Appendix A

City of Santee
GHG Inventory, Forecasting, Target-Setting Report

Revised February 2019

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List of Acronyms and Abbreviations

AB	Assembly Bill
ADC	Alternative Daily Cover
ARB	California Air Resources Board
BAU	Business-as-Usual
CAFE	Corporate Average Fuel Economy
CAP	Climate Action Plan
CH_4	Methane
CARB	California Air Resources Board
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalents
EO	Executive Order
E-Grid	Emissions and Generation Resource Integrated Database
EMFAC2014	On-road emission factors model version 2014
EPA	Environmental Protection Agency
EPIC	Energy Policy Initiatives Center
GHG	Greenhouse Gas
GWP	Global Warming Potential
IFT	Inventories, Long-Term Forecasts, and Target-Setting
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilowatt-hour
LCFS	Low Carbon Fuel Standard
LGOP	Local Government Operations Protocol
MT	Metric Tons
NDN	Nitrification/denitrification
N_2O	Nitrous Oxide
RPS	Renewable Portfolio Standard
RTP	Regional Transportation Plan
SANDAG	San Diego Association of Governments
SDG&E	San Diego Gas & Electric
SEEC	Statewide Energy Efficiency Collaborative
VMT	Vehicle Miles Traveled

Key Findings

Community

- The City of Santee increased total greenhouse gas (GHG) emissions 18.4% from 2005 to 2013, from 339,972 metric tons of carbon dioxide equivalent (MT CO_2e) to 402,574 MT CO_2e.
- Solid waste, water, and off-road sources sector emissions decreased while on-road transportation, commercial energy, residential energy, and wastewater sectors increased emissions from 2005 to 2013.
- On-road transportation emissions account for about 54% of the total community emissions in 2005 and 60% in 2013.
- Energy-related emissions account for about 30% of the total community emissions in 2005 and 31% in 2013.
- Under the Adjusted Business-as-Usual (BAU) forecast, emissions will be 352,106 MT CO_2e in 2020, 339,514 MT CO_2e in 2030 and 336,543 MT CO_2e in 2035. These emissions levels are 3.6%, increase from 2005 by 2020 and a 0.1% and 1.0% lower than 2005 by 2030 and 2035 respectively.
- The State recommends a 15% reduction below 2005 levels by 2020, which the City will have met the target under an Adjusted BAU forecast by 2020.

Municipal

- Emissions from City government services (municipal emissions) are a subset of communitywide emissions and represent less than 1% of community emissions.
- Municipal emissions have increased 15% from 2005 to 2013, from 1,657 MT CO_2e to 1,909 MT CO_2e.
- Emissions in the buildings and facilities, fleet and equipment, solid waste, city-owned outdoor lights, and water pumping sectors increased between 2005 and 2013, and the employee commute, and SDG&E-owned outdoor lights sectors decreased.
- Municipal energy use accounted for 53% of total municipal emissions in 2005 and 57% in 2013.
- Under the Adjusted BAU forecast, emissions will be 1,611 MT CO_2e in 2020, which is 3% lower than in 2005. In 2030, emissions will be equivalent to 2005. By 2035, emissions will grow to 1,681, which is 1% higher than in 2005. The changes reflect anticipated growth in the City's municipal operations and reductions from State-mandated policies.

Introduction

This Greenhouse Gas (GHG) Inventories, Long-Term Forecasts, and Target-Setting (IFT) Report contains the first steps toward the City of Santee (City) identifying energy-efficiency and GHG reduction measures in a Climate Action Plan or Sustainable Santee Plan. The inventories describe historic energy use and GHG emissions and the forecasts describe projected future emissions in the City. The target-setting section describes GHG reduction approaches that are consistent with State goals and may assist the City in establishing local GHG reduction targets. This IFT Report will help the City identify energy efficiency and GHG reduction measures to meet their local reduction targets.

Specifically, the IFT Report includes (words and phrases in bold are described in Table 1):

- Historic GHG emissions in **community inventories** for 2005, 2008, 2012, and 2013 and **municipal inventories** for 2005 and 2013;
- Future GHG emissions for 2020, 2030 and 2035 under a **business-as-usual** forecast scenario and **adjusted business-as-usual** forecast scenario; and
- GHG **reduction targets** for 2020, 2030 and 2035 that are aligned with State goals.

Table 1. Key Terms in the Report[1]

Term	Definition
Adjusted business- as-usual	A GHG forecast scenario that accounts for known policies and regulations that will affect future emissions. Generally, these are state and federal initiatives that will reduce emissions from the business-as-usual scenario.
Baseline year	The inventory year used for setting targets and comparing future inventories against.
Business-as-usual	A GHG forecast scenario that assumes no change in policy affecting emissions since the most recent inventory. Changes in emissions are driven primarily through changes in demographics.
Community Inventory	GHG emissions that result from the activities by residents and businesses in the city. An inventory reports emissions that occur over a single calendar year.
Emission factors	The GHG-intensity of an activity.
Municipal Inventory	GHG emissions that result from the activities performed as part of the government operations in the city and are a subset of the community inventory. An inventory reports emissions that occur over a single calendar year.
Reduction targets	Goals of GHG emissions levels not to be exceeded by a specific date. Local reduction targets are often informed by state recommendations and different targets may be established for different years.
Sector	A subset of the emissions inventory classified by a logical grouping such as economic or municipal-specific category.

[1] A glossary of terms is also included as Attachment A.

GHG Emission Inventories

GHG emissions inventories are the foundation of planning for future reductions. Establishing an existing inventory of emissions helps to identify and categorize the major sources of emissions currently being produced. In this report, four years of historic inventories are presented to show not only the major sources of emissions in the city, but also how those sources vary over time. For the community, the years 2005, 2008, 2012, and 2013 are presented, and for the municipal inventories the years 2005 and 2013 are presented. The 2005 inventory (for both community and municipal operations) is considered the **baseline year**. A baseline year is established as a starting point against which other inventories may be compared and targets may be set, and is generally the earliest year with a full emissions inventory. The most recent inventory (2013) has the most relevant data for planning purposes, while the interim years (2008 and 2012) provide context and may help identify trends or anomalies in the community emissions. Appendix B of the Sustainable Santee Plan provides the general methodology used to calculate the inventories.

The following explains why 2013 was considered the most recent inventory, how the City's community inventories were calculated, and why this information is still considered valid for use within the Sustainable Santee Plan. The 2013 inventory of emissions was considered the most recent inventory because the inventory process began in September of 2014. At that time, the most current modeling was used to translate activity data into GHG emissions. Activity data for the 2013 inventory and forecasts associated with on-road transportation was provided using the San Diego Association of Governments (SANDAG) Series 12 Transportation Model which became available in October 2013. The on-road transportation activity data from the Series 12 transportation model is provided in Attachment C. GHG emissions associated with the on-road activity data was calculated using the California Air Resources Board (ARB) on-road emissions factor model 2014 (EMFAC2014) which became available in April 2014.

Emission factors (EFs) for natural gas and electricity use within the community were provide by the University of San Diego School of Law Energy Policy Initiatives Center (EPIC) and shown in Attachment D. Electricity consumption for the 2005 and 2008 inventories used the 2010 EF provided by EPIC which originated from the Environmental Protection Agency (EPA) Emissions and Generation Resource Integrated Database (E-Grid) for San Diego Gas and Electric (SDG&E). The EFs for electrify consumption for the 2012 and 2013 inventories as well as the forecast years 2020, 2030, and 2035 used the 2012 E-Grid for SDG&E provided by EPIC.

The latest versions of these models as of January 2019 include SANDAG Series 13 Transportation Model, EMFAC2017, and E-Grid 2018 values for SDG&E. In evaluating the difference between the SANDAG Series 12 and Series 13 Transportation Models, the primary difference is in forecasted growth rates. The SANDAG Series 12 Transportation Model included very aggressive growth rates for future years which resulted in higher levels of transportation related travel in 2020, 2030 and 2035 than what the SANDAG Series 13 Transportation Model would have provided. Additionally, the EMFAC2014 emission factors for on-road transportation emissions did not include the low carbon fuel standard in calculating emissions. Because of this on-road transportation emissions for future years 2020, 2030, and 2035 shown in this report are higher than what would have been calculated using the most recent models.

The 2012 EFs from E-Grid used to calculate emissions from the use of electricity in 2020, 2030, and 2035 are higher than the 2018 EFs from E-Grid. The primary reason that the 2012 EFs are higher is due to the fact that in 2012 SDG&E was compensating for the loss of zero emissions electricity generation provided by San Onofre Nuclear Generating Station by generating more electricity with natural gas fired generation stations, which resulted in higher emissions. In 2018, the increased use of renewable electric generation in compliance with the required Renewable Portfolio Standard (RPS) resulted in lower GHG emissions compared with 2012. Because of this, future years 2020, 2030 and 2035 forecasts show higher energy related GHG emissions in this report than what would have been calculated using the 2018 E-Grid values.

The higher forecasted emission levels for 2020, 2030, and 2035, required more local reduction measures to reduce emissions down to the reduction targets.

Updating the 2020, 2030, and 2035 forecasts is considered unnecessary because doing so would only result in the local reduction measures reducing emissions even further below the reduction targets. The following describes how the inventories and forecasts were calculated.

Emission Reporting

The primary GHGs from the community and municipal operations are from carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) since they are most relevant to human activities[1]. Because each of these gases has a different capacity for trapping heat in the atmosphere, known as its global warming potential (GWP), a method of reporting is needed to be able to compare gases in the same terms. As a result, emissions are reported in carbon dioxide equivalents, or CO_2e, with each GHG normalized and calculated relative to CO_2 using its GWP. Table 2 describes the GHGs analyzed in this report, their symbol, GWP, and primary community sources of emissions. While N_2O has the highest GWP and may be considered the most dangerous on a per-molecule basis, CO_2 is by far the most prevalent pollutant, accounting for 88% of total statewide GHG emissions in 2005 (CARB 2011).

Table 2. GHGs Analyzed in the Inventories

Greenhouse Gas	Symbol	Global Warming Potential	Primary Community Sources
Carbon Dioxide	CO_2	1	Fossil fuel combustion
Methane	CH_4	25	Fossil fuel combustion, landfills, wastewater treatment
Nitrous Oxide	N_2O	298	Fossil fuel combustion, wastewater treatment

Source: IPCC Fourth Assessment Report, 2007.

Emission Sectors

The inventories identify the major sources of GHGs emissions caused by activities in sectors that are specific to community or municipal activities. A **sector** is a subset of the economy, society, or municipal operations whose components share similar characteristics. An emissions sector can also contain

[1] Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report. 2007.

subsectors that provide more specificity about the source of emissions (e.g., natural gas and electricity are subsectors of the energy sector).

Inventories were completed for the community and municipal operations. Because the majority of municipal activities occur within the boundaries of the city and therefore contribute to the overall emissions of the community, both inventories are interconnected, with the municipal inventory considered a subset of the community inventory. As a result, municipal emissions are included in numbers reported for the community. The municipal inventory is separated to highlight areas of emissions that the city has more direct control over and to identify where they can begin to set examples for the community on how reduction strategies can be implemented.

The following subsections describe the sectors used in the community and municipal inventories. It is important to note that both inventories capture similar types of information but may be categorized differently. For example, energy is reported in both the community and municipal inventory, but community level energy emissions are reported as "Residential" and "Commercial/Industrial", whereas municipal energy emissions are more logically reported as "Buildings & Facilities" and "Streetlights".[2]

Community Sectors

The community inventory is categorized by sectors based on the sector's ability to be affected through regional and local programs, incentives, zoning, and other policies. The City's community inventories were divided into the following sectors:

- **Energy** in the Community Inventory is further broken down into two sectors:
    - **Commercial/Industrial Energy** includes emissions from electricity and natural gas consumption in non-residential buildings and facilities (including outdoor lighting) in the city.
    - **Residential Energy** includes emissions from electricity and natural gas consumption in residential buildings in the city.
- **On-Road Transportation** includes emissions from vehicle fuel use in trips wholly within the city (in-boundary) and trips that either originate or end in the city (cross-boundary). Emissions from in-boundary trips are fully accounted for in the inventory, whereas only half of the emissions from cross-boundary trips are accounted for. Trips that pass-through the city, (such as on SR-125 and SR-67) are not accounted for in the inventory because the City no control of these emissions. As a result, this methodology reflects only trips or parts of trips within city borders that the City has the ability to affect. To calculate emissions associated with in-boundary and cross-boundary vehicle trips for the City of Santee, vehicle miles traveled (VMT) must be used. The source of the VMT data used in this report was calculated by the San Diego Association of Governments (SANDAG) and provided as an Excel Spreadsheet. SANDAG calculated the VMT using their Series 12 Transportation Model. The SANDAG VMT calculations are provided as Attachment C to this Report.

[2] Streetlights are further categorized as SDG&E-owned or City-owned as described later.

As part of a public outreach / public workshop campaign conducted in 2018, the City reported GHG emissions from on-road transportation were lower than some of the public expected. The Climate Action Campaign questioned the source of these numbers. Staff and the consultant researched the issue. A review determined that the consultant used the SANDAG VMT data labeled "SANTEE TOTAL" which resulted in lower number for VMT and GHG. During conference calls and a meeting with SANDAG staff it was discovered that the SANDAG VMT data titled "REGIONAL TOTAL" should have been used. This has been corrected and the VMT and resulting GHG numbers have been adjusted. The revised levels in the Sustainable Santee Plan appear consistent with levels reported by other jurisdictions.

- **Solid Waste** includes emissions from waste that is generated in the community and sent to landfills.
- **Water** includes emissions from the electricity used to source, treat, and deliver imported water in the community that is not accounted for in the community utility data.
- **Wastewater** includes emissions from treating wastewater generated in the community.
- **Off-Road Sources** include emissions from operating equipment for construction, commercial, light industrial and agricultural activities; lawn and garden equipment; and recreational vehicles such as all-terrain vehicles.

Municipal Sectors

Sources of municipal emissions are divided into the following sectors:

- **Energy** in the municipal inventory is further broken down into four sectors:
  - **Buildings and Facilities** includes energy use by the government, including electricity and natural gas.
  - **SDG&E-owned Streetlights** includes energy for streetlights on fixtures owned by SDG&E.
  - **City-owned Outdoor Lighting** includes energy for streetlights on fixtures owned by the City, traffic control signals, and outdoor lighting.
  - **Water Pumping** includes energy for water pumping and irrigation.
- **Fleet & Equipment** includes emissions from vehicles owned or operated by the government or contracted by the City for services such as street cleaning. It also includes equipment, such as emergency generators.
- **Employee Commute** includes emissions from fuel use in vehicle trips by municipal employees commuting to and from work in the city.
- **Solid waste** includes emissions from waste generated by municipal employees or at municipally-owned facilities.

Calculation Methodology

GHG emissions were calculated using activity data available (e.g., kilowatt-hours of electricity, therms of natural gas, vehicle miles traveled) for each sector and protocols for converting activity data to emissions output using relevant **emission factors**. Emission factors relate the activity to GHG emissions and may vary by year (e.g., for electricity) and often are not affected by local actions or behavior, unlike activity data. The U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (ICLEI 2012), The California Supplement to the U.S. Community Protocol (AEP 2013), and the Local Government Operations Protocol for the Quantification and Reporting of GHG Emissions Inventories (LGOP) (CARB 2010) were the primary protocols used for developing the community and municipal inventories, respectively. Activity data are reported in the community and municipal emissions subsections below, and emission factors are detailed in Attachment B.

Community Emissions

The community inventory includes the GHG emissions that result from activities within city boundaries. This section presents the findings of the community inventory for four years: 2005 (baseline year), 2008, 2012, and 2013. It also provides more specific detail and findings on the energy sectors, which will form the basis of the reduction targets and reduction measures the City identifies in the CAP.

2005—2013 Emissions Summary

Overall, emissions increased 18 percent from 2005 to 2013, from 339,972 MT CO_2e to 402,574 MT CO_2e, with On-Road Transportation emissions showing the greatest overall increase. As shown in Figure 1 and Table 3, the Transportation sector was the largest contributor to emissions in 2005, contributing 54% of total emission. By 2013, Transportation emissions increased to 60% of total emissions.

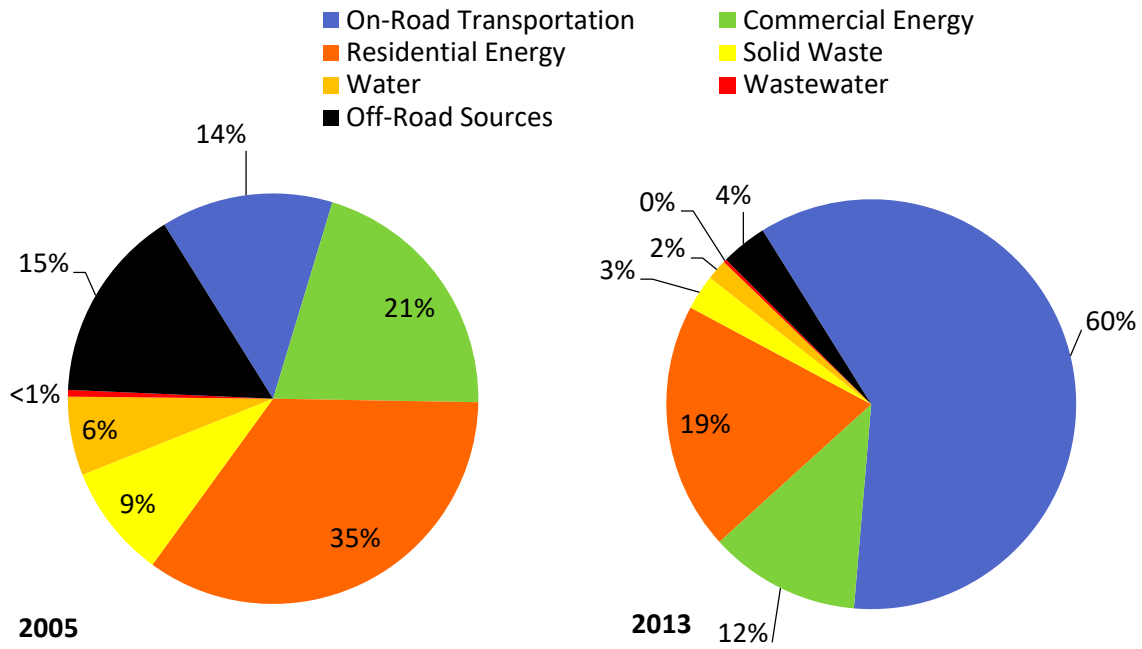


Figure 1. Community GHG Emissions by Sector for 2005 and 2013

Table 3. Community-Wide GHG Emissions by Sector for 2005 and 2013

Sector	2005 (MT CO_2e)	2013 (MT CO_2e)	% Change 2005–2013
On-Road Transportation	181,812	242,499	33.4%
Residential Energy	63,544	78,651	23.8%
Commercial Energy	37,697	48,025	27.4%
Solid Waste	16,376	11,151	-31.9%
Water	11,354	6,578	-42.1%
Off-Road Sources	28,230	14,699	-47.9%
Wastewater	959	971	1.3%
Total	339,972	402,574	18.4%

2005, 2008, 2012, and 2013 Inventories

While the total emissions from 2005 to 2013 decreased, there has been variation in the City's emissions by sector over time. Figure 2 and Table 4 show the GHG emissions by sector for four inventory years. Emissions are variable among the inventory years, and may reflect changes in the economy, weather, and programs implemented to reduce emissions. The table also lists the percentage of each sector relative to total emissions and shows how the proportion of each sector changed over the years. Of note are the relatively large variations in Commercial/Industrial Energy (varying from 15 to 21% of total emissions) and Off-Road Sources (which varied from 6 to 17% of total emissions), which were primarily due to changes in construction-related emissions.

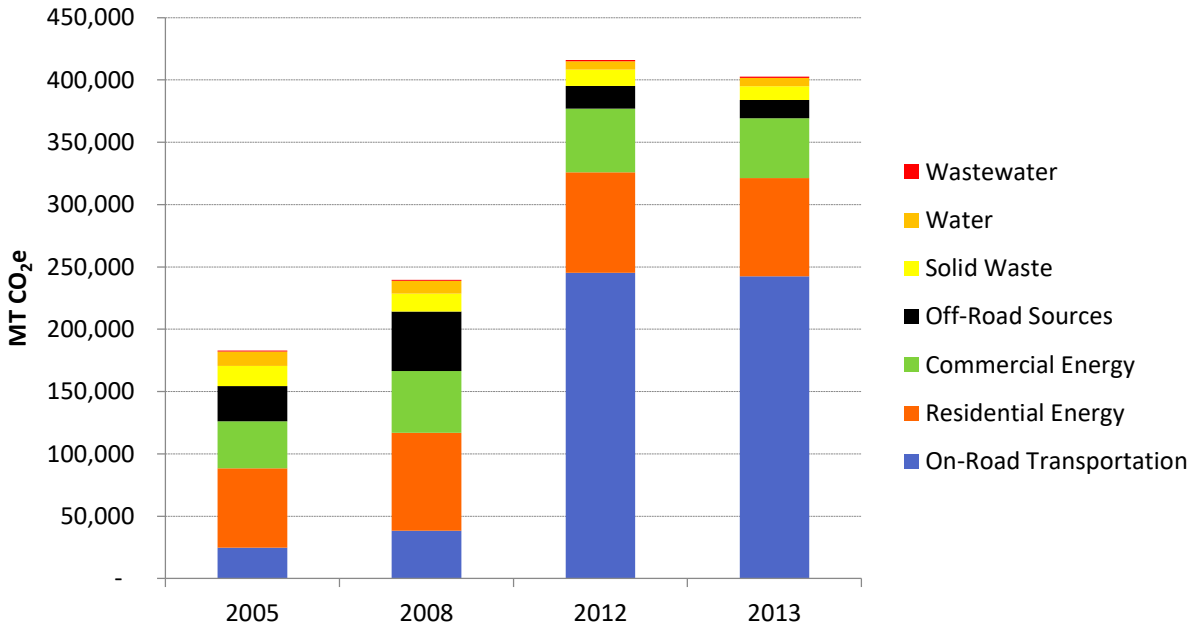


Figure 2. Community GHG Emissions for 2005, 2008, 2012, and 2013

Table 4. Community GHG Emissions for 2005, 2008, 2012, and 2013

Sector	2005 (MT CO_2e)	% of Total	2008 (MT CO_2e)	% of Total	2012 (MT CO_2e)	% of Total	2013 (MT CO_2e)	% of Total
On-Road Transportation	181,812	53%	251,184	55%	245,171	59%	242,499	60%
Residential Energy	63,544	19%	78,477	17%	80,673	19%	78,651	20%
Commercial/ Industrial Energy	37,697	11%	49,580	11%	51,148	12%	48,025	12%
Solid Waste	16,376	5%	14,295	3%	13,163	3%	11,151	3%
Water	11,354	3%	10,235	2%	6,722	2%	6,578	2%
Wastewater	959	<1%	985	<1%	964	<1%	971	<1%
Off-Road Sources	28,230	8%	47,829	11%	18,186	4%	14,699	4%
Total	**339,972**		**452,585**		**416,027**		**402,574**	
% Change from 2005	**—**		**33.1%**		**22.4%**		**18.4%**	

Activity data can provide more insight into behavioral changes in the community, as these data are not affected by emission factors. Table 5 summarizes activity data for each sector and subsector. The activity data show that while emissions from the Residential and Commercial/Industrial sectors increased, activity (kWh and therms) generally decreased (except for Residential electricity). The next section, Energy, discusses this apparent anomaly, which is related to the applicable emissions factors. Also notable, while On-road Transportation emissions increased 33.3% between 2005 and 2013, vehicle miles traveled increased by nearly 38%. The difference reflects that for each vehicle mile traveled, fewer emissions are generated due to improvements in the fuel efficiency of vehicles.

Table 5. Activity Data Used in 2005, 2008, 2012, and 2013 Community Inventories

Sector	2005	2008	2012	2013	% Change 2005–2013
On-Road Transportation					
Total Vehicle Miles Traveled	352,711,238	479,229,830	485,123,704	486,608,464	38.0%
Residential Energy					
Electricity (kWh)	129,290,439	149,427,819	141,649,936	136,108,148	5.3%
Natural Gas (therms)	5,878,287	5,797,758	5,734,216	5,723,205	-2.6%
Commercial/Industrial Energy					
Electricity (kWh)	120,725,233	108,987,978	102,850,529	115,339,581	-4.5%
Natural Gas (therms)	1,419,790	1,494,426	1,568,104	1,347,484	-5.1%
Solid Waste					
Landfilled (tons)	60,825	52,184	46,644	38,742	-36.3%
ADC (tons)[a]	8,136	7,362	8,531	8,185	0.6%
Water and Wastewater					
Water (MG)	2,197	2,044	1,863	1,822	-17.1%
Recycled Water (MG)	232.4	253.4	284.4	292.7	25.9%
Wastewater (City portion of countywide residents)	1.548%	1.547%	1.517%	1.523%	-1.57%
Off-Road sources[b] (% of San Diego County emissions attributed to the City)					
Lawn & Garden (% Households)	1.75%	1.69%	1.78%	1.78%	1.8%
Construction (% Building permits)	3.46%	6.22%	1.65%	1.14%	-67.2%
Industrial (% Manufacturing jobs)	2.22%	2.22%	2.22%	2.22%	-0.1%
Light Commercial (% Other jobs)	0.97%	0.97%	0.97%	0.97%	-0.01%
Recreation (Population weighted by income)	2.42%	2.30%	1.95%	1.87%	-22.6%
Agriculture (% Ag. Jobs)	0.68%	0.68%	0.68%	0.68%	0.0%

a. ADC is Alternative Daily Cover, which is green waste (grass, leaves, and branches) that is used to cover landfill emissions. They are reported separately by CalRecycle and therefore shown separately here.

b. Off-road emissions are available at the county level through CARB's OFFROAD model. Emissions attributable to the City were derived using indicator data related to the off-road source. For example, the percentage of households in the City compared to the county was used to attribute the same percentage of lawn & garden equipment emissions to the City. See Attachment B for more methodology details.

Demographic data also help provide perspective to changes in emissions over time. Table 6 shows the number of households, jobs, population, and service population (jobs + population) for each inventory year.

Table 6. Demographic Data for 2005, 2008, 2012, and 2013

	2005	2008	2012	2013	% Change 2005–2013
Service Population (Population + Jobs)	70,152	71,859	70,959	71,663	1.0%
Population	54,370	55,850	54,643	55,033	1.2%
Households	18,563	19,080	19,725[1]	19,725	6.3%
Jobs	15,782	16,009	16,316	16,630	5.4%

[1] 2012 households data is the proxy from 2013 since 2012 data is not available through SANDAG.

Energy

Energy is an area over which local agencies often have the greatest opportunities for affecting change. In Santee, energy use has largely declined, although emissions have increased. Electricity and natural gas use remains a key area for reduction opportunities. Emissions from energy use account for 40% and 54% of total community emissions in 2005 and 2013, respectively. Commercial electricity use decreased 4.5% between 2005 and 2013; and emissions increased by 56%. Residential electricity use increased by about 5% but emissions increased by about 49%. The difference between the change in activity data and emissions data are due to the emission factor used for electricity for 2005 and 2013. Emission factors convert activity data into GHG emissions and electricity emission factors vary annually based on how electricity is generated by the electricity provider (i.e., the amount of renewables, natural gas, coal, etc.). In 2005, San Diego Gas & Electric (SDG&E) generated electricity that resulted in an emission factor of 550.488 pounds (lbs) CO_2e per megawatt hour (MWh). In 2013, SDG&E's electricity generation resulted in an emission factor of 781.062 lbs CO_2e per MWh. Therefore, a kilowatt-hour of electricity used in 2013 emitted more GHGs than a kilowatt-hour of electricity used in 2005. Future emissions could increase or decrease based on changes to SDG&E's emission factors, which the City cannot directly affect, or through changes in usage, which can be affected by changes in local policy, outreach, or incentive programs. Unlike electricity, the emission factor for natural gas is estimated on a national basis and remains fairly constant over time. Therefore, the natural gas GHG emissions follow the same trend as usage. In Santee, Commercial/ Industrial natural gas consumption (therms) decreased by 5% from 2005 to 2013; therefore the emissions also decreased 5%. Residential

Electricity-Related Emissions

All emissions are comprised of activity data and the emission factor, or GHG-intensity, of that activity. For electricity, the activity data are the kilowatt-hours (kWh) used by the city's residents and businesses and the energy intensity is based on the sources of power that San Diego Gas & Electric uses to generate electricity. Changes to either component can affect the GHG emissions from electricity in the city.

natural gas therms used and GHG emissions declined nearly 3% from 2005 to 2013. Figure 3 shows the trend in electricity and natural gas emissions from 2005 to 2013 for the Commercial/Industrial and Residential sectors. Figure 3 shows the GHG emissions from 2005 to 2013 and Table 7 includes the activity data and GHG emissions for 2005 and 2013.

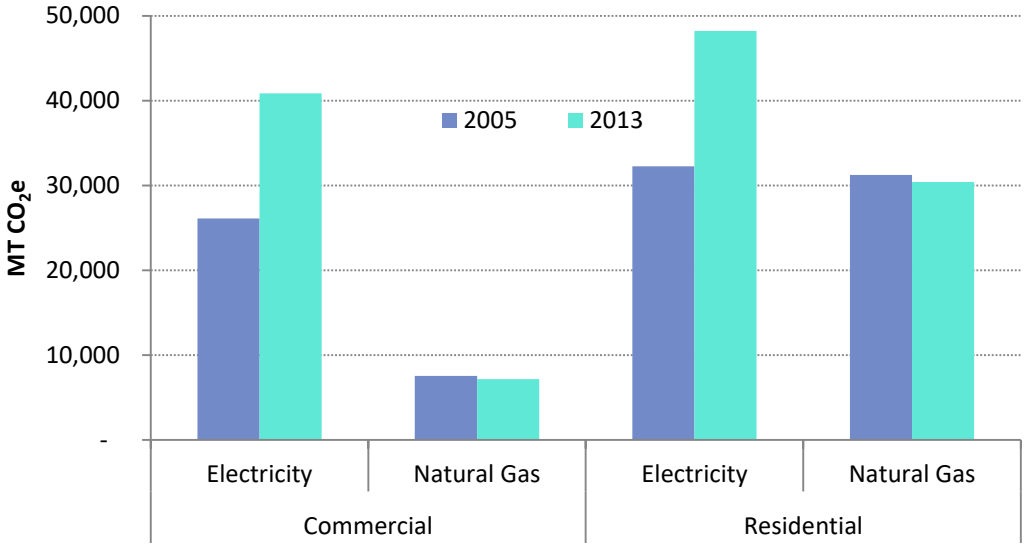


Figure 3. GHG Emissions for Community Electricity and Natural Gas, by Sector

Table 7. Activity Data and GHG Emissions of Energy in 2005 and 2013

Sector	2005		2013		% Change in Activity 2005–2013	% Change in Emissions 2005–2013
	Activity (kWh or therms)	Emissions (MT CO_2e)	Activity (kWh or therms)	Emissions (MT CO_2e)		
Commercial/Industrial						
Electricity	120,725,233	26,127	115,339,581	40,860	-4.5%	56.4%
Natural Gas	1,419,790	7,550	1,347,484	7,165	-5.1%	-5.1%
Residential						
Electricity	129,290,439	32,286	136,108,148	48,218	5.3%	49.3%
Natural Gas	5,878,287	31,258	5,723,205	30,433	-2.6%	-2.6%
Total (MT CO_2e)		**97,221**		**126,676**		**30.3%**

Municipal Emissions

As described earlier, a municipal GHG emissions inventory is a subset of the community inventory. The community inventory, as reported, includes the municipal emissions inventory. The municipal inventory includes emissions from activities conducted as part of government operations in the City. While emissions from government operations are normally a fraction of the overall community emissions, the City has the most direct control over municipal emissions and the City can demonstrate leadership in the community by adopting and implementing energy and GHG reduction strategies. This section presents

the findings of the municipal inventory for 2005 (the baseline year) and 2013. Interim data were not available for municipal operations.

2005—2013 Emissions Summary

Emissions from municipal activities increased 15% from 2005 to 2013, from 1,657 MT CO_2e to 1,909 MT CO_2e. As shown in Figure 4 and Table 8, the most significant change was from City-Owned Outdoor Lighting, whose emissions tripled over the period. All sectors of municipal emissions increased except SDG&E-Owned Streetlights (decreasing emissions by 42%) and Employee Commute (decreasing emissions by 10%). The decline in commute emissions is most likely due to a decline in the number of employees (7%). The distribution of emissions by sector remained relatively constant except for City- versus SDG&E-owned Outdoor Lights, as shown in Figure 4 and Table 8. Total emissions increased by 252 MT CO_2e and overall, municipal emissions account for less than 1% of the total community emissions.

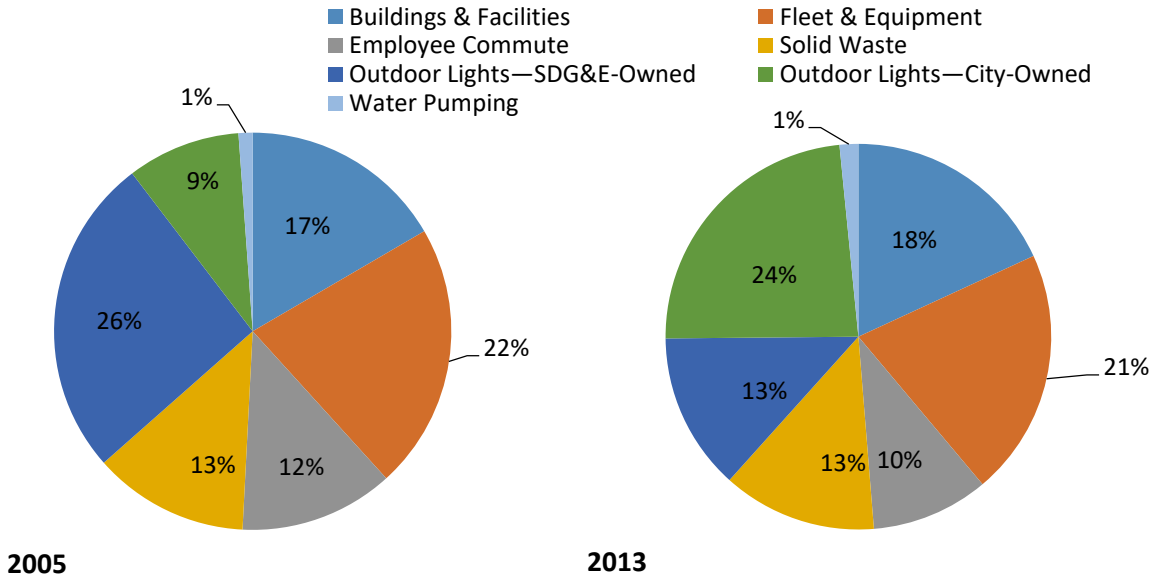


Figure 4. Municipal GHG Emissions by Sector for 2005 and 2013

Table 8. Municipal GHG Emissions by Sector for 2005 and 2013

Sector	2005 (MT CO_2e)	% of Total	2013 (MT CO_2e)	% of Total	% Change 2005–2013
Outdoor Lights–SDG&E-Owned	433	17%	252	18%	-42%
Fleet & Equipment	359	22%	396	21%	10%
Buildings & Facilities	275	13%	346	10%	26%
Solid Waste	210	13%	247	13%	18%
Employee Commute	208	26%	188	13%	-10%
Outdoor Lights–City-Owned	153	9%	450	24%	194%
Water Pumping	19.0	1%	30.0	2%	58%
Total	**1,657**		**1,909**		**15%**

Table 9 summarizes activity data for each sector and subsector.

Table 9. Activity Data used in 2005 and 2013 Municipal Inventories

Sector	2005	2013	% Change 2005–2013
Buildings & Facilities			
Electricity (kWh)	968,991	900,602	-7%
Natural Gas (therms)	6,136	5,013	-18%
Streetlights & Outdoor Lighting			
City-Owned Electricity (kWh)	613,342	1,271,181	107%
SDG&E-Owned (kWh)	1,735,514	712,155	-59%
Fleet & Equipment			
Gasoline Regular (gallons)	13,996	12,573	-10%
Gasoline Hybrid (gallons)	0	369	-
Diesel (gallons)	22,842	27,392	20%
Employee Commute			
Gasoline (vehicle miles traveled)	516,765	479,549	-7%
Diesel (vehicle miles traveled)	0	0	
# Full-Time Equivalent Employees	122	113	-7%
Solid Waste			
Generated Waste (tons)	864	1,006	16%
Water Pumping			
Electricity (kWh)	77,535	83,990	8%

Energy

As with the community energy, municipal energy use decreased but GHG emissions increased from 2005 to 2013 due to the emission factors for electricity. Municipal energy use includes Buildings & Facilities, SDG&E-owned Streetlights, City-owned Outdoor Lighting, and Water Pumping. Energy accounted for

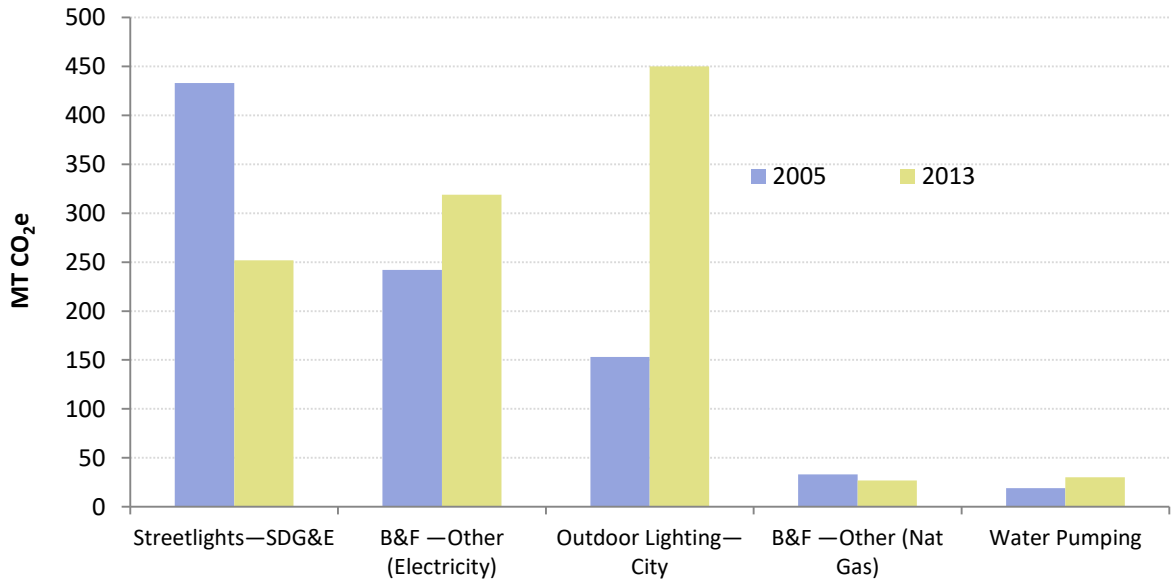
53% of total emissions in 2005 and 57% in 2013. While both electricity and natural gas are used for Building & Facilities, Streetlights and Water Pumping only use electricity. Emissions from energy increased 23% from 2005 to 2013 (Table 10). Electricity emissions increased for each sector except SDG&E-owned Streetlights. As with community energy, municipal emissions use variable electricity emission factors and constant natural gas emission factors.

Table 10. Activity Data and GHG Emissions of Energy in 2005 and 2013

Sector	2005		2013		% Change in Activity 2005–2013	% Change in Emissions 2005–2013
	Activity (kWh or therms)	Emissions (MT CO_2e)	Activity (kWh or therms)	Emissions (MT CO_2e)		
Buildings & Facilities						
Electricity	968,991	242	900,602	319	-7%	32%
Natural Gas	6,136	33	5,013	27	-18%	-18%
Streetlights—SDG&E-owned						
Electricity	1,735,514	433	712,155	252	-59%	-42%
Streetlights & Traffic Signals—City-owned						
Electricity	613,342	153	1,271,181	450	107%	194%
Water Pumping						
Electricity	77,535	19	83,990	30.00	8%	58%
Total (MTCO_2e)	**3,401,518**	**880**	**2,972,941**	**1,078**	**-13%**	**23%**

Electricity activity data are reported in kWh; Natural Gas activity data are reported in therms.

Figure 5 shows the trend in electricity and natural gas emissions from 2005 to 2013 for the municipal energy sectors.



Note: B&F is Buildings and Facilities

Figure 5. GHG Emissions for Municipal Electricity and Natural Gas, by Sector

Inventory Forecasts

GHG emissions are forecast using two scenarios: a Business-as-Usual (BAU) and an Adjusted BAU scenario. The BAU scenario describes emissions based on projected growth in population and employment and does not consider policies that will reduce emissions in the future (that is, the policies and related efficiency levels in place in 2013 are assumed to remain constant through 2035). The Adjusted BAU scenario describes emissions based on projected growth *and* considers policies that will achieve GHG reductions in the future. Policies, described in detail below, include State-adopted or approved legislation that will affect future emissions. By evaluating the two scenarios, the City can see the effect that existing policies may have on future emissions and be better able to determine how local measures can provide additional reductions. Three future years are forecasted for each scenario: 2020, 2030, and 2035. The 2020 forecast year is consistent with the goals identified in Assembly Bill (AB) 32, which identifies a statewide GHG reduction target by 2020. The 2030 and 2035 forecast years will allow the City to develop long-term strategies to continue GHG reductions beyond 2020.

Business-as-Usual Forecasts

The BAU forecasts estimate future emissions using current (2013) consumption patterns and emission factors with the anticipated growth in the City. Anticipated growth is estimated using data from regional planning scenarios developed by the SANDAG, the City, and other relevant sources (Table 11). The most relevant growth factors are used to project emissions by sector. For example, future Residential Energy emissions were developed using current energy use per household (from the 2013 inventory) and the anticipated number of households in the future. Actual energy use is a function of several variables, not only the number of households; however, this approach is supported by current protocols and best practices within the State and provides a consistent approach to forecasting. Compound annual growth rates were developed using the growth projections from 2013 to 2020 and from 2021 to 2035, as shown Table 11.

In general, the City is expecting modest growth to 2020 and 2035 as population, housing, jobs, and VMT are all expected to increase. At this time, the City expects its services to remain fairly constant over time. Please note the differences in growth rates used in the forecasts using the SANDAG Series 12 Transportation Model, EMFAC2014, and the energy related 2012 E-Grid values in these forecasts as discussed on page 2.

Table 11. Growth Factors for 2013, 2020, and 2035

Sector	Demographic Indicator	2013	2020	2035	2013–2020 CAGR[a]	2020–2035 CAGR[a]
Solid Waste, Water, Wastewater, Off-Road Sources	Service Population (Population + Jobs)	71,663	76,437	84,200	0.93%	0.65%
Population [b]	Population	55,033	59,488	63,518	1.12%	0.44%
Residential Energy	Households	19,725	20,995	24,165	0.90%	0.94%
Commercial/Industrial Energy	Jobs	16,630	16,949	20,682	0.27%	1.34%
Transportation [c]	VMT – Gas	458,785,827	493,494,150	576,966,520	25.76%	16.91%
	VMT – Diesel	27,822,637	32,536,348	45,500,895	16.94%	39.85%
Municipal Jobs	Municipal Emissions[d]	112.8	115	120	0.28%	0.28%

SOURCE: SANDAG
FTE: Full-time equivalent employees
a. Compound annual growth rate.
b. Population data are shown for informational purposes but are not used for forecasting any sector.
c. CAGR is calculated using 2013 and 2035 VMT data, and 2020 VMT is derived from the CAGR between 2013 and 2035.
d. The number of jobs in the City is used as an indicator for all municipal operation emissions.

Community Business-as-Usual Forecast

- **BAU community emissions are expected to increase 3% from baseline levels by 2020, 16% by 2030, and 23% by 2035.**

The City's BAU emissions in 2020 are estimated to be 432,982 MT CO_2e, or a 27.4% increase from baseline (2005) emissions. By 2030, emissions are estimated to increase 43.0% from the baseline level to 486,170 MT CO_2e. By 2035, emissions are estimated to increase 51.6% from the baseline level to 515,462 MT CO_2e (Table 12).

Table 12. Community BAU Forecast

Sector	2005 (MT CO_2e)	2013 (MT CO_2e)	2020 (MT CO_2e)	% Change 2013–2020	2030 (MT CO_2e)	%Change 2013–2030	2035 (MT CO_2e)	%Change 2013–2035
On-Road Transportation	181,812	242,499	264,162	8.9%	298,992	23.3%	318,334	31.3%
Residential Energy	63,544	78,651	83,753	6.5%	91,986	17.0%	96,401	22.6%
Commercial Energy	37,697	48,025	49,467	3.0%	56,486	17.6%	60,362	25.7%
Solid Waste	16,376	11,151	11,861	6.4%	12,651	13.5%	13,066	17.2%
Water & Wastewater	11,354	6,578	8,029	6.4%	8,565	13.5%	8,845	17.2%
Off-Road Sources	28,230	14,699	15,710	6.9%	17,490	19.0%	18,454	25.5%
Total	**339,972**	**402,574**	**432,982**	**7.6%**	**486,170**	**20.8%**	**515,462**	**28.0%**
% Change from 2005		**18.4%**	**27.4%**		**43.0%**		**51.6%**	

Municipal Business-as-Usual Forecast

- **BAU municipal emissions are expected to be 18% above baseline levels in 2020, 21% above baseline levels in 2030, and 23% above baseline levels by 2035.**

The City is anticipating approximately 2% growth in city utility use by 2020, 5% by 2030 and 6% by 2035, relative to 2013 levels. However, emission levels are expected to be 18, 21, and 23% higher, respectively, due to the higher electricity emission factor assumed under a BAU forecast compared to the 2005 factor as described above (Table 13 and Figure 6).

Table 13. Municipal BAU Forecast

	2005 (MT CO_2e)	2013 (MT CO_2e)	2020 (MT CO_2e)	% Change 2013–2020	2030 (MT CO_2e)	% Change 2013–2030	2035 (MT CO_2e)	% Change 2013–2035
Outdoor Lighting	586	702	716	2%	737	5%	747	6%
Vehicle Fleet	359	396	404	2%	416	5%	421	6%
Buildings & Facilities	275	346	353	2%	363	5%	368	6%
Solid Waste	210	247	252	2%	259	5%	263	6%
Employee Commute	208	188	192	2%	197	5%	200	6%
Water Pumping	19	30	31	3%	31	3%	32	7%
Total	**1,657**	**1,909**	**1,948**	**2%**	**2,003**	**5%**	**2,031**	**6%**
% Change from 2005			**15%**	**18%**	**21%**			**23%**

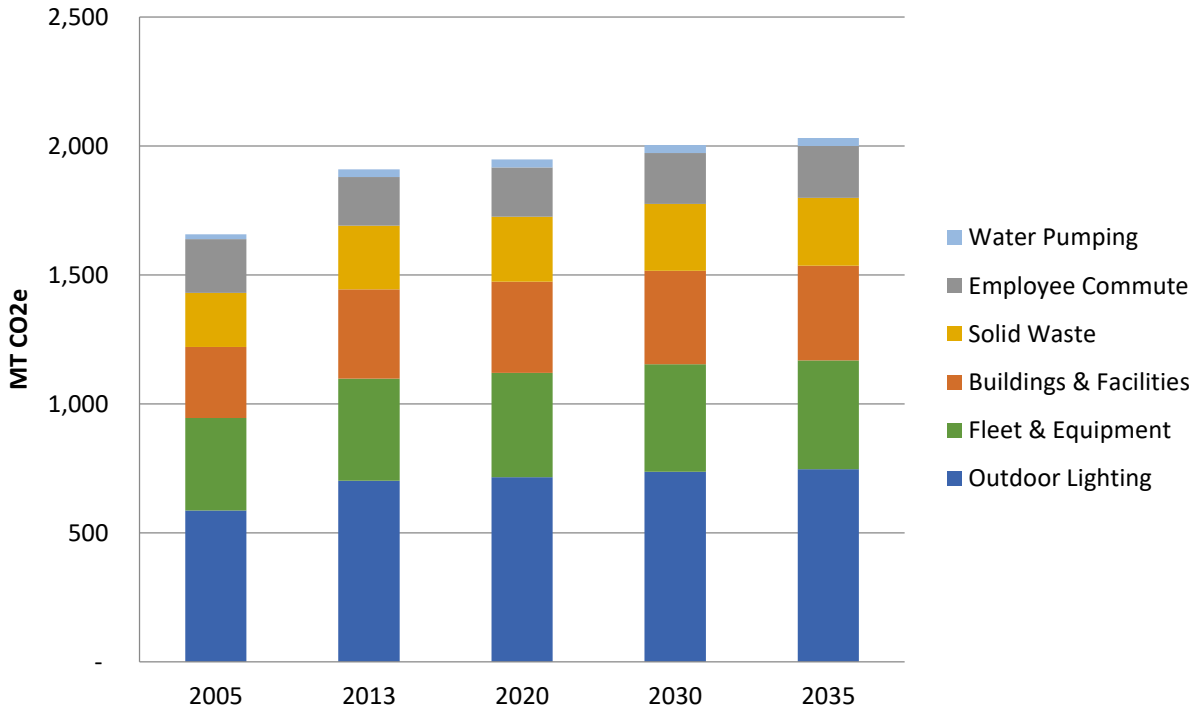


Figure 6. Municipal BAU Forecast

Adjusted Business-as-Usual Forecasts

State legislation has been approved and/or adopted that will reduce GHG emissions in the City. These policies do not require additional local action, but should be accounted for in the City's emissions forecasts to provide a more accurate picture of future emissions and the level of local action needed to reduce emissions to levels consistent with State recommendations. This forecast is called the Adjusted BAU forecast. The measures are described briefly below.

Low Carbon Fuel Standard. The Low Carbon Fuel Standard (LCFS) was developed as a result of Executive Order S-1-07, which mandates that the carbon intensity of transportation fuels in California are lowered 10% by 2020. The State is currently implementing this standard, which is being phased in and will achieve full implementation in 2020.

Assembly Bill (AB) 1493 and Advanced Clean Cars. AB 1493 directed California Air Resources Board to adopt GHG standards for motor vehicles through model year 2015 that would result in reductions in GHG emissions by up to 25% in 2030. In addition, the State's Advanced Clean Cars program includes additional components that will further reduce GHG emissions statewide, including more stringent fuel efficiency standards for model years 2017—2025 and support infrastructure for the commercialization of zero-emission vehicles. CARB anticipates additional GHG reductions of 3% by 2020, 27% by 2035, and 33% by 2050.[3] CARB recently released a 2014 version of EMFAC, the standard mobile source emissions inventory tool, which includes current assumptions about how these regulations will increase fuel efficiency. Factors from EMFAC were applied to account for changes in mobile source emissions.

California Building Code Title 24. California's building efficiency standards are updated regularly to incorporate new energy efficiency technologies. The code was most recently updated in 2013 and went into effect for new development in 2014. For projects implemented after January 1, 2014, the California Energy Commission estimates that the 2013 Title 24 energy efficiency standards will reduce consumption by an estimated 25% for residential buildings and 30% for commercial buildings, relative to the 2008 standards. These percentage savings relate to heating, cooling, lighting, and water heating only; therefore, these percentage savings were applied to the estimated percentage of energy use by Title 24.

Renewable Portfolio Standard. The Renewable Portfolio Standard (RPS) requires energy providers to derive 33 percent of their electricity from qualified renewable sources by 2020 and 60 percent by 2030. This is anticipated to lower emission factors (i.e., fewer GHG emissions per kilowatt-hour used) from utilities across the state, including SDG&E. Reductions anticipated were modeled by the SEEC ClearPath software and are detailed in Attachment B.

Senate Bill X7-7. California's Senate Bill (SB) X7-7 requires water suppliers to reduce urban per capita water consumption 20% from a baseline level by 2020. Reductions in GHG emissions from SB X7-7 were calculated by applying the reduction goals established by Padre Dam to the City's population in 2020 and 2035.

[3] CARB Advanced Clean Cars Summary Sheet, http://www.arb.ca.gov/msprog/clean_cars/acc%20summary-final.pdf

Community Adjusted Business-as-Usual Forecast

- **Emissions are expected to decrease under the Adjusted BAU forecast and will be 16.9% lower in 2020 than 2005, 14.8% lower in 2030 than 2005, and 13.2% lower than 2005 levels by 2035.**

The City's Adjusted BAU emissions are estimated to be 352,106 MT CO_2e in 2020, 339,514 MT CO_2e in 2030, and 336,543 MT CO_2e in 2035 (Table 14). This change represents 3.6% increase from 2005 by 2020, a very small reduction (0.001%) by 2030, and a 0.01% reduction by 2035. Due to the stringent State vehicle standards, while VMT is going up the emissions from the Transportation sector are expected to decrease over time. The RPS will also result in reductions in the electricity sector compared to BAU but emissions from energy are still anticipated to grow by 2035. Emissions from Solid Waste is expected to increase over time but account for less than 10% of total emissions.

Table 14. Community Adjusted BAU Emissions

Sector	2005 (MT CO_2e)	2013 (MT CO_2e)	2020 (MT CO_2e)	2020 % of Total	2030 (MT CO_2e)	2030 % of Total	2035 (MT CO_2e)	2035 % of Total
Transportation & Mobile Sources	181,812	242,499	234,283	67%	210,692	62%	201,729	60%
Residential Energy	63,544	78,651	65,424	19%	71,292	21%	74,483	22%
Commercial Energy	37,697	48,025	34,597	10%	38,543	11%	40,721	12%
Solid Waste	16,376	11,151	11,861	3%	12,651	4%	13,066	4%
Water & Wastewater	12,313	7,549	5,941	1%	6,336	2%	6,544	2%
Total	**339,972**	**402,574**	**352,106**	**100%**	**339,514**	**100%**	**336,543**	**100%**
% Change from 2005		**18.4%**	**3.6%**		**-0.001%**		**-0.01%**	

Municipal Adjusted Business-as-Usual Forecast

- **Under an Adjusted BAU forecast, the City's municipal emissions are projected to be 3% below 2005 levels in 2020. In 2030, emissions are projected to be equivalent to 2005 levels. In 2035, emissions are anticipated to be 1% higher than 2005 levels under an Adjusted BAU forecast.**

The City's Municipal Adjusted BAU emissions in 2020 are estimated to be 1,611 MT CO_2e, which is 3% lower than the 2005 baseline level (Table 15 and Figure 7). In 2030, emissions are projected to be equivalent to 2005 levels. In 2035, emissions are expected to be 1% higher than in 2005 (1,681 MT CO_2e). The Adjusted BAU emissions are lower than the BAU emissions due to the Low Carbon Fuel Standard and RPS policies described earlier. The Low Carbon Fuel Standard would lower the carbon intensity of fuels used in both the City's Fleet & Equipment and Employee Commute sectors and RPS would lower electricity-related emissions.

Table 15. Municipal Adjusted BAU Emissions

Sector	2005 (MT CO_2e)	2013 (MT CO_2e)	2020 (MT CO_2e)	2020 % of Total	2030 (MT CO_2e)	2030 % of Total	2035 (MT CO_2e)	2035 % of Total
Outdoor Lighting	586	702	514	32%	529	32%	536	32%
Fleet & Equipment	359	396	379	24%	390	24%	396	24%
Buildings & Facilities	275	346	261	16%	268	16%	272	16%
Solid Waste	210	247	252	16%	259	16%	263	16%
Employee Commute	208	188	180	11%	185	11%	188	11%
Water Pumping	19	30	25	2%	26	2%	26	2%
Total	**1,657**	**1,909**	**1,611**	**100%**	**1,657**	**100%**	**1,681**	**100%**
% Change from 2005		**15%**	**-3%**		**0%**		**1%**	

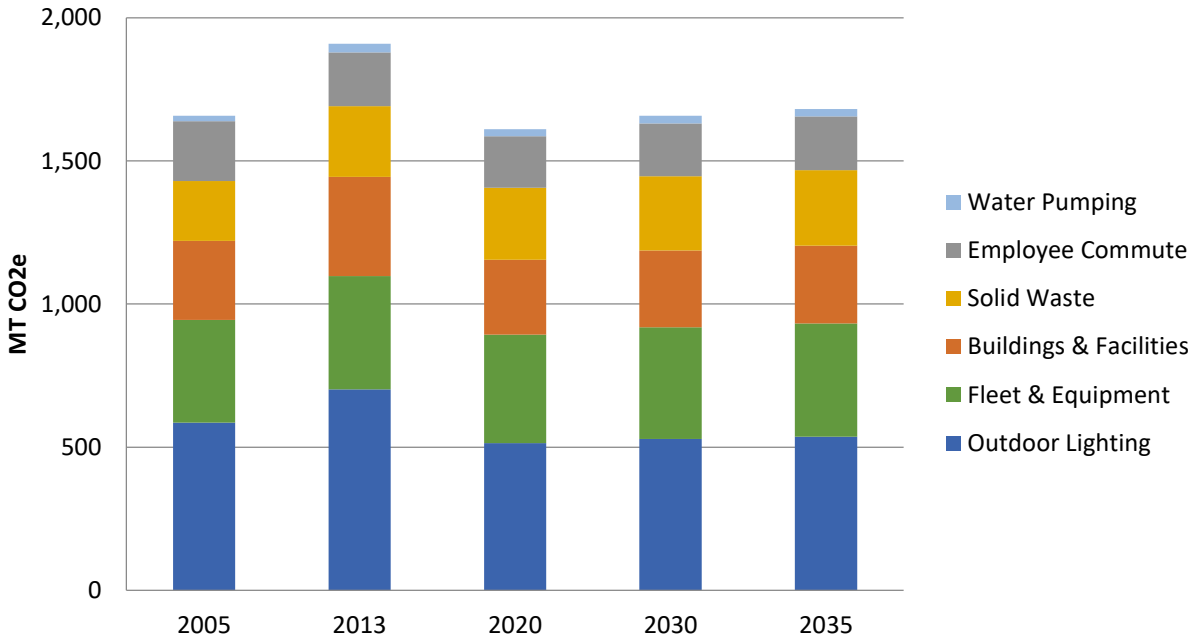


Figure 7. Municipal Adjusted BAU Emissions

Reduction Targets

The State has set goals for reducing GHG emissions by 2020 and 2050 through AB 32 and Executive Order (EO) S-3-05, respectively. The State has also provided guidance to local jurisdictions as "essential partners" in achieving the State's goals by identifying a 2020 recommended reduction goal. That goal, stated in the AB 32 Scoping Plan, was for local governments to achieve a 15% reduction below 2005 levels by 2020, which aligns with the State's goal of not exceeding 1990 emissions levels by 2020.[4] The State's long term target is to emit no more than 20% of 1990 levels by 2050 (or, a reduction of 80% below 1990 levels by 2050). On April 29, 2015, Executive Order B-30-15 set an interim reduction goal of

[4] In an analysis, the State concluded that a 15% reduction in emissions from 2005 levels by 2020 would be equivalent to achieving 1990 emissions levels.

40% from 1990 levels by the year 2030. However, the state has not assigned a corresponding interim goal for local governments. The newly adopted interim state goal is not recommended for the City since some of the emission sources, such as major industrial processes, are not under the control of local governments. In this case, according to the Scoping Plan, a straight-line projection from the 2020 to 2050 goals would be recommended, which result in a reduction goal of 38% below 2005 levels by 2030, and 49% below 2005 levels by mid-2035.

The 2017 Scoping Plan Update released by ARB in January 2017 provides strategies for achieving the 2030 target established by Executive Order B-30-15 and codified in SB 32 (40 percent below 1990 levels by 2030). The 2017 Scoping Plan Update recommends local plan level GHG emission reduction goals. ARB recommends that local governments aim to achieve community-wide goal to achieve emissions of no more than 6 MT CO_2e per capita by 2030 and no more than 2 MT CO_2e per capita by 2050.

Ultimately, the City will determine the level of reductions that it can and should achieve. Both mass emissions (performance target) and per capita emissions (efficiency target) GHG reduction targets are identified for 2020, 2030, and 2035. The targets provided below are guidance based on consistency with the State's goals for local governments and are provided to guide the City in determining targets.

Recommended Community Targets

In 2020, the City would meet the State-Aligned performance and efficiency GHG reduction targets under the Adjusted BAU scenario, but would need to reduce 63,130 MT CO_2e to meet the performance target. In 2030, under the Adjusted BAU scenario, the City would meet the State-Aligned efficiency target, but would need to reduce 135,531 MT CO_2e to meet the performance target. In 2035, under the Adjusted BAU scenario, the City would meet the State-Aligned efficiency target, but would need to reduce 163,157 MT CO_2e to meet the performance target (Table 16, Figure 8 and Figure 9).

Table 16. State-Aligned GHG Reduction Targets

Sector	2005	2013	2020	2030	2035
BAU Emissions (MT CO_2e)	339,972	402,574	432,982	486,170	515,462
Adjusted BAU Emissions (MT CO_2e)	339,972	402,574	352,106	339,514	336,543
Service Population (Population + Jobs)	70,152	71,663	76,437	81,499	84,200
Adjusted BAU Per Capita Emissions (MT CO_2e/SP)			2.65	2.55	2.51
State-Aligned Performance Target (% change from 2005)			-15%	-40%	-49%
State-Aligned Performance Target (MT CO_2e)			288,976	203,983	173,386
Reductions from Adjusted BAU needed to meet the Performance Target (MT CO_2e)			63,130	135,531	163,157
State-Aligned Efficiency Target (MT CO_2e/SP)			5.06	3.80	3.16
Reductions from Adjusted BAU needed to meet the Efficiency Target (MT CO_2e/SP)			Target Met	Target Met	Target Met

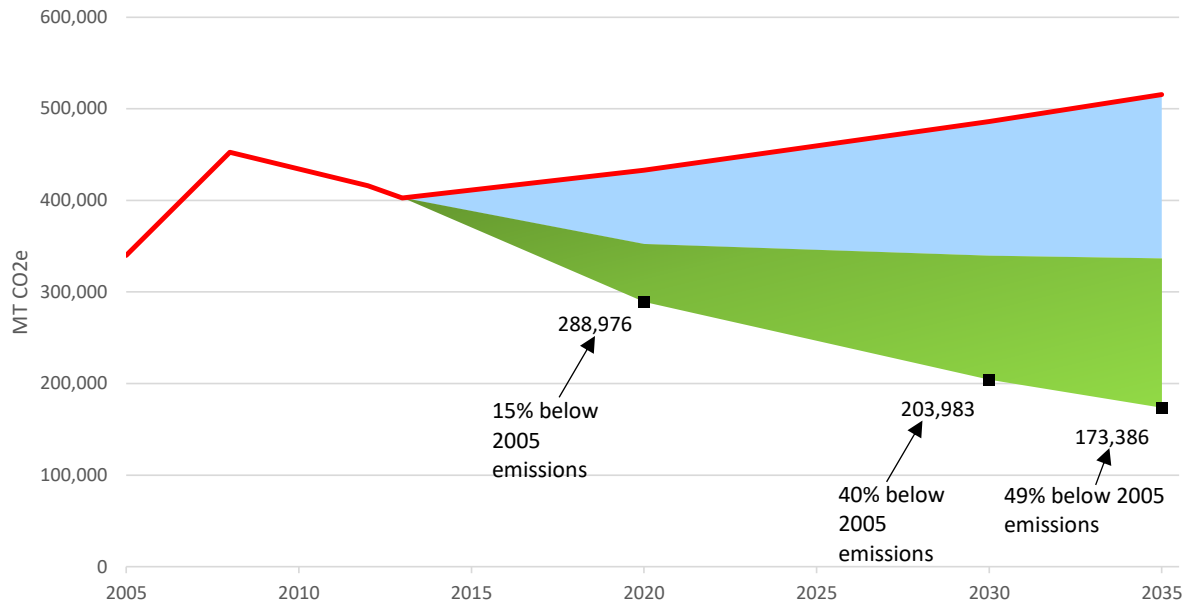


Figure 8. Community Emissions Inventories, Projections, and Performance Targets

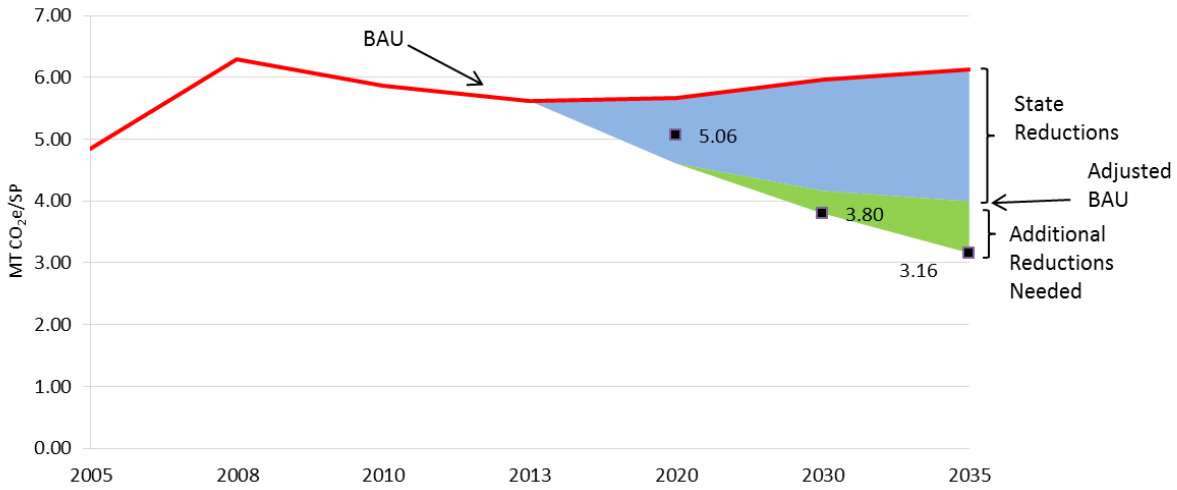


Figure 9. Community Emission Inventories, Projections, and Efficiency Targets

Recommended Municipal Targets

In 2020, the City would need to reduce its emissions by 203 MT CO_2e from the Adjusted BAU forecast to achieve a reduction goal consistent with the State (Table 17 and Figure 10). The City will also need to implement measures to continue to achieve GHG reductions beyond 2020. Early implementation of measures demonstrates the City's commitment to the CAP, leadership in the community, and allows the City to phase implementation of new strategies so that ongoing reductions may be achieved. By 2030, the City will need to reduce municipal operation emissions by 1,033 MT CO_2e from an Adjusted BAU forecast to meet a 38% reduction goal below 2005 levels. By 2035, the City will need to reduce

municipal operation emissions by 836 MT CO_2e from an Adjusted BAU forecast to meet a 49% reduction goal (below 2005 levels).

Table 17. State-Aligned Municipal GHG Reduction Targets

	2005	2013	2020	2030	2035
BAU Emissions (MT CO_2e)	1,657	1,909	1,948	2,003	2,031
Adjusted BAU Emissions (MT CO_2e)	1,657	1,909	1,611	1,657	1,681
State-Aligned Target (% change from 2005)			-15%	-38%	-49%
State-Aligned Target (% change from 2013)			-26%	-46%	-56%
State-Aligned Emissions Goal (MT CO_2e)			1,408	994	845
Reductions from Adjusted BAU needed to meet the Target (MT CO_2e)			203	663	836

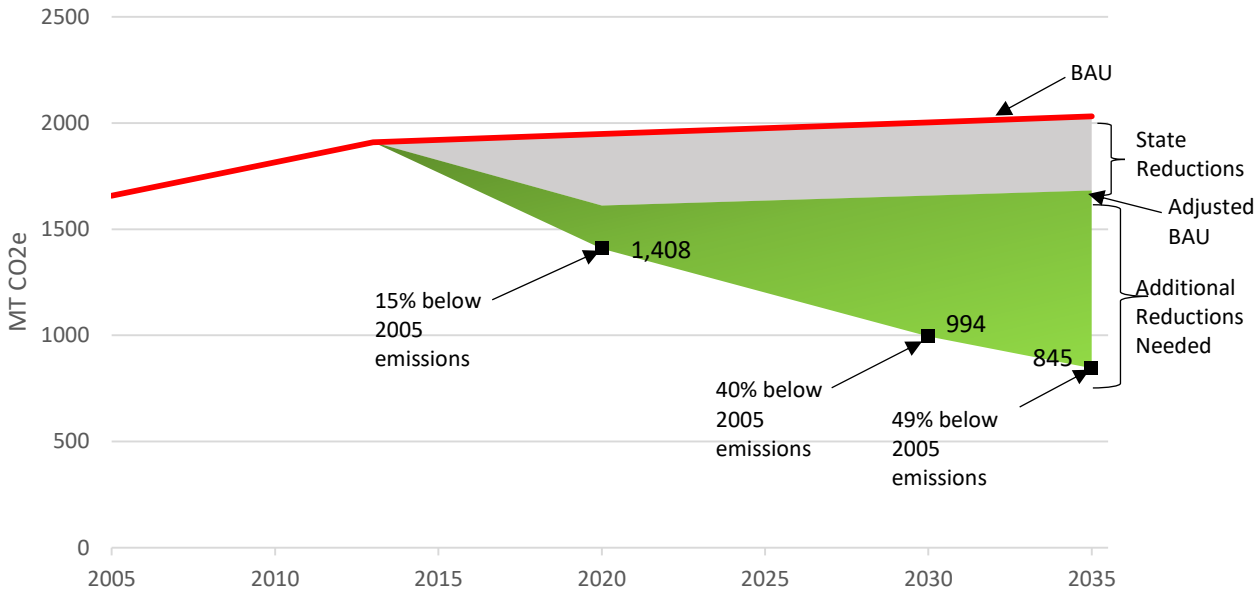


Figure 10. Municipal Emissions and Targets

Conclusions and Next Steps

This Report presents the City's community and municipal inventories, forecasts, and recommended reduction targets. It provides the City a first look at what will be needed to meet emissions reductions that are aligned with the State and to mitigate the City's impacts on climate change. This Report also helps to guide the City in determining feasible energy efficiency and GHG reduction opportunities by detailing the sources of emissions by sector.

The next steps in the CAP development process are to review the information provided in this Report and to determine preliminary GHG reduction targets for the community and municipal operations.

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Attachment A: Glossary of Terms

Adjusted Business-as-Usual: A GHG forecast scenario that accounts for known policies and regulations that will affect future emissions. Generally, these are state and federal initiatives that will reduce emissions from the business-as-usual scenario.

Baseline Year: The inventory year used for setting targets and comparing future inventories against.

Business-as-Usual (BAU): A GHG forecast scenario used for the estimation of greenhouse gas emissions at a future date based on current technologies and regulatory requirements and in the absence of other reduction strategies.

Carbon Dioxide Equivalent (CO_2e): This is a common unit for normalizing greenhouse gases with different levels of heat trapping potential. For carbon dioxide itself, emissions in tons of CO_2 and tons of CO_2e are the same, whereas one ton of nitrous oxide emissions equates to 298 tons of CO_2e and one ton of methane equates to 25 tons of CO_2e. The values are based on the gases' global warming potentials.

Community Inventory: GHG emissions that result from the activities by residents and businesses in the city. An inventory reports emissions that occur over a single calendar year.

Emissions Factor: A coefficient used to convert activity data into greenhouse gas emissions. The factor is a measure of the greenhouse gas intensity of an activity, such as the amount of CO_2 in one kilowatt-hour of electricity.

Global Warming Potential (GWP): The relative effectiveness of a molecule of a greenhouse gas at trapping heat compared with one molecule of CO_2.

Metric Ton (MT): Common international measurement for the quantity of greenhouse gas emissions. A metric ton is equal to 2205 lbs. or 1.1 short tons.

Municipal Inventory: GHG emissions that result from the activities performed as part of the government operations in the city and are a subset of the community inventory. An inventory reports emissions that occur over a single calendar year.

Reduction Targets: GHG emissions levels not to be exceeded by a specific date. Reduction targets are often informed by state recommendations and different targets may be established for different years.

Sector: A subset of the emissions inventory classified by a logical grouping such as economic or municipal-specific category.

Attachment B: Methodology

See Appendix B of the Sustainable Santee Plan.

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Attachment C: Vehicle Miles Traveled (VMT) Calculations

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2008 Base Year

JURISDICTION	TOTAL VMT	TOTAL City of Santee VMT	Two Trip End City of Santee VMT	One Trip End City of Santee VMT	NON-City of Santee VMT
			I-I	I-E and E-I	
CARLSBAD TOTAL	3,344,347	14,245	-	14,245	3,330,102
CHULA VISTA TOTAL	3,943,542	32,507	-	32,507	3,911,035
CORONADO TOTAL	431,181	2,874	-	2,874	428,307
DEL MAR TOTAL	97,064	264	-	264	96,800
EL CAJON TOTAL	2,167,286	282,301	-	282,301	1,884,985
ENCINITAS TOTAL	2,078,290	16,997	-	16,997	2,061,293
ESCONDIDO TOTAL	2,802,466	16,903	-	16,903	2,785,563
External TOTAL	347,582	3,127	-	3,127	344,455
IMPERIAL BEACH TOTAL	119,733	343	-	343	119,390
LA MESA TOTAL	1,831,122	163,686	-	163,686	1,667,436
LEMON GROVE TOTAL	834,635	53,702	-	53,702	780,933
NATIONAL CITY TOTAL	1,648,766	12,206	-	12,206	1,636,560
OCEANSIDE TOTAL	3,194,608	5,040	-	5,040	3,189,568
POWAY TOTAL	1,107,533	17,169	-	17,169	1,090,364
SAN DIEGO TOTAL	38,705,172	882,135	-	882,135	37,823,037
SAN MARCOS TOTAL	2,020,178	5,470	-	5,470	2,014,708
SANTEE TOTAL	881,909	627,655	200,301	427,354	254,254
SOLANA BEACH TOTAL	572,631	6,133	-	6,133	566,498
Unincorporated TOTAL	17,398,289	417,937	-	417,937	16,980,352
VISTA TOTAL	1,721,580	1,137	-	1,137	1,720,443
REGIONWIDE TOTAL	85,247,914	2,561,831	200,301	2,361,530	82,686,083
			100% * (I-I)+ 50% * (I-E + E-I)	1,381,066	

2013 Verification

JURISDICTION	TOTAL VMT	TOTAL City of Santee VMT	Two Trip End City of Santee VMT	One Trip End City of Santee VMT	NON-City of Santee VMT
		I-I, I-E and E-I	I-I	I-E and E-I	
CARLSBAD TOTAL	3,376,864	14,282	-	14,282	3,362,582
CHULA VISTA TOTAL	3,964,512	33,677	-	33,677	3,930,835
CORONADO TOTAL	431,668	2,948	-	2,948	428,720
DEL MAR TOTAL	95,056	254	-	254	94,802
EL CAJON TOTAL	2,055,440	265,255	-	265,255	1,790,185
ENCINITAS TOTAL	2,110,816	17,144	-	17,144	2,093,672
ESCONDIDO TOTAL	2,859,486	17,618	-	17,618	2,841,868
External TOTAL	353,337	3,275	-	3,275	350,062
IMPERIAL BEACH TOTAL	120,868	357	-	357	120,511
LA MESA TOTAL	1,745,064	168,487	-	168,487	1,576,577
LEMON GROVE TOTAL	842,238	54,908	-	54,908	787,330
NATIONAL CITY TOTAL	1,656,923	12,875	-	12,875	1,644,048
OCEANSIDE TOTAL	3,188,610	5,053	-	5,053	3,183,557
POWAY TOTAL	1,074,614	16,974	-	16,974	1,057,640
SAN DIEGO TOTAL	39,384,287	878,189	-	878,189	38,506,098
SAN MARCOS TOTAL	2,055,701	5,806	-	5,806	2,049,895
SANTEE TOTAL	1,121,191	667,430	210,476	456,954	453,761
SOLANA BEACH TOTAL	583,015	6,175	-	6,175	576,840
Unincorporated TOTAL	17,512,378	422,155	-	422,155	17,090,223
VISTA TOTAL	1,734,411	1,322	-	1,322	1,733,089
REGIONWIDE TOTAL	86,266,479	2,594,184	210,476	2,383,708	83,672,295
			100% * (I-I)+ 50% * (I-E + E-I)	1,402,330	

City Preferred 2035 Scenario A

JURISDICTION	TOTAL VMT	TOTAL City of Santee VMT	Two Trip End City of Santee VMT	One Trip End City of Santee VMT	NON-City of Santee VMT
		I-I, I-E and E-I	I-I	I-E and E-I	E-E
CARLSBAD TOTAL	4,280,026	21,770	-	21,770	4,258,256
CHULA VISTA TOTAL	5,642,301	48,222	-	48,222	5,594,079
CORONADO TOTAL	470,638	3,258	-	3,258	467,380
DEL MAR TOTAL	100,867	325	-	325	100,542
EL CAJON TOTAL	2,477,835	318,427	-	318,427	2,159,408
ENCINITAS TOTAL	2,554,267	24,559	-	24,559	2,529,708
ESCONDIDO TOTAL	3,491,727	23,639	-	23,639	3,468,088
External TOTAL	526,361	5,057	-	5,057	521,304
IMPERIAL BEACH TOTAL	134,250	348	-	348	133,902
LA MESA TOTAL	2,148,837	212,975	-	212,975	1,935,862
LEMON GROVE TOTAL	979,458	75,353	-	75,353	904,105
NATIONAL CITY TOTAL	1,987,933	15,640	-	15,640	1,972,293
OCEANSIDE TOTAL	4,055,786	7,782	-	7,782	4,048,004
POWAY TOTAL	1,312,994	22,861	-	22,861	1,290,133
SAN DIEGO TOTAL	47,645,328	1,075,221	-	1,075,221	46,570,107
SAN MARCOS TOTAL	2,721,799	6,797	-	6,797	2,715,002
SANTEE TOTAL	1,386,488	871,692	268,056	603,636	514,796
SOLANA BEACH TOTAL	717,427	8,690	-	8,690	708,737
Unincorporated TOTAL	24,372,628	575,904	-	575,904	23,796,724
VISTA TOTAL	2,216,087	1,132	-	1,132	2,214,955
REGIONWIDE TOTAL	109,223,037	3,319,652	268,056	3,051,596	105,903,385
			100% * (I-I)+ 50% * (I-E + E-I)	1,793,854	

Attachment D: Emission Factors

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Emission Factors

The emission factors for the built environment used in this analysis were the same as employed by the Energy Policy Initiatives Center (EPIC) in 2014.

GHG emissions associated with the on-road activity data was calculated using the California Air Resources Board (ARB) on-road emissions factor model 2014 (EMFAC2014).

Emission Factors

Built Environment		
Input Type	Value	Source
Natural Gas (MMT CO2e/ MM Therms)	0.0053052	ARB
Electricity (2010 lb/MWh)	680.4	FERC/SDG&E/EPA E-Grid
Electricity (2011 lb/MWh)	676.2	FERC/SDG&E/EPA E-Grid
Electricity (2012 lb/MWh)	778.5	FERC/SDG&E/EPA E-Grid

Source: Dr. Nilmini Silva-Send email of September 12, 2014.