government's emission reduction targets for municipal operations. Most local governments in California that have adopted targets are aiming for 15 – 25% reductions under 2005 levels by 2020.

**Figure 5.1: California Greenhouse Gas Reduction Targets**

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

### 5.1.3 Department Targets

If possible, ICLEI recommends that the City consider department-specific targets for each of the departments that generate emissions within its operations. This allows the staff to do a more in-depth analysis of what is achievable

in each sector in the near-, mid- and long-term, and also encourages department heads to consider their department's impact on the climate and institute a climate-conscious culture in each department's operations.

## 5.2 Creating an Emissions Reduction Strategy

Given the results of the inventory, ICLEI recommends that the City of Del Mar focus on the following tasks in order to significantly reduce emissions from its government operations:

- Continue to replace lights with LED alternatives.
- Continue green building initiatives and retrofits.
- Increase waste-diversion efforts by adding and promoting recycling efforts within all facilities and public areas.
- Create more efficient vehicle fleets by decreasing the size of the overall fleet and replacing retired vehicles with hybrid or fuel-efficient alternatives.

In addition to the types of actions described above, which reduce emissions from government operations, ICLEI recommends developing policies and actions that will help to reduce emissions throughout the community.

Examples include:

- Promote growth through redevelopment and infill that maintains or improves the quality of life for existing neighborhoods.
- Adopt local parking standards that encourage reduced single-occupancy vehicle travel.
- Adopt building codes that exceed Title 24 energy requirements, on either a mandatory or voluntary basis.
- Establish water conservation guidelines and standards for existing development, new development and City facilities.
- Provide public education programs on waste prevention, source reduction, recycling, yard waste, wood waste and hazardous waste.

By identifying and implementing a set of these types of strategies, the City should be able to reduce and reverse its impact upon 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.

# Appendices





# Appendix A:

## The Local Government Operations Protocol

This inventory follows the standard outlined in the Local Government Operations Protocol, which was adopted in 2008 by the California Air Resources Board (CARB) and serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. This and the other inventories conducted for the San Diego Regional Climate Protection Initiative are among the first to follow LGOP, representing a strong step toward standardizing how inventories are conducted and reported.

### A.1 Local Government Operations Protocol

#### A.1.1 Background

In 2008, ICLEI, CARB, and the California Climate Action Registry (CCAR) released LGOP to serve as a U.S. supplement to the International Emissions Analysis Protocol. The purpose of LGOP is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory. It leads participants through the process of accurately quantifying and reporting emissions, including providing calculation methodologies and reporting guidance. LGOP guidance is divided into three main parts: identifying emissions to be included in the inventory, quantifying emissions using best available estimation methods, and reporting emissions.

The overarching goal of LGOP is to allow local governments to develop emissions inventories using standards that are consistent, comparable, transparent, and recognized nationally, ultimately enabling the measurement of emissions over time. LGOP adopted five overarching accounting and reporting principles toward this end: relevance, completeness, consistency, transparency and accuracy. Methodologies that did not adhere to these principles were either left out of LGOP or included as Scope 3 emissions. LGOP was created solely to standardize how emissions inventories are conducted and reported; as such it represents a currently accepted standard for inventorying emissions but does not contain any legislative or program-specific requirements. Mandates by the State of California or any other legislative body, while possibly using LGOP as a standard, do not currently exist, and California local governments are not currently required to inventory their emissions. Program-specific

requirements, such as ICLEI's Milestones or CCAR's reporting protocol, are addressed in LGOP but should not be confused with LGOP itself.

Also, while LGOP standardizes inventories from government operations, it does not seek to be a wholly accurate inventory of all emissions sources, as certain sources are currently excluded or otherwise impossible to accurately estimate. This and all emissions inventories therefore represent a best estimate of emissions using best available data and calculation methodologies; it does not provide a complete picture of all emissions resulting from government operations, and emissions estimates are subject to change as better data and calculation methodologies become available in the future.

### **A.1.2 Organizational Boundaries**

Setting an organizational boundary for greenhouse gas emissions accounting and reporting is an important first step in the inventory process. The organizational boundary for the inventory determines which aspects of operations are included in the emissions inventory, and which are not. Under LGOP, 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 its operating policies at 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.<sup>23</sup> Local governments must choose which approach is the most applicable and apply this approach consistently throughout the inventory.

While both control approaches are acceptable, there may be some instances in which the choice may determine whether a source falls inside or outside of a local government's boundary. LGOP 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, all inventories in the San Diego Regional Climate Protection Initiative are being conducted according to the operational control framework.

### **A.1.3 Types of Emissions**

The greenhouse gases inventoried in this report are described in Section 2.1 As described in LGOP, emissions from each of the greenhouse gases can come in a number of forms:

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<sup>23</sup> Please see Local Government Operations Protocol for more detail on defining your organizational boundary: <http://www.icleiusa.org/programs/climate/ghg-protocol>

**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 City of Del Mar.

**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).

### A.1.4 Quantifying Emissions

Emissions can be quantified 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. This methodology is not generally available for most types of emissions and will only apply to a few local governments that have these monitoring systems.

The majority of the emissions recorded in the inventory can be and will be estimated using **calculation-based methodologies** to calculate their emissions using activity data and emission factors. To calculate emissions, the equation below is used:

**Activity Data x Emission Factor = Emissions**

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 energy consumption, and annual vehicle mileage by vehicle type. Emissions factors are calculated ratios relating emissions to a proxy measure of activity at an emissions source (e.g., CO<sub>2</sub> generated/kWh consumed). For a list of common emissions calculations see Table 2.2.

The guidelines in LGOP are meant to provide a common method for local governments to quantify and report greenhouse gas emissions by using comparable activity data and emissions factors. However, LGOP recognizes that local governments differ in how they collect data concerning their operations and that many are not able to meet the data needs of a given estimation method. Therefore, LGOP outlines both “recommended” and “alternative” methods to estimate emissions from a given source. In this system, recommended methods are the preferred method for estimating emissions, as they will result in the most accurate estimate for a given emission source. Alternative methods often require less intensive data collection, but are likely to be less accurate. This approach allows local governments to estimate emissions based on the data currently available to them. It also allows local governments

that are unable to meet the recommended methods to begin developing internal systems to collect the data needed to meet these methods.

This inventory has used the recommended activity data and emissions factors wherever possible, using alternative methods where necessary.

## **A.1.5 Reporting Emissions**

### **A.1.5.1 Significance Thresholds**

Within any local government's own operations there will be emission sources that fall within Scope 1 and Scope 2 that are minimal in magnitude and difficult to accurately measure. Within the context of local government operations, emissions from leaked refrigerants and backup generators may be common sources of these types of emissions. For these less significant emissions sources, LGOP specifies that up to 5% of total emissions can be reported using estimation methods not outlined in LGOP. In this report, all documented emissions were calculated using LGOP methods; emissions sources not analyzed in the report that fall under the significance threshold include hand-held fire extinguishers.

### **A.1.5.2 Units Used in Reporting Emissions**

In this narrative report, emissions from all gases released by an emissions source (e.g., stationary combustion of natural gas in facilities) are combined and reported in metric tons of carbon dioxide equivalent (CO<sub>2</sub>e). 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. For the GWPs of reported greenhouse gases, see Table 2.1.

## **A.2 Baseline Years**

Part of the local government operations emissions inventory process requires selecting a “performance datum” with which to compare current emissions, or a base year. Local governments should examine the range of data they have over time and select a year that has the most accurate and complete data for all key emission sources. It is also preferable to establish a base year several years in the past to be able to account for the emissions benefits of recent actions. A local government's emissions inventory should comprise all greenhouse gas emissions occurring during a selected *calendar* year.

For the San Diego Regional Climate Protection Initiative, 2005 was chosen as the baseline year, since this year is increasingly becoming the standard for such inventories. The 1990 baseline year for California is usually difficult for most local governments to meet and would not produce the most accurate inventory.

After setting a base year and conducting an emissions inventory for that year, local governments should make it a practice to complete a comprehensive emissions inventory on a regular basis to compare to the baseline year. ICLEI recommends conducting an emissions inventory at least every five years.

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## Appendix B: Government-Generated Solid Waste Methodology

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. This frontloading of emissions is the approach taken by EPA's Waste Reduction Model (WARM). Attributing all future emissions to the year in which the waste was generated incorporates all emissions from actions taken during the inventory year into that year's greenhouse gas release. This facilitates comparisons of the impacts of actions taken between inventory years and between jurisdictions. It also simplifies the analysis of the impact of actions taken to reduce waste generation or divert it from landfills.

### **B.1 Estimating Waste Tonnages from the City of Del Mar's Operations**

Like most local governments, the City of Del Mar does not directly track the amount of waste generated from its operations. Therefore, to estimate the amount of waste generated, ICLEI used: (1) waste haul information derived from contracts with waste haulers; and (2) directly weighed waste information provided by Waste Management Inc. for compacted waste from the City of Del Mar in 2005. The information on the amount of waste from the second method is an accurate accounting; however, the amount of waste from the first method had to be estimated by compiling pick-up accounts. Garbage trucks do not weigh waste at each pick-up; therefore, it is not possible to directly track disposal figures in mass per facility. Mass of waste generation was estimated using volumetric container size (gallons, yards, etc.) data, along with pick-up frequency and average fill of containers. These data produced a comprehensive annual volumetric figure, which was then converted to mass using standard conversion factors supplied by CalRecycle.

### **B.2 Emissions Calculation Methods**

As some types of waste (e.g., paper, plant debris, food scraps, etc.) generate methane within the anaerobic environment of a landfill and others do not (e.g., metal, glass, etc.), it is important to characterize the various

components of the waste stream. Waste characterization for government-generated solid waste was estimated using CalRecycle's 2004 statewide waste characterization study.<sup>24</sup>

Most landfills in the San Diego region capture methane emissions either for energy generation or for flaring. EPA estimates that 60 – 80% of total methane emissions are recovered at the landfills to which Del Mar's wastes are sent.<sup>25</sup> Following the recommendation of LGOP, ICLEI adopted a 75% methane recovery factor.

Recycling and composting programs are reflected in the emissions calculations as reduced total tonnage of waste going to the landfills. The model, however, does not capture the associated emissions reductions in “upstream” energy use from recycling as part of the inventory.<sup>26</sup> This is in-line with the “end-user” or “tailpipe” approach taken throughout the development of this inventory. It is important to note that, recycling and composting programs can have a significant impact on greenhouse gas emissions when a full lifecycle approach is taken. Manufacturing products with recycled materials avoids emissions from the energy that would have been used during extraction, transporting and processing of virgin material.

### **B.2.1 Methane Commitment Method**

CO<sub>2</sub>e emissions from waste disposal were calculated using the methane commitment method outlined in the EPA WARM model. This model has the following general formula:

$$\text{CO}_2\text{e} = W_t * (1-R)A$$

Where:

W<sub>t</sub> is the quantity of waste type “t”

R is the methane recovery factor,

A is the CO<sub>2</sub>e emissions of methane per metric ton of waste at the disposal site (the methane factor)

While the WARM model often calculates upstream emissions, as well as carbon sequestration in the landfill, these dimensions of the model were omitted for this particular study for two reasons:

This inventory functions on an end-use analysis, rather than a life-cycle analysis, which would calculate upstream emissions), and this inventory solely identifies emissions sources, and no potential sequestration “sinks.”

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24 CIWMB Waste Characterization Study-Public Administration Group available at <http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.aspx>.

25 AP 42, section 2.4 Municipal Solid Waste, 2.4-6, <http://www.epa.gov/ttn/chief/ap42/index.html>.

26 “Upstream” emissions include emissions that may not occur in your Del Mar resulting from manufacturing or harvesting virgin materials and transportation of them.



# Appendix C:

## Community Inventory Methodology

This appendix expands on the description of methodology provided in Section 2, describing in more detail the data sources and processes used to calculate emissions in the community inventory.

### C.1 Overview of Inventory Contents and Approach

The community inventory describes emissions of the major greenhouse gases from the residential, commercial/industrial, transportation, solid waste, and wastewater sectors. As explained in Section 2, emissions are calculated by multiplying activity data—such as kilowatt hours or gallons of gasoline consumed—by emissions factors, which provide the quantity of emissions per unit of activity. Activity data is typically available from electric and gas utilities, planning and transportation agencies and air quality regulatory agencies. Emissions factors are drawn from a variety of sources, including the California Climate Action Registry, the Local Governments Operations Protocol, and air quality models produced by the California Air Resources Board (CARB).

In this inventory, all GHG emissions are converted into carbon dioxide equivalent units, or CO<sub>2</sub>e, per guidance in the Local Government Operations Protocol (LGOP). The LGOP provides standard factors to convert various greenhouse gases into carbon dioxide equivalent units; these factors are known as Global Warming Potential factors, representing the ratio of the heat-trapping ability of each greenhouse gas relative to that of carbon dioxide.

The community inventory methodology is based on guidance from ICLEI's draft International Local Government GHG Emissions Analysis Protocol (IEAP), as well as methods utilized in the *San Diego County Greenhouse Gas Inventory* produced by the University of San Diego's Energy Policy Initiatives Center (EPIC)—which evaluated emissions County-wide, both incorporated and unincorporated—and methods used in ongoing climate change planning work at SANDAG.

#### C.1.1 Emissions Sources Included and Excluded

In general, local jurisdictions should seek to measure all emissions of the six Kyoto Protocol greenhouse gases<sup>27</sup> occurring within the jurisdictional boundaries. In practice, this level of detail may not be feasible for the local

<sup>27</sup> CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, SF<sub>6</sub>, perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs)

jurisdiction. The table below describes sources included in this community inventory, followed by sources that were excluded:

Sector	Emissions Source	Sector	Emissions Source
Residential	Bundled Electricity	Transportation	<i>On-Road Transportation</i>
	Direct Access Electricity		Travel on Local/Regional Roads
	Bundled Natural Gas		Travel on State Highways
	Direct Access Natural Gas		
Commercial / Industrial	Bundled Electricity		<i>Off-Road Sources</i>
	Direct Access Electricity		Lawn and Garden Equipment
	Bundled Natural Gas		Construction Equipment
	Direct Access Natural Gas		Industrial Equipment
Solid Waste	Community-generated Solid Waste		Light Commercial Equipment
	Landfill Waste-in-Place	Wastewater	Community-generated Wastewater

Local governments will often choose to exclude emissions sources that meet the following criteria:

- ***Below the significance threshold.*** In the ICLEI reporting standard, emissions sources can be excluded from the analysis (e.g. are “*de minimis*”) if, when combined, the excluded emissions total less than 5% of the total of the emissions from the Community or Government Inventory.<sup>28</sup>
- ***Insufficient data or accepted standard methodology.*** The science is still evolving in many sectors, and accurate records or standards for measuring emissions are not always available. Examples include non-combustion industrial emissions sources or emissions from composting activities.
- ***Emissions largely located outside the Del Mar’s boundaries.*** These types of emissions could include such sources as aviation departing from local airports or regional transit emissions.

In this inventory, the following emissions were below the significance threshold and were not included:

- SF<sub>6</sub>, perfluorocarbons (PFCs), and hydrofluorocarbon (HFCs) emissions
- N<sub>2</sub>O emissions from transportation

<sup>28</sup> Note: an inventory should include at least 95% of the emissions released by the government and community as a whole. Therefore, if a large number of small emissions sources occur within the Del Mar, they cannot all be ignored.

- Emissions of minor off-road sources (those not included in the table above)
- Stationary emissions from propane and diesel fuels
- Non-combustion industrial emissions sources

The following sources were excluded because they occurred largely outside the Del Mar’s boundaries:

- Aviation
- Rail
- Regional public transit

## C.2 Emissions Forecast

This inventory includes a “business-as-usual” forecast to 2020, estimating emissions that will occur if no new emissions reduction policies are implemented. The forecast is based on household, population, and job projections from SANDAG’s *2030 Regional Growth Forecast Update*. As a business-as-usual projection, the forecast does not take into account legislation or regulation currently under development, and relies on demographic data as the basis for estimating growth in each sector. The forecasting approach varies for each sector:

- Residential emissions are based on projected growth in local Del Mar *households*.
- Commercial / industrial sector emissions are correlated with forecasted *job growth* in the local Del Mar.
- Transportation emissions are based on projected growth rates in *regional vehicle miles traveled* associated with SANDAG’s Regional Transportation Plan 2030.
- Solid waste and wastewater emissions are correlated with forecasted *population* growth in the local Del Mar.

## C.3 The Built Environment: Residential, Commercial, and Industrial Sectors

Electricity and natural gas sold to San Diego Gas & Electric customers as bundled service was provided by Benjamin Lopez at SDG&E. Direct access electricity and natural gas was also provided by SDG&E, which records the direct access resources that are distributed through its grid. Bundled SDG&E electricity emissions were calculated in ICLEI’s CACP software using SDG&E-specific emissions factors provided by the California Climate Action Registry. Direct access electricity consumption was calculated in CACP using EPA eGrid emissions factors for the WECC California eGrid sub-region. All natural gas emissions were calculated in CACP with default emissions factors from the Local Government Operations Protocol.

## C.4 On-road Transportation and Off-road Mobile Sources

### C.4.1 On-road Transportation

On-road transportation emissions were derived from local jurisdiction vehicle miles traveled (VMT) data and regional vehicle and travel characteristics. Observed 2005 VMT on non-state facilities (referred to in the inventory as “local roads”) was obtained from Caltrans’ Highway Performance Monitoring System reports. VMT on state highways in the local jurisdiction was derived from a GIS shapefile output from the SANDAG transportation model, which is the basis of air quality reporting associated with the Regional Transportation Plan. For state highway segments that crossed jurisdictional boundaries, the segments were clipped in GIS and only the portion within the boundaries was accounted for.

The EMFAC2007 model developed by CARB was used to calculate emissions factors. EMFAC defaults for San Diego County include regionally-specific information on the mix of vehicle classes and model years, as well as ambient conditions and travel speeds, that determine fuel efficiency. The model estimates carbon dioxide and methane emissions from these factors and inputted vehicle activity data. The following regional emissions factors were calculated from the model and multiplied by VMT to obtain emissions totals:

Carbon dioxide: 0.568 (metric tons emissions per 1,000 miles travelled)

Methane: 0.0627 (metric tons emissions per 1 million miles travelled)

EMFAC2007 was also used to determine the regional share of emissions from gasoline and diesel transportation fuels. This 89% / 11% share was applied to total emissions to estimate emissions from each fuel.

EMFAC outputs are reported in short tons per day. Results were converted to metric tons per year. Because state highway VMT and associated emissions were based on average *weekday* traffic volumes, a 5-day to 7-day conversion factor was obtained from Caltrans and applied to the output to allow for annualizing.<sup>29</sup> Methane emissions were converted to carbon dioxide equivalent units based on the Global Warming Potential factor from LGOP.

### C.4.2 Off-road Mobile Sources

Off-road emissions were obtained from the CARB OFFROAD2007 model. The model was run using default equipment population, usage, and efficiency data for San Diego County. Emissions outputs were scaled to the local jurisdiction level by population share. Results were converted from short tons per day to metric tons per year.

<sup>29</sup> Provided by Kim Sturmer, Caltrans. The 2008 5-day to 7-day factor (only available) for state highways is 0.94.

Methane and nitrous oxide emissions were converted to carbon dioxide equivalent units based on the Global Warming Potential factors from LGOP.

## **C.5 Solid Waste**

Emissions from solid waste were captured in two ways: emissions from landfills located in the jurisdiction in the base year (“landfill waste-in-place”), and future emissions from decomposition of waste generated in the local jurisdiction in the base year (“community-generated solid waste”).

### **C.5.1 Landfill Waste-in-Place**

Landfill emissions data was obtained from CARB, which utilized a First Order Decay Model (FOD) to estimate emissions from organic waste disposal facilities located within the County.<sup>30</sup> The FOD incorporates data on waste disposal and facility conditions extending back several decades to calculate methane and carbon dioxide equivalent emissions.

### **C.5.2 Community-Generated Solid Waste**

Community-generated solid waste emissions were calculated in CACP using waste disposal data obtained from the California Integrated Waste Management Board Disposal Reporting System, which records tonnages of municipal solid waste and alternative daily cover by local jurisdiction. Emissions were calculated using the same methodology as described in Appendix B for government-generated solid waste.

## **C.6 Wastewater**

This inventory utilizes wastewater emissions estimates from the EPIC San Diego County inventory. EPIC obtained a per capita wastewater emissions estimate from CARB for 2005. This figure was reduced to account for biogas capture at regional wastewater facilities using gas capture data provided by the San Diego County Air Pollution Control District. For the purposes of this inventory, this per capita County-wide emissions rate was scaled to the local jurisdiction level by population share.

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<sup>30</sup> Provided by Larry Hunsaker, CARB, on Nov. 27, 2007. This data is embedded in the community master data file provided to Del Mar with this report.



# Appendix D:

## Conducting a Monitoring Inventory

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The purpose of this appendix is to assist staff in conducting a monitoring inventory to measure progress against the baseline established in this inventory report. Conducting such an inventory represents milestone five of the Five-Milestone Process, and allows a local government to assess how well it is progressing toward achieving its emissions reduction targets.

This inventory was conducted by a Climate Fellow with the San Diego Regional Climate Protection Initiative, in conjunction with local staff, who provided resources and assisted in gathering data for the inventory. To facilitate a monitoring inventory, the Fellow has 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. Wherever possible, however, ICLEI strongly recommends institutionalizing internal data collection in order to be able to meet the recommended methods outlined in LGOP.

### D.1 ICLEI Tools for Local Governments

ICLEI has created a number of tools for City staff to use to assist them in future monitoring inventories. These tools are designed to work in conjunction with LGOP, which is, and will remain, the primary reference document for conducting an emissions inventory. These tools include:

- A “master data sheet” that contains most or all of the raw data (including emails), data sources, emissions calculations, data templates, notes on inclusions and exclusions, and reporting tools (charts and graphs and the excel version of LGOP reporting tool).
- A copy of all electronic raw data, such as finance records or Excel spreadsheets.
- Sector-specific instructions that discuss the types of emissions, emissions calculations methods, and data required to calculate emissions from each sector, as well as instructions for using the data collection tools and calculators in the master data sheet.
- The appendices in this report include detailed methodology for calculating emissions from Scope 3 government-generated solid waste.

It is also important to note that all ICLEI members receive on-demand technical assistance from their ICLEI liaison, which local staff should feel free to contact at any point during this process.

## **D.2 Relationship to Other San Diego Regional Climate Protection Initiative Inventories**

While the emissions inventories for the 17 participating local governments were conducted using the same tools, a local government operations inventory is based on data specific to each local government's operations. For this reason, data must be collected internally within each local government, and the availability of data (and thus emissions estimation methods) will vary between local governments.

That said, local governments in the San Diego Regional Climate Protection Initiative may benefit by cooperating during the re-inventorying process. For example, by coordinating inventories, they may be able to hire a team of interns to collectively perform the inventories – saving money in the process. In addition, local staff may be able to learn from each other during the process or conduct group training sessions if necessary. As a whole, the Climate Protection Initiative provides the basis for a continuing regional platform for climate actions, and ICLEI recommends taking advantage of this opportunity during all climate actions, including conducting future greenhouse gas emissions inventories.

## **D.3 Improving Emissions Estimates**

One of the benefits of a local government operations inventory is that local government staff can identify areas in their current data collection systems where data collection can be improved. For example, a local government may not directly track fuel consumption by each vehicle and instead will rely upon estimates based upon VMT or purchased fuel to calculate emissions. This affects both the accuracy of the emissions estimate and may have other implications for government operations as a whole.

During the inventory process, ICLEI and local government staff identified the following gaps in data that, if resolved, would allow the City of Del Mar to meet the recommended methods outlined in LGOP in future inventories.

- Direct tracking of refrigerants recharged into vehicle fleet
- Amount and type of fuel consumption by individual vehicle
- Amount and type of fuel consumption by mobile equipment
- Amount and type of fuel consumption by diesel and other generators
- Tracking of employee commutes

ICLEI encourages staff to review the areas of missing data and establish data collection systems for this data as part of normal operations. In addition, some information-gathering methods could be improved, such as complete records of vehicle miles traveled by each vehicle. In this way, when staff are ready to re-inventory for a future year, they will have the proper data to make a more accurate emissions estimate.

## **D.4 Conducting the Inventory**

ICLEI recommends the following approach for San Diego Regional Climate Protection Initiative local governments that wish to conduct a monitoring inventory:

### **Step 1: Identify a Climate Steward**

This steward will be responsible for the City of Del Mar's climate actions as a whole and could serve as an ICLEI liaison in all future climate work. In the context of a monitoring inventory, the steward will be responsible for initiating discussions on a new inventory.

### **Step 2: Determine which Sectors to Inventory**

The LGOP describes the sectors that should be included in an emissions inventory. This document clearly delineates which sectors will need to be inventoried within a local government's operations and which LGOP sectors do not apply to the City of Del Mar.

### **Step 3: Gather Support: Identify Data Gathering Team and Leads**

Coordination and acceptance among all participating departments is an important factor in coordinating a successful inventory. To that end, the inventory coordinator should identify all staff who will need to be part of the inventory. To facilitate this process, the Climate Fellow has documented all people associated with the inventory in the master data sheet—these names are located in the final completed data form for each sector. Once this team has been identified, the inventory coordinator should hold a kickoff meeting with the administrator, all necessary staff, and relevant department heads which clearly communicates the priority of the inventory in relationship to competing demands. At this meeting, the roles of each person, including the inventory coordinator, should be established.

### **Step 4: Review Types of Emissions and Available Methodologies for Applicable Sectors**

Local staff should then review LGOP and the instructions documents provided through this inventory to better understand the types of emissions for each sector (for example, within Mobile Emissions, CO<sub>2</sub> emissions and CH<sub>4</sub>/N<sub>2</sub>O emissions represent two different data requirements and emissions calculations methodologies). Each emissions type may have more than one possible estimation methodology, and it is important that the inventory coordinator understands all possible methodologies and be able to communicate this to all parties assisting in the data gathering.

## **Step 5: Review Methodologies Used for the 2005 Inventory to Determine Data to Collect**

In order to duplicate or improve upon the methods used in this inventory, local staff should again review the methods used for this inventory and within the master data sheet. These methods reflect the data limitations for each local government (as many local governments could not obtain data necessary to meet the recommended methods in LGOP). Wherever possible, these methods should be duplicated or, if it is possible, replaced with the recommended methods outlined in LGOP. Using these methodologies, staff will determine what data needs to be collected and communicate this effectively to the data gathering team.

## **Step 6: Use the Data Forms as a Resource During Data Gathering**

A number of questions will come up during the data-gathering process that may be difficult to answer. ICLEI has attempted to capture all of the questions that arose during the 2005 inventory and how they were addressed through the master data sheet. Within the master data sheet, staff should review the raw data, working data, and completed data forms to review how raw data was converted to final data, and also to review any notes taken by ICLEI staff during the 2005 inventory process.

For example, reviewing the stationary sources SDG&E data within the master data sheet will allow local staff to review how individual accounts were separated into each category and which accounts may have been excluded from the inventory.

## **Step 7: Use Emissions Software to Calculate Emissions**

ICLEI has provided the staff lead on the 2005 inventory with a backup of the software used to calculate many of the emissions included in this report. Staff should use this (or more current ICLEI software) to calculate emissions by inputting the activity data into the software. ICLEI staff and ICLEI trainings are available to assist local government staff in calculating emissions.

## **Step 8: Standardize and Compare to Base Year**

Conducting a monitoring inventory is meant to serve as a measuring point against the baseline year represented in this report. In order to make a more accurate comparison, it is necessary to standardize emissions from stationary sources based upon heating and cooling degree days (staff can use a ratio of heating / cooling degree days to standardize across years).

In addition, it is important, when comparing emissions across years, to clearly understand where emissions levels may have changed due to a change in methodology or due to excluding an emissions source. For example, if the default method was used to estimate refrigerant leakage in 2005 (this method highly overestimates these emissions), and the recommended method was available in a monitoring year, this would appear as a dramatic reduction in these emissions even though actual leaked refrigerants may be similar to the base year. Changes such as these should not

be seen as progress toward or away from an emissions reduction target, but emissions estimates should be adjusted to create as much of an apples-to-apples comparison as possible. If such an adjustment is not possible, staff should clearly note the change in methodology between years when comparing emissions.

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