Subregional GHG Inventory, Forecasting, and Target-Setting Report for an Energy Efficiency Climate Action Plan

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Prepared for:

SOUTH BAY CITIES COUNCIL OF GOVERNMENTS

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List of Acronyms and Abbreviations

AB	Assembly Bill
ADC	Alternative Daily Cover
BAU	Business-as-Usual
CAFE	Corporate Average Fuel Economy
CH_4	Methane
CARB	California Air Resources Board
CIWMB	California Integrated Waste Management Board
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
EECAP	Energy Efficiency Climate Action Plan
EO	Executive Order
GHG	Greenhouse Gas
GWP	Global Warming Potential
IEAP	International Local Government GHG Emissions Analysis Protocol
IFT	Inventories, Long-Term Forecasts, and Target-Setting
IPCC	Intergovernmental Panel on Climate Change
JWPCP	Joint Water Pollution Control Plant
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
SBCCOG	South Bay Cities Council of Governments
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SCG	Southern California Gas Company
SEEC	Statewide Energy Efficiency Collaborative

Key Findings

Community-Level Greenhouse Gas Emissions

- Greenhouse gas (GHG) community emissions in the South Bay subregion decreased 7% from 2005 to 2012, from 8,020,432 MT CO_2e to 7,469,574 MT CO_2e. All but two cities decreased emissions.
- On a subregional basis, emissions from all sectors decreased from 2005 to 2012.
- Energy-related emissions from electricity and natural gas consumption account for about 55% of the total subregional emissions.
- Under the Adjusted Business-as-Usual (BAU) forecast, community emissions will be 6,963,872 MT CO_2e in 2020 and 6,270,736 MT CO_2e in 2035. These emissions levels represent a 13% decrease from 2005 levels in 2020 and a 22% decrease from 2005 levels in 2035.
- The State of California is calling on local governments to achieve a 15% reduction below 2005 levels by 2020. This would require cities in the South Bay subregion to reduce 146,505 MT CO_2e from the total subregional Adjusted BAU emissions by 2020. Nine cities are anticipated to meet the 15% reduction goal from State measures (e.g. Low Carbon Fuel Standard, California Building Code Title 24, etc.) alone.
- The State has not provided guidance to local governments for GHG reduction targets beyond 2020, but it is likely that all cities will need to reduce emissions beyond their 2035 Adjusted BAU levels.

Municipal-Level Greenhouse Gas Emissions

- Subregional municipal GHG emissions are a subset of community emissions and decreased 11% from 2005 to 2012, from 91,569 MT CO_2e to 81,302 MT CO_2e.
- Emissions from subregional municipal operations account for 1% of subregional community emissions.
- On a subregional basis, municipal emissions in all sectors decreased except for the Building and Facilities sector.
- Under an Adjusted BAU forecast, the subregion will achieve a 13% decrease in municipal emissions from 2005 levels by 2020. The region is predicted to grow between 2020 and 2035, and, as a result, there will be a 2% increase in GHG emissions after 2020. This change means that the emissions reduction will shrink from 13% below 2005 levels in 2020 to 11% below 2005 levels in 2035.

Introduction

A city-level Greenhouse Gas (GHG) Inventory, Forecasting, and Target-Setting (IFT) report was developed by a technical consultant for each city within the South Bay subregion to provide the first steps toward identifying energy-efficiency measures that will ultimately be included in their city-level Energy Efficiency Climate Action Plans (EECAPs). The IFT reports were funded through Southern California Edison's (SCE) Local Government Partnership Strategic Plan Pilot Program. Each city-level IFT report contains inventories for 2005, 2007, 2010, and 2012 that quantify historic energy use and associated GHG emissions; forecasts that predict projected future emissions in each city; and target-setting practices that describe GHG reduction recommendations that are consistent with State goals. This subregional report, prepared for the South Bay Cities Council of Governments (SBCCOG), summarizes the inventory, forecast, and target-setting information at the subregional level. Key terms in this report are listed in Table 1.

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 that is used as a benchmark for setting targets and comparing GHG emissions over time.
Business-as-usual	A forecast scenario that assumes that nothing additional will be done to reduce GHG emissions beyond what would happen anyway. The business-as-usual scenario is measured against the baseline year.
Community Inventory	The GHG emissions that result from the activities of the residents and businesses within a city on a calendar year basis.
Emission factor	A unique value for determining an amount of a GHG emitted on a per unit activity basis (e.g. metric tons of carbon dioxide per gallon of gasoline consumed).
Municipal Inventory	The GHG emissions that result from the operations of a local government on a calendar year basis. The municipal inventory is a subset of the community inventory.
Reduction target	A goal to reduce GHG emissions by a specific date.
Sector	A categorization of GHG emissions within an inventory. This framework is based on GHG accounting standards, but is more policy relevant to local governments.

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

GHG Emissions Inventories

In response to overwhelming evidence that greenhouse gas emissions from human activities are linked to global climate change, many local governments are looking inward to identify opportunities to reduce GHG emissions from their communities and their own operations. Cities can inventory the emissions from these two sources in order to track their performance and ensure that their actions reduce GHG emissions. GHG inventories are the foundation of planning for future reductions.

This report presents four years of historic inventories for the South Bay subregion to show not only the major sources of emissions, but also how those sources vary over time. The 2005 inventory is the baseline year for each of the South Bay cities and is used to set targets and compare emissions over time. The year 2005 was chosen as the baseline year because it aligns with reduction target recommendations the State of California has provided for local governments in Assembly Bill 32 (AB 32). The most recent inventory (2012) has the most relevant data for planning purposes, while interim years provide context and may help identify trends or anomalies. The individual city IFT reports show city-level variability, whereas this report contains aggregated data for all cities and therefore shows subregional trends.

Emissions Reporting

The GHGs included in the community and municipal inventories are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Because each individual gas 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 included in this report in addition to their chemical formula (e.g. CO_2), GWP, and primary sources of emissions.

Table 2. GHGs Included in the Inventories

Greenhouse Gas	Chemical Formula	Global Warming Potential	Primary 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.

Emissions Sectors

The community and municipal inventories show the major sources of GHG emissions within each sector. A sector (e.g. transportation, energy, solid waste, etc.) is a subset of the economy, society, or municipal operations whose components share similar characteristics. An emissions sector can also contain

subsectors that provide more details about the source of emissions (e.g. commercial/industrial energy and residential energy are subsectors of the energy sector). Emissions are categorized into sectors to create a framework that is useful to local governments and decision makers.

As mentioned above, a technical consultant quantified separate GHG inventories for community and municipal operations. These inventories are connected, however, because the majority of municipal activities occur within the boundaries of the cities and therefore contribute to the overall emissions of the community. This connection makes the municipal inventory a part of the community inventory and, as such, municipal emissions are included in the community inventory. The municipal inventory also exists as a stand-alone document to highlight areas of emissions that the cities have 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 sections of the report 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 "Outdoor Lights". The difference in sectors between inventories creates a structure that is relevant to the respective community and municipal policy makers.

Community Inventory 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. Subregional emissions represent a summation of individual cities' inventories. The city-level community inventories are divided into the following sectors and subsectors:

- **Energy**
  - **Commercial/Industrial Energy** includes emissions from electricity and natural gas consumption in non-residential buildings and facilities (including outdoor lights) in the subregion.
  - **Residential Energy** includes emissions from electricity and natural gas consumption in residential buildings in the subregion.
- **Transportation & Mobile Sources** includes emissions from vehicle fuel use in trips wholly within the Cities (in-boundary) and trips that either originate or end in the Cities (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 Cities (such as on Pacific Coast Highway 1) are not accounted for in the inventory because the City has little or no control over these emissions. As a result, this methodology includes only trips or parts of trips within City borders that the City has the ability to affect. In addition, this sector includes emissions from off road sources (i.e. operating equipment for construction, commercial, light industrial, and agricultural activities; lawn and garden equipment; and recreational vehicles such as all-terrain vehicles).

- **Solid Waste** includes emissions from waste that is generated in the community and sent to landfills.
- **Water & Wastewater** includes emissions from the electricity used to source, treat, and deliver imported water and wastewater in the community that is not already accounted for in the community utility data.

Municipal Inventory Sectors

Sources of municipal emissions are divided into the following sectors and subsectors:

- **Energy**
  - **Buildings & Facilities** includes electricity and natural gas used in facilities owned or operated by the government.
  - **Outdoor Lights** includes energy for streetlights, traffic control signals, and outdoor lights owned either by the cities or Southern California Edison (SCE). Data by ownership are presented in the city-level reports.
  - **Water Pumping, Delivery, & Irrigation** includes energy for water pumping, delivery, and/or irrigation, depending on the services provided by the individual cities in the subregion.
- **Fleet & Equipment** includes emissions from vehicles owned, operated, or contracted by the cities for services such as street cleaning. This sector also includes equipment, such as emergency generators.
- **Employee Commute** includes emissions from fuel use in vehicle trips made by municipal employees commuting to and from work.
- **Solid Waste** includes emissions from waste generated by municipal employees or at municipally-owned facilities.

Calculation Methodology

A technical consultant quantified GHG emissions using available activity data (e.g., kilowatt-hours of electricity) and internationally accepted GHG accounting protocols. Sources for the subregional activity data are included in Appendix B. The U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (ICLEI 2012) 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.

Community Emissions

The community inventory includes the GHG emissions that result from activities within the boundary of the subregion. This section presents a summary of the community inventories for four years: 2005, 2007, 2010, and 2012. This section also provides more specific detail and findings on the energy sectors at a subregional level, and finally presents city-level emissions.

2005—2012 Emissions Summary

- **The subregion reduced emissions 7% from 2005 to 2012, from 8,020,432 MT CO2e to 7,469,574 MT CO2e.**
- **Emissions from each sector decreased from 2005 to 2012.**

Water and Wastewater had the greatest percentage of reductions (37%) and Commercial/Industrial Energy had the greatest absolute reductions (346,768 MT CO_2e, Table 3). While variable in relative contribution to each city, Commercial/Industrial Energy accounts for the highest proportion of emissions within the subregion compared to the other sectors. As shown in Figure 1 and Table 3, the Commercial/Industrial Energy sector accounted for 42% (3,361,410 MT CO_2e) of total emissions in 2005. Emissions from Commercial/Industrial Energy decreased 10% between 2005 and 2012 (to 3,014,642 MT CO_2e), but still accounted for 40% of total emissions in 2012. Transportation and Mobile Sources was the second-largest contributor to emissions, adding 36% in 2005 and 39% in 2012. While the proportion increased, total emissions from this sector decreased by less than 1%, from 2,878,078 MT CO_2e in 2005 to 2,877,430 MT CO_2e in 2012. The proportion of emissions from the Residential Energy sector was at 13% in 2005 and 14% in 2012. Emissions from this sector decreased by less than 1%, from 1,024,840 MT CO_2e in 2005 to 1,021,652 MT CO_2e in 2012. Solid waste comprised 6% of the total emissions (525,548 MT CO_2e) in 2005, but was reduced to 5% of the total (410,182 MT CO_2e) in 2012. Water and Wastewater sources made up the remaining emissions in each year (3% in 2005, 2% in 2012).

Table 3. Community-Wide GHG Emissions by Sector for 2005 and 2012

Sector	2005 (MT CO_2e)	2012 (MT CO_2e)	% Change 2005 to 2012
Transportation & Mobile Sources	2,878,078	2,877,430	-0.02%
Commercial/Industrial Energy	3,361,410	3,014,642	-10.3%
Residential Energy	1,024,840	1,021,652	-0.3%
Solid Waste	525,548	410,182	-21.9%
Water & Wastewater	230,556	145,668	-36.8%
Total	**8,020,432**	**7,469,574**	**-6.9%**

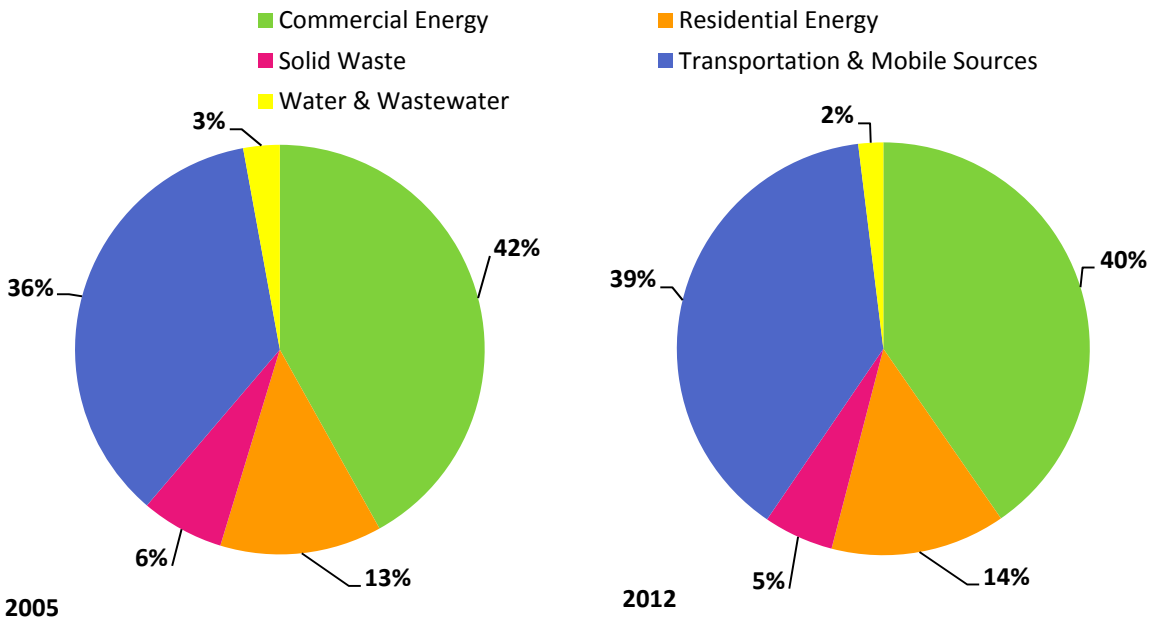

Figure 1. Community-Wide GHG Emissions by Sector for 2005 and 2012

2005, 2007, 2010, and 2012 Inventories

Figure 2 and Table 4 show the GHG emissions by sector for all inventory years for the subregion. 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 that each sector contributes relative to total emissions, which does not vary greatly by year at the subregional level.

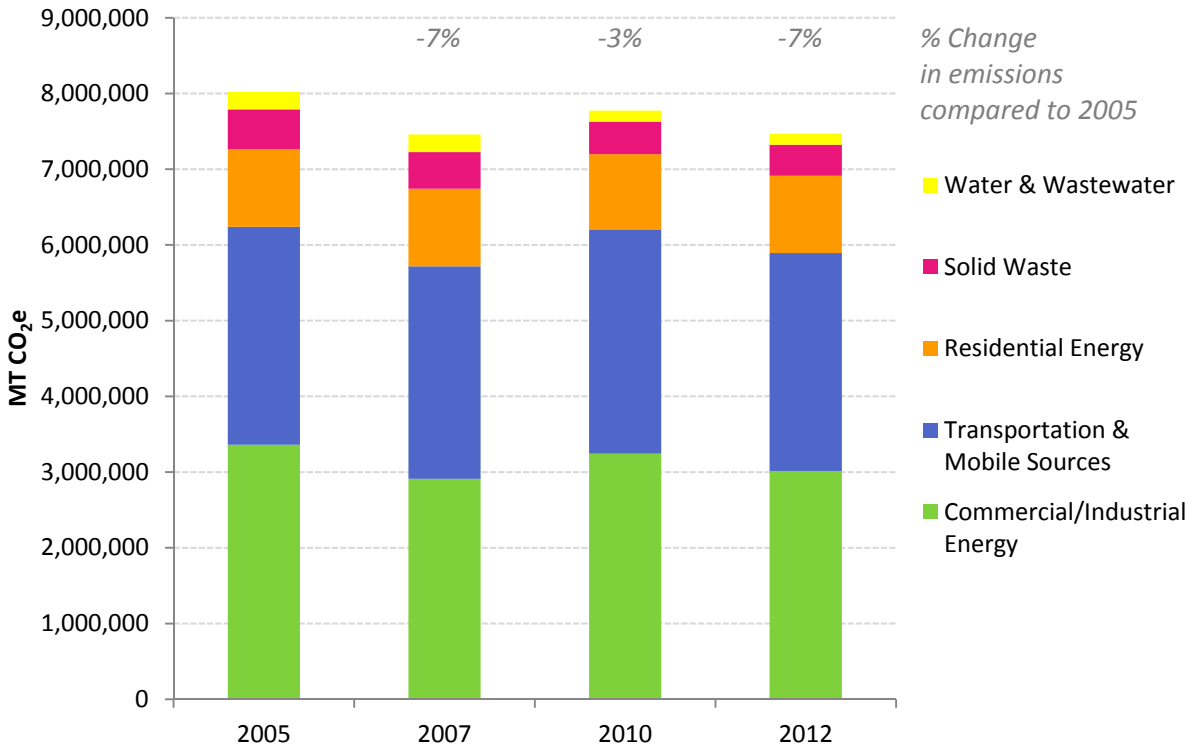

Figure 2. Community GHG Emissions for 2005, 2007, 2010, and 2012

Note that at the subregional level the emissions associated with off-road mobile sources are combined with the Transportation and Mobile sector, and Water and Wastewater are combined as a single sector as well.

Table 4. Community GHG Emissions for 2005, 2007, 2010, and 2012

Sector	2005 (MT CO_2e)	% of Total	2007 (MT CO_2e)	% of Total	2010 (MT CO_2e)	% of Total	2012 (MT CO_2e)	% of Total
Commercial/ Industrial Energy	3,361,410	42%	2,911,282	39%	3,243,425	42%	3,014,642	40%
Transportation & Mobile Sources	2,878,078	36%	2,806,555	37%	2,952,708	38%	2,877,430	39%
Residential Energy	1,024,840	13%	1,025,286	14%	1,002,631	13%	1,021,652	14%
Solid Waste	525,548	7%	484,023	6%	429,725	5%	410,182	5%
Water & Wastewater	230,556	3%	231,976	3%	145,666	2%	145,668	2%
Total	**8,020,432**		**7,459,122**		**7,774,155**		**7,469,574**	
% Change from 2005	—		-7%		-3%		-7%	

Note: Percent totals may not add up to 100% due to rounding.

Variations in demographic data also help provide perspective on changes in emissions over time. Table 5 shows the number of households, jobs, population, and service population (population + jobs) for each inventory year for the subregion.

Table 5. Subregional Demographic Data for 2005, 2007, 2010, and 2012

	2005	2007	2010	2012	% Change 2005–2012
Population	751,724	745,989	746,212	749,950	-0.2%
Households	267,314	268,026	268,584	268,963	0.6%
Jobs	374,035	388,590	352,461	358,316	-4.2%
Service Population (Population + Jobs)	1,125,759	1,134,579	1,098,673	1,108,266	-1.5%

Source: SCAG.

Energy

The EECAPs ultimately will focus on increasing energy efficiency and reducing GHG emissions from energy; therefore, it is important for the cities to understand their current energy consumption to make informed decisions for reducing energy-related emissions. At the subregional level, understanding energy use can help the SBCCOG identify energy efficiency programs that would be most beneficial. Energy use consists of electricity and natural gas. Emissions from Commercial and Residential Energy use account for about 55% of the total community emissions in 2005 and 2012. Table 6 shows the breakdown in activity data (kWh or therms) and GHG emissions by sector and energy source for the subregion.

Table 6. Activity Data and GHG Emissions of Energy in 2005 and 2012

Sector	2005		2012		% Change in Activity 2005–2012	% Change in Emissions 2005–2012
	Activity Data (kWh or therms)	Emissions (MT CO_2e)	Activity Data (kWh or therms)	Emissions (MT CO_2e)		
Commercial/Industrial						
Electricity	5,604,871,869	1,717,600	5,234,612,038	1,673,939	-6.6%	-2.5%
Natural Gas	309,133,064	1,643,810	252,131,220	1,340,703	-18.4%	-18.4%
Residential						
Electricity	1,415,208,916	431,701	1,420,238,819	503,359	0.3%	16.6%
Natural Gas	111,545,007	593,139	106,720,574	567,485	-4.3%	-4.3%
Total (MT CO_2e)		**4,386,250**		**4,085,486**		**-6.8%**

Commercial electricity use decreased nearly 7% between 2005 and 2012; however, Commercial electricity emissions decreased by less than 3%. Residential electricity use decreased by 0.3% but emissions increased by 17%. The difference between the change in activity data and emissions data is due to the emission factor used for electricity for 2005 and 2012. 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, SCE generated electricity that resulted in an emission factor of 669.7 CO_2e. In 2012, SCE's electricity generation resulted in an emission factor of 705.0 CO_2e. Therefore, a kilowatt-hour of electricity used in 2012 emitted more GHGs than a kilowatt-hour of electricity used in 2005. Future emissions could increase or decrease based on changes to SCE'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.

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 Southern California Edison uses to generate electricity. Changes to either component can affect the GHG emissions from electricity in the City.

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 a trend that relates more directly to usage. In the subregion, Commercial/Industrial natural gas consumption (therms) decreased by 18.4% from 2005 to 2012; therefore the emissions also declined 18.4%. Residential natural gas therms consumption and GHG emissions declined approximately 4% from 2005 to 2012. Figure 3 shows the trend in electricity and natural gas emissions from 2005 to 2012 for the Commercial/Industrial and Residential sectors. Figures 4 and 5 show the raw consumption (kWh or therms) by sector and year.

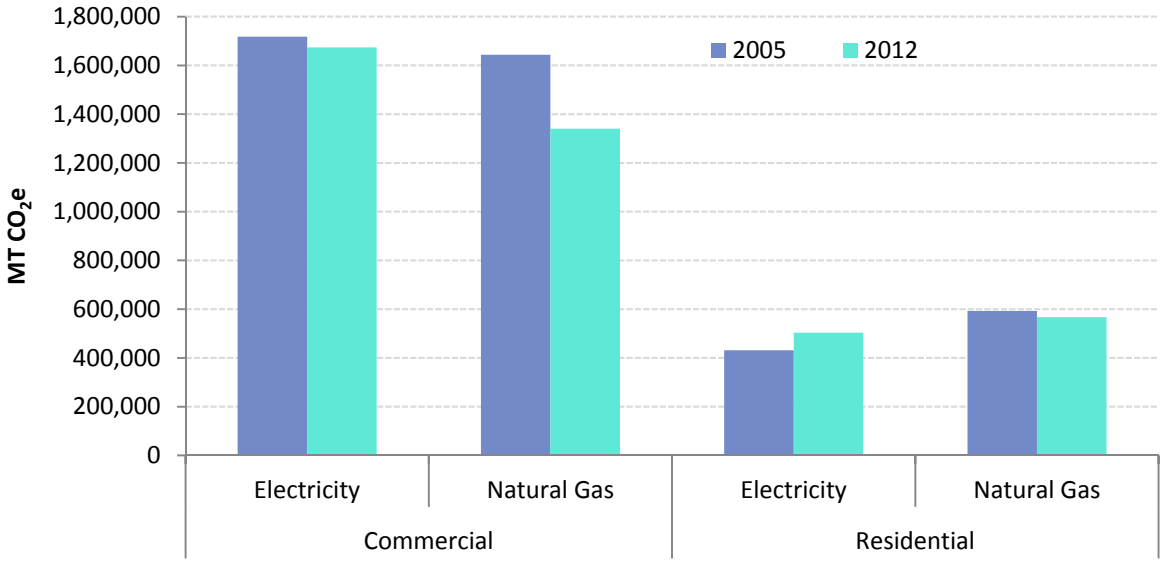

Figure 3. GHG Emissions for Community Electricity and Natural Gas, by Sector

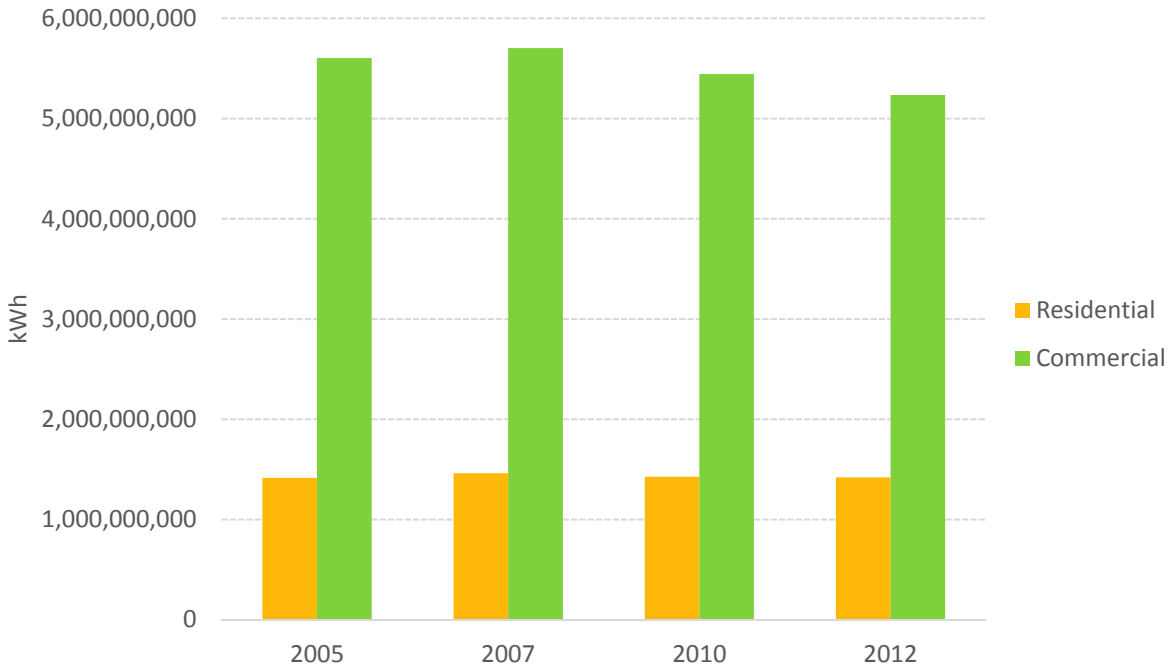

Figure 4. Subregional Residential and Commercial Electricity Use (kWh)

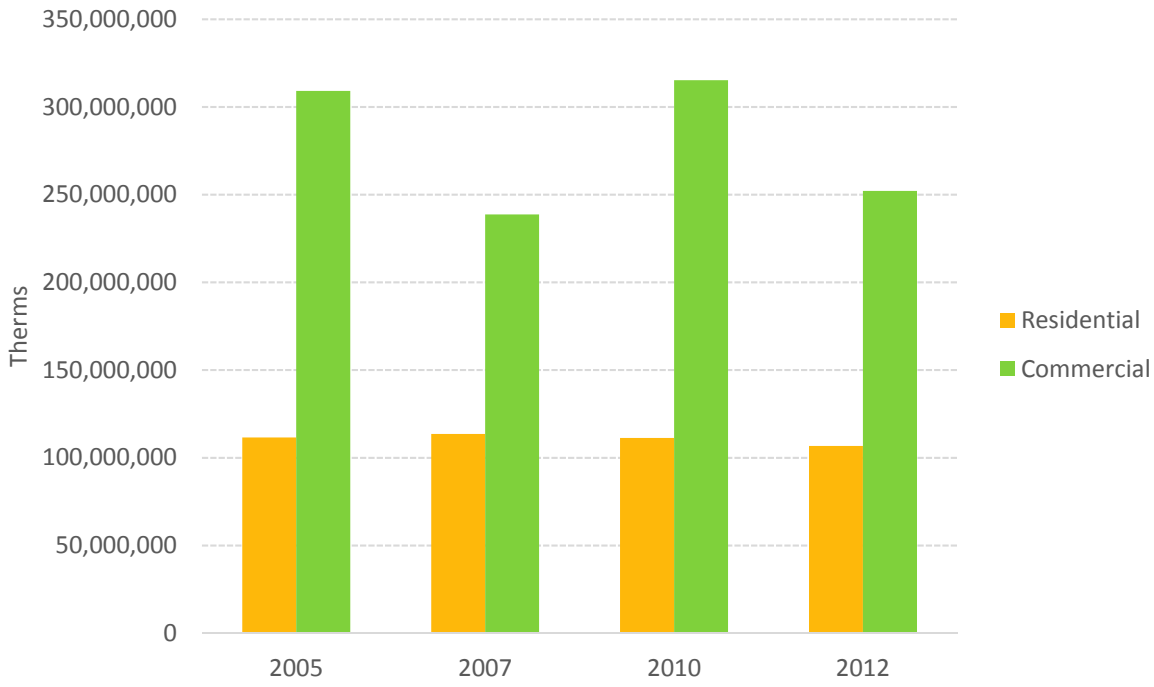

Figure 5. Subregional Residential and Commercial Natural Gas Use (therms)

City-Level Community Emissions

The cities in the South Bay subregion are diverse, ranging greatly in population size, employment, and land uses. In turn, the emissions proportions by sector and total emissions also vary considerably by city, reflecting each community's unique characteristics.

The total emissions among the South Bay cities vary ten-fold, from Carson with the highest emissions in 2005 and 2012, to Rolling Hills, with the lowest emissions in both years (Figure 6). Of course, this variability is a function of physical size, land uses, and activities that occur with each city. Together, Torrance, Carson, and Rancho Palos Verdes represent 50% of the land area in the subregion (Figure 7). Torrance contains 28% of subregional jobs and 19% of the subregional population, with Carson following at 14% and 12%, respectively (Figure 8). In contrast, Rolling Hills is a mostly residential community, with less than 1% of the subregion's jobs within its borders.

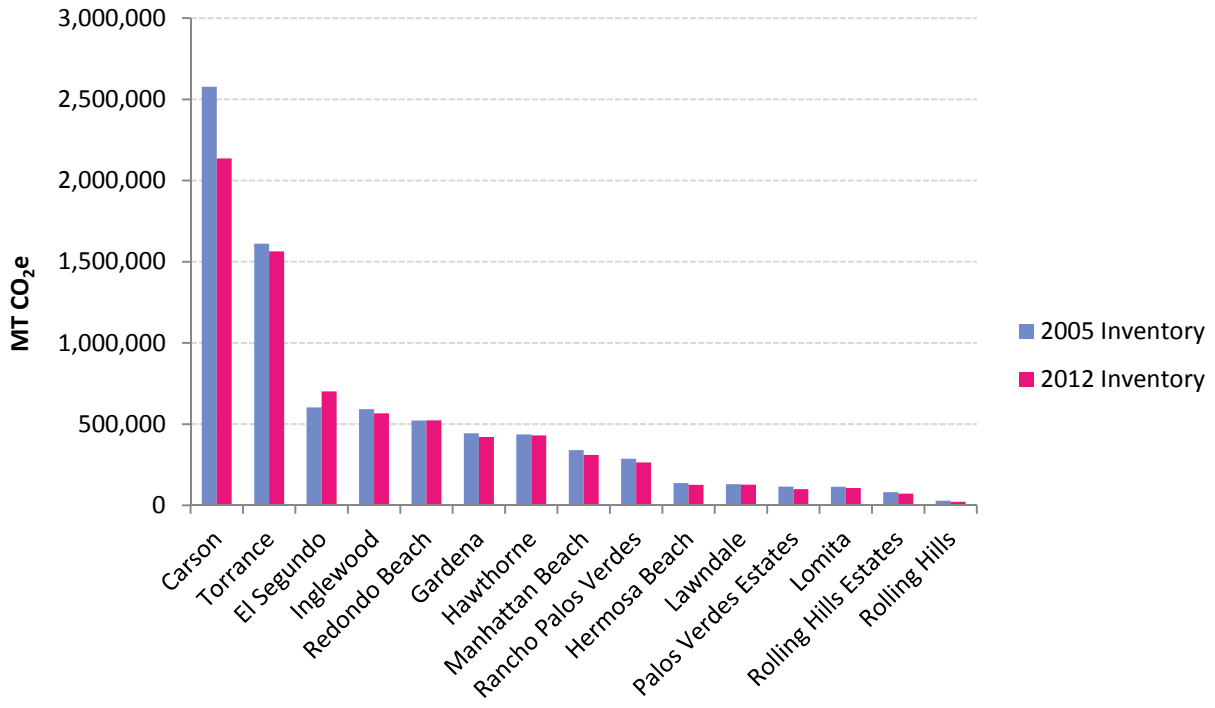

Figure 6. Community-Wide Emissions by City for 2005 and 2012

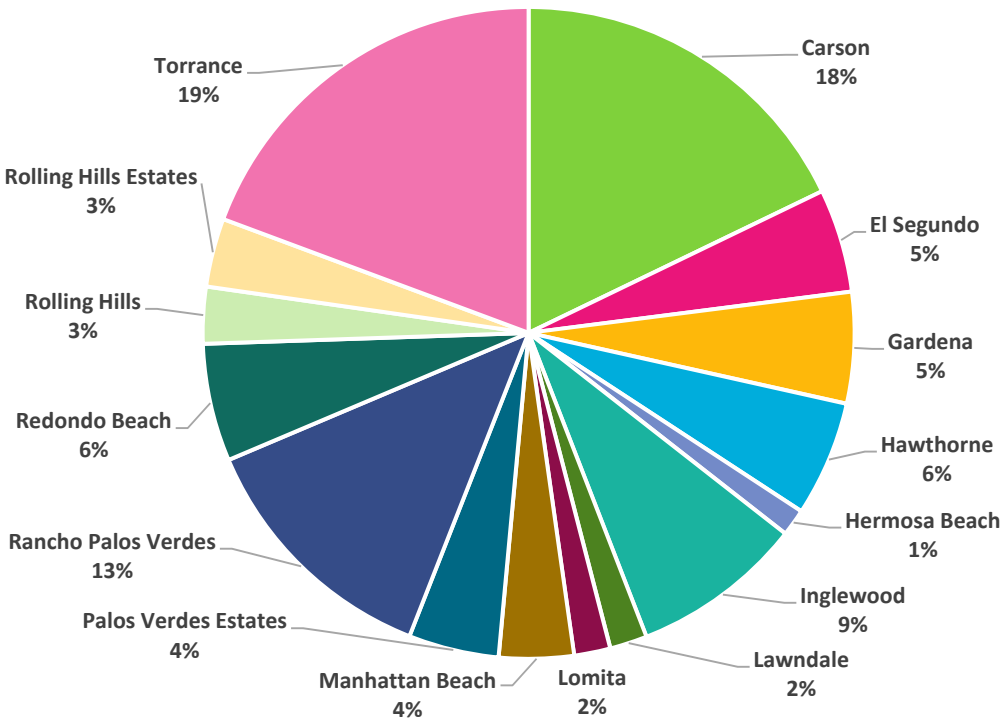

Figure 7. Proportion of Land Area in the South Bay Subregion by City

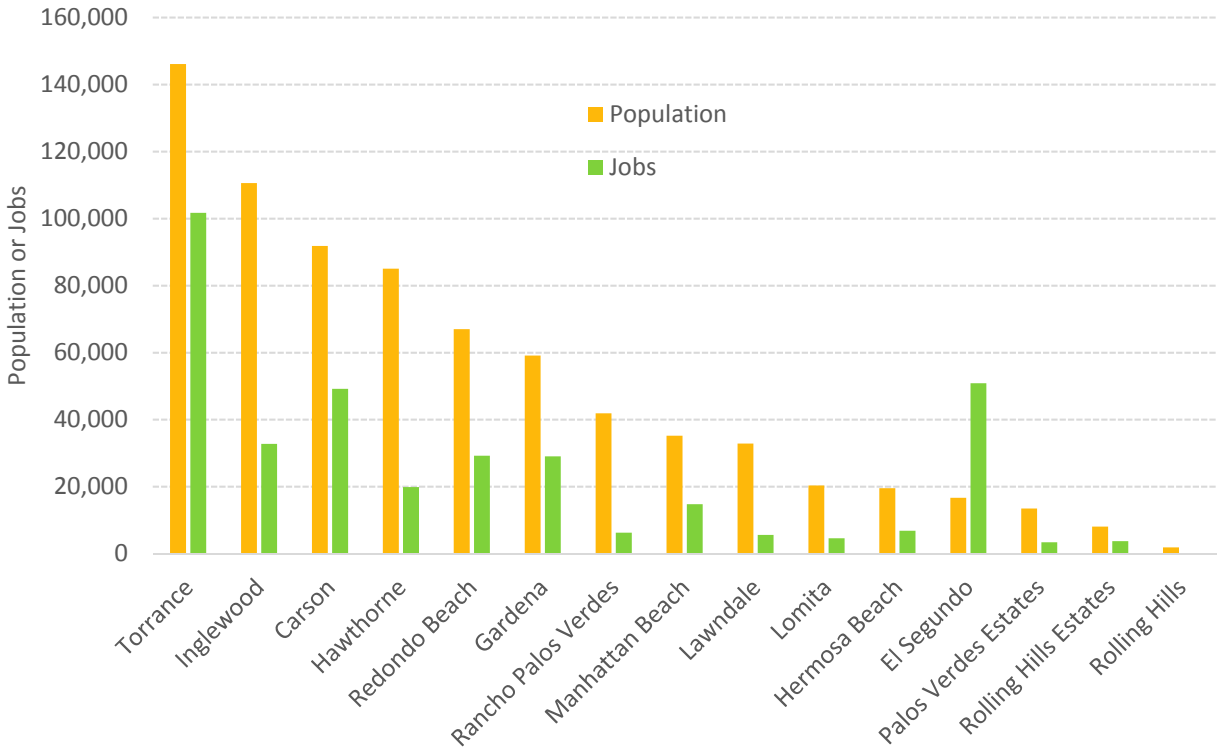

Figure 8. Population and Jobs by City, 2012

The relative proportion of sector emissions within each city in the South Bay subregion is also highly variable and reflective of community characteristics (Figure 9). For example, emissions from Commercial/Industrial Energy vary from 4% in Palos Verdes Estates to 63% in Carson, while emissions from Residential Energy account for only 4% of total emissions in El Segundo, but over 43% of emissions in Rolling Hills. The differences in emissions, emission sources, and land uses highlight the need for unique approaches to emissions reductions in each community.

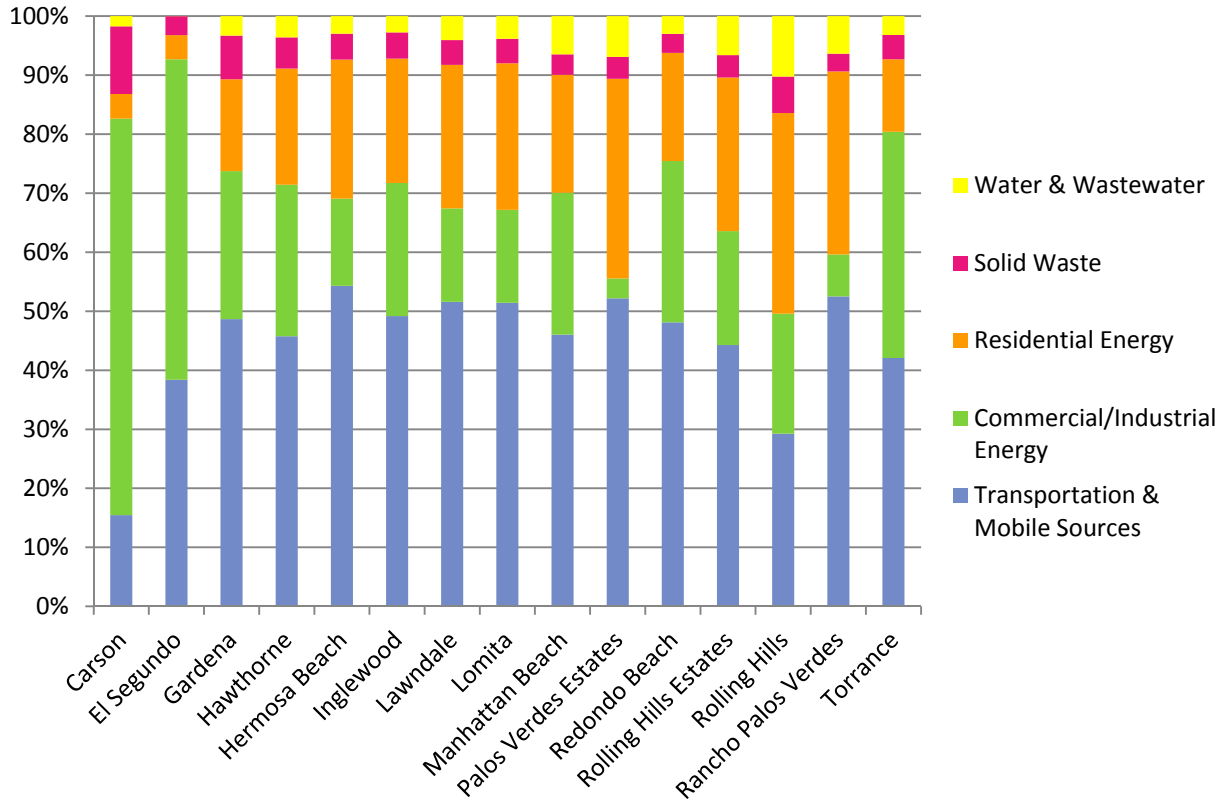

Figure 9. Distribution of Community-Wide Emissions by City by Sector

Municipal Emissions

As described earlier, municipal GHG emissions are a subset of the community emissions. The municipal inventory includes emissions from activities conducted as part of municipal government operations in the South Bay cities. While emissions from municipal government operations are normally a fraction of the overall community emissions, cities have the most direct control over municipal emissions. For each of the inventory years, municipal emissions represent 1% of the total subregional emissions (from 1.0 to 1.2%) and are illustrated in Figure 10. The remainder of this section presents a summary of municipal emissions for 2005 and 2012 at a subregional level.

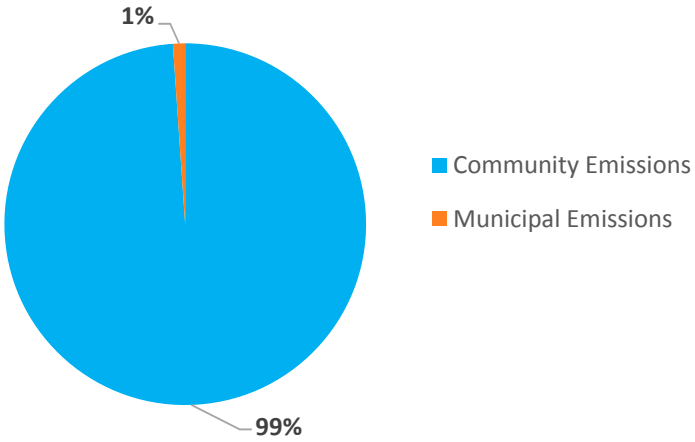

Figure 10. Percentage of Municipal Emissions from Total Emissions

2005—2012 Emissions Summary

- **Municipal emissions have decreased 11% from 2005 to 2012, from 91,569 MT CO2e to 81,302 MT CO_2e.**
- **Emissions in all sectors decreased except for the Building & Facilities sector.**
- **Emissions from municipal operations accounted for 1% of community emissions in 2012.**

The subregion's Fleet & Equipment sector contributed the largest percentage of emissions in 2005 (38%) and 2012 (36%), although emissions from this sector decreased by 17% over the period (Table 7). The second largest-emitting sector for 2005 and 2012 was Buildings & Facilities. While the percentage of emissions from this sector increased between the two inventory years, from 19% to 23%, total emissions increased by 7% (1,135 MT CO_2e) between 2005 and 2012. The Outdoor Lights sector contributed 13% of total emissions (11,670 MT CO_2e) in 2005 and decreased by less than 1% (355 MT CO_2e) in 2012 (to 11,315 MT CO_2e representing 14% of the total emissions). Between 2005 and 2012, emissions from the Solid Waste sector decreased by 24%, Employee Commute emissions decreased by 14%, and Water Pumping, Delivery, & Irrigation emissions decreased from 3,647 MT CO_2e to 3,417 MT CO_2e. The 2005 and 2012 emissions and changes are detailed in Figure 11 and Table 7.

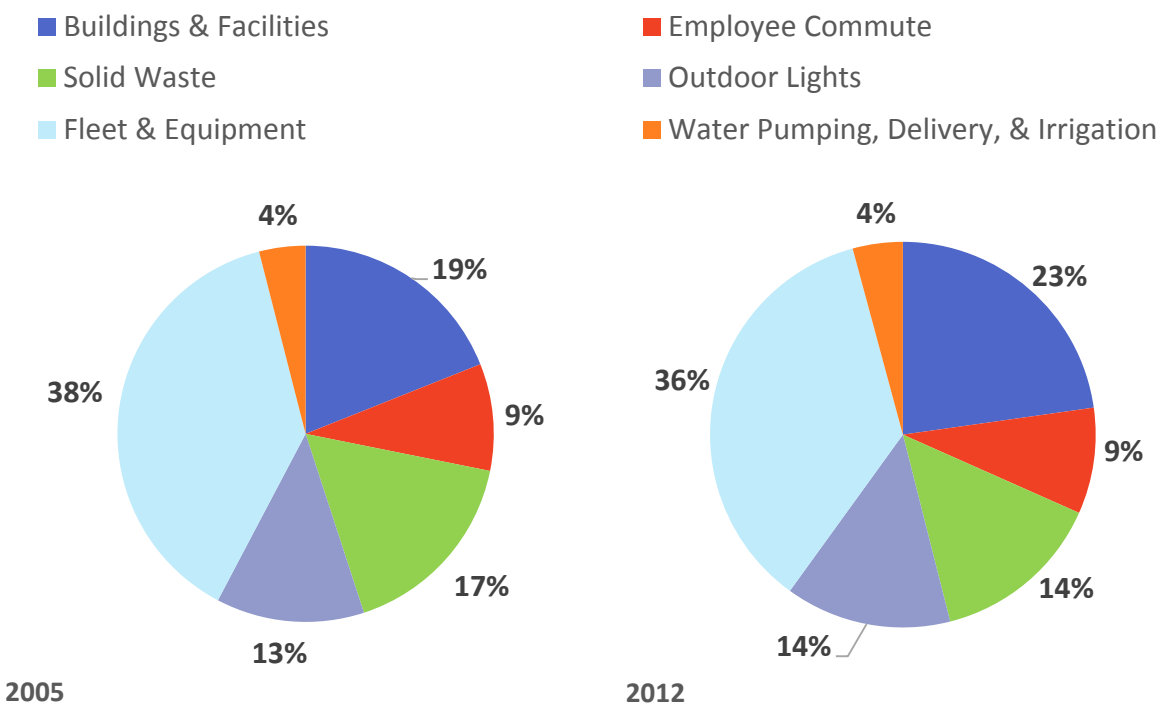

Figure 11. Municipal GHG Emissions by Sector for 2005

Table 7. Municipal GHG Emissions by Sector for 2005 and 2012

Sector	2005 (MT CO_2e)	2012 (MT CO_2e)	% Change 2005–2012
Fleet & Equipment	35,073	29,129	-17%
Buildings & Facilities	17,366	18,501	7%
Outdoor Lights	11,670	11,315	-3%
Employee Commute	8,417	7,231	-14%
Solid Waste	15,396	11,709	-24%
Water Pumping, Delivery, & Irrigation	3,647	3,417	-6%
Total	**91,569**	**81,302**	**-11%**

City-Level Municipal Emissions

As with the community-wide emissions, the municipal emissions within the South Bay are variable in both total emissions (Figure 12) and proportion of emissions (Figure 13), reflecting the differences in land use type and size described above and the services provided by each local government, such as water or police services.

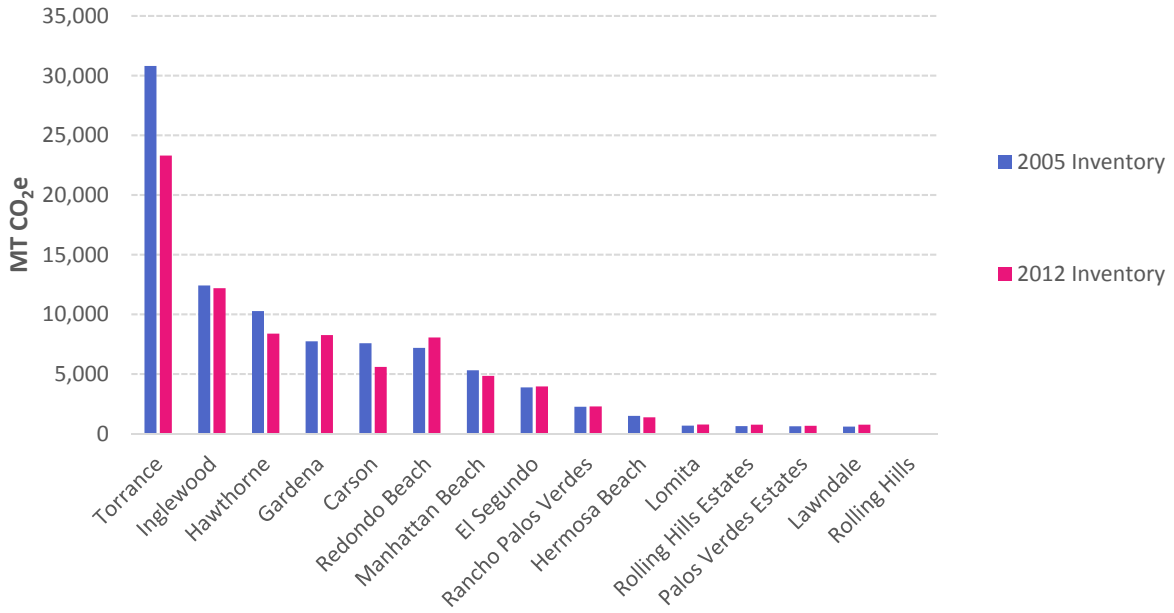

Figure 12. Municipal Emissions by City for 2005 and 2012

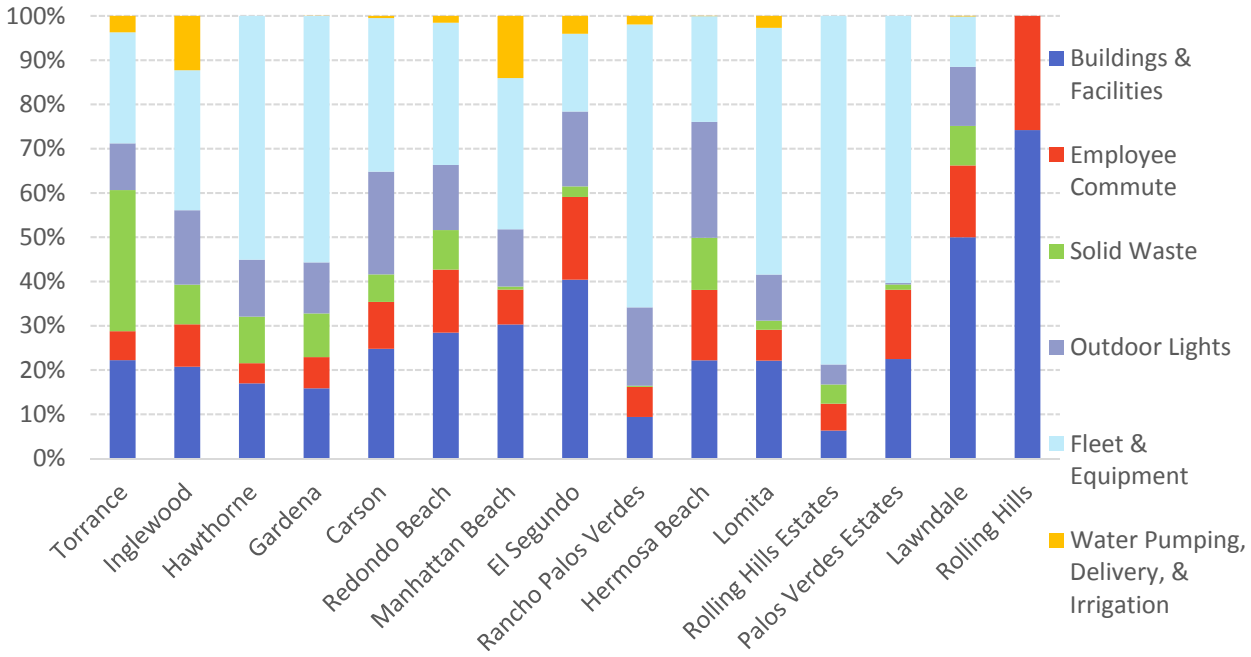

Figure 13. Distribution of Municipal Emissions by City by Sector for 2012

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 in place in 2012 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 subregion 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. Two future years are forecasted for each scenario: 2020 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 2035 forecast year will allow the subregion to develop long-term strategies to continue GHG reductions beyond 2020.

Business-as-Usual Forecasts

The BAU forecasts estimate future emissions using current (2012) consumption patterns and emission factors with the anticipated growth in the subregion. Anticipated growth is estimated using data from regional planning scenarios developed by the Southern California Association of Governments (SCAG), the Cities, and other relevant sources (Table 8). 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 2012 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 2012 to 2020 and from 2021 to 2035, as shown in Table 8.

In general, the subregion is expecting modest growth to 2020 and 2035 as population, housing, and jobs are all expected to increase moderately. SCAG is projecting fewer vehicle miles traveled from 2012 to 2020 despite population and job growth, but that trend is reversed after 2020, when vehicle miles traveled is projected to increase. Due to the relatively low growth, the subregion does not anticipate major staffing changes in its government services.

Table 8. Growth Factors for 2012, 2020, and 2035

Sector	Demographic Indicator	2012	2020	2035	2012–2020 CAGR[a]	2020–2035 CAGR[b]
Transportation	Vehicle Miles Traveled	5,789,341,246	5,290,265,170	5,427,046,410	-1.12%	0.17%
Solid Waste, Water, Wastewater	Service Population (Population + Jobs)	1,108,266	1,151,797	1,205,558	0.48%	0.30%
NA[2]	Population	749,950	771,997	810,858	0.36%	0.33%
Residential Energy	Households	268,963	277,777	288,200	0.40%	0.25%
Commercial/ Industrial Energy	Jobs	358,316	379,800	394,700	0.73%	0.26%

Source: SCAG 2012

F/T: Full-time employees; P/T: Part-time employees

a. Compound annual growth rate.

b. Not Applicable. Population data are shown for informational purposes but are not used for forecasting any sector.

Community Business-as-Usual Forecast

- **Community BAU emissions are expected to decrease 5.3% from baseline levels by 2020 and 2.8% by 2035.**

The subregion's BAU emissions in 2020 are estimated to be 7,590,632 MT CO_2e, which represent a 5.3% decrease from the 2005 baseline emissions. By 2035, emissions are estimated to be to 7,792,156 MT CO_2e (Table 9), or a 2.8% decrease from the baseline level.

Table 9. Community BAU Forecast

Sector	2005 (MT CO_2e)	2012 (MT CO_2e)	2020 (MT CO_2e)	% Change 2012–2020	2035 (MT CO_2e)	%Change 2012–2035
Transportation & Mobile Sources	2,878,078	2,877,429	2,813,796	-2.2%	2,902,164	0.8%
Residential Energy	1,024,840	1,021,652	1,051,545	2.9%	1,088,032	6.5%
Commercial/Industrial Energy	3,361,410	3,014,642	3,189,812	5.8%	3,298,734	9.4%
Solid Waste	525,548	410,182	386,264	-5.8%	349,153	-14.8%
Water & Wastewater	230,556	145,668	149,215	2.4%	154,073	5.7%
Total	**8,020,432**	**7,469,573**	**7,590,632**	**1.6%**	**7,792,156**	**4.3%**
% Change from 2005		-6.9%	-5.3%		-2.8%	

Municipal Business-as-Usual Forecast

- **Municipal BAU emissions are expected to be 10% and 8% below baseline levels in 2020 and 2035, respectively.**

The subregion's Municipal BAU emissions in 2020 are estimated to be 82,628 MT CO_2e, which is 10% below the 2005 baseline level (Table 10). By 2035, the level of reductions is anticipated to be 8% below 2005 levels, or 84,309 MT CO_2e. The Solid Waste sector emissions are projected to decrease from 2012 to 2035 by 19%; all other municipal sector emissions are estimated to increase during this time period. The decrease in the Solid Waste sector is anticipated due to the closure of various landfills throughout the subregion, which emit fewer emissions than operational landfills. The Employee Commute sector is estimated to be the sector with the largest increase in emissions with a 10% increase from 2012 levels in 2020 and a 13% increase from 2012 levels in 2035. The remaining sectors, except the Water Pumping, Delivery, & Irrigation sector, are estimated to increase between 4-5% from 2012 to 2035. The Water Pumping, Delivery, & Irrigation sector's emissions are estimated to remain constant through 2035.

Table 10. Municipal BAU Forecast

	2005 (MT CO_2e)	2012 (MT CO_2e)	2020 (MT CO_2e)	% Change 2012–2020	2035 (MT CO_2e)	% Change 2012–2035
Buildings & Facilities	17,366	18,501	18,773	1%	19,248	4%
Employee Commute	8,417	7,231	7,957	10%	8,175	13%
Solid Waste	15,396	11,709	10,804	-8%	9,507	-19%
Outdoor Lights	11,670	11,315	11,555	2%	11,913	5%
Fleet & Equipment	35,073	29,129	30,122	3%	32,049	10%
Water Pumping, Delivery, & Irrigation	3,647	3,417	3,417	0%	3,417	0%
Total	**91,569**	**81,302**	**82,628**	**2%**	**84,309**	**4%**
% Change from 2005		-11%	-10%		-8%	

Adjusted Business-as-Usual Forecasts

State legislation has been approved and/or adopted that will reduce GHG emissions in the subregion. These policies do not require additional local action, but should be accounted for in the subregion'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 CARB 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. 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[2]. These are also known as "Pavley I" and "Pavley II" regulations.

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% of their electricity from qualified renewable sources. This is anticipated to lower emission factors (i.e., fewer GHG emissions per kilowatt-hour used) statewide. Therefore, reductions from RPS are taken for energy embedded in water, which uses energy sources throughout the state to move from the water source area to the City. However, no credit was taken for this measure for the SCE service region (i.e., for residential and commercial electricity used in the City supplied by SCE). Analysis of SCE's current portfolio and the sources needed to replace the nuclear generation that has been taken out of service has revealed great uncertainty in how SCE's emission factors may change over time. Therefore, the emission factor used in the 2012 inventory and the BAU forecast was also used in the Adjusted BAU forecast.

Senate Bill X7-7. California's SB X7-7 requires water suppliers to reduce urban per capita water consumption 20% from a baseline level by 2020. California Water Service, Golden State Water Company, and five municipal service providers supply the subregion. Reductions in GHG emissions from SB X7-7 were calculated by applying the reduction goals established by each city's provider and city-level population estimates for 2020 and 2035.

Community Adjusted Business-as-Usual Forecast

- **Community emissions are expected to decrease under the Adjusted BAU forecast and will be 13% lower in 2020 than 2005 levels and 22% lower than 2005 levels by 2035.**

The subregion's Adjusted BAU emissions in 2020 are estimated to be 6,963,872 MT CO_2e in 2020 and 6,270,736 MT CO_2e in 2035 (Table 11). This change represents a 13% reduction from 2005 levels by 2020 and 22% reduction from 2005 levels by 2035. Due to the stringent State vehicle standards, the emissions from the Transportation sector are expected to decrease significantly over time, while the proportion of emissions from Residential and Commercial/Industrial Energy will increase. Figure 14 shows the past inventories, BAU, and Adjusted BAU emissions for the subregion.

[2] CARB Advanced Clean Cars Summary Sheet

Table 11. Community Adjusted BAU Emissions

Sector	2005 (MT CO_2e)	2012 (MT CO_2e)	2020 (MT CO_2e)	2020 % of Total	2035 (MT CO_2e)	2035 % of Total
Transportation & Mobile Sources	2,878,078	2,877,429	2,260,968	32%	1,487,668	24%
Commercial/Industrial Energy	3,361,410	3,014,642	3,161,132	45%	3,248,656	52%
Residential Energy	1,024,840	1,021,652	1,049,058	15%	1,081,813	17%
Solid Waste	525,548	410,182	386,264	5%	349,153	5%
Water & Wastewater	230,556	145,668	106,450	2%	103,446	2%
Total	**8,020,432**	**7,469,573**	**6,963,872**	**100%**	**6,270,736**	**100%**
% Change from 2005		-7%	-13%		-22%	

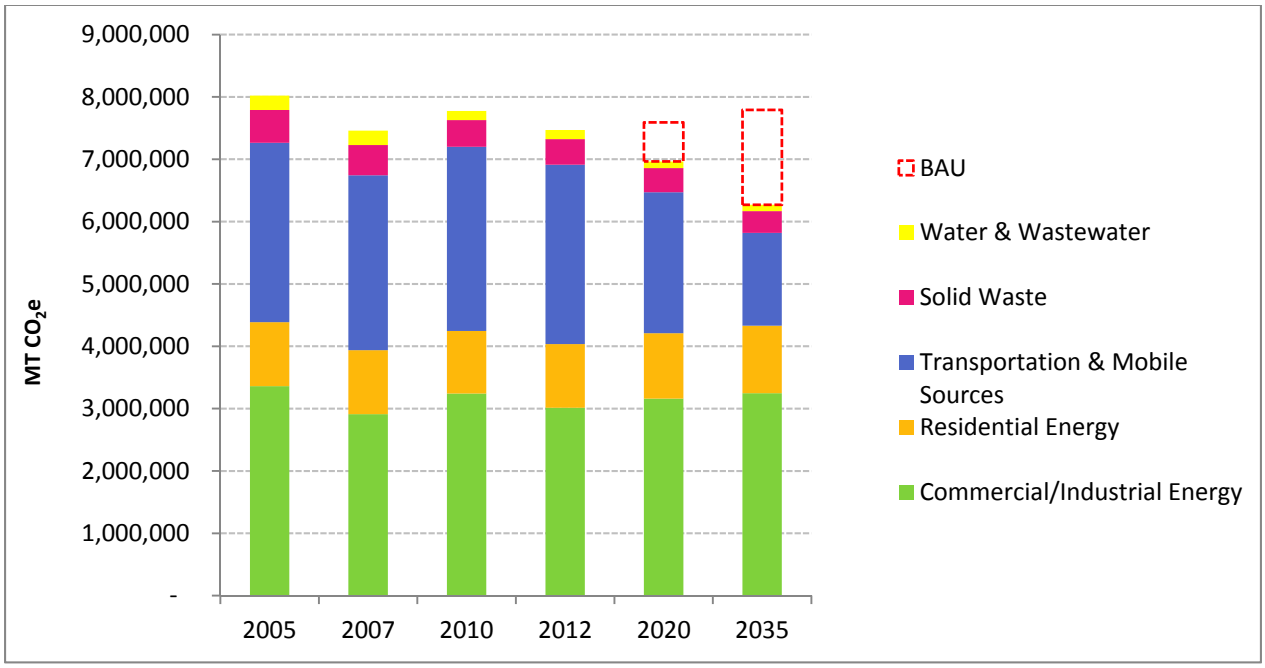

Figure 14. Community-Wide Historical, BAU, and Adjusted BAU Emissions

The following three figures show emissions by City for 2005, 2012, and Adjusted BAU 2020 for total emissions (Figure 15), Residential Energy (Figure 16), and Commercial/Industrial Energy (Figure 17). These figures illustrate that most cities' total emissions have decreased from 2005 to 2012 and are expected to continue to decrease under an Adjusted BAU forecast; however, the trend for the energy sectors is more variable.

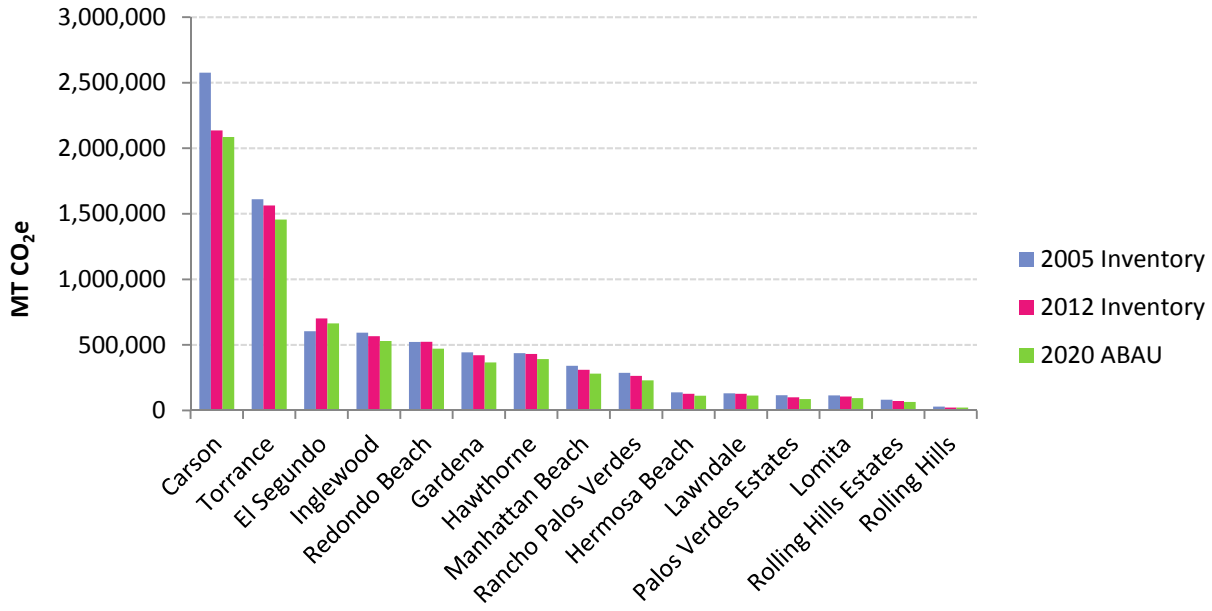

Figure 15. Total Community-Wide Emissions by Jurisdiction for 2005, 2012, and Adjusted BAU

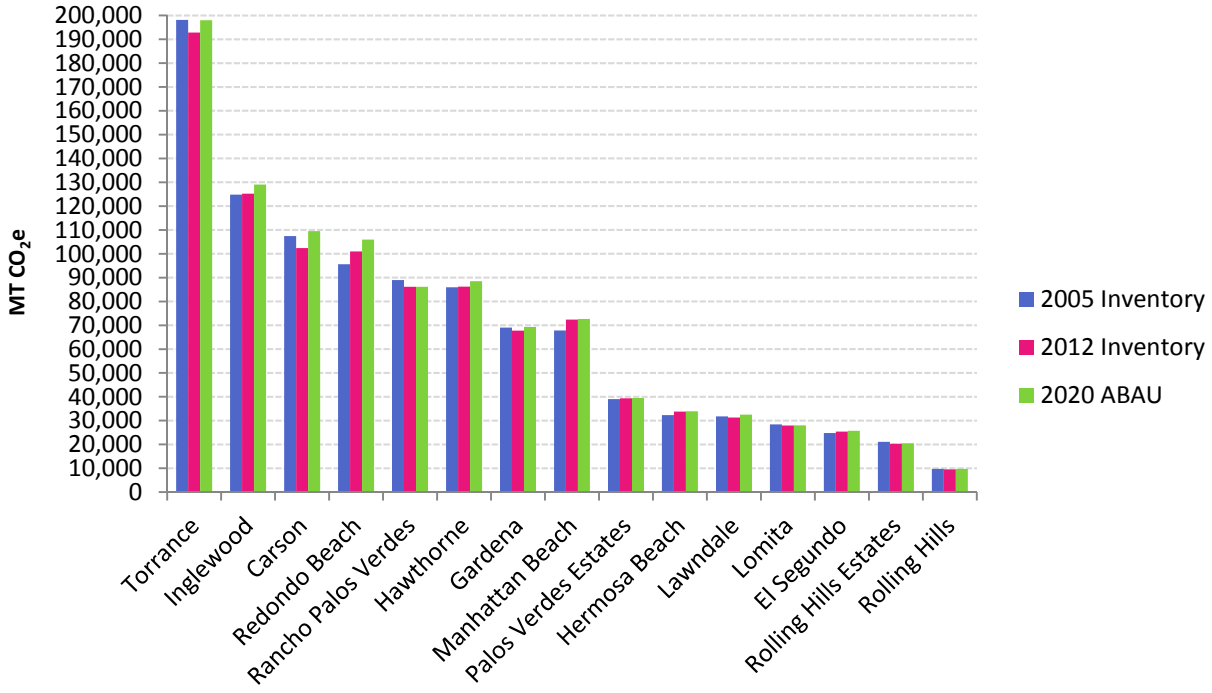

Figure 16. Residential Energy Emissions by Jurisdiction for 2005, 2012, and Adjusted BAU

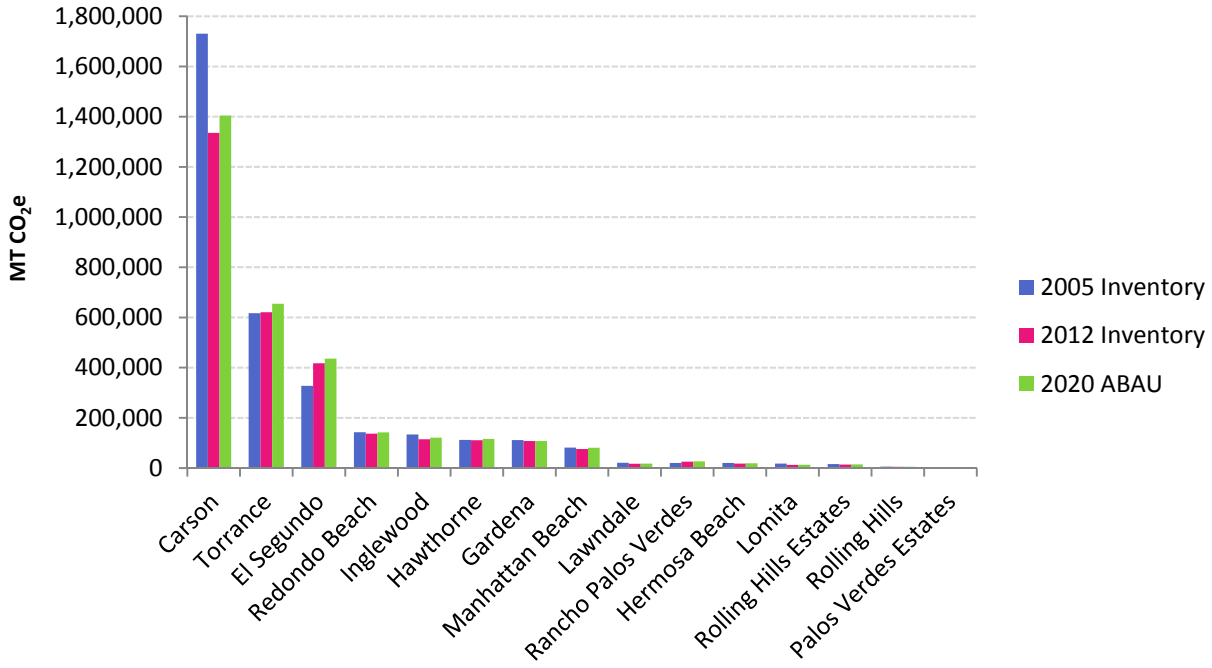

Figure 17. Commercial/Industrial Energy Emissions by Jurisdiction for 2005, 2012, and Adjusted BAU

Municipal Adjusted Business-as-Usual Forecast

- **Under an Adjusted BAU forecast, the subregion will have a 13% decrease in municipal emissions from 2005 levels in 2020. By 2035, the reduction will be 11% below 2005 levels.**

The subregion's Municipal Adjusted BAU emissions in 2020 are estimated to be 79,818 MT CO_2e, which is 13% below the 2005 baseline level (Table 12). By 2035, the level of reductions is anticipated to be 11% below 2005 levels, or 81,371 MT CO_2e. The Fleet & Equipment sector accounts for the largest portion of total municipal emissions. The Adjusted BAU emissions are slightly lower than the BAU emissions due to the Low Carbon Fuel Standard measure described earlier. The Low Carbon Fuel Standard would lower the carbon intensity of fuels used in both the subregion's Fleet & Equipment and Employee Commute sectors. Figure 18 shows the past inventories, BAU, and Adjusted BAU for the subregion.

Table 12. Municipal Adjusted BAU Emissions

Sector	2005 (MT CO_2e)	2012 (MT CO_2e)	2020 (MT CO_2e)	2020 % of Total	2035 (MT CO_2e)	2035 % of Total
Buildings & Facilities	17,366	18,501	18,773	24%	19,248	24%
Employee Commute	8,417	7,231	6,858	9%	7,060	9%
Solid Waste	15,396	11,709	10,804	14%	9,507	12%
Outdoor Lights	11,670	11,315	11,555	14%	11,913	15%
Fleet & Equipment	35,073	29,129	28,411	36%	30,226	37%
Water Pumping, Delivery, & Irrigation	3,647	3,417	3,417	4%	3,417	4%
Total	**91,569**	**81,302**	**79,818**	**100%**	**81,371**	**100%**
% Change from 2005		-11%	-13%		-11%	

Figure 19 shows the municipal GHG emissions by city for 2005, 2012, and 2020 Adjusted BAU. Torrance has the highest emissions across all three inventory years. Torrance municipal emissions significantly decreased from 2005 to 2012 (30,818 MT to 23,307 MT) and are estimated to further decrease in the 2020 ABAU scenario (to 22,023 MT). Rolling Hills has the fewest emissions across the three inventory years, and emissions are estimated to continue to remain relatively constant.

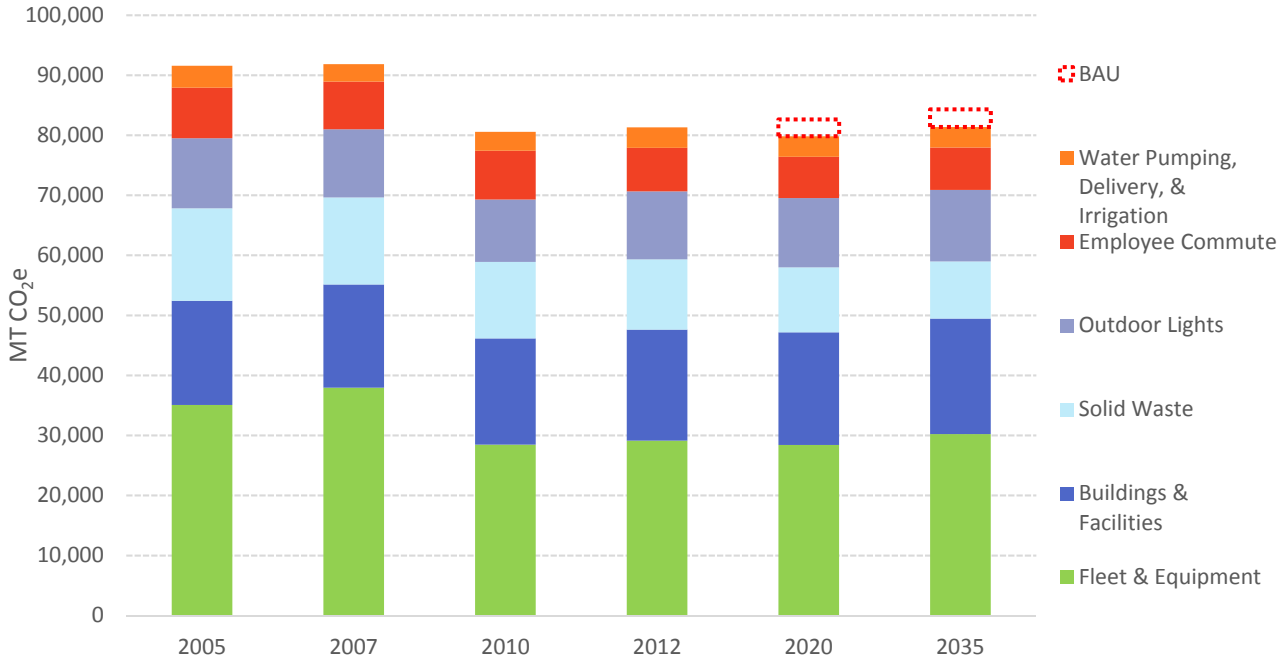

Figure 18. Municipal Historical, BAU, and Adjusted BAU Emissions

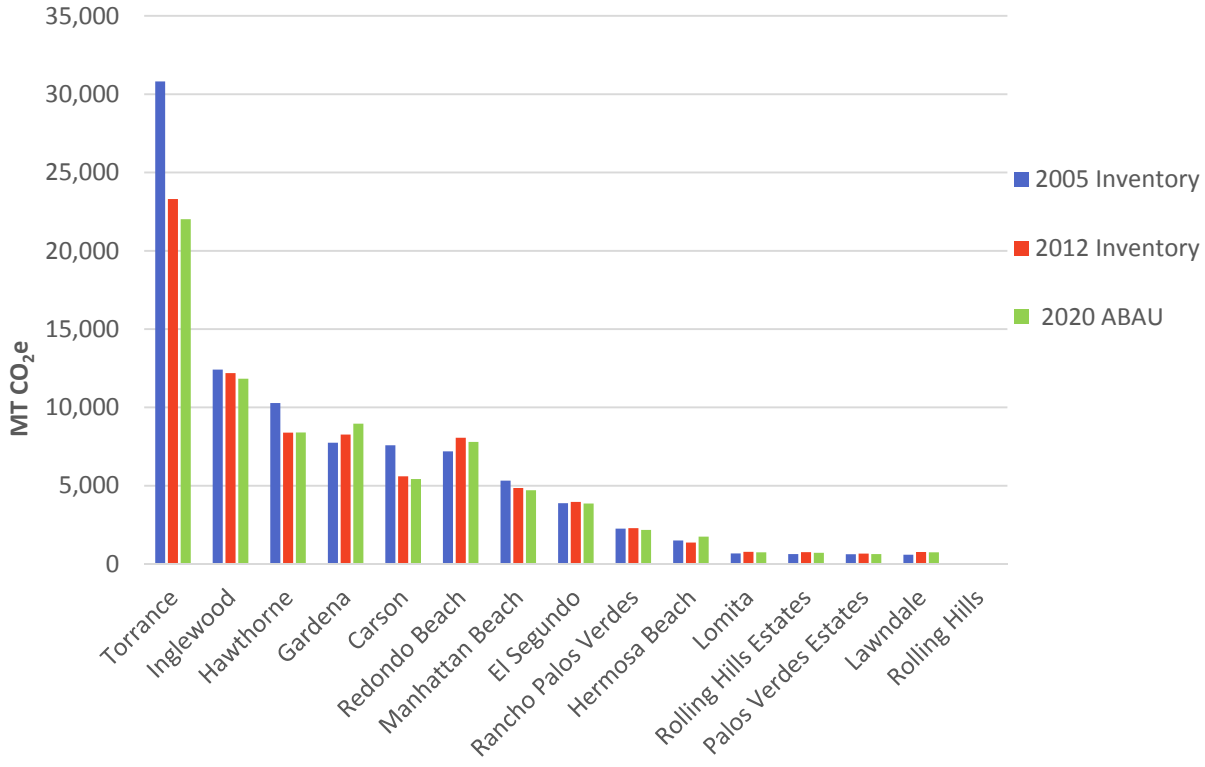

Figure 19. Total Municipal Emissions by Jurisdiction for 2005, 2012, and 2020 Adjusted BAU

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.[3] This goal is intended for community-level emissions although many jurisdictions also apply it to their municipal emissions. There are currently no State prescribed goals or guidance for GHG emissions reductions at the subregional level. 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). The State has not provided an interim target, nor has it provided guidance to local governments beyond the 2020 emissions target recommendations. It is, however, clear that the issue of climate change will not end in 2020 and continued reductions should be achieved to keep the State on a path toward the 2050 goal. A straight-line projection from the 2020 to 2050 goals would result in a reduction goal of 49% below 2005 levels by 2035 midpoint.

Ultimately, each city in the subregion will determine the level of reductions that it can and should achieve, but a subregional perspective might provide opportunities to deliver reductions that cannot be accomplished by each city alone. The following discussion on subregional community targets are based on subregional totals and State-aligned targets.

State-Aligned Subregional Community Targets

In 2020, the subregion would need to reduce 146,505 MT CO_2e emissions below the Adjusted BAU scenario to meet a 15% reduction from 2005 emissions. In 2035, the subregion would need to reduce 2,180,316 MT CO_2e emissions below the Adjusted BAU scenario to be 49% below 2005 levels and achieve the State-aligned target (Table 13 and Figure 20). The 2020 emissions goal is 9% below the 2012 emissions level while the 2035 goal is 45% below the 2012 emissions level. Figure 21 shows historic emissions, BAU, Adjusted BAU, and the "gap" of additional emission needed to meet these State-aligned targets.

Table 13. State-Aligned GHG Reduction Targets

Sector	2005	2012	2020	2035
BAU Emissions (MT CO_2e)	8,020,432	7,469,573	7,590,632	7,792,156
Adjusted BAU Emissions (MT CO_2e)	8,020,432	7,469,573	6,963,872	6,270,736
State-Aligned Target (% change from 2005)			-15%	-49%
State-Aligned Target (% change from 2012)			-9%	-45%
State-Aligned Emissions Goal (MT CO_2e)			6,817,367	4,090,420
Reductions from Adjusted BAU needed to meet the Target (MT CO_2e)			146,505	2,180,316

[3] 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.

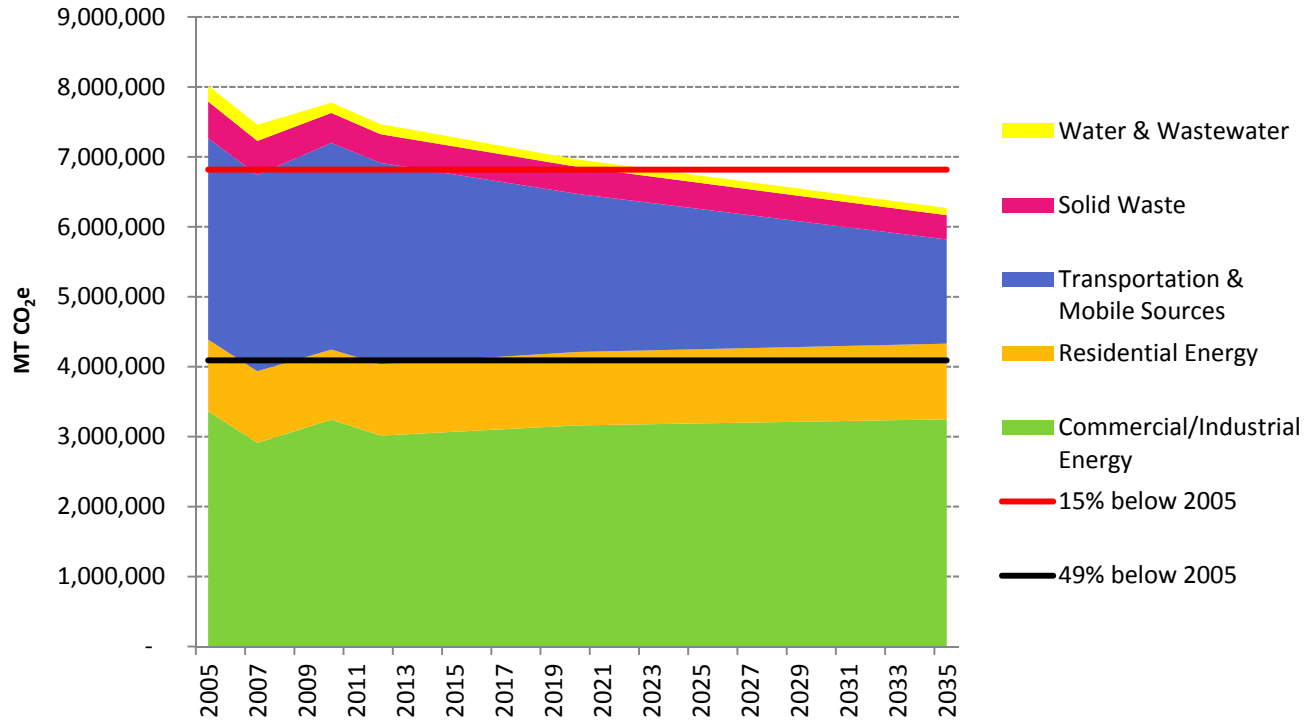

Figure 20. Community Emissions Inventories, Projections, and Target Reduction

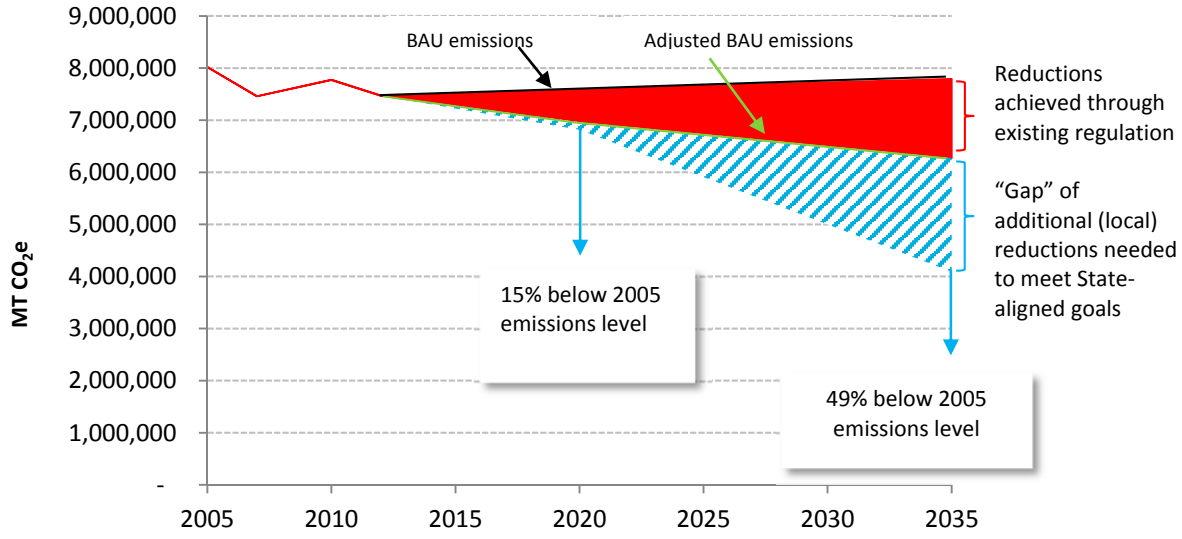

Figure 21. Gap Chart of Community BAU, Adjusted BAU, and Target Emissions

State-Aligned Subregional Municipal Targets

As a subregion, municipal emissions in 2020 would need to be reduced by about 2,000 MT CO_2e from the 2020 Adjusted BAU to meet a 15% reduction target from 2005 levels. This represents a 4% reduction from the 2012 emissions level. By 2035, the subregion would need to reduce municipal emissions by 34,685 MT CO_2e from the 2035 Adjusted BAU level to meet a 49% below 2005 levels reduction goal (Table 14). The 2020 goal is 4% below 2012 emission levels and the 2035 goal is 43% below 2012 emission levels. Figure 22 shows the trends over time and Figure 23 shows the "gap" of emission reductions for municipal operations.

Table 14. State-Aligned Municipal GHG Reduction Targets

	2005	2012	2020	2035
BAU Emissions (MT CO_2e)	91,569	81,302	82,628	84,309
Adjusted BAU Emissions (MT CO_2e)	91,569	81,302	79,818	81,371
State-Aligned Target (% change from 2005)			-15%	-49%
State-Aligned Target (% change from 2012)			-4%	-43%
State-Aligned Emissions Goal (MT CO_2e)			77,834	46,700
Reductions from Adjusted BAU needed to meet the Target (MT CO_2e)			1,985	34,671

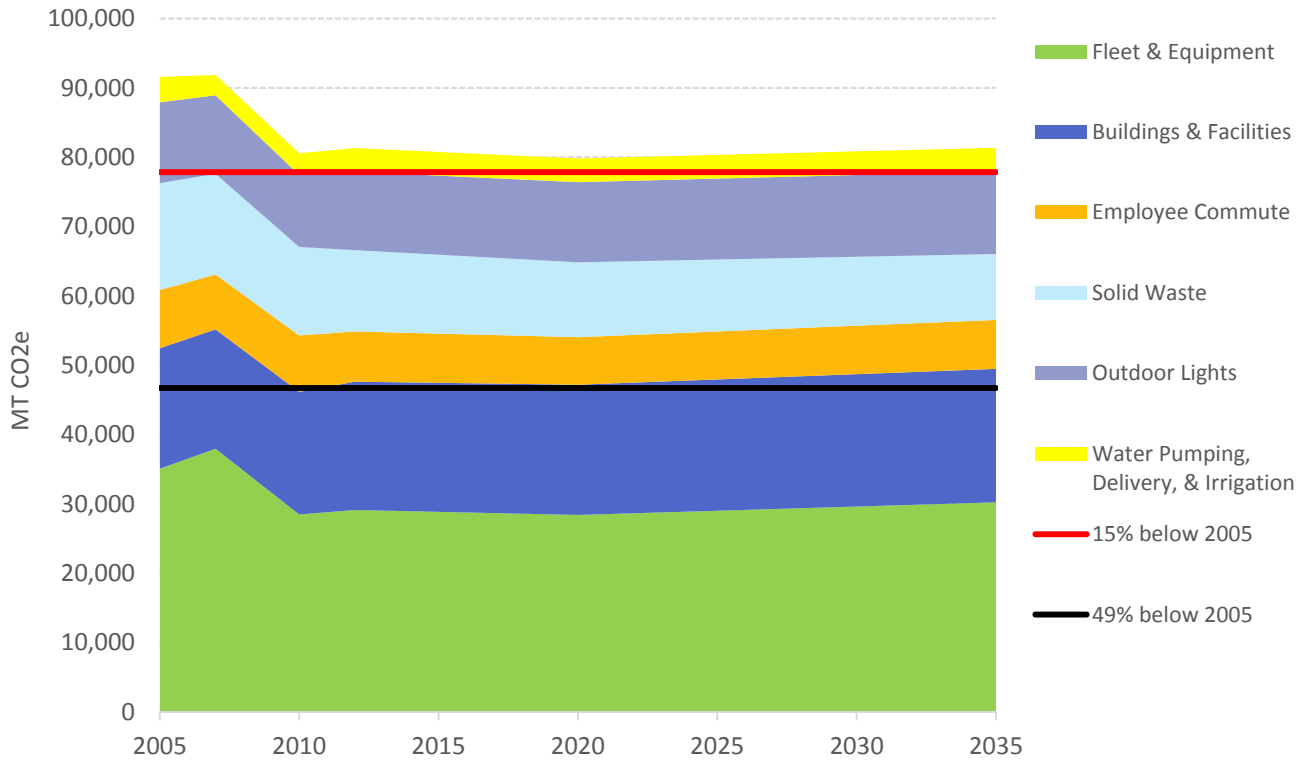

Figure 22. Municipal Emissions Inventories, Projections, and Targets

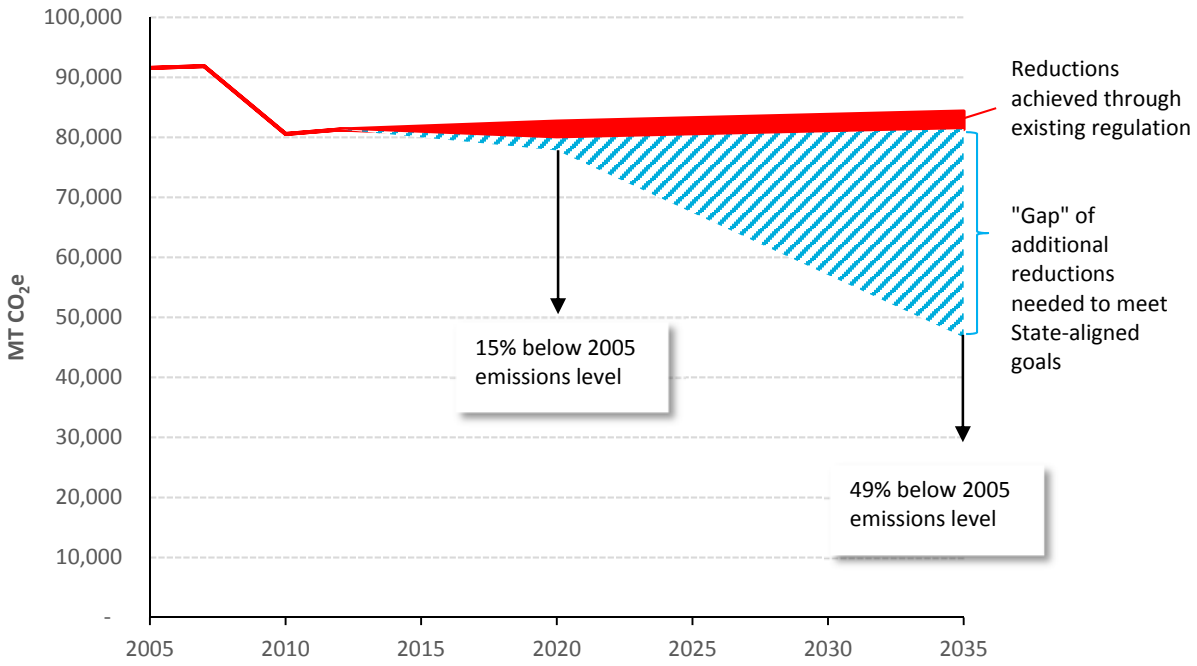

Figure 23. Gap Chart of Municipal BAU, Adjusted BAU, and Target Emissions

Conclusions and Next Steps

This report presents the South Bay subregional summary of community and municipal inventories, forecasts, and recommended reduction targets. The report shows that the subregion has achieved reductions to date (from 2005 to 2012) and will continue to see emissions reductions through 2020 due to existing State regulations. However, the level of emissions and the increase or decrease achieved on a per-city basis is highly variable and reflects the unique characteristics of the subregion. Emissions inventories should be tracked and monitored regularly, such as every 3 to 5 years.

References

Association of Environmental Professionals. 2013. The California Supplement to the United States Community-Wide Greenhouse Gas (GHG) Emissions Protocol.

California Air Resources Board. 2010. Local Government Operations Protocol For the quantification and reporting of greenhouse gas emissions inventories version 1.1.

———. 2011. California Greenhouse Gas Emissions Inventory: 2000–2009.

ICLEI 2012. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions version 1.0.

Intergovernmental Panel on Climate Change (IPCC). 1996. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.

———. 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Appendix 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.

Appendix B: Methodology

This appendix provides a detailed description of the data sources, emission factors, policies, and assumptions used to develop the greenhouse gas (GHG) emissions inventories, forecasts under a business-as-usual (BAU) scenario, forecasts under an Adjusted BAU scenario, and the recommended GHG reduction targets.

Protocols

The city-specific GHG inventories for 2005, 2007, 2010, and 2012 were calculated using tools and guidance documents developed or supported by government agencies. Calculation protocols have been developed to ensure consistency among community and municipal inventories. Specifically, the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) (ICLEI 2012) and the California Supplement (AEP 2013) were used for the community inventories and the Local Government Operations Protocol (LGOP) was used for the municipal inventories (CARB 2010). These protocols often have multiple calculation methods for a single emission source depending on the data available. There are two broad approaches for calculating emissions: "bottom-up" and "top-down." A bottom-up approach relies on end-use data, such as the city-level electricity usage. A top-down approach relies on aggregated data that is allocated to the city based on population, employment, or other relevant indicator. Bottom-up calculations were performed whenever possible to provide the most detailed and likely accurate picture of emissions within a jurisdiction; however, when detailed data were not available, other appropriate methods were used and are described in this appendix. Data were also calculated and managed to best fit the GHG inventory and planning software tool used for this project, called ClearPath. ClearPath was developed by the Statewide Energy Efficiency Collaborative (SEEC) which is a partnership between several statewide agencies, utilities, and non-profits to assist cities and counties in climate mitigation planning. ClearPath is further described at californiaseec.org. In addition, a South Bay Cities Council of Governments (SBCCOG) User's Guide is being developed as part of this project to help cities and SBCCOG to maintain the data and provide for consistent reporting of emissions over time. Subregional emissions were developed by summing the emissions calculated for each city (community and municipal operations).

Global Warming Potential Factors

The inventories include the three GHGs most relevant to community and municipal emissions: CO_2, CH_4, and N_2O. Each GHG differs in its ability to absorb heat in the atmosphere based on their molecular properties and expected lifetime in the atmosphere, and it is useful to describe emissions in one unit of measurement. That unit of measurement is a CO_2-equivalent, or CO_2e and Global Warming Potential (GWP) factors are used to standardize emissions from various GHGs. GWP factors, developed by the Intergovernmental Panel on Climate Change (IPCC), represent the heat-trapping ability of each GHG relative to that of CO_2. For example, the GWP factor of CH_4 is 25 because one metric ton (MT) of CH_4 has 25 times the heat-trapping capacity as one MT CO_2 (over a 100-year period). IPCC periodically updates the GWP factors of GHGs based on new science and updated background mixing ratios of CO_2. CO_2 always has a GWP factor of 1 and the other GHGs are calculated relative to CO_2. The California Air Resources Board (CARB) recently updated their GWP factors to align with the IPCC's Fourth Assessment Report, as shown in Table B-1. GWP factors are unitless. Emissions in the inventories are reported in units of CO_2e.

Table B-1. Global Warming Potentials

	CO_2	CH_4	N_2O
GWP	1	25	298

Source: IPCC Fourth Assessment Report, 2007.

Activity Data

Activity data is the end-use consumption amount of a sector, such as kilowatt hours of electricity, therms of natural gas, and vehicle miles traveled for on-road transportation. In estimating the city-level historic GHG emissions, activity data at the city level were obtained when possible (a "bottom-up" approach). When not available, other data sources were used, generally at the county level (a "top-down" approach). Municipal data for 2005 and 2007 were obtained from the city-specific previous inventory reports. Other data were provided by the sources as identified Table B-2.

Table B-2. Activity Data Sources

Data	Data Source	Notes
Community Electricity	Southern California Edison	
Municipal Electricity	Southern California Edison	Maintained by SBCCOG
Community Natural Gas	Southern California Gas Company	
Municipal Natural Gas	Southern California Gas Company	
Community Water	Various water providers in the South Bay subregion	
Vehicle Miles Traveled	Southern California Association of Governments (SCAG)	Origin-destination approach, described below
Demographic Data	SCAG	
Vehicle Fleet	Cities	
Employee Commute	Cities	
Off-Road Emissions	OFFROAD Model	County-level data
Waste	CalRecycle	

Origin-Destination VMT

For the community inventory, activity data (vehicle miles traveled) were based on an origin-destination approach used by the State in developing emissions target for metropolitan planning organizations under SB 375. This approach has also been the typical approach used in estimating emission within a city. This approach accounts for:

- Half of the emissions where one endpoint is in the City, for example either the origin or destination of the trip.
- All of the emissions where the trip begins and ends within the City.
- None of the emissions that are "pass-through"; that is, a trip passes through the City but does not begin or end within its boundary.

This approach is used to account for trips or portions of trips that the city may have some control over. Again, subregional data used a summation of city-level data.

Cap-and-Trade Entities

Some cities within the subregion have major industrial facilities within their borders. Through the Cap-and-Trade Program, the State regulates the GHG emissions from some of these industrial facilities. The Cap-and-Trade Program currently includes electric utilities and large industrial facilities with emissions equal to or exceeding 25,000 MT CO_2e and will expand in 2015 to include suppliers of transportation, natural gas, and other fuels with annual emissions equal to or exceeding 25,000 MT CO_2e. Entities that are regulated as part of the Cap-and-Trade Program are called "covered entities" and must obtain compliance instruments equal to their entity's emissions. Each covered entity is required to procure emissions allowances and/or offset credits equal to their emissions. The allowances and offset credits are the two types of compliance instruments permitted in the Cap-and-Trade Program. Allowances are distributed by CARB to entities directly or by auction and may be traded in the free market. CARB-approved offset credits may be purchased from third-party registries to meet up to 8% of the entity's compliance obligation. Each compliance instrument is equivalent to 1 MT CO_2e.

Over time, the number of compliance instruments available at the State level will decline and emissions will decrease. The emissions associated with covered entities are already regulated at the State level and therefore, the cities do not have significant local control over the GHG emissions. The current protocol recommends excluding the covered entities' GHG emissions from a city's inventories. In an effort to be consistent with protocol, data were reviewed to determine to what extent covered entities are included.

Emissions from covered entities that would be included in a city's inventory are from natural gas and electricity, and major industrial users generally utilize natural gas for their operations to a much larger extent than they utilize electricity. Data provided by SCG and SCE for the inventories are protected under privacy restrictions which fall under the 15/15 rule.[1] Each utility provides data with these protections applied consistent with their individual corporate reporting protocols. The utilities do not specify if covered entities are included in the data provided. In comparing data from past inventory years, the electricity data are consistent and natural gas data are significantly reduced in cities with major industrial users, leading to the conclusion that once the 15/15 rule was applied, major emitters, including many covered entities, were likely removed from the total natural gas data. If additional information becomes available that either allows the individual cities to better separate out the energy usage from covered entities or provides better clarity of the current data aggregation, SBCCOG recommends that those cities review the information and determine whether adjustments to the inventories and/or associated reports are warranted. If adjustments are made, SBCCOG recommends they be consistent among all inventory years and with current quantification methodology.

Community Activity Data

Community activity data are shown in Table B-3, except for off-road emissions, which are shown in Table B-4 for Los Angeles County.

[1] The 15/15 rule requires that any aggregated information provided by the Utilities must be made up of at least 15 customers and a single customer's load must be less than 15% of an assigned category. If the number of customers in the compiled data is below 15, or if a single customer's load is more than 15% of the total data, categories must be combined before the information is released. The Rule further requires that if the 15/15 Rule is triggered for a second time after the data has been screened once already using the 15/15 Rule, the customer be dropped from the information provided.

Table B-3. Activity Data used in 2005, 2007, 2010, and 2012 Community Inventories

Sector	2005	2007	2010	2012	% Change 2005 to 2012
On-road Transportation					
Total Vehicle Miles Traveled	5,437,032,949	5,370,381,937	5,784,570,414	5,789,341,246	6.5%
Residential Energy[1]					
Electricity (kWh)	1,415,208,916	1,462,712,125	1,426,494,894	1,420,238,819	0.4%
Natural Gas (therms)	111,545,007	113,634,137	111,334,047	106,720,574	-4.3%
Commercial/Industrial Energy					
Electricity (kWh)	5,604,871,869	5,181,332,627	1,333,203,873	5,234,612,038	-6.6%
Natural Gas (therms)	309,133,064	238,760,343	315,215,365	252,131,220	-18.4%
Solid Waste					
Landfilled (tons)	1,093,309	978,979	824,050	774,255	-29.2%
ADC (tons) [2]	29,151	26,890	15,127	22,648	-22.3%
Closed Landfills (CO_2e)	247,582	237,874	224,022	215,238	-13.1%
Water and Wastewater					
Water (MG)	43,808	45,309	39,157	39,647	-9.5%
Recycled Water (MG)	4,024	4,043	3,907	4,329	7.6%
Wastewater (City portion of countywide residents)	7.7%	7.6%	7.6%	7.6%	-1.0%
Off-road sources[3] (% of LA County emissions attributed to the subregion)					
Lawn & Garden (% Households)	8.4%	8.3%	7.8%	7.8%	-7.4%
Construction (% Building permits)	6.6%	5.4%	8.5%	4.5%	-31.6%
Industrial (% Manufacturing jobs)	11.8%	12.3%	12.4%	12.3%	4.4%
Light Commercial (% Other jobs)	7.89%	8.19%	8.18%	8.16%	3.4%
Recreation (Population weighted by income)	13.39%	13.24%	13.04%	12.48%	-6.8%
Agriculture (% Ag. Jobs)	3.1%	3.3%	3.8%	3.4%	7.6%

1 Data provided as a single number by Edison. Data were apportioned using Residential/Non-residential proportion in 2012.

2 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.

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

Table B-4. Emissions from Off-road Categories for Los Angeles County

Off-road Class	GHG Type	2005 (MT CO_2e /yr)	2007 (MT CO_2e /yr)	2010 (MT CO_2e /yr)	2012 (MT CO_2e /yr)
Agricultural Equipment	CO_2	921.79	910.27	893.24	882.09
	CH_4	0.19	0.17	0.14	0.12
	N_2O	0.01	0.01	0.01	0.01
Construction and Mining Equipment	CO_2	268,646.23	277,541.76	290,911.26	299,875.79
	CH_4	34.12	31.44	28.24	26.28
	N_2O	0.22	0.24	0.25	0.26
Industrial Equipment	CO_2	8,099.90	8,562.29	9,255.58	9,870.65
	CH_4	7.16	6.2	4.46	3.89
	N_2O	0.69	0.63	0.56	0.55
Lawn and Garden Equipment	CO_2	2,581.13	2,737.30	2,968.71	3,215.02
	CH_4	4.98	4.87	4.76	4.96
	N_2O	2.01	2.01	2.01	2.13
Light Commercial Equipment	CO_2	5,300.36	5,572.36	5,979.92	6,387.77
	CH_4	2.83	2.54	2.18	2.05
	N_2O	0.91	0.97	1.02	1.07
Recreational Equipment	CO_2	286.54	309.8	343.68	369.04
	CH_4	2.14	2.32	2.58	2.77
	N_2O	0.52	0.57	0.64	0.68

Municipal Activity Data

The summation of all cities' municipal operations activity data are shown in Table B-5.

Employee Commute

Data for Employee Commute in ClearPath are entered as gasoline or diesel. Annual vehicle miles traveled is entered as is the percent of miles traveled by passenger cars, light trucks, and heavy trucks. Data for employee commute was gathered using ridership surveys in 2014 through SurveyMonkey.com, through ridership analysis conducted as part of an annual requirement through the South Coast Air Quality Management District, or previous survey data. City-specific details are available in individual city IFT reports.

Table B-5. Activity Data used in 2005, 2007, 2010, and 2012 Municipal Inventories

Sector	2005	2007	2010	2012	% Change 2005 to 2012
Buildings & Facilities					
Electricity (kWh)	43,153,171	41,909,538	40,454,841	42,029,692	-3%
Natural Gas (therms)	786,713	966,187	1,131,058	941,142	20%
Outdoor Lights					
City-owned Electricity (kWh)	18,147,801	18,867,262	15,557,904	14,909,722	-18%
SCE-owned (kWh)	20,270,780	20,544,656	20,546,803	20,432,348	1%
Fleet & Equipment					
City-owned Fleet					
Gasoline (gallons)	926,802	1,279,933	1,105,710	1,067,393	15%
Diesel (gallons)	1,053,842	995,176	494,438	439,903	-58%
LPG (gallons)	8,128	11,718	8,656	8,905	10%
CNG (standard cubic feet)	3,954,322	5,691,584	5,752,257	6,039,635	53%
Contracted Fleet[1]					
Gasoline (gallons)	86,292	89,707	60,258	61,217	-29%
Diesel (gallons)	378,164	363,245	223,176	192,367	-49%
LPG (gallons)	46,094	66,661	102,499	94,493	105%
CNG (standard cubic feet)	5,454,678	5,631,949	33,047,748	38,586,632	607%
LNG (gallons)	652,989	557,800	557,800	557,800	-15%
Employee Commute[2]					
Gasoline (vehicle miles traveled)	19,805,963	18,895,982	19,435,405	18,727,302	-5%
Diesel (vehicle miles traveled)	59,247	66,884	195,869	181,498	206%
# Full-time Equivalent Employees	5,976	5,366	4,660	4,968	-17%
Solid Waste[1]					
Generated Waste (tons)	19,462	17,745	17,605	17,774	-9%
Water Delivery, Pumping, & Irrigation					
Electricity (kWh)	12,006,051	10,155,756	10,881,624	10,690,266	-11%
Aviation					
Aviation Gasoline (gallons)	109,503	135,752	69,075	100,699	-8%
Jet A Fuel (gallons)	275,195	335,100	157,002	214,562	-22%

Emission Factors

Emissions factors are used to convert activity data to GHG emissions. An emission factor is defined as the average emission rate of a given GHG for a given source, relative to units of activity. By definition, an emission factor is related to activity data. The emission factors used in the inventories are described by sector below.

Electricity

California utilities report the average CO_2 content per output of electricity on an intermittent basis. The CO_2-intensity of electricity varies by utility and year, due to changes in supply, renewable generation, and other factors. The community and municipal operations use electricity provided by SCE except for embedded energy in water, which travels throughout the state and therefore utilizes electricity from multiple utilities (and are shown under the Water Sector).

Southern California Edison

SCE reported CO_2 factors for 2005 and 2007 through the Climate Registry, and a CO_2e factor for 2012 in their 2012 Corporate Responsibility & Sustainability Report. When an emission factor is unknown for a certain year, it is standard to use the most recently-reported historic factor until (and if) there is an updated factor. There is no published SCE emission factor for 2010; therefore the factor for 2007 was used for SCE electricity-related emissions calculations in 2010 (Table B-6).

Table B-6. Southern California Edison Electricity Emission Factors

Year	CO_2	CH_4	N_2O	Proxy Year	Data Source
2005	665.72	0.03	0.011	NA	CO_2: Climate Registry. CH_4 and N_2O: U.S. Community Protocol
2007	630.89	0.029	0.010	NA	CO_2: Climate Registry. CH_4 and N_2O: U.S. Community Protocol
2010	630.89	0.029	0.010	2007	CO_2: Climate Registry. CH_4 and N_2O: U.S. Community Protocol
2012	705[1]	NA	NA	NA	2012 Corporate Responsibility & Sustainability Report

NA: Not Applicable.

1 The 2012 factor was reported as CO_2e; therefore, there are no CH_4 and N_2O factors.

Natural Gas Combustion

Emission factors for natural gas do not vary greatly over time or by supplier. Therefore, emissions factors are U.S. averages as listed in the Community Protocol and are applied for all years (TableB-7).

Table B-7. Natural Gas Emission Factors

	CO_2	CH_4	N_2O	Data Source
kg /MMBtu	53.02	0.005	0.0001	U.S. Community Protocol

Transportation and Mobile Sources

EMFAC Model

CO_2 emission factors for transportation and mobile sources are calculated using the State-developed Emissions Factor (EMFAC) model, which can be downloaded at http://www.arb.ca.gov/emfac/. Emissions are available at the county level and emission factors were developed and applied to vehicle miles traveled specific to each inventory year. Data are aggregated as annual emissions for all vehicle model years and speeds, but separated by vehicle category. Vehicle categories include light-duty autos, light-duty trucks, medium-duty vehicles, heavy-duty trucks, and motorcycles.[2] These categorizations are used to develop an emissions factor for gasoline and diesel vehicles. Emission factors were developed using total CO_2 exhaust, which includes emissions from vehicles in motion, idling, and ignition. While emissions from idling and ignitions are not directly related to mileage, they were included so that reductions from measures that may decrease idling could be accounted for in future inventories.

On-Road Transportation

Emissions were converted to emission factors as grams of CO_2 per mile for gasoline and diesel vehicle using EMFAC and a 3-step process (for each inventory year):

1. Calculate the vehicle-class average fuel efficiency (miles/gallon) using EMFAC vehicle miles traveled and gallons of fuel consumed for Los Angeles County;
2. Calculate the vehicle-class average CO_2 emission factor using EMFAC CO_2 emissions[3] and gallons of fuel consumed for Los Angeles County;
3. Calculate the average grams CO_2/mile traveled factor weighted by vehicle class miles traveled for Los Angeles County.

[2] Vehicle categories may use either EMFAC2007 or EMFAC2011 categorizations and result in the same data for the purposes of these inventories; EMFAC2007 categories were used here EMFAC2011 further disaggregates medium heavy-duty vehicles and heavy heavy-duty vehicles into 29 vehicle categories. This level of detail is not needed for these inventories. More information on vehicle categories is available at http://www.arb.ca.gov/msei/vehicle-categories.xlsx.

[3] For 2010 and 2012, the emissions accounting for the effects of existing policies (Pavley and Low Carbon Fuel Standard) were used. These standards did not exist in 2005 and 2007.

EMFAC does not provide emissions for CH_4 and N_2O; therefore, factors from the Community Protocol were used (Table B-8).

Table B-8. Fleet-Average Emission Factors

	Gasoline On Road Average Factor (grams/mile)			Diesel On Road Average Factor (grams/mile)		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
2005	466.062	0.030	0.034	1329.797	0.001	0.001
2007	464.019	0.028	0.029	1331.634	0.001	0.001
2010	458.638	0.028	0.029	1280.045	0.001	0.001
2012	442.657	0.028	0.029	1302.653	0.001	0.001

Employee Commute

Emissions from employee commute in the municipal operations are calculated using annual vehicle miles traveled for gasoline and diesel. CO_2 emissions are estimated using a default emission factor of 8.78 and 10.21 kg/gallon for gasoline and diesel, respectively[4] and fuel economy, which is based on EMFAC outputs for each inventory year and vehicle class. Vehicle miles traveled are converted to CH_4 and N_2O emissions using emission factors from the Community Protocol. Table B-9 shows the miles per gallon and grams (CH_4 and N_2O) per mile used to estimate emissions from employee commute by vehicle class.

Vehicle Fleet

Vehicle fleet consists of city-owned and contracted vehicles used to perform city services. Vehicle Fleet requires input of gallons of fuel used by fuel type to estimate CO_2 emissions. Vehicle miles traveled are used to estimate CH_4 and N_2O. The factors used for each city are shown in Table B-9.

Table B-9. Employee Commute and Vehicle Fleet Emission Factors

		2005	2007	2010	2012
Gasoline					
Passenger Vehicle	MPG	21.700	21.875	22.027	22.064
	g CH_4/mi	0.030	0.028	0.028	0.028
	g N_2O/mi	0.034	0.029	0.029	0.029
Light Truck	MPG	16.575	16.666	16.795	16.823
	g CH_4/mi	0.035	0.031	0.031	0.031
	g N_2O/mi	0.049	0.043	0.043	0.043
Heavy Truck	MPG	12.754	12.806	12.854	12.856
	g CH_4/mi	0.033	0.033	0.033	0.033
	g N_2O/mi	0.013	0.013	0.013	0.013
Diesel					
Passenger Vehicle	MPG	27.558	27.662	29.006	29.889
	g CH_4/mi	0.001	0.001	0.001	0.001

[4] Information from ClearPath developers e-mail dated June 19, 2014.

	g N_2O/mi	0.001	0.001	0.001	0.001
Light Truck	MPG	27.032	27.251	27.705	28.498
	g CH_4/mi	0.001	0.001	0.001	0.001
	g N_2O/mi	0.001	0.001	0.001	0.001
Heavy Truck	MPG	17.343	17.588	18.797	18.858
	g CH_4/mi	0.005	0.005	0.005	0.005
	g N_2O/mi	0.005	0.005	0.005	0.005

Note: MPG is miles per gallon and is derived from EMFAC at the county level. CH_4 and N_2O emission factors are from the Community Protocol; Passenger Vehicle and Light Truck emission factors have data for 2005 and later; Heavy Truck only have 2010 data.

Off-Road

Off-road emissions include emissions from agriculture, construction, industrial, lawn and garden, light commercial, and recreational equipment. Annual emissions of CO_2, CH_4, and N_2O are available at the county level from the State's OFFROAD model. To estimate values for each city, relevant indicator data are used to estimate the proportion of county-level emissions attributable to the city. Table B-10 lists the indicator used to estimate each city's portion of emissions for each category and Table B-11 shows summed subregional data. Indicator data were obtained from SCAG.

Table B-10. Off-road Emissions Indicators

Category	Indicator
Agriculture Equipment	Agriculture Jobs
Construction Equipment	Building Permits Issued
Industrial Equipment	Manufacturing Jobs
Lawn and Garden Equipment	Households
Light Commercial Equipment	Non- Manufacturing or Agriculture Jobs
Recreational Equipment	Population, Weighted by Median Income

Table B-11. Off-road Emissions Indicator Data

		Ag. Jobs	Building Permits	Mfg. Jobs	Households	Other Jobs[1]	Population	Income ($)
2005	Subregion	426	1,688	54,367	267,314	319,242	751,724	85,011
	County	13,562	25,623	461,099	3,178,736	4,045,922	9,816,200	48,606
	%	3.14%	6.59%	11.79%	8.41%	7.89%	13.39%	
2007	Subregion	447	1,090	56,708	268,026	331,435	745,989	89,268
	County	13,562	20,303	461,099	3,224,053	4,045,922	9,780,800	51,439
	%	3.30%	5.37%	12.30%	8.31%	8.19%	13.24%	
2010	Subregion	408	631	44,745	268,584	307,308	746,212	96,107
	County	10,598	7,466	362,157	3,454,093	3,758,244	9,818,605	56,000
	%	3.85%	8.45%	12.36%	7.78%	8.18%	13.04%	
2012	Subregion	365	853	45,412	268,963	312,539	749,950	88,697
	County	10,798	18,926	369,005	3,454,093	3,829,313	9,889,632	53,880
	%	3.38%	4.51%	12.31%	7.79%	8.16%	12.48%	

Note: Some percentages may appear off due to rounding. Ag. = Agriculture. Mfg. = Manufacturing.

1 Other indicates non-manufacturing and non-agricultural.

Water

Emissions from water are indirect. Water requires energy to move from its source to final treatment and the energy for most of these processes is not captured in local utility data (i.e., the portion that is used in a home or business and therefore contained in the owner's utility bill). This portion is termed the "embedded energy" in water and particularly for southern California, the energy embedded in water is high and should be accounted for in a community inventory. The California Energy Commission (CEC) developed a report, titled Refining Estimates for Water-Related Energy Use in California, which estimates the energy required to supply, convey, distribute, and treat water in northern and southern California. Recycled water is less energy-intensive because it does not require the supply and conveyance energy. Outdoor water infiltrates into the ground and therefore does not have the wastewater energy treatment component. Therefore, the emission factors are adjusted to account for the proportion of recycled and outdoor water. The amount of water used for indoor or outdoor use was not available at the city level; however, the 2010 Los Angeles Department of Water & Power, Urban Water Management Plan states that 61% of water is for indoor use for the City of Los Angeles. The water usage is assumed to be similar for the South Bay sub-region. Therefore, the embedded energy in a million gallon (MG) of water in each is estimated in Table B-12 using the CEC report and estimated indoor vs. outdoor water usage in the region.

Table B-12. Energy Embedded in Water

	Conventional[1] (kWh/MG)	Recycled (kWh/MG)
Supply and Convey	9,727	--
Treatment	111	111
Distribution	1,272	1,272
Wastewater Treatment	1,911	1,911
Total	13,022	3,294
South Bay Factor	12,275.71	2,548.71

1 From CEC's 2006 Refining Estimates for Water-Related Energy Use in California, for Indoor water use in southern California.

Statewide Average Electricity

For energy embedded in water, a statewide average emission factor is applied because water in the South Bay sub-region is supplied from various regions in the State (Table B-13). Similar to SCE data, statewide emission factors are not available for each inventory year. For 2010 and 2012, the 2009 statewide emission factors were used as the proxy year.

Table B-13. California Statewide Electricity Emission Factors

Year	CO_2	CH_4	N_2O	Proxy Year	Data Source
2005	948.28	0.03	0.011	NA	U.S. Community Protocol
2007	919.64	0.029	0.010	NA	U.S. Community Protocol
2010	658.68	0.029	0.006	2009	U.S. Community Protocol
2012	658.68	0.029	0.006	2009	U.S. Community Protocol

NA: Not Applicable.

Wastewater

The emissions for wastewater include the CH_4 and N_2O emissions from processing which consist of three sources: **stationary**, **process**, and **fugitive** emissions.

Stationary emissions are derived from combustion of digester gas at a centralized treatment facility. All cities in the subregion are served by the Los Angeles County Sanitation District's Joint Water Pollution Control Plant (JWPCP). JWPCP is a centralized treatment facility that uses an anaerobic digester process and does not employ a formal nitrification/denitrification (N/DN) system. Detailed information regarding the amount of digester gas produces was not available, so an alternative method using city population information was used. Default factors from the Community Protocol were applied to estimate CH_4 and N_2O emissions for stationary emissions. Although CO_2 emissions are also produced, the fuel source is considered a biofuel, and the resulting CO_2 emissions are considered "biogenic" and are not reported[5].

Process emissions include N_2O emissions as a result of N/DN processes at the treatment facility. All wastewater facilities have emissions from N/DN—some facilities have a formal N/DN process, which would result in greater N/DN emissions, but for the JWPCP, N/DN emissions are solely a result of natural processes. The recommended approach to estimating these emissions is through the population served

[5] Emissions from digester gas combustion are automatically calculated in ClearPath when population is entered.

and default factors listed in the Community Protocol. In an advanced, centralized treatment facility, stationary and process emissions are relatively small compared to fugitive emissions. The Community Protocol, and likewise ClearPath, recommends multiplying the population-derived emissions by 1.25 to account for commercial and industrial discharges to the system. Regions without any commercial and industrial sources should use a factor of 1.0. Individual city IFT reports describe which factor was used. Subregional data sum emissions data from all individual cities.

Fugitive emissions occur from inflow (septic systems) and effluent discharge. JWPCP reports facility-wide effluent, and effluent nitrogen content, which are factors used in estimating fugitive emissions (Table B-14). Individual cities' portion was determined by estimating the proportion of the population served by JWPCP. Subregional emissions were determined by summing each city's emissions. The ClearPath tool requires the daily N load in kg N per day. This is calculated using the factors listed in Table B-14 and the Community Protocol Equation WW.12:

> Daily N Load for the City (kg N/day) = Effluent X Effluent Nitrogen Content X gallons/liter X City Population/Service Population,

Where Effluent is the facility-wide discharge in millions of gallons per day (MGD), Effluent Nitrogen Content is the average nitrogen content per volume (mg/L), and gallons/liter is a conversion factor (3.79). The Daily N Load entered into ClearPath was adjusted by a factor of 0.5 to account for the difference in emission factors for direct ocean discharge and stream/river discharge. In ClearPath, ocean discharge is not an option; however, the emissions are estimated to be ½ of those from discharge to a stream or river (see Community Protocol Appendix F). Therefore, the Daily N Load was adjusted by 0.5 to account for this difference.

Table B-14. Los Angeles County Joint Water Pollution Control Plant Data Used in Wastewater Fugitive Emissions

	2005	2007	2010	2012
Effluent (MGD)	403[a]	296[b]	237[c]	264[d]
Effluent Nitrogen content (mg/L)	40[a]	36.7[b]	39.7[e]	41.1[d]

a Default assumption based on influent.
b 2008 annual report data.
c 2011 annual report data.
d 2013 annual report data.
e Based on communication with Los Angeles County Sanitation District for 2009.

Solid Waste

Emissions from solid waste are primarily in the form of fugitive emissions of methane from decomposition. Emission factors are derived from the Community Protocol, based on the type of waste disposed. The State conducts a Waste Characterization Study (Study) every 4 to 6 years to determine the amount of waste attributable to each waste type. The Study is conducted at the State level by economic sector; therefore, community-level characterizations are not available. For the community inventory, the overall composition of California's disposed waste stream was used to convert total tons into waste types (Table B-15). For the municipal inventory, the characterization for public administration was used (Table B-15). In addition to community-generated waste, some diverted green waste is used as landfill cover rather than importing landfill cover from other regions. This green waste is known as alternative daily cover

(ADC) and is reported by CalRecycle for each community. The ADC characterization was determined through communication with the developers of ClearPath and does not vary by year or community. The emission factor to determine methane generation varies if the landfill operates a methane flare or generates electricity from methane capture. The Community Protocol recommends using an average factor of 75% recovery from landfill gas, although some landfills with have much higher gas recovery systems, and other landfills do not have any. Carbon dioxide generated by decomposition of waste in landfills is not considered anthropogenic because it would be produced through the natural decomposition process regardless of its disposition in the landfill. Nitrous oxide is not a by-product of decomposition and therefore no fugitive emissions of nitrous oxide are anticipated from this source. The waste characterizations and emission factors used to estimate emissions from solid waste are provided in Table B-15. The "Category in in the 2004 and 2008 Studies" detail which Study categories make up the ClearPath Category.

Table B-15. Waste Characterization and Emission Factors for Solid Waste

ClearPath Category	Category in 2004 and 2008 Studies	Alternative Daily Cover[1]	2004 Study[2]	2008 Study[3]	Public Administration	Emission Factor[1]
Newspaper	Newspaper	0%	2.2%	1.3%	5.5%	0.043
Office Paper	White/Colored Ledger Paper + Other Office Paper + Other Miscellaneous Paper	0%	5.4%	4.9%	13%	0.203
Cardboard	Uncoated Corrugated Cardboard + Paper Bags	0%	6.7%	5.2%	5.1%	0.120
Magazine/ Third Class Mail	Magazines and Catalogs + Remainder/ Composite Paper	0%	6.5%	5.9%	15.4%	0.049
Food Scraps	Food	0%	14.6%	15.5%	9.8%	0.078
Grass	Leaves and Grass	30%	2.1%	1.9%	8.05%	0.038
Leaves	Leaves and Grass	40%	2.1%	1.9%	8.05%	0.013
Lumber	Branches and Stumps + Prunings and Trimmings	0%	9.6%	14.5%	0.1%	0.062
Branches	Lumber	30%	2.6%	3.3%	5%	0.062

1 Breakdown from ClearPath Developers via e-mail dated June 19, 2014. Used for all inventory years.

2 2004 Waste Characterization Study for California, Overall Waste Stream. Used for 2005 inventory. Does not total 100% as not all waste is organic.

3 2008 Waste Characterization Study for California, Overall Waste Stream Used for 2007, 2010, 2012 inventories. Does not total 100% as not all waste is organic.

Forecasts

The forecasts are an estimate of what emissions in the City may be in 2020 and 2035. The forecasts were developed using standard methodologies under two scenarios: Business-as-Usual (BAU) and Adjusted BAU. Subregional forecasts represent the summation of each city's forecast.

Business-as-Usual Forecasts

The BAU scenario uses current (2012) consumption patterns and predicted growth in each in the absence of state and federal legislation that would reduce future emissions. The growth assumptions are those estimated by SCAG in their 2012 Regional Transportation Plan and are applied to emissions sectors based on their relevance. For example, future Residential Energy emissions were developed using current energy use per household (from the 2012 inventory) and the anticipated number of households in the future. Table B-16 shows the growth factors used to project emissions in each city.

Table B-16. Emissions Sectors and Demographic Growth Indicators

Sector	Demographic Indicator
Residential Energy	Households
Commercial/ Industrial Energy	Jobs
Solid Waste, Water, Wastewater, Aviation, Off-Road Sources	Service Population (Population + Jobs)
Transportation	Vehicle Miles Traveled, modeled by SCAG
Municipal Jobs	Municipal Emissions[1]

SCAG: Southern California Association of Governments

1 The number of jobs in each city is used as an indicator for all municipal operation emissions except Aviation, which is forecast consistent with the community forecast (by change in service population).

Adjusted Business-as-Usual Forecasts

The Adjusted BAU scenario also uses growth estimates for each city, and accounts for legislation that will reduce emissions in the future, regardless of city or subregional actions. Table B-17 summarizes the legislation that will reduce emissions in the future and which sectors the legislation applies to.

Table B-17. Legislation Applied to Adjusted BAU Forecasts

Legislation	Description	Emissions Sector Affected
Low Carbon Fuel Standard	Reduce carbon intensity of transportation fuels 10% by 2020.	On-road Transportation, Employee Commute, Vehicle Fleet
AB 1493 and Advanced Clean Cars	Implement GHG standards for passenger vehicles, implement zero-emission vehicle program, support clean fuels outlet regulation.	On-road Transportation
California Building Code Title 24	Improved energy efficiency standards for new residential and non-residential construction.	Residential Energy, Non-residential Energy
Renewable Portfolio Standard[1]	Provide 33% of electricity from renewable sources by 2020.	Water
Senate Bill X7-7	Reduce urban per capita water consumption 20% by 2020.	Water

1 Potential GHG reductions from this legislation were not applied to the electricity in SCE's service territory due to the uncertainty in SCE's generation sources after the closure of the San Onofre Nuclear Generating Station.

Low Carbon Fuel Standard, AB 1493, and Advanced Clean Cars

Changes in on-road emissions in Los Angeles County were modeled using EMFAC, which models both the emissions with and without Low Carbon Fuel Standard and Pavley I. Additional modeling was conducted to estimate the change in emissions due to Advanced Clean Cars. The rate of reductions from on-road transportation measures through 2020 was assumed to be 0.0344% per year for gasoline and 0.0106% per year for diesel. After 2020, the rate of reductions was assumed to be 0.03452% per year for gasoline and 0.0251% per year for diesel.

California Building Code Title 24

Title 24 updates will raise the minimum energy efficiency standards for new buildings, thereby decreasing the expected energy consumption of future development in each city. Under the adjusted BAU scenario, it was assumed that the 2013 Title 24 standards that went into effect in 2014 will make new residential and non-residential buildings more efficient than they would be under the 2008 Title 24 standards for new residential buildings. The energy savings were estimated using analyses developed by the California Energy Commission and the applied to the expected new development in each city to 2020 and 2035. The rate of reductions was applied to each city's 2012 energy use (kWh or therms) per household (for Residential energy) or per job (for Commercial energy). Savings were applied to new development anticipated in each city. Detailed energy savings assumptions are below.

Residential

Residential electricity is estimated to be 32.6% lower under the new standards.[6] This percentage savings is relative to heating, cooling, lighting and water heating only and do not include other appliances, outdoor lighting that is not attached to buildings, plug loads, or other energy uses. Electricity consumption due to heating, cooling, lighting, and water heating accounts for 34% of total household electricity use.[7] Therefore, the percentage of total residential electricity that will be reduced as a result of the 2013 Title 24 standards is 11.1%.

Residential natural gas savings were estimated 5.8% lower under the new standards. Again, this percentage savings pertains only to the energy sources affected by Title 24 Standards. Natural gas consumption due to space and water heating accounts for 86% of total household natural gas use.[8] Therefore, the percentage of total residential natural gas that will be reduced as a result of the 2013 Title 24 standards is 5.0%.

Commercial

Commercial Electricity savings were estimated to be 21.8% lower under the new standards. Title 24-related measures would impact 77.2% of total electricity use in commercial buildings[9]; therefore, 16.8% reduction in electricity consumption may be expected in new commercial development.

Natural gas savings were estimated to be 16.8% under the new standards compared to the previous standards. Heating and cooling account for 69.7% of natural gas consumption in commercial facilities;

[6] CEC Impact Analysis, California's 2013 Building Energy Efficiency Standards, July 2013. CEC-400-2013-008.
[7] CEC 2009 California Residential Appliance Saturation Appliance Study, October 2010. CEC-200-2010-004.
[8] CEC 2009 California Residential Appliance Saturation Appliance Study, October 2010. CEC-200-2010-004.
[9] CEC 2006. California Commercial End-Use Survey. March 2006. CEC-400-2006-005.

therefore, 11.7% reduction in natural gas consumption may be expected from 2013 Title 24 standards applied to new commercial development.

Renewable Portfolio Standard

The Renewable Portfolio Standard will be fully implemented in 2020. The level of implementation varies by utility; however, ICLEI estimates that the average statewide level of implementation is 5% per year, compounded annually. As noted in the Report, this reduction is only taken for electricity used in the transport and treatment of water, which moves throughout the State. The reduction is not taken for electricity wholly within SCE's territory.

Senate Bill X7-7

SB X7-7 will be implemented by individual water districts. The cities in the subregion obtain water from several water districts and each water district has its own water conservation goal. The Adjusted BAU emissions include reductions assumed from each district's conservation goal applied to the expected service population. The individual city assumptions are provided in the city-level IFT reports.

Target Setting

There are no requirements for reductions at the subregional level. Recommended reduction targets were provided in the city-level IFT reports and are based on existing California climate change legislation and State guidance relevant to establishing a GHG reduction target. While State goals are based on a 1990 baseline year, the cities and the subregion have a baseline year of 2005. Therefore, the reduction targets are expressed as a percent reduction below 2005 levels. Targets are recommended for 2020 to align with AB 32 and 2035, which is a midpoint between the 2020 goal and the State's long-term 2050 goal. Planning beyond 2035 is considered speculative, as legislation and technology may change significantly before 2050. While it is important for continued reductions well beyond 2035, no local or subregional targets are recommended at this time.

Table B-18 provides a summary of the State's goals and the State's guidance to local governments regarding GHG reduction targets. This guidance applies to both municipal operations and communitywide emissions reductions efforts and were applied to the subregional emissions.

Table B-18. Summary of State Reduction Targets and Guidance on Local Government Targets Aligned with State Targets

	2020	Interim Year Between 2020-2050	2050
State Targets (AB 32 and EO S-3-05)	1990 levels	NA	80% below 1990 levels
State Guidance on Local Government Targets (AB 32) Scoping Plan Recommended Target and Attorney General's Office Guidance	15% below 2005-2008 levels	Demonstrate a trajectory toward statewide 2050 levels (e.g., 49% below 2005 levels by 2035)	NA

Table B-19 demonstrates how the local and subregional targets are aligned with State targets.

Table B-19. Comparison of 1990 Baseline Targets vs. 2005 Baseline Targets

Target Year	Percent below 1990 Emission Levels	Percent below 2005 Emission Levels
2020	0.0%	15.0%
2021	2.7%	17.3%
2022	5.3%	19.5%
2023	8.0%	21.8%
2024	10.7%	24.1%
2025	13.3%	26.3%
2026	16.0%	28.6%
2027	18.7%	30.9%
2028	21.3%	33.1%
2029	24.0%	35.4%
2030	26.7%	37.7%
2031	29.3%	39.9%
2032	32.0%	42.2%
2033	34.7%	44.5%
2034	37.3%	46.7%
2035	40.0%	49.0%

Appendix B: Methodology

This appendix provides a detailed description of the data sources, emission factors, policies, and assumptions used to develop the greenhouse gas (GHG) emissions inventories, forecasts under a business-as-usual (BAU) scenario, forecasts under an Adjusted BAU scenario, and the recommended GHG reduction targets.

Protocols

The city-specific GHG inventories for 2005, 2007, 2010, and 2012 were calculated using tools and guidance documents developed or supported by government agencies. Calculation protocols have been developed to ensure consistency among community and municipal inventories. Specifically, the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) (ICLEI 2012) and the California Supplement (AEP 2013) were used for the community inventories and the Local Government Operations Protocol (LGOP) was used for the municipal inventories (CARB 2010). These protocols often have multiple calculation methods for a single emission source depending on the data available. There are two broad approaches for calculating emissions: "bottom-up" and "top-down." A bottom-up approach relies on end-use data, such as the city-level electricity usage. A top-down approach relies on aggregated data that is allocated to the city based on population, employment, or other relevant indicator. Bottom-up calculations were performed whenever possible to provide the most detailed and likely accurate picture of emissions within a jurisdiction; however, when detailed data were not available, other appropriate methods were used and are described in this appendix. Data were also calculated and managed to best fit the GHG inventory and planning software tool used for this project, called ClearPath. ClearPath was developed by the Statewide Energy Efficiency Collaborative (SEEC) which is a partnership between several statewide agencies, utilities, and non-profits to assist cities and counties in climate mitigation planning. ClearPath is further described at californiaseec.org. In addition, a South Bay Cities Council of Governments (SBCCOG) User's Guide is being developed as part of this project to help cities and SBCCOG to maintain the data and provide for consistent reporting of emissions over time. Subregional emissions were developed by summing the emissions calculated for each city (community and municipal operations).

Global Warming Potential Factors

The inventories include the three GHGs most relevant to community and municipal emissions: CO_2, CH_4, and N_2O. Each GHG differs in its ability to absorb heat in the atmosphere based on their molecular properties and expected lifetime in the atmosphere, and it is useful to describe emissions in one unit of measurement. That unit of measurement is a CO_2-equivalent, or CO_2e and Global Warming Potential (GWP) factors are used to standardize emissions from various GHGs. GWP factors, developed by the Intergovernmental Panel on Climate Change (IPCC), represent the heat-trapping ability of each GHG relative to that of CO_2. For example, the GWP factor of CH_4 is 25 because one metric ton (MT) of CH_4 has 25 times the heat-trapping capacity as one MT CO_2 (over a 100-year period). IPCC periodically updates the GWP factors of GHGs based on new science and updated background mixing ratios of CO_2. CO_2 always has a GWP factor of 1 and the other GHGs are calculated relative to CO_2. The California Air Resources Board (CARB) recently updated their GWP factors to align with the IPCC's Fourth Assessment Report, as shown in Table B-1. GWP factors are unitless. Emissions in the inventories are reported in units of CO_2e.

Table B-1. Global Warming Potentials

	CO_2	CH_4	N_2O
GWP	1	25	298

Source: IPCC Fourth Assessment Report, 2007.

Activity Data

Activity data is the end-use consumption amount of a sector, such as kilowatt hours of electricity, therms of natural gas, and vehicle miles traveled for on-road transportation. In estimating the city-level historic GHG emissions, activity data at the city level were obtained when possible (a "bottom-up" approach). When not available, other data sources were used, generally at the county level (a "top-down" approach). Municipal data for 2005 and 2007 were obtained from the city-specific previous inventory reports. Other data were provided by the sources as identified Table B-2.

Table B-2. Activity Data Sources

Data	Data Source	Notes
Community Electricity	Southern California Edison	
Municipal Electricity	Southern California Edison	Maintained by SBCCOG
Community Natural Gas	Southern California Gas Company	
Municipal Natural Gas	Southern California Gas Company	
Community Water	Various water providers in the South Bay subregion	
Vehicle Miles Traveled	Southern California Association of Governments (SCAG)	Origin-destination approach, described below
Demographic Data	SCAG	
Vehicle Fleet	Cities	
Employee Commute	Cities	
Off-Road Emissions	OFFROAD Model	County-level data
Waste	CalRecycle	

Origin-Destination VMT

For the community inventory, activity data (vehicle miles traveled) were based on an origin-destination approach used by the State in developing emissions target for metropolitan planning organizations under SB 375. This approach has also been the typical approach used in estimating emission within a city. This approach accounts for:

- Half of the emissions where one endpoint is in the City, for example either the origin or destination of the trip.
- All of the emissions where the trip begins and ends within the City.
- None of the emissions that are "pass-through"; that is, a trip passes through the City but does not begin or end within its boundary.

This approach is used to account for trips or portions of trips that the city may have some control over. Again, subregional data used a summation of city-level data.

Cap-and-Trade Entities

Some cities within the subregion have major industrial facilities within their borders. Through the Cap-and-Trade Program, the State regulates the GHG emissions from some of these industrial facilities. The Cap-and-Trade Program currently includes electric utilities and large industrial facilities with emissions equal to or exceeding 25,000 MT CO_2e and will expand in 2015 to include suppliers of transportation, natural gas, and other fuels with annual emissions equal to or exceeding 25,000 MT CO_2e. Entities that are regulated as part of the Cap-and-Trade Program are called "covered entities" and must obtain compliance instruments equal to their entity's emissions. Each covered entity is required to procure emissions allowances and/or offset credits equal to their emissions. The allowances and offset credits are the two types of compliance instruments permitted in the Cap-and-Trade Program. Allowances are distributed by CARB to entities directly or by auction and may be traded in the free market. CARB-approved offset credits may be purchased from third-party registries to meet up to 8% of the entity's compliance obligation. Each compliance instrument is equivalent to 1 MT CO_2e.

Over time, the number of compliance instruments available at the State level will decline and emissions will decrease. The emissions associated with covered entities are already regulated at the State level and therefore, the cities do not have significant local control over the GHG emissions. The current protocol recommends excluding the covered entities' GHG emissions from a city's inventories. In an effort to be consistent with protocol, data were reviewed to determine to what extent covered entities are included.

Emissions from covered entities that would be included in a city's inventory are from natural gas and electricity, and major industrial users generally utilize natural gas for their operations to a much larger extent than they utilize electricity. Data provided by SCG and SCE for the inventories are protected under privacy restrictions which fall under the 15/15 rule.[1] Each utility provides data with these protections applied consistent with their individual corporate reporting protocols. The utilities do not specify if covered entities are included in the data provided. In comparing data from past inventory years, the electricity data are consistent and natural gas data are significantly reduced in cities with major industrial users, leading to the conclusion that once the 15/15 rule was applied, major emitters, including many covered entities, were likely removed from the total natural gas data. If additional information becomes available that either allows the individual cities to better separate out the energy usage from covered entities or provides better clarity of the current data aggregation, SBCCOG recommends that those cities review the information and determine whether adjustments to the inventories and/or associated reports are warranted. If adjustments are made, SBCCOG recommends they be consistent among all inventory years and with current quantification methodology.

Community Activity Data

Community activity data are shown in Table B-3, except for off-road emissions, which are shown in Table B-4 for Los Angeles County.

[1] The 15/15 rule requires that any aggregated information provided by the Utilities must be made up of at least 15 customers and a single customer's load must be less than 15% of an assigned category. If the number of customers in the compiled data is below 15, or if a single customer's load is more than 15% of the total data, categories must be combined before the information is released. The Rule further requires that if the 15/15 Rule is triggered for a second time after the data has been screened once already using the 15/15 Rule, the customer be dropped from the information provided.

Table B-3. Activity Data used in 2005, 2007, 2010, and 2012 Community Inventories

Sector	2005	2007	2010	2012	% Change 2005 to 2012
On-road Transportation					
Total Vehicle Miles Traveled	5,437,032,949	5,370,381,937	5,784,570,414	5,789,341,246	6.5%
Residential Energy[1]					
Electricity (kWh)	1,415,208,916	1,462,712,125	1,426,494,894	1,420,238,819	0.4%
Natural Gas (therms)	111,545,007	113,634,137	111,334,047	106,720,574	-4.3%
Commercial/Industrial Energy					
Electricity (kWh)	5,604,871,869	5,181,332,627	1,333,203,873	5,234,612,038	-6.6%
Natural Gas (therms)	309,133,064	238,760,343	315,215,365	252,131,220	-18.4%
Solid Waste					
Landfilled (tons)	1,093,309	978,979	824,050	774,255	-29.2%
ADC (tons) [2]	29,151	26,890	15,127	22,648	-22.3%
Closed Landfills (CO_2e)	247,582	237,874	224,022	215,238	-13.1%
Water and Wastewater					
Water (MG)	43,808	45,309	39,157	39,647	-9.5%
Recycled Water (MG)	4,024	4,043	3,907	4,329	7.6%
Wastewater (City portion of countywide residents)	7.7%	7.6%	7.6%	7.6%	-1.0%
Off-road sources[3] (% of LA County emissions attributed to the subregion)					
Lawn & Garden (% Households)	8.4%	8.3%	7.8%	7.8%	-7.4%
Construction (% Building permits)	6.6%	5.4%	8.5%	4.5%	-31.6%
Industrial (% Manufacturing jobs)	11.8%	12.3%	12.4%	12.3%	4.4%
Light Commercial (% Other jobs)	7.89%	8.19%	8.18%	8.16%	3.4%
Recreation (Population weighted by income)	13.39%	13.24%	13.04%	12.48%	-6.8%
Agriculture (% Ag. Jobs)	3.1%	3.3%	3.8%	3.4%	7.6%

1 Data provided as a single number by Edison. Data were apportioned using Residential/Non-residential proportion in 2012.

2 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.

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

Table B-4. Emissions from Off-road Categories for Los Angeles County

Off-road Class	GHG Type	2005 (MT CO_2e /yr)	2007 (MT CO_2e /yr)	2010 (MT CO_2e /yr)	2012 (MT CO_2e /yr)
Agricultural Equipment	CO_2	921.79	910.27	893.24	882.09
	CH_4	0.19	0.17	0.14	0.12
	N_2O	0.01	0.01	0.01	0.01
Construction and Mining Equipment	CO_2	268,646.23	277,541.76	290,911.26	299,875.79
	CH_4	34.12	31.44	28.24	26.28
	N_2O	0.22	0.24	0.25	0.26
Industrial Equipment	CO_2	8,099.90	8,562.29	9,255.58	9,870.65
	CH_4	7.16	6.2	4.46	3.89
	N_2O	0.69	0.63	0.56	0.55
Lawn and Garden Equipment	CO_2	2,581.13	2,737.30	2,968.71	3,215.02
	CH_4	4.98	4.87	4.76	4.96
	N_2O	2.01	2.01	2.01	2.13
Light Commercial Equipment	CO_2	5,300.36	5,572.36	5,979.92	6,387.77
	CH_4	2.83	2.54	2.18	2.05
	N_2O	0.91	0.97	1.02	1.07
Recreational Equipment	CO_2	286.54	309.8	343.68	369.04
	CH_4	2.14	2.32	2.58	2.77
	N_2O	0.52	0.57	0.64	0.68

Municipal Activity Data

The summation of all cities' municipal operations activity data are shown in Table B-5.

Employee Commute

Data for Employee Commute in ClearPath are entered as gasoline or diesel. Annual vehicle miles traveled is entered as is the percent of miles traveled by passenger cars, light trucks, and heavy trucks. Data for employee commute was gathered using ridership surveys in 2014 through SurveyMonkey.com, through ridership analysis conducted as part of an annual requirement through the South Coast Air Quality Management District, or previous survey data. City-specific details are available in individual city IFT reports.

Table B-5. Activity Data used in 2005, 2007, 2010, and 2012 Municipal Inventories

Sector	2005	2007	2010	2012	% Change 2005 to 2012
Buildings & Facilities					
Electricity (kWh)	43,153,171	41,909,538	40,454,841	42,029,692	-3%
Natural Gas (therms)	786,713	966,187	1,131,058	941,142	20%
Outdoor Lights					
City-owned Electricity (kWh)	18,147,801	18,867,262	15,557,904	14,909,722	-18%
SCE-owned (kWh)	20,270,780	20,544,656	20,546,803	20,432,348	1%
Fleet & Equipment					
City-owned Fleet					
Gasoline (gallons)	926,802	1,279,933	1,105,710	1,067,393	15%
Diesel (gallons)	1,053,842	995,176	494,438	439,903	-58%
LPG (gallons)	8,128	11,718	8,656	8,905	10%
CNG (standard cubic feet)	3,954,322	5,691,584	5,752,257	6,039,635	53%
Contracted Fleet[1]					
Gasoline (gallons)	86,292	89,707	60,258	61,217	-29%
Diesel (gallons)	378,164	363,245	223,176	192,367	-49%
LPG (gallons)	46,094	66,661	102,499	94,493	105%
CNG (standard cubic feet)	5,454,678	5,631,949	33,047,748	38,586,632	607%
LNG (gallons)	652,989	557,800	557,800	557,800	-15%
Employee Commute[2]					
Gasoline (vehicle miles traveled)	19,805,963	18,895,982	19,435,405	18,727,302	-5%
Diesel (vehicle miles traveled)	59,247	66,884	195,869	181,498	206%
# Full-time Equivalent Employees	5,976	5,366	4,660	4,968	-17%
Solid Waste[1]					
Generated Waste (tons)	19,462	17,745	17,605	17,774	-9%
Water Delivery, Pumping, & Irrigation					
Electricity (kWh)	12,006,051	10,155,756	10,881,624	10,690,266	-11%
Aviation					
Aviation Gasoline (gallons)	109,503	135,752	69,075	100,699	-8%
Jet A Fuel (gallons)	275,195	335,100	157,002	214,562	-22%

Emission Factors

Emissions factors are used to convert activity data to GHG emissions. An emission factor is defined as the average emission rate of a given GHG for a given source, relative to units of activity. By definition, an emission factor is related to activity data. The emission factors used in the inventories are described by sector below.

Electricity

California utilities report the average CO_2 content per output of electricity on an intermittent basis. The CO_2-intensity of electricity varies by utility and year, due to changes in supply, renewable generation, and other factors. The community and municipal operations use electricity provided by SCE except for embedded energy in water, which travels throughout the state and therefore utilizes electricity from multiple utilities (and are shown under the Water Sector).

Southern California Edison

SCE reported CO_2 factors for 2005 and 2007 through the Climate Registry, and a CO_2e factor for 2012 in their 2012 Corporate Responsibility & Sustainability Report. When an emission factor is unknown for a certain year, it is standard to use the most recently-reported historic factor until (and if) there is an updated factor. There is no published SCE emission factor for 2010; therefore the factor for 2007 was used for SCE electricity-related emissions calculations in 2010 (Table B-6).

Table B-6. Southern California Edison Electricity Emission Factors

Year	CO_2	CH_4	N_2O	Proxy Year	Data Source
2005	665.72	0.03	0.011	NA	CO_2: Climate Registry. CH_4 and N_2O: U.S. Community Protocol
2007	630.89	0.029	0.010	NA	CO_2: Climate Registry. CH_4 and N_2O: U.S. Community Protocol
2010	630.89	0.029	0.010	2007	CO_2: Climate Registry. CH_4 and N_2O: U.S. Community Protocol
2012	705[1]	NA	NA	NA	2012 Corporate Responsibility & Sustainability Report

NA: Not Applicable.

1 The 2012 factor was reported as CO_2e; therefore, there are no CH_4 and N_2O factors.

Natural Gas Combustion

Emission factors for natural gas do not vary greatly over time or by supplier. Therefore, emissions factors are U.S. averages as listed in the Community Protocol and are applied for all years (TableB-7).

Table B-7. Natural Gas Emission Factors

	CO_2	CH_4	N_2O	Data Source
kg /MMBtu	53.02	0.005	0.0001	U.S. Community Protocol

Transportation and Mobile Sources

EMFAC Model

CO_2 emission factors for transportation and mobile sources are calculated using the State-developed Emissions Factor (EMFAC) model, which can be downloaded at http://www.arb.ca.gov/emfac/. Emissions are available at the county level and emission factors were developed and applied to vehicle miles traveled specific to each inventory year. Data are aggregated as annual emissions for all vehicle model years and speeds, but separated by vehicle category. Vehicle categories include light-duty autos, light-duty trucks, medium-duty vehicles, heavy-duty trucks, and motorcycles.[2] These categorizations are used to develop an emissions factor for gasoline and diesel vehicles. Emission factors were developed using total CO_2 exhaust, which includes emissions from vehicles in motion, idling, and ignition. While emissions from idling and ignitions are not directly related to mileage, they were included so that reductions from measures that may decrease idling could be accounted for in future inventories.

On-Road Transportation

Emissions were converted to emission factors as grams of CO_2 per mile for gasoline and diesel vehicle using EMFAC and a 3-step process (for each inventory year):

1. Calculate the vehicle-class average fuel efficiency (miles/gallon) using EMFAC vehicle miles traveled and gallons of fuel consumed for Los Angeles County;
2. Calculate the vehicle-class average CO_2 emission factor using EMFAC CO_2 emissions[3] and gallons of fuel consumed for Los Angeles County;
3. Calculate the average grams CO_2/mile traveled factor weighted by vehicle class miles traveled for Los Angeles County.

[2] Vehicle categories may use either EMFAC2007 or EMFAC2011 categorizations and result in the same data for the purposes of these inventories; EMFAC2007 categories were used here EMFAC2011 further disaggregates medium heavy-duty vehicles and heavy heavy-duty vehicles into 29 vehicle categories. This level of detail is not needed for these inventories. More information on vehicle categories is available at http://www.arb.ca.gov/msei/vehicle-categories.xlsx.

[3] For 2010 and 2012, the emissions accounting for the effects of existing policies (Pavley and Low Carbon Fuel Standard) were used. These standards did not exist in 2005 and 2007.

EMFAC does not provide emissions for CH_4 and N_2O; therefore, factors from the Community Protocol were used (Table B-8).

Table B-8. Fleet-Average Emission Factors

	Gasoline On Road Average Factor (grams/mile)			Diesel On Road Average Factor (grams/mile)		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
2005	466.062	0.030	0.034	1329.797	0.001	0.001
2007	464.019	0.028	0.029	1331.634	0.001	0.001
2010	458.638	0.028	0.029	1280.045	0.001	0.001
2012	442.657	0.028	0.029	1302.653	0.001	0.001

Employee Commute

Emissions from employee commute in the municipal operations are calculated using annual vehicle miles traveled for gasoline and diesel. CO_2 emissions are estimated using a default emission factor of 8.78 and 10.21 kg/gallon for gasoline and diesel, respectively[4] and fuel economy, which is based on EMFAC outputs for each inventory year and vehicle class. Vehicle miles traveled are converted to CH_4 and N_2O emissions using emission factors from the Community Protocol. Table B-9 shows the miles per gallon and grams (CH_4 and N_2O) per mile used to estimate emissions from employee commute by vehicle class.

Vehicle Fleet

Vehicle fleet consists of city-owned and contracted vehicles used to perform city services. Vehicle Fleet requires input of gallons of fuel used by fuel type to estimate CO_2 emissions. Vehicle miles traveled are used to estimate CH_4 and N_2O. The factors used for each city are shown in Table B-9.

Table B-9. Employee Commute and Vehicle Fleet Emission Factors

		2005	2007	2010	2012
Gasoline					
Passenger Vehicle	MPG	21.700	21.875	22.027	22.064
	g CH_4/mi	0.030	0.028	0.028	0.028
	g N_2O/mi	0.034	0.029	0.029	0.029
Light Truck	MPG	16.575	16.666	16.795	16.823
	g CH_4/mi	0.035	0.031	0.031	0.031
	g N_2O/mi	0.049	0.043	0.043	0.043
Heavy Truck	MPG	12.754	12.806	12.854	12.856
	g CH_4/mi	0.033	0.033	0.033	0.033
	g N_2O/mi	0.013	0.013	0.013	0.013
Diesel					
Passenger Vehicle	MPG	27.558	27.662	29.006	29.889
	g CH_4/mi	0.001	0.001	0.001	0.001

[4] Information from ClearPath developers e-mail dated June 19, 2014.

	g N_2O/mi	0.001	0.001	0.001	0.001
Light Truck	MPG	27.032	27.251	27.705	28.498
	g CH_4/mi	0.001	0.001	0.001	0.001
	g N_2O/mi	0.001	0.001	0.001	0.001
Heavy Truck	MPG	17.343	17.588	18.797	18.858
	g CH_4/mi	0.005	0.005	0.005	0.005
	g N_2O/mi	0.005	0.005	0.005	0.005

Note: MPG is miles per gallon and is derived from EMFAC at the county level. CH_4 and N_2O emission factors are from the Community Protocol; Passenger Vehicle and Light Truck emission factors have data for 2005 and later; Heavy Truck only have 2010 data.

Off-Road

Off-road emissions include emissions from agriculture, construction, industrial, lawn and garden, light commercial, and recreational equipment. Annual emissions of CO_2, CH_4, and N_2O are available at the county level from the State's OFFROAD model. To estimate values for each city, relevant indicator data are used to estimate the proportion of county-level emissions attributable to the city. Table B-10 lists the indicator used to estimate each city's portion of emissions for each category and Table B-11 shows summed subregional data. Indicator data were obtained from SCAG.

Table B-10. Off-road Emissions Indicators

Category	Indicator
Agriculture Equipment	Agriculture Jobs
Construction Equipment	Building Permits Issued
Industrial Equipment	Manufacturing Jobs
Lawn and Garden Equipment	Households
Light Commercial Equipment	Non- Manufacturing or Agriculture Jobs
Recreational Equipment	Population, Weighted by Median Income

Table B-11. Off-road Emissions Indicator Data

		Ag. Jobs	Building Permits	Mfg. Jobs	Households	Other Jobs[1]	Population	Income ($)
2005	Subregion	426	1,688	54,367	267,314	319,242	751,724	85,011
	County	13,562	25,623	461,099	3,178,736	4,045,922	9,816,200	48,606
	%	3.14%	6.59%	11.79%	8.41%	7.89%	13.39%	
2007	Subregion	447	1,090	56,708	268,026	331,435	745,989	89,268
	County	13,562	20,303	461,099	3,224,053	4,045,922	9,780,800	51,439
	%	3.30%	5.37%	12.30%	8.31%	8.19%	13.24%	
2010	Subregion	408	631	44,745	268,584	307,308	746,212	96,107
	County	10,598	7,466	362,157	3,454,093	3,758,244	9,818,605	56,000
	%	3.85%	8.45%	12.36%	7.78%	8.18%	13.04%	
2012	Subregion	365	853	45,412	268,963	312,539	749,950	88,697
	County	10,798	18,926	369,005	3,454,093	3,829,313	9,889,632	53,880
	%	3.38%	4.51%	12.31%	7.79%	8.16%	12.48%	

Note: Some percentages may appear off due to rounding. Ag. = Agriculture. Mfg. = Manufacturing.

1 Other indicates non-manufacturing and non-agricultural.

Water

Emissions from water are indirect. Water requires energy to move from its source to final treatment and the energy for most of these processes is not captured in local utility data (i.e., the portion that is used in a home or business and therefore contained in the owner's utility bill). This portion is termed the "embedded energy" in water and particularly for southern California, the energy embedded in water is high and should be accounted for in a community inventory. The California Energy Commission (CEC) developed a report, titled Refining Estimates for Water-Related Energy Use in California, which estimates the energy required to supply, convey, distribute, and treat water in northern and southern California. Recycled water is less energy-intensive because it does not require the supply and conveyance energy. Outdoor water infiltrates into the ground and therefore does not have the wastewater energy treatment component. Therefore, the emission factors are adjusted to account for the proportion of recycled and outdoor water. The amount of water used for indoor or outdoor use was not available at the city level; however, the 2010 Los Angeles Department of Water & Power, Urban Water Management Plan states that 61% of water is for indoor use for the City of Los Angeles. The water usage is assumed to be similar for the South Bay sub-region. Therefore, the embedded energy in a million gallon (MG) of water in each is estimated in Table B-12 using the CEC report and estimated indoor vs. outdoor water usage in the region.

Table B-12. Energy Embedded in Water

	Conventional[1] (kWh/MG)	Recycled (kWh/MG)
Supply and Convey	9,727	--
Treatment	111	111
Distribution	1,272	1,272
Wastewater Treatment	1,911	1,911
Total	13,022	3,294
South Bay Factor	12,275.71	2,548.71

1 From CEC's 2006 Refining Estimates for Water-Related Energy Use in California, for Indoor water use in southern California.

Statewide Average Electricity

For energy embedded in water, a statewide average emission factor is applied because water in the South Bay sub-region is supplied from various regions in the State (Table B-13). Similar to SCE data, statewide emission factors are not available for each inventory year. For 2010 and 2012, the 2009 statewide emission factors were used as the proxy year.

Table B-13. California Statewide Electricity Emission Factors

Year	CO_2	CH_4	N_2O	Proxy Year	Data Source
2005	948.28	0.03	0.011	NA	U.S. Community Protocol
2007	919.64	0.029	0.010	NA	U.S. Community Protocol
2010	658.68	0.029	0.006	2009	U.S. Community Protocol
2012	658.68	0.029	0.006	2009	U.S. Community Protocol

NA: Not Applicable.

Wastewater

The emissions for wastewater include the CH_4 and N_2O emissions from processing which consist of three sources: **stationary**, **process**, and **fugitive** emissions.

Stationary emissions are derived from combustion of digester gas at a centralized treatment facility. All cities in the subregion are served by the Los Angeles County Sanitation District's Joint Water Pollution Control Plant (JWPCP). JWPCP is a centralized treatment facility that uses an anaerobic digester process and does not employ a formal nitrification/denitrification (N/DN) system. Detailed information regarding the amount of digester gas produces was not available, so an alternative method using city population information was used. Default factors from the Community Protocol were applied to estimate CH_4 and N_2O emissions for stationary emissions. Although CO_2 emissions are also produced, the fuel source is considered a biofuel, and the resulting CO_2 emissions are considered "biogenic" and are not reported[5].

Process emissions include N_2O emissions as a result of N/DN processes at the treatment facility. All wastewater facilities have emissions from N/DN—some facilities have a formal N/DN process, which would result in greater N/DN emissions, but for the JWPCP, N/DN emissions are solely a result of natural processes. The recommended approach to estimating these emissions is through the population served

[5] Emissions from digester gas combustion are automatically calculated in ClearPath when population is entered.

and default factors listed in the Community Protocol. In an advanced, centralized treatment facility, stationary and process emissions are relatively small compared to fugitive emissions. The Community Protocol, and likewise ClearPath, recommends multiplying the population-derived emissions by 1.25 to account for commercial and industrial discharges to the system. Regions without any commercial and industrial sources should use a factor of 1.0. Individual city IFT reports describe which factor was used. Subregional data sum emissions data from all individual cities.

Fugitive emissions occur from inflow (septic systems) and effluent discharge. JWPCP reports facility-wide effluent, and effluent nitrogen content, which are factors used in estimating fugitive emissions (Table B-14). Individual cities' portion was determined by estimating the proportion of the population served by JWPCP. Subregional emissions were determined by summing each city's emissions. The ClearPath tool requires the daily N load in kg N per day. This is calculated using the factors listed in Table B-14 and the Community Protocol Equation WW.12:

> Daily N Load for the City (kg N/day) = Effluent X Effluent Nitrogen Content X gallons/liter X City Population/Service Population,

Where Effluent is the facility-wide discharge in millions of gallons per day (MGD), Effluent Nitrogen Content is the average nitrogen content per volume (mg/L), and gallons/liter is a conversion factor (3.79). The Daily N Load entered into ClearPath was adjusted by a factor of 0.5 to account for the difference in emission factors for direct ocean discharge and stream/river discharge. In ClearPath, ocean discharge is not an option; however, the emissions are estimated to be ½ of those from discharge to a stream or river (see Community Protocol Appendix F). Therefore, the Daily N Load was adjusted by 0.5 to account for this difference.

Table B-14. Los Angeles County Joint Water Pollution Control Plant Data Used in Wastewater Fugitive Emissions

	2005	2007	2010	2012
Effluent (MGD)	403[a]	296[b]	237[c]	264[d]
Effluent Nitrogen content (mg/L)	40[a]	36.7[b]	39.7[e]	41.1[d]

a Default assumption based on influent.
b 2008 annual report data.
c 2011 annual report data.
d 2013 annual report data.
e Based on communication with Los Angeles County Sanitation District for 2009.

Solid Waste

Emissions from solid waste are primarily in the form of fugitive emissions of methane from decomposition. Emission factors are derived from the Community Protocol, based on the type of waste disposed. The State conducts a Waste Characterization Study (Study) every 4 to 6 years to determine the amount of waste attributable to each waste type. The Study is conducted at the State level by economic sector; therefore, community-level characterizations are not available. For the community inventory, the overall composition of California's disposed waste stream was used to convert total tons into waste types (Table B-15). For the municipal inventory, the characterization for public administration was used (Table B-15). In addition to community-generated waste, some diverted green waste is used as landfill cover rather than importing landfill cover from other regions. This green waste is known as alternative daily cover

(ADC) and is reported by CalRecycle for each community. The ADC characterization was determined through communication with the developers of ClearPath and does not vary by year or community. The emission factor to determine methane generation varies if the landfill operates a methane flare or generates electricity from methane capture. The Community Protocol recommends using an average factor of 75% recovery from landfill gas, although some landfills with have much higher gas recovery systems, and other landfills do not have any. Carbon dioxide generated by decomposition of waste in landfills is not considered anthropogenic because it would be produced through the natural decomposition process regardless of its disposition in the landfill. Nitrous oxide is not a by-product of decomposition and therefore no fugitive emissions of nitrous oxide are anticipated from this source. The waste characterizations and emission factors used to estimate emissions from solid waste are provided in Table B-15. The "Category in in the 2004 and 2008 Studies" detail which Study categories make up the ClearPath Category.

Table B-15. Waste Characterization and Emission Factors for Solid Waste

ClearPath Category	Category in 2004 and 2008 Studies	Alternative Daily Cover[1]	2004 Study[2]	2008 Study[3]	Public Administration	Emission Factor[1]
Newspaper	Newspaper	0%	2.2%	1.3%	5.5%	0.043
Office Paper	White/Colored Ledger Paper + Other Office Paper + Other Miscellaneous Paper	0%	5.4%	4.9%	13%	0.203
Cardboard	Uncoated Corrugated Cardboard + Paper Bags	0%	6.7%	5.2%	5.1%	0.120
Magazine/ Third Class Mail	Magazines and Catalogs + Remainder/ Composite Paper	0%	6.5%	5.9%	15.4%	0.049
Food Scraps	Food	0%	14.6%	15.5%	9.8%	0.078
Grass	Leaves and Grass	30%	2.1%	1.9%	8.05%	0.038
Leaves	Leaves and Grass	40%	2.1%	1.9%	8.05%	0.013
Lumber	Branches and Stumps + Prunings and Trimmings	0%	9.6%	14.5%	0.1%	0.062
Branches	Lumber	30%	2.6%	3.3%	5%	0.062

1 Breakdown from ClearPath Developers via e-mail dated June 19, 2014. Used for all inventory years.

2 2004 Waste Characterization Study for California, Overall Waste Stream. Used for 2005 inventory. Does not total 100% as not all waste is organic.

3 2008 Waste Characterization Study for California, Overall Waste Stream Used for 2007, 2010, 2012 inventories. Does not total 100% as not all waste is organic.

Forecasts

The forecasts are an estimate of what emissions in the City may be in 2020 and 2035. The forecasts were developed using standard methodologies under two scenarios: Business-as-Usual (BAU) and Adjusted BAU. Subregional forecasts represent the summation of each city's forecast.

Business-as-Usual Forecasts

The BAU scenario uses current (2012) consumption patterns and predicted growth in each in the absence of state and federal legislation that would reduce future emissions. The growth assumptions are those estimated by SCAG in their 2012 Regional Transportation Plan and are applied to emissions sectors based on their relevance. For example, future Residential Energy emissions were developed using current energy use per household (from the 2012 inventory) and the anticipated number of households in the future. Table B-16 shows the growth factors used to project emissions in each city.

Table B-16. Emissions Sectors and Demographic Growth Indicators

Sector	Demographic Indicator
Residential Energy	Households
Commercial/ Industrial Energy	Jobs
Solid Waste, Water, Wastewater, Aviation, Off-Road Sources	Service Population (Population + Jobs)
Transportation	Vehicle Miles Traveled, modeled by SCAG
Municipal Jobs	Municipal Emissions[1]

SCAG: Southern California Association of Governments

1 The number of jobs in each city is used as an indicator for all municipal operation emissions except Aviation, which is forecast consistent with the community forecast (by change in service population).

Adjusted Business-as-Usual Forecasts

The Adjusted BAU scenario also uses growth estimates for each city, and accounts for legislation that will reduce emissions in the future, regardless of city or subregional actions. Table B-17 summarizes the legislation that will reduce emissions in the future and which sectors the legislation applies to.

Table B-17. Legislation Applied to Adjusted BAU Forecasts

Legislation	Description	Emissions Sector Affected
Low Carbon Fuel Standard	Reduce carbon intensity of transportation fuels 10% by 2020.	On-road Transportation, Employee Commute, Vehicle Fleet
AB 1493 and Advanced Clean Cars	Implement GHG standards for passenger vehicles, implement zero-emission vehicle program, support clean fuels outlet regulation.	On-road Transportation
California Building Code Title 24	Improved energy efficiency standards for new residential and non-residential construction.	Residential Energy, Non-residential Energy
Renewable Portfolio Standard[1]	Provide 33% of electricity from renewable sources by 2020.	Water
Senate Bill X7-7	Reduce urban per capita water consumption 20% by 2020.	Water

1 Potential GHG reductions from this legislation were not applied to the electricity in SCE's service territory due to the uncertainty in SCE's generation sources after the closure of the San Onofre Nuclear Generating Station.

Low Carbon Fuel Standard, AB 1493, and Advanced Clean Cars

Changes in on-road emissions in Los Angeles County were modeled using EMFAC, which models both the emissions with and without Low Carbon Fuel Standard and Pavley I. Additional modeling was conducted to estimate the change in emissions due to Advanced Clean Cars. The rate of reductions from on-road transportation measures through 2020 was assumed to be 0.0344% per year for gasoline and 0.0106% per year for diesel. After 2020, the rate of reductions was assumed to be 0.03452% per year for gasoline and 0.0251% per year for diesel.

California Building Code Title 24

Title 24 updates will raise the minimum energy efficiency standards for new buildings, thereby decreasing the expected energy consumption of future development in each city. Under the adjusted BAU scenario, it was assumed that the 2013 Title 24 standards that went into effect in 2014 will make new residential and non-residential buildings more efficient than they would be under the 2008 Title 24 standards for new residential buildings. The energy savings were estimated using analyses developed by the California Energy Commission and the applied to the expected new development in each city to 2020 and 2035. The rate of reductions was applied to each city's 2012 energy use (kWh or therms) per household (for Residential energy) or per job (for Commercial energy). Savings were applied to new development anticipated in each city. Detailed energy savings assumptions are below.

Residential

Residential electricity is estimated to be 32.6% lower under the new standards.[6] This percentage savings is relative to heating, cooling, lighting and water heating only and do not include other appliances, outdoor lighting that is not attached to buildings, plug loads, or other energy uses. Electricity consumption due to heating, cooling, lighting, and water heating accounts for 34% of total household electricity use.[7] Therefore, the percentage of total residential electricity that will be reduced as a result of the 2013 Title 24 standards is 11.1%.

Residential natural gas savings were estimated 5.8% lower under the new standards. Again, this percentage savings pertains only to the energy sources affected by Title 24 Standards. Natural gas consumption due to space and water heating accounts for 86% of total household natural gas use.[8] Therefore, the percentage of total residential natural gas that will be reduced as a result of the 2013 Title 24 standards is 5.0%.

Commercial

Commercial Electricity savings were estimated to be 21.8% lower under the new standards. Title 24-related measures would impact 77.2% of total electricity use in commercial buildings[9]; therefore, 16.8% reduction in electricity consumption may be expected in new commercial development.

Natural gas savings were estimated to be 16.8% under the new standards compared to the previous standards. Heating and cooling account for 69.7% of natural gas consumption in commercial facilities;

[6] CEC Impact Analysis, California's 2013 Building Energy Efficiency Standards, July 2013. CEC-400-2013-008.
[7] CEC 2009 California Residential Appliance Saturation Appliance Study, October 2010. CEC-200-2010-004.
[8] CEC 2009 California Residential Appliance Saturation Appliance Study, October 2010. CEC-200-2010-004.
[9] CEC 2006. California Commercial End-Use Survey. March 2006. CEC-400-2006-005.

therefore, 11.7% reduction in natural gas consumption may be expected from 2013 Title 24 standards applied to new commercial development.

Renewable Portfolio Standard

The Renewable Portfolio Standard will be fully implemented in 2020. The level of implementation varies by utility; however, ICLEI estimates that the average statewide level of implementation is 5% per year, compounded annually. As noted in the Report, this reduction is only taken for electricity used in the transport and treatment of water, which moves throughout the State. The reduction is not taken for electricity wholly within SCE's territory.

Senate Bill X7-7

SB X7-7 will be implemented by individual water districts. The cities in the subregion obtain water from several water districts and each water district has its own water conservation goal. The Adjusted BAU emissions include reductions assumed from each district's conservation goal applied to the expected service population. The individual city assumptions are provided in the city-level IFT reports.

Target Setting

There are no requirements for reductions at the subregional level. Recommended reduction targets were provided in the city-level IFT reports and are based on existing California climate change legislation and State guidance relevant to establishing a GHG reduction target. While State goals are based on a 1990 baseline year, the cities and the subregion have a baseline year of 2005. Therefore, the reduction targets are expressed as a percent reduction below 2005 levels. Targets are recommended for 2020 to align with AB 32 and 2035, which is a midpoint between the 2020 goal and the State's long-term 2050 goal. Planning beyond 2035 is considered speculative, as legislation and technology may change significantly before 2050. While it is important for continued reductions well beyond 2035, no local or subregional targets are recommended at this time.

Table B-18 provides a summary of the State's goals and the State's guidance to local governments regarding GHG reduction targets. This guidance applies to both municipal operations and communitywide emissions reductions efforts and were applied to the subregional emissions.

Table B-18. Summary of State Reduction Targets and Guidance on Local Government Targets Aligned with State Targets

	2020	Interim Year Between 2020-2050	2050
State Targets (AB 32 and EO S-3-05)	1990 levels	NA	80% below 1990 levels
State Guidance on Local Government Targets (AB 32) Scoping Plan Recommended Target and Attorney General's Office Guidance	15% below 2005-2008 levels	Demonstrate a trajectory toward statewide 2050 levels (e.g., 49% below 2005 levels by 2035)	NA

Table B-19 demonstrates how the local and subregional targets are aligned with State targets.

Table B-19. Comparison of 1990 Baseline Targets vs. 2005 Baseline Targets

Target Year	Percent below 1990 Emission Levels	Percent below 2005 Emission Levels
2020	0.0%	15.0%
2021	2.7%	17.3%
2022	5.3%	19.5%
2023	8.0%	21.8%
2024	10.7%	24.1%
2025	13.3%	26.3%
2026	16.0%	28.6%
2027	18.7%	30.9%
2028	21.3%	33.1%
2029	24.0%	35.4%
2030	26.7%	37.7%
2031	29.3%	39.9%
2032	32.0%	42.2%
2033	34.7%	44.5%
2034	37.3%	46.7%
2035	40.0%	49.0%